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Terminal ulcers in end-of-life care: a scoping review

Ilaria Saguatti[1*], Romina Baldessarini[1], Dalia Caleffi[1], Domenico Cannizzaro[1] and Paola Ferri[1]

Abstract

Background In the final stage of life, the skin may fail, leading to the development of terminal ulcers. These ulcers are considered unavoidable, since they occur despite all pressure-relieving interventions being implemented and the best quality of care being provided. However, they are often misdiagnosed as pressure injuries, since healthcare professionals are not always adequately prepared for this topic. Thus, effective palliative care and palliative wound care is not provided and prevalence data is missed, despite it being considered a solid indicator of the quality of nursing care. Since the goals of palliative and standard care differ, failing to correctly identify the underlying cause of the ulcer may result in the skin injury being treated inappropriately, and the overall needs of the patient and their family not being accurately addressed. While palliative care settings are probably more accustomed to this type of assessment, recognising and accepting this situation could be more challenging in other clinical settings.
The aim of this work is to summarise the current knowledge regarding terminal ulcers. Specifically, the researchers seek to provide a comprehensive overview of the concept of unavoidability, the terminology employed in relation to terminal ulcers, the diagnostic criteria and assessment tools, the prevention and management of such ulcers, their aetiology, and the understanding clinicians have regarding this topic.

Methods To achieve this goal a scoping review was performed. Following Arksey and O'Malley's framework and Joanna Briggs Institute guidelines, we systematically searched the PubMed, Scopus, CINAHL, Embase, Google Scholar, ProQuest databases, up to March 2025, without time or methodological limitations. The review incorporated studies that explicitly referenced terminal injuries occurring at the end of life, written in English. The study encompasses all patients in all healthcare settings. A narrative synthesis was performed.

Results Twenty-six studies were included in the analysis. The review summarises the huge amount of terminology applied to terminal ulcers and identifies multiple potential aetiologies. Diagnostic criteria were outlined, and considerations regarding the prevention, management, and professional education were discussed. The need for validation of assessment tools and clearer diagnostic criteria was highlighted.

Conclusions This review maps current evidence on terminal ulcers and identifies significant gaps. Future research should focus on healthcare professionals' training, communication skills, and the early recognition and prevention of these lesions to promote dignity in end-of-life care. Nurses are responsible for the proper identification and management of terminal wounds, which raises ethical concerns about the quality of care and the principles of

*Correspondence:
Ilaria Saguatti
i.saguatti@unimore.it

Full list of author information is available at the end of the article

beneficence and non-maleficence. Although correct identification may affect reimbursement, ensuring the best possible care and a dignified end-of-life process remains the priority.

Trial registration The protocol was prospectively registered on the Open Science Framework (January 12, 2026 https//osf.io/d8xr2).

Keywords Scoping review, Palliative care, End-of-life care, Terminal ulcer, End-of-life wound, Palliative wound care, Skin failure

Background

Palliative care is an active and holistic approach that aims to achieve the best quality of life for patients with life-threatening illness and their families or caregivers [1].

Terminology such as "end-of-life", "terminally ill" or "actively dying" denote a particular phase of life in which it is imperative to acknowledge that the individual is still alive, likely afflicted by an illness that is progressively deteriorating and will ultimately result in death. As healthcare professionals, it is imperative that we continue to provide the necessary care to this person.

Since palliative care's goal is to achieve the best quality of life possible for patients facing life-limiting illnesses and their families, skin issues need to be taken into account as they frequently result into symptoms of pruritus, discomfort or pain. These symptoms can not only affect the physical well-being of the patient but also have a substantial impact on their emotional state and that of their family members. Despite knowing that, skin condition at the end of life is often a neglected area [2].

Palliative wound care is recognised as a complex concept, extending beyond the management of unpleasant symptoms and not being limited to the end-of-life period. Both palliative care and palliative wound care can be applied across the whole care continuum: as the first one is suitable even during active cure, the latter is indicated for conditions involving long-standing wounds or wounds due to uncorrected physiological pathologies and it is not strictly limited to end-of-life period. A concept analysis has posited that "prevention" is an important antecedent of the concept of palliative wound care assuming that, while it may not be possible to avoid all the instances of skin breakdown, it should be possible to decrease their severity and to avoid the preventable ones [3].

In the human body, the skin represents the largest and most exposed organ and about 15% of the body weight; one third of the blood supply goes to the skin to permit all its functions, which include body protection, thermal homeostasis, sensory function, endocrine and exocrine functions [4], as well as expression and not-verbal perception.

Any organs of the body may undergo dysfunction at any point in life, but especially during the final stages of life or in the context of acute critical illness. As an organ, skin can fail at the end of life, showing signs and symptoms of dysfunction. The concept of skin as an organ that could fail was first advanced in the early nineties, when it was argued that, if other organs such the heart, lungs or kidneys show signs of failure, it might be possible for the same to be true of the skin. Considering that, why should pressure injuries always been seen as indicator of inadequate care, if symptoms of heart, lungs or kidneys disease are not [5]?

At the end of life, patients may experience different kinds of skin breakdown, some of them are considered avoidable, whilst others are not. According to the National Pressure Ulcer Advisory Panel (NPUAP) consensus conference results, held in 2011, an ulcer is considered avoidable if it develops because carers don't implement at least one of the following parts of the care plan [6]:

- Evaluation of the individual's clinical conditions and assessment of the pressure injury risk factors.
- Definition and implementation of interventions consistent with individual needs and recognized standard of practice.
- Monitoring and evaluation of the impact of the interventions.
- Revision of the intervention, if needed.

If an ulcer develops despite any of the aforementioned elements of the process have been implemented, thus it is possible to say that the ulcer is unavoidable. It's important to note that this also means that the unavoidability of a lesion cannot be predetermined, without evaluating the whole care process [6].

There are more issues concerning how to accurately recognise terminal ulcers, not only because of the complex terminology, but also because they can only be diagnosed after patient's death. Moreover, since the aetiology is not yet fully understood and these ulcers often occur in areas exposed to pressure, they are difficult to distinguish from pressure injuries [7].

The treatment of this condition should be limited to a palliative approach focusing on caring for the individual rather than curing the skin [2]. It has been stated that a proper care plan should be developed according to the

patient's and, when possible, the family's priorities, which may differ from those of the healthcare team [3].

According to Emmons and Lachman (2010), possible goals of the palliative wound management are [3]:

1. Preventing the deterioration of the wound, while achieving its stabilization.
2. Promoting a clean and protected wound environment.
3. Minimizing the risk of infection or sepsis.
4. Managing pain, odour and exudate.
5. Reducing the frequency of dressing changes.
6. Controlling the risk of bleeding.
7. Preventing wound bed and periwound skin from the risk of trauma.
8. Controlling moisture and preventing maceration.
9. Eliminating pruritus.

The plan of care needs to be implemented by a multidisciplinary team, including different professional roles, such as nurses, physician and many others, according to the specific case [3].

Even if skin care is a part of palliative care, it still exists a issue about management of terminal wounds: while pressure ulcers are considered preventable, some of the ulcers that arise at the end of life are unavoidable. In such cases, it should be considered whether to deliver skin care, what to do or what to withdraw from, according to patient's preferences and priorities [8].

Research has indicated that approximately 25% of patients receiving palliative care are affected by pressure ulcers, suggesting that the end-of-life population is more susceptible to the development of pressure injuries compared to the general population [9]. However, the development of these ulcers is not always associated to shortfall in standard of care but in some cases, ulcers occur despite a proper pressure relief therapy, or an appropriate care plan, aligned with patient's wishes [10].

Furthermore, the terminology employed in relation to such ulcers constitutes an additional concern: the literature reveals a necessity to simplify the nomenclature surrounding terminal ulcers, with a view to unifying overlapping concepts and elucidating the relationship between unavoidable pressure injuries and terminal ulcers [11].

In summary, there is a requirement for consistent terminology for this kind of skin ulcer [7] in order to enhance the quality of care for patients and their families: while misdiagnosing a pressure ulcer as a terminal one may result in undertreatment, inaccurate labelling patients with a terminal ulcer may cause emotional distress to patients and families [11], preventing them from receiving adequate treatment.

Aims

The scoping review aims to shed light on the current state of knowledge regarding terminal ulcers, which are frequently overlooked and misclassified as other types of lesions, particularly pressure injuries [12]. Specifically, the researchers want to highlight the issues of definition of the concept of unavoidability, the terminology used in relation to terminal ulcers, the diagnostic criteria and assessment tools, prevention and management, and the aetiology of this type of ulcer, for all patients in all healthcare settings. Moreover, we would like to understand the clinicians' awareness regarding this topic and its repercussions on the quality of care.

Methods

Design

To achieve these goals, a scoping review was chosen as the most suitable methodology, since it helps to map evidence and to clarify main concepts [13]. The protocol was prospectively registered on the Open Science Framework (January 12, 2026; https://osf.io/d8xr2, DOI https://doi.org/10.17605/OSF.IO/SN27E).

The review followed the five-step process described by Arksey and O'Malley framework [14]. First, the research question was identified. Then, relevant studies were found. Next, studies were selected. Then, the data was charted. Finally, the results were collected, summarised and reported.

Moreover, the Preferred Reporting Items for Systematic reviews and Meta-Analysis, extended to Scoping Reviews checklist (PRISMA-ScRs) [15] and the JBI guidelines [16] were used as methodological guides for the structure of this study.

Clarifying the research question

To achieve the goals of this scoping review, the following research questions were identified:

- How can the concept of unavoidability be defined?
- What is the correct terminology regarding terminal ulcers?
- Are there any diagnostic criteria or assessment tools that could help healthcare professionals to recognise this type of skin breakdown?
- Can these injuries be prevented?
- How should they be managed?
- What causes these ulcers?
- How aware are healthcare professionals of terminal ulcers?

Search methods

Following the framework provided by the Joanna Briggs Institute [16], a search strategy as comprehensive as possible was set up, using the three-step search strategy:

1. First of all, only two databases were used (PubMed and CINAHL) in order to identify the most appropriate keywords.
2. Then, the keywords contained in the most significant articles were analysed; a more complete search was carried out across all the included databases based on the newly identified keywords. This step was carried out with the help of a librarian.
3. Lastly, the reference lists the articles included were searched for additional sources.

The search string was created based on the PCC mnemonic (population, concept, context) [16]:

P = Population: patients of any age, afflicted by a life-threatening illness or an end-stage disease, receiving palliative or end-of-life care, who develop unavoidable skin breakdown.

C = Concept: terminal ulcers.

C = Context: any settings.

We systematically searched PubMed, Scopus, CINAHL, Embase, Google Scholar, ProQuest databases, up to March 2025, with no time or methodological limitations. The language included was English. The search terms used were "palliative wound care", "pressure ulcer", "skin ulcer", "terminal ulcer", "Kennedy terminal ulcer", "Trombley-Brennan terminal ulcer". Quotation marks and the Boolean operators AND and OR were used, as shown in Table 1. The reference lists of the identified papers were examined in order to include any other relevant sources.

Table 1 presents the full electronic search strategies for each database used.

Table 1 Search strategies for each database

DATABASE	SEARCH STRATEGY	NUMBER of RECORDS
Scopus	(TITLE-ABS-KEY ("pressure injur*" OR "pressure ulcer*" OR "skin ulcer" OR "terminal ulcer*" OR "kennedy terminal" OR "trombley-brennan" OR "terminal injury" OR "deep injury") AND TITLE-ABS-KEY ("palliative care" OR "terminal care" OR "end of life")) OR TITLE-ABS-KEY ("palliative wound care" OR "palliative wound*" OR "palliative pressure ulcer*")	491
PubMed	(palliative wound care[title/abstract] OR palliative wound*[title] OR palliative pressure ulcer*[title]) OR ((pressure injur*[ti] OR pressure ulcer*[ti] OR skin ulcer[mesh: noexp] OR pressure ulcer[mesh] OR terminal ulcer*[title] OR kennedy[title/abstract] OR trombley-brennan[title/abstract] OR terminal injury[title] OR deep injury[title]) AND (palliative care[mesh] OR terminal care[mesh] OR terminal[title] OR palliative[title] OR end of life[title] OR terminally[title]))	354
CINAHL	("pressure injur*" OR "pressure ulcer*" OR "skin ulcer" OR "terminal ulcer*" OR "kennedy terminal" OR "trombley-brennan" OR "terminal injury" OR "deep injury") AND ("palliative care" OR "terminal care" OR "end of life") OR ("palliative wound care" OR "palliative wound*" OR "palliative pressure ulcer*")	409
Google Scholar	("pressure injury*" OR "pressure ulcer*" OR "skin ulcer" OR "terminal ulcer*" OR "kennedy terminal" OR "trombley-brennan" OR "terminal injury" OR "deep injury") AND ("palliative care" OR "terminal care" OR "end of life") OR ("palliative wound care" OR "palliative wound*" OR "palliative pressure ulcer*")	82
Embase	(("pressure injur*" OR "pressure ulcer*" OR "skin ulcer" OR "terminal ulcer*" OR "kennedy terminal" OR "trombley-brennan" OR "terminal injury" OR "deep injury") AND ("palliative care" OR "terminal care" OR "end of life")):ti, ab, kw OR ((("palliative wound care" OR "palliative wound*" OR "palliative pressure ulcer*")):ti, ab, kw)	351
Proquest Database	(("terminal ulcer*" OR "kennedy terminal" OR "trombley-brennan" OR "terminal injury" OR "deep injury") AND ("palliative care" OR "terminal care" OR "end of life")) OR ("palliative wound care" OR "palliative wound*" OR "palliative pressure ulcer*")	47
Total number of records		1 734

Inclusion and exclusion criteria

Inclusion criteria

Broad inclusion criteria were selected to avoid the losing of important evidence:

- Studies that make explicit reference to terminal injuries that occur at the end of life.
- Studies encompassing individuals of all age groups, cared for in any setting.
- Any methodology.
- No restrictions on the publication period.
- Studies published in English.
- Research papers for which the full text is available.

Exclusion criteria

On the other hand, the following criteria were used not to include a research paper in this scoping review:

- Studies dealing with injuries that arise in the final stages of life different from terminal ulcers, such as fungating malignant wounds.
- Studies published in a language different from English.
- Studies for which the full text cannot be found.

Study selection

Initially identified references ($n = 1\ 734$) were imported into Rayyan, a free software aimed to assist researchers in the first phases of a review. After the duplicate removal, three researchers (D.C., D.C., I.S.) independently screened the titles and abstracts, assigning a rating to each research paper. The researchers found out a consensus about the inclusion, if it was lacking at the beginning, according to the inclusion and exclusion criteria. The selection process has been documented through the PRISMA diagram (Fig. 1).

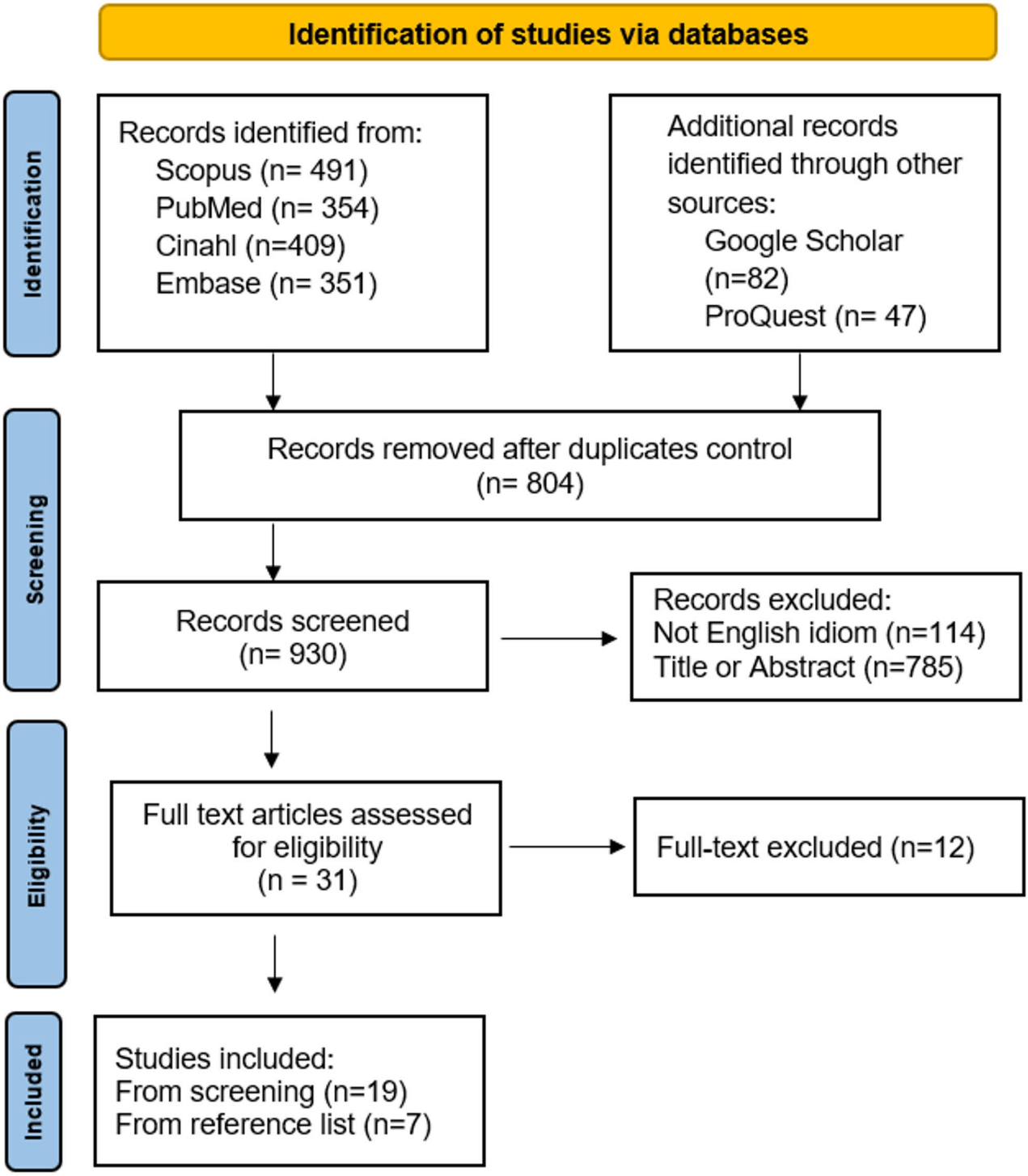

Fig. 1 PRISMA diagram demonstrating selection process [17]

Quality appraisal

A quality appraisal of the included studies was not performed, according to the methodology [16].

Data charting

The research team developed two data-charting tables to collect all the data and summarise the main results of each study included, presented as Tables 2 and 3.

The first table collects the following information, according to the studies included:

- Title of the study, first author and year of publication.
- Methodology used.
- Definition of the concept of unavoidability.
- Terminology regarding terminal ulcers.
- Diagnostic criteria and assessment tools.
- Prevention and management of these ulcers.
- Aetiology or risk factors identified for terminal ulcers.
- Healthcare professional's awareness and education.

To facilitate the process of data extraction in the fourth area, a specific table about terminology was developed. This form was used only for the studies that provided a detailed description of different types of terminal ulcer. In this case, the information collected was as follow:

- Title of the study, first author and year of publication.
- Kennedy Terminal Ulcer (KTU).
- 3:30 Syndrome.
- Trombley-Brennan Terminal Tissue Injury (TB-TTI).
- SCALE.
- Skin Failure.
- Decubitus ominosus.
- Miller pressure equivalent injury (MPEI).

The first author performed the initial data extraction. Other authors verified the data charting approach and that all the process was in line with the aims of the scoping review.

Data synthesis and analysis

The findings were collated and synthesised narratively in relation to the scope of the review.

The data collected have been organised thematically in order to present an effective overview of the studies included [14].

Results

A total of 1 734 sources were initially identified from databases and grey literature.

Following the inclusion and exclusion criteria, 19 studies were included through the screening and 7 were added from reference lists. The total number of studies included in this scoping review is 26.

The process for selecting sources of evidence is described in Fig. 1.

Characteristics of the included studies

The 26 articles included in the scoping review were published between 2009 [18] and 2025 [19, 20].

The methodologies employed in the studies were as follows:

- Case study or case series [19, 21–23].
- Narrative review [7, 24, 25].
- Modified Delphi study [26, 27].
- Retrospective study [20, 28].
- Commentary or editorial or letter to the editor [11, 18, 29–36].
- Continuing education article [29].
- Scoping review [12].
- Integrative review [37].
- Observational study [38].
- Retrospective case-control study [39].

Despite the search strings used, most of the studies focused on Kennedy Terminal Ulcers (KTUs). The studies that focused exclusively on this type of lesion are listed thereafter: [12, 18, 19, 21–23, 25, 30–34, 37, 38].

Of the studies considered, only one focused on pediatric patients [21].

The care settings in which this type of injury has been most frequently studied include palliative care [20, 28], intensive care units (ICU) [19, 21, 38–40] and primary care [22].

The concept of unavoidability for terminal ulcers

The differential diagnosis between avoidable and unavoidable wounds is not merely a matter of words: this classification is the basis on which to plan achievable goals. If an injury is unavoidable, the purpose of completely healing it will probably be unrealistic [37].

Nowadays, there is a broad consensus in literature that terminal ulcers are unavoidable [12, 19, 24, 26], unlike pressure injuries, thus they cannot be prevented even through the best quality of care, and they are not attributable to substandard care [19].

However, this concept deserves further elucidation for at least two reasons: on one side, not all end-of-life patients develop a terminal ulcer but only a proportion of them do so [29]; on the other side, it's not fully clarified how terminal ulcers are different from pressure-related injuries, since both of them commonly occur over bony prominences [11].

Table 2 Summary of the included studies

REF	TITLE, AUTHOR, YEAR	METHODOLOGY	DEFINITION OF THE CONCEPT OF UNAVOIDABILITY	TERMINOLOGY REGARDING TERMINAL ULCERS (See Table 3)	DIAGNOSTIC CRITERIA AND ASSESSMENT TOOLS	PREVENTION AND MANAGEMENT	AETIOLOGY OR RISK FACTORS	AWARENESS AND EDUCATION
19	Ultrasound evaluation of Kennedy terminal ulcer: case study. Tavares Gomes, 2025	Case study	It is important to emphasize that unlike pressure injuries, a KTU cannot be prevented through care, and is considered unavoidable and not attributable to substandard care.	Kennedy Terminal Ulcers (KTUs)	The use of ultrasound as a tool that complements the clinical examination by nurses is an important milestone for documenting this kind of ulcer. The KTU-type injury exhibited a pattern similar to the cobblestone-like appearance.	KTUs are important indicators of imminent mortality, helping to clarify the need for often exclusive palliative care and corroborating the understanding of the exhaustion of therapeutic interventions, avoiding dysthanasia because of therapeutic obstinacy. Nurses involved in this case-study performed the differential diagnosis, informed the family and modified the therapeutic plan from the perspective of palliative care, anticipating death.	For cardiology patients several important factors may contribute to skin failure, such as shock states with macro- and micro-hemodynamic alterations and prolonged use of vasopressors and inotropes that directly affect circulation.	In this case, the healthcare team was led by a wound care nurse in the unit where the KTU was identified. The team has been strengthening ongoing education about skin prevention and wound treatment, significantly increasing the quality of records. These efforts helped to correctly identify the KTU.
7	Reexamining the literature on terminal ulcer, SCALE, skin failure, and unavoidable pressure injuries. Ayello, 2019.	Narrative Review		- Kennedy Terminal Ulcer (KTU) - 3:30 Syndrome - Trombley Brennan Terminal Tissue Injury (TB-TTI) - SCALE - Skin Failure - Decubitus Ominosus - Miller Pressure Equivalent Injuries			*RISK FATCTORS*: . Chronic disease, infections, acute injuries. . Pain is associated with more pressure injuries.	Having multiple terms to describe these phenomena can be confusing and may impede communication among clinicians, especially across disciplines.

Table 2 (continued)

REF	TITLE, AUTHOR, YEAR	METHODOLOGY	DEFINITION OF THE CONCEPT OF UNAVOIDABILITY	TERMINOLOGY REGARDING TERMINAL ULCERS (See Table 3)	DIAGNOSTIC CRITERIA AND ASSESSMENT TOOLS	PREVENTION AND MANAGEMENT	AETIOLOGY OR RISK FACTORS	AWARENESS AND EDUCATION
26	Development of a wound assessment tool for use in adults at end of life: a modified Delphi study. Latimer, 2023.	Modified Delphi study	Terminal ulcers (TUs), which include KTU and TB-TTI, are considered unavoidable injuries associated with dying.	TU are pear-, horseshoe- or butterfly-shaped red, black or maroon skin ulcers that quickly develop in the absence of external pressure on the buttock, sacrum, spine and extremities. TU can develop in a matter of hours from intact skin to a deep wound. TU often develop in months, weeks, days or hours before death.	A panel of international wound experts developed an "End of Life Wound Assessment Tool".			
28	Prelude to death or practice failure? Trombley-Brennan terminal tissue injury update. Brennan, 2019.	Retrospective study		- KTU - TB-TTI - SCALE		TREATMENT: TB-TTIs, as a prognosticator of death, will allow clinician to make necessary changes in the plan of care and discontinue aggressive interventions and testing, while shifting curative care to comfort care.	TB-TTIs are not related to pressure.	
27	SCALE: Skin Changes at Life's End: Final Consensus Statement: October 1, 2009 Sibbald, 2010	Modified Delphi method	At the end of life, failure of the homeostatic mechanisms that support the skin can occur, resulting in a diminished reserve to handle insults such as minimal pressure. Therefore, contrary to popular myth, not all PIs are avoidable.	- KTU - SCALE - Skin Failure - Decubitus ominosus		. Charting by exception is an appropriate method of documentation . SCALE statement describes 5 P's for determining appropriate intervention strategies	The body may react to crisis conditions by shunting blood away from the skin to these vital organs, resulting in decreased skin and soft-tissue perfusion, and a reduction of the normal cutaneous metabolic processes. Diminished tissue perfusion is the most significant risk factor for SCALE.	The panel concluded that healthcare practitioners' current comprehension of skin changes that can occur at life's end is limited. Healthcare professionals need to facilitate communication and collaboration across care settings and disciplines; organizations need to prepare staff to identify and manage SCALE.

Table 2 (continued)

REF	TITLE, AUTHOR, YEAR	METHODOLOGY	DEFINITION OF THE CONCEPT OF UNAVOIDABILITY	TERMINOLOGY REGARDING TERMINAL ULCERS (See Table 3)	DIAGNOSTIC CRITERIA AND ASSESSMENT TOOLS	PREVENTION AND MANAGEMENT	AETIOLOGY OR RISK FACTORS	AWARENESS AND EDUCATION
20	Use of electronic health records to identify factors related to skin changes in terminal patients. Chan, 2025	Retrospective study		- KTU – 3:30 Syndrome - TB-TTI Skin color changes are indicative of the degree of skin ischemia.	Despite the frequent occurrence of terminal ulcers on bony prominences, the literature is inconclusive whether terminal ulcer vary from pressure related injuries, which complicates the precise diagnosis and treatment of these conditions. **PREDICTORS OF SCALE**: . Elevated ECOG grades (ECOG (Eastern Cooperative Oncology Group) grade, also known as ECOG performance status (PS), is a scale used to assess how a patient's disease affects their daily functioning and physical ability. It ranges from 0 to 5, with 0 indicating full activity and 5 indicating death) . Higher CCI scores (Charlson Comorbidity Index, indicative of greater comorbility burden) . Decreased Braden scale, particularly before death. . The incidence of SCALE increased with age.	**GOALS OF CARE**: . Maximize patient's comfort and ensuring a dignified dying process. . . Conservative management of the wound, even if preventing all instances of skin breakdown might not be achievable. . Regular repositioning, effective moisture management, adequate nutrition, management of the underlying condition. . Pain management. . Document meticulously all interventions, providing evidence of the quality of care administered. . Communication with family member.	The vulnerability of the skin results from inadequate blood perfusion in the skin and subcutaneous tissue, often accompanied by severe dysfunction or failure of other organ systems. SCALE doesn't stem from external pressures or shear stress, but from intrinsic factors.	
11	Unavoidable pressure injuries, terminal ulceration and skin failure: in search of a unifying classification system. Levine, 2017	Commentary	The literature is unclear as to whether "terminal ulcers" are different from pressure-related injuries, even though they commonly appear over bony prominences.	- Skin Failure			HYPOTESIS: . Destructive pathways that share commonalities with other organs system failure, such as inflammation or fibrosis. . Genetic factors that underlie vascular responses to ischemia.	Many conditions associated with unavoidable pressure injuries are present in patients in intensive care. Despite this, few intensivists would accept the terminology "terminal ulcer".

Table 2 (continued)

REF	TITLE, AUTHOR, YEAR	METHODOLOGY	DEFINITION OF THE CONCEPT OF UNAVOIDABILITY	TERMINOLOGY REGARDING TERMINAL ULCERS (See Table 3)	DIAGNOSTIC CRITERIA AND ASSESSMENT TOOLS	PREVENTION AND MANAGEMENT	AETIOLOGY OR RISK FACTORS	AWARENESS AND EDUCATION
36	Skin failure in patients with a terminal illness. Julian, 2020	Continuing -Education Article	The patient who's terminally ill and entering the final stage of the dying process is at the greatest risk for developing skin breakdown. Pressure injuries that occur in the pre-active or active phases of dying are considered terminal injuries, with unavoidable nature.	- Kennedy Terminal Ulcer (KTU) - 3:30 Syndrome - Trombley Brennan Terminal Tissue Injury (TB-TTI) - SCALE - Skin Failure	There are no specific biomarkers, as with other organs, to determine whether skin is compromised. Diagnosis is also complicated by the fact that both a pressure injury and skin failure can happen simultaneously.	. The SCALE statement also recommends a 5 Ps approach to treatment . The treatment plan may differ as goals shift from complete wound healing to providing the patient with the best quality of life. . Controlling exudate and odor, minimizing pain, environment free of moisture . Frequent repositioning must be weighed against the potential for inflicting unnecessary pain. . Providing counseling and education so families have realistic expectations for wound healing.		
24	Skin changes at life's end: SCALE ulcer or pressure ulcer? Beldon, 2011.	Narrative review	Pressure damage at the end of life may be inevitable in some individuals.	- SCALE - Skin Failure - Decubitus ominosus	The ability of predict which patients may develop a pressure ulcer or a SCALE ulcer is currently not possible.	**TREATMENT**: . Plan of care and documentation . Pressure-relieving support surface: not all patients find these surfaces comfortable because they may exacerbate pain, contribute towards nausea and restrict the ability of independent movement. . Total skin assessment performed regularly . Sought advice from an identified expert . Palliation of symptoms, preservation of skin, respect of patient wishes . Education for patient and family	**Hypoperfusion**: at the end of life the patient may be unable to maintain blood pressure sufficiently to adequately perfuse the extremities and the skin.	

Table 2 (continued)

REF	TITLE, AUTHOR, YEAR	METHODOLOGY	DEFINITION OF THE CONCEPT OF UNAVOIDABILITY	TERMINOLOGY REGARDING TERMINAL ULCERS (See Table 3)	DIAGNOSTIC CRITERIA AND ASSESSMENT TOOLS	PREVENTION AND MANAGEMENT	AETIOLOGY OR RISK FACTORS	AWARENESS AND EDUCATION
40	Pressure ulcers at the end of life. Elbourne, 2022	Editorial		Lesions appear suddenly and rapidly deteriorate from a superficial ulcer to a category 3 or 4. These ulcers can have a blush or purple color and can look like dirt or fecal remains. Bilateral presentation can cause confusion between SCALE and MASD (moisture associated skin damage), if the patient has incontinence. Lesions may begin as numerous superficial spots and then become a larger lesion in a matter of hours.		**GOAL OF CARE**: wound management and good quality of life, rather than wound healing. Discuss wound management plan with patients and their families. Discuss the necessity for repositioning, so as to establish the best possible treatment for the individual's end of life care.	The main difference between SCALEs and pressure injuries is in etiology: SCALEs are often unavoidable and a result of multiorgan failure. Vasopressor medication may be related to the development of SCALE. PATIENTS AT RISK: those with respiratory, renal, circulatory insufficiency, hypoalbuminemia, hypoxemia, or insufficiency of two or more organs. Hypoperfusion Alteration of elimination of toxic metabolites Decreased defensive capacity of the skin Loss weight, loss appetite, cachexia, poor nutrition, reduced mobility, low albumin levels.	
29	End-of-life wounds and pressure injuries in dying adults: distinguishing the difference. Latimer, 2022	Editorial	End-of-life (EOL) wounds only occur in some patients who can develop pressure injuries as well.	EOL wounds occur on the buttocks, sacrum, extremities and spine. They appear as pear- horseshoe- or butterfly- shaped injuries, red, black or maroon, with the skin intact or ulcerated. They develop suddenly, in days, weeks or months before a person's death, and they rapidly progress from a Stage 1 to a Stage 4 in several hours.		**MANAGEMENT**: Exudate containment Pain management Educate patient and families about the imminent nature of death	Hypoperfusion and multi-organ system failure are thought to be contributing factors. End-of-life wound may develop in absence of pressure.	Clinician's limited awareness of EOL wounds results in their misclassification and reporting as PIs.

Table 2 (continued)

REF	TITLE, AUTHOR, YEAR	METHODOLOGY	DEFINITION OF THE CONCEPT OF UNAVOIDABILITY	TERMINOLOGY REGARDING TERMINAL ULCERS (See Table 3)	DIAGNOSTIC CRITERIA AND ASSESSMENT TOOLS	PREVENTION AND MANAGEMENT	AETIOLOGY OR RISK FACTORS	AWARENESS AND EDUCATION
12	Kennedy terminal ulcer: a scoping review. Latimer, 2019	Scoping review		- Kennedy Terminal Ulcer (KTU) - 3:30 Syndrome - Trombley Brennan Terminal Tissue Injury - SCALE - Skin Failure - Decubitus Ominosus - Miller Pressure Equivalent Injuries	Assessing and staging KTU is difficult because of the lack of assessment tools.	Treatment requires combined approach of palliative care, pressure relieving skin care, advanced wound management, wound exudate and odor management, family and staff education and counselling. Consultation with specialist wound nurses, physicians and allied health care professionals is the first step for KTU management. Educating families about possible unavailable skin changes Setting realistic wound management goals Maintaining patient's comfort and dignity		Assessing and staging KTU is difficult because of the low rate of KTU awareness among clinicians. It is recommended that only advanced clinical specialists undertake this assessment. It is vital to arise clinician's awareness of the unavoidable nature of KTU so that realistic wound care expectations will be set. Clinicians often feel ill-prepared to have an open discussion with patients about their impelling death: educating clinicians about KTU will help them to support dying patients and their families.

Table 2 (continued)

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37	Kennedy terminal ulcer and other skin wounds at the end of life: an integrative review. Roca-Biosca, 2021	Integrative review	An unavoidable pressure injury is one that develops even if the caregiver has: evaluated the patient's clinical condition and PI risk factors; defined and implemented interventions that are consistent with the patient's needs and goals and with recognized practice standards; monitored and evaluated the impact of interventions; revised these approaches as appropriate.	- KTU - TB-TTI - SCALE - Skin Failure	There are no clinical studies or validated algorithms that allow us to determine which PUs are unavoidable.	1 Periodic monitoring and recording skin changes, in order to prevent greater deterioration 2 Prioritizing palliative care: manage symptoms, comfort and well-being 3 Wound pain management, infection prevention, avoiding perilesional maceration 4 Non aggressive care plan that seeks the welfare and comfort of patient and family 5 Emotional assistance and support to patient and family	The main hypothesis is that KTU and TB-TTI are caused by skin failure or skin death. The skin failure is caused by a decrease of blood flow (hypoperfusion) and hypoxemia, produced by multiple organ failure. OTHER FACTORS THAT COULD INFLUENCE: 1 Pressure and rubbing 2 Vasopressor medication 3 Alteration in the elimination of toxic metabolites 4 Decreased defensive capacity of the skin 5 Low weight, loss of appetite, cachexia, reduced mobility, poor nutrition, low albumin levels. 6 Respiratory, renal or circulatory insufficiency, hypoalbuminemia, hypoxemia, or insufficiency of two or more organs. We are not evaluating wounds but people, so contextual elements, like the patient health status and the context of appearance, are essential for a proper differential diagnosis.	It is possible that professionals' ignorance means that this pathological entity is underdiagnosed in settings different from palliative care or long stay units.

Table 2 (continued)

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30	Kennedy terminal ulcers and Trombley Brennan terminal tissue injuries: mistery solved? Melnychuck, 2024	Hypothesis from experts		Most terminal skin changes occur in the sacral, coccygeal and gluteal areas; fewer report have described them on the lower extremities, spine or ribs. Some don't ulcerate. Some have been observed in children on vasoactive agents. These lesions have been observed both in areas under pressure and in areas without any external pressure (e.g., anterior legs) Some are symmetrical, but unilateral lesion have also been seen. Terminal skin lesions have various degree of epidermolysis with transient blistering. - KTU - TB-TTI - Decubitus ominosus			Terminal ulceration develop due to hypoperfusion of tissues in the final stages of life. Everyone develops hypoperfusion before death but not everyone develops terminal skin changes. POSSIBLE CONTRIBUTING FACTORS: 1 Use of vasoactive agents 2 Hypotension 3 External pressure 3 Anatomic arterial aberrancies 4 Reperfusion injury in cases of recurrent hypotension	Incidence has not been well established. Some ulceration may be unrecognized and some terminal ulcers may be mistaken for PIs.

Table 2 (continued)

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18	Understanding the Kennedy Terminal Ulcer. Kennedy-Evans, 2009	Editorial		Shaped like a pear, a butterfly or a horseshoe, usually on the coccyx or sacrum but can appear in other areas, had the color of red, yellow and black, had a sudden onset, and death was imminent. The edges are usually irregular and may develop rapidly to a Stage II, III or IV ulcer. KTU is a subset of pressure ulcers.				
38	Early skin temperature characteristics of the Kennedy lesion (Kennedy terminal ulcer). Kennedy-Evans, 2023.	Observational study		- KTU (Kennedy lesion) - TB-TTI	Early skin temperature of the KL, occurring within 24 h of a newly identified area of discoloration. Abnormal if Relative Temperature Differential (RTD) is > +1.2 °C or <−1.2 °C. There's a lack of skin temperature change in several patient with KLs, which contrasts with the majority of the studies examining skin temperature changes of PIs.		**RISK FACTORS** for skin failure and thus for KL are: . Multiple organ disfunction . Hypotension . Use of vasopressor . Use of mechanical ventilation . Co-morbid conditions (cardio-vascular disease, smoking, pneumonia, sepsis…) . Abnormal white cell counts . Malnutrition, low albumin levels . Immobility . Aging, that is associated with altered immune responses and changes in vascular structure	

Table 2 (continued)

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25	Avoidable & Inevitable? Skin Failure: the Kennedy Terminal Lesion. Lepak, 2012.	Narrative review	Not all PIs are preventable, especially those at the end-of-life.	- KTU - Decubitus ominosus		**TREATMENT**: . Pain control . Odor, infection and drainage control . Palliative wound care: the primary goal should shift to symptoms and psychological management.	During the physiological process of dying, the body shunts blood from the periphery to maintain vital organs making it more difficult to prevent external stresses from damaging the integumentary.	
31	Kennedy Terminal Ulcer #383. Bateman, 2019.	Expert opinion		- KTU - 3:30 Syndrome - Skin Failure		**PREVENTION**: similar to the one for pressure ulcers. **MANAGEMENT**: . Similar to any pressure ulcers but with few unique elements . Emotional support and KTU counselling for caregivers . Individual judgement to determine the need for repositioning in dying patients . Premedicating with an as needed analgesic before repositioning . Involve more than one person to assist with the repositioning . Use of pressure-relieving surfaces in order to reduce pain . Manage odor with proper dressing (metronidazole or charcoal) Need for clear documentation.		

Table 2 (continued)

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21	Pediatric Kennedy Terminal Ulcer. Reitz, 2016.	Case study		KTU most commonly presents as a dark red and pear-shaped with irregular borders on the coccyx, but it may also be yellow or black and may be found in other locations. It progresses dramatically within hours to 2 weeks preceding a patient's death. It develops rapidly in size and depth; it may appear as an abrasion or blister and can progress to a stage III or IV ulcer.	Underrecognized phenomenon in children KTU is in fact distinct from PIs: identifying this difference can have a potential impact on reimbursement.	**Prevention**: KTU develops despite use of preventive measures. Strategies to mitigate risks include: 1 Optimizing nutritional support 2 Using appropriate pressure redistribution surfaces 3 Moisture management 4 Frequent repositioning **Treatment in paediatric ICU**: 1 Optimize peripheral oxygen and substrate delivery 2 Mantaining skin's acid mantle 3 Optimize child's nutrition 4 The underlying cause of organ failure should be treated rather than using pressure redistribution. **Set appropriate goals**: 1 Controlling pain 2 Preventing infections 3 Managing any drainage to prevent maceration of the peri-wound skin.	KTU originates from skin failure rather than from pressure or shearing (PUs). It occurs when skin, like other organ systems, exhibits increasing signs of dysfunction. **Intrinsic factors**: 1 hypoperfusion and ischemia, associated with multiorgan failure **Risk factors are**: 1. Multiple organ failure 2. Vasopressor medications 3. Respiratory failure, diabetes mellitus, hypoalbuminemia, hypoxemia, renal disease, failure of two or more organs beside the skin. **Factors that contribute are**: 1 Use of vasopressors 2 Use of cooling mattress 3 Anemia, malnutrition, immobility	The pediatric nurse practitioner can help the team about the pathophysiology of the KTU and lead discussions about the treatment plan.
22	Nursing care plan for the Kennedy terminal ulcer patient. Case report. Alarcón-Alfonso, 2022.	Case report			There are no unified diagnostic criteria so information on the aetiology and pathophysiology is incomplete. The differential diagnosis of KTU is difficult because of its similarities to Pus.	Priority given to patient comfort and pain control, odor management, preventing new ulcers, avoid complications, helping the family to cope with the situation. Individualized care plan. Emotional support and counselling for patient and family. **Prevention**: strategy similar to that of PUs is recommended.		1 Lack of training of healthcare professionals in ulcers other than PUs. 2 The use of different terms (KTU, TBTL…) is confusing as they are very similar concepts.

Table 2 (continued)

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23	Kennedy's terminal ulcer and pressure injury: two different aspects of medical liability related to the same injury. Garcea, 2023.	Case series		- KTU		Medical competence: palliative therapy for local and systemic pain. Nursing competence: nurses are responsible for the correct management of lesions and treatments, together with possible complications. A correct diagnosis of a terminal lesion doesn't fully protect against convictions because in lawsuits it is necessary to provide proper evidence for every single choice, even that of reducing mobilizations to avoid unless pain. An informed consent, possibly signed by the patient, is a necessary safeguard.		
32	The Death of the Kennedy Terminal Ulcer. Miller, 2016.	Expert opinion		KTU describes a rapid progression of a pressure-based tissue injury or itself is an indicator of terminal status. They propose the concept of Miller Pressure Equivalent Injuries (MPEI). - KTU - Miller Pressure Equivalent Injuries			The presumption that a terminal condition alone will result in a pressure-based tissue injury, despite appropriate care, is not a viable consideration because: **1** Systemic diseases have an equal effect on all body tissues **2** If a turning schedule is utilized, pressure, friction and shear would have the same effect on all the body, so why just one specific area is affected by KTU?	

Table 2 (continued)

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33	Poly Ulceration Patient Terminal: Kennedy Terminal Ulcer (KTU). Sarabia-Cobo, 2017.	Expert opinion		1983: Karen Lou Kennedy coined the term KTU; 1989: first description at NPUAP. Sudden appearance of multiple PIs in elderly patients may be indicative of closeness to death Unavoidable skin breakdown which occurs in some patients as part of the dying process. Occurs not long before the death. **5 main characteristics**: 1 Located in sacrococcygeal area 2 Appears as a discoloration of the skin, in the shape of a butterfly or pear 3 It's purple, red, blue or black 4 Sudden onsets, sometimes referred to as 3:30 syndrome 5 Irregular borders		1 Differentiate KTU from PIs in order to provide optimal care to patient and family. 2 Don't abandon the goal of avoiding the emergence of new PIs or not aggravate existing. 3 The treatment of ulcers prioritizes comfort 4 Assess the desirability of postural changes for each patient 5 Involvement of caregivers 6 Relieve pain and the smell of wound	A KTU occurs when the body's vascular system is no longer reliable to adequately perfuse the skin.	

Table 2 (continued)

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34	The Kennedy Terminal Ulcer – Alive and Well Schank, 2016.	Letter to the editor	Unavoidable skin breakdown which occurs in some patients as part of the dying process.	- KTU - Decubitus ominosus			Still unknown. It has been suggested that there may be an element of pressure: in the dying patient, the least amount of pressure might result in a major ulceration. KTU appears to be a part of a multiorgan system failure and end-stage disease.	
35	Pressure ulcers at the end of life. Mitchell, 2022.	Clinical comment		- KTU - Decubitus ominosus - SCALE - Skin failure		SKIN ASSESSMENT IN END-OF-LIFE-PATIENT: Assessment of skin integrity over bony prominences Assessment of uncommon locations Color changes or discoloration Disparities in heat, firmness and moisture Finger palpation to ascertain if erythema or discoloration is blanchable and reassessment of risk and preventative actions are recommended. MANAGEMENT . Provide the best quality of life for patients and their families . Advanced care planning discussions. . Respect of family expectations . Respect of patients' cultural preferences . When the duration of pressure cannot be reduced, the appropriate mattress must be used to reduce the intensity	Vasopressor medications administered at the end of life for certain diseases that divert blood flow to other vital organs may also be related to the development of SCALE. Patients at the greatest risk of SCALE and end-of-life ulcers are those with respiratory, renal or circulatory insufficiency, hypoalbuminemia, hypoxemia or insufficiency of two or more organs. Further risk factors are: hypoperfusion, alteration of the elimination of toxic metabolites, decreased defensive capacity of the skin, low weight, loss of appetite and cachexia, inadequate or poor nutrition, reduced mobility and low albumin levels.	

Table 2 (continued)

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						. Body image should be discussed with the patient . Manage odor, infection, per-wound skin conditions . The peri-wound skin should be assessed for color and temperature . Management of pain, use of prophylactic dressing.		
39	Skin Failure Clinical Indicator Scale: Proposal of a Tool for Distinguishing Skin Failure From a Pressure Injury. Hill, 2020.	Retrospective case control study		Skin failure is a concept that include multiple similar phenomena described in the literature, as KTY, TB-TTI, SCALE.	No validated assessment tools or clinical indicators are available that can assist in determining aetiology or providing a more definitive diagnosis of skin failure. Currently, discernment of wound etiology is heavily reliant on visual analysis and patient history.		Risk factors: . Age, Braden score and BMI were not significant predictor of skin failure . Serum albumin level less than 3.5 g/dl . Impaired blood flow . Sepsis or multiorgan dysfunction syndrome . Vasopressor – inotrope use . Mechanical ventilation	

Table 3 Terminology related to terminal ulcers

	TITLE, AUTHOR, YEAR	Kennedy Terminal Ulcer KTU	3:30 Syndrome	Trombley Brennan Terminal Tissue Injury TB-TTI	SCALE	Skin Failure	Decubitus Ominosus	Miller Pressure Equivalent Injuries (MPEI)
19	Ultrasound evaluation of Kennedy terminal ulcer: case study. Tavares Gomes, 2025	KTUs commonly occur in the sacral and gluteal regions, and have a pear, butterfly or horseshoe shape with irregular borders that appear suddenly with rapid and progressive deterioration. It was documented as a hyperchromic purpuric lesion with irregular borders in the left gluteal region. KTU were first reported by Karen Kennedy in 1983, in an intermediate care unit at the Byron Health Center in the US.						
7	Reexamining the literature on terminal ulcer, SCALE, skin failure, and unavoidable pressure injuries. Ayello, 2019.	Definition: "a pressure ulcer that some people develop as they are dying". The literature is not clear as so whether KTU should be considered a PI or a separate skin problem that also occur over a bony prominence. Different from a PI because it is attributable to hypoperfusion (local ischemia) of the skin, rather than the pressure.	A variant of KTU Life expectancy: from 8 to 24 h.	These lesions could be confused with a DTI. The median time from identification of the injury until death was 36 h. The 75% of patients died within 72 h of the first identification of these skin changes.	There are degrees of skin impact during the dying process and not everyone with SCALE has skin failure. Not all patients with SCALE necessarily have multi-organ failure: more research is needed to determine which diagnostic criteria should be used to document the severity and the extent of skin (as an organ) failure.	Definition provided by Langemo (2006): "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". Three types of SF are described: ACUTE: with an acute illness. There are no clear-cut diagnostic criteria for Acute Skin Failure (there are predictors, e.g. Peripheral arterial disease, mechanical ventilation for more than 72 h, respiratory failure, liver failure, sever sepsis or septic shock). CHRONIC: concurrently with a chronic condition END STAGE: with an end-of-life issue	Jean Martin Charcot recognized some kind of ulcers that occurred at the end of life that used to precede death.	Miller introduced the idea that systemic physiologic effect and local stressor, rather than just terminal status, may explain this status. There's not a unique consensus on Miller's assumptions.

Table 3 (continued)

	TITLE, AUTHOR, YEAR	Kennedy Terminal Ulcer KTU	3:30 Syndrome	Trombley Brennan Terminal Tissue Injury TB-TTI	SCALE	Skin Failure	Decubitus Ominosus	Miller Pressure Equivalent Injuries (MPEI)
						Definition provided by Levine (2017): "the 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 buildup of toxic metabolic byproducts". Levine uses Skin Failure as a unifying concept that encompasses broader etiologies, including pressure ulcers, KTU, TB-TTI, SCALE and so on. Pressure is not a necessary component of skin failure.		
28	Prelude to death or practice failure? Trombley-Brennan terminal tissue injury update. Brennan, 2019.	Reported in 1989. KTU were described as an indicator of potential death in 6 to 8 weeks, caused by shunting the blood away from the skin to other organs, during the dying process. KTUs are considered as end stage skin failure: "a subgroup of pressure injury that may develop during the dying process"; typical measures to prevent occurrence or progression of these pressure injuries failed. They appear as full-thickness wounds. Pear shaped wounds, usually located on the sacrum, rapidly change in size and depth.		Considered as Skin Failure at End of life. Originally classified as pressure injury or DTI. The skin remains intact, with purple reddish discoloration. Seen in patients ranging from 35 to 95 years old. The interval between the occurrence of the wound and the death was from 20 min to several days. Despite preventive measures, these lesions never progress to open wounds or wound presenting nonviable tissue.		SF is an event in which the skin and underlying tissue die due to hypoperfusion that occurs concurrently to severe dysfunction or failure of other organ systems. Skin Failure is classified as ACUTE (associated with critical illness), CHRONIC (associated with chronic disease) and END STAGE (associated with end-of-life).		

Table 3 (continued)

	TITLE, AUTHOR, YEAR	Kennedy Terminal Ulcer KTU	3:30 Syndrome	Trombley Brennan Terminal Tissue Injury TB-TTI	SCALE	Skin Failure	Decubitus Ominosus	Miller Pressure Equivalent Injuries (MPEI)
				They may show a linear presentation occurring on the extremities and butterfly shapes on the sacrum. Different from KTU and DTI for the evolution (doesn't evolve as a PI and doesn't resolve after its appearance) and the surface area. TB-TTI is a unique, unavoidable, irreversible phenomenon occurring at the end of life.				
27	SCALE: Skin Changes at Life's End: Final Consensus Statement: October 1, 2009. Sibbald, 2010	1989: KTU as a specific subgroup of PIs that some individuals develop as they are dying. They are usually shaped like a pear, butterfly, or horseshoe and are located predominantly on the coccyx or sacrum (but have been reported in other anatomical areas). The ulcers are a variety of colors, including red, yellow, or black; are sudden in onset; typically deteriorate rapidly; and usually indicate that death is imminent.			SCALE is a mnemonic used to describe a group of clinical phenomena and should not be confused with a risk assessment tool	In 2003, Langemo proposed a working definition of skin failure such as the result of hypoperfusion, creating an extreme inflammatory reaction concomitant with severe dysfunction or failure of multiple organ systems. Although the term skin failure has been introduced, it is not currently a widely accepted term in the dermatologic or the wound literature.	In 1877, Charcot described a specific type of ulcer that is butterfly-shaped and occurred over the sacrum. Charcot's writings of decubitus ominosus were basically forgotten in the medical literature until recently with renewed interest in skin organ compromise.	
20	Use of electronic health records to identify factors related to skin changes in terminal patients. Chan, 2025	The term was conied in 1989. Clinical features of PIs, as sacrococcygeal or butterfly-shaped lesions with irregular borders that exhibit varying colors, were identified.	Characterized by discoloration expansion irrespective of pressure relief measures.	Notion introduced in 2012. It delineates a rapid alteration in skin conditions among terminal patients, even in noncompressed skin.				

Table 3 (continued)

	TITLE, AUTHOR, YEAR	Kennedy Terminal Ulcer KTU	3:30 Syndrome	Trombley Brennan Terminal Tissue Injury TB-TTI	SCALE	Skin Failure	Decubitus Ominosus	Miller Pressure Equivalent Injuries (MPEI)
11	Unavoidable pressure injuries, terminal ulceration and skin failure: in search of a unifying classification system. Levine, 2017					Skin Failure The state in which tissue tolerance is so compromised that cells can no longer survive in zones of physiologic impairment such as hypoxia, local mechanical stress, impaired delivery of nutrients, and buildup of toxic metabolic byproducts. Skin failure is a unifying concept.		
36	Skin failure in patients with a terminal illness. Julian, 2020	A KTU presents on the sacrum as an irregularly shaped wound (like a butterfly or pear) that may be red, yellow, black, or purple. One of the most distinguishing features of a KTU is how quickly it can appear. It's also much larger at the onset than other pressure injuries, initially beginning very superficially and rapidly progressing. There are five key characteristics to differentiate between a pressure injury and a KTU. A KTU is usually: • shaped like a butterfly or pear and contains irregular borders • located bilaterally on the coccyx or sacrum • initially erythematous and/or purpuric • sudden in development • noted within 2 weeks to several months before a patient's death. Pressure is a contributing factor, with other physiologic changes such as hypoperfusion possibly potentiating the effects of pressure.	A variation of the KTU, which develops more rapidly than a KTU and may initially appear as small black specks on the patient's skin. Gets its name from a nurse's description of the spots appearing between completion of the morning assessment and when skin is assessed later in the afternoon. 3:30 syndrome is significant because many patients who develop it have a very short life expectancy, approximately 8 to 24 h.	The TB-TTI presents as a pink, purple, or maroon discoloration of the skin that remains intact and shouldn't be confused with a suspected deep tissue injury. The TB-TTI can occur in areas not considered to be pressure points and may appear as linear striations. The TB-TTI is a unique, irreversible phenomenon associated with end-of-life organ failure and can be predictive of impending death. Some research has shown that death occurs within 72 h of a patient developing a TB-TTI.	SCALE encompasses a range of alterations that can occur at the end of life, including cancer wounds, deep tissue injuries, gangrene, ischemic wounds, pressure injuries, skin tears, KTUs, and inflammatory and infectious wounds. This statement was the product of a panel of experts who met in 2008 with the purpose of clarifying what was known about skin breakdown in patients with a terminal illness. Although the SCALE statement does agree that skin integrity is impacted by exposure to moisture, irritants,	The process in which skin, as an organ, can fail in the same way other organs in the body can fail. The skin receives up to one-third of the body's circulating blood volume, and it's believed that skin failure happens as blood is shunted away from the peripheral tissue to the vital organs. Skin failure is associated with multi organ failure and end-stage illness and can occur despite the provision of quality skin care. Skin failure may be acute, chronic or End-stage. The latter happens in the final days or weeks of life, with skin breakdown occurring rapidly within days or even hours.		

Table 3 (continued)

	TITLE, AUTHOR, YEAR	Kennedy Terminal Ulcer KTU	3:30 Syndrome	Trombley Brennan Terminal Tissue Injury TB-TTI	SCALE	Skin Failure	Decubitus Ominosus	Miller Pressure Equivalent Injuries (MPEI)
					friction, and shear, it also recognizes that skin changes occur as the result of decreased tissue perfusion, impaired skin oxygenation, mottling, and decreased skin temperature.			
24	Skin changes at life's end: SCALE ulcer or pressure ulcer? Beldon, 2011.	1989 – investigation started in 1983.			"Physiologic changes that occur as a result of the dying process may affect the skin and the soft tissues and may manifest as observable changes in skin color, turgor, or integrity, or as a subjective symptoms such as localized pain. These changes can be unavoidable and may occur with the application of appropriate interventions that meet or exceed the standard of care" Signs and symptoms of SCALE: . Muscle weakness and mobility impairment . Loss of appetite, loss of weight, sarcopenia, dehydration . Reduced skin perfusion	**Acute skin failure**: related to acute illness. When multiorgan failure occurs, the body protects the vital organs shunting blood to these organs and depriving extremities and skin. Hypoperfusion may also occur in chronic conditions	In 1877 Charcot described a specific butterfly-shaped lesion which appeared on the buttocks of dying patients shortly before dying.	

Table 3 (continued)

	TITLE, AUTHOR, YEAR	Kennedy Terminal Ulcer KTU	3:30 Syndrome	Trombley Brennan Terminal Tissue Injury TB-TTI	SCALE	Skin Failure	Decubitus Ominosus	Miller Pressure Equivalent Injuries (MPEI)
					. Loss of skin integrity (due to incontinence, devices…) . Reduced immunity, leading to an increased risk of infection . Loss of vascular supply to extremities			
12	Kennedy terminal ulcer: a scoping review. Latimer, 2019	1989 KTUs, before named Kennedy terminal lesion, are a subset of pressure injuries. Two possible presentations: unilateral and bilateral. Bilateral: butterfly- horseshoe- or pear-shaped with irregular margins. The lesion usually appears on the patient's sacrum or coccyx, 2 weeks to several months prior to death. Unilateral: 3.30 syndrome. Unavoidable Etiology unknown: however, it is theorized that it is due to hypoperfusion and multisystem failure. Underrecognized in the pediatric population	The unilateral presentation of KTU is known as 3:30 syndrome. Macular lesion of less than 1 cm, with purpuric or black irregular margins, that appears in only one buttock. This rapidly developing lesion is seen 8 to 24 h before death, without epidermal erosion. The name is due to the time of the day when staff observed these skin changes.	Unstageable tissue injuries that remain intact. Unavoidable. Located on body parts where there are no pressure points and caused by end-of-life organ failure.	Unavoidable phenomenon that, despite appropriate care, may occur in the period prior to death. Removing pressure from tissue doesn't guarantee skin survival.	Is a term used to describe skin changes at the end of life, which include KTU, SCALE, TB-TTI and Charcot's Decubitus ominosus.	1877: Charcot described a butterfly shaped lesion on the buttocks of dying people.	Miller stated the concept of KTU is not viable because "systemic diseases should have an equal effect on all body". Miller proposed the concept of "Miller Pressure Equivalent Injuries" which accepts the dying process as another systemic stressor, not main causative factor of pressure-based tissue injuries.

Table 3 (continued)

	TITLE, AUTHOR, YEAR	Kennedy Terminal Ulcer KTU	3:30 Syndrome	Trombley Brennan Terminal Tissue Injury TB-TTI	SCALE	Skin Failure	Decubitus Ominosus	Miller Pressure Equivalent Injuries (MPEI)
37	Kennedy terminal ulcer and other skin wounds at the end of life: an integrative review. Roca-Biosca, 2021	KTU was defined as a pressure injury that appears at the end of life, usually located at the sacrum or coccyx, in the shape of a pear, butterfly or horseshoe, with rapid progression, producing ulceration of total sickness. It is indicator of imminent death. It coincides with the description of the "decubitus ominosus". Standard presentation, bilateral or unilateral. For KTU, no assessment tools are available.		TB-TTI are injuries that spontaneously appear, with rapid evolution, enlargement and progression. They appear in areas with little to no pressure and they can be mirroring imaging. Aetiology unknown The skin is intact, never evolve into a deep wound.	Defined in 2008 by a panel of 18 experts. SCALE are "physiological" changes that occur as a result of a dying process and affect the skin color, turgor or integrity, or as subjective symptoms such as localized pain". It is a broad term that includes all the skin changes at the end of life, regardless of whether they are avoidable.	In 2006, Langemo and Brown defined it as "an event in which the skin and underlying tissues die due to hypoperfusion that occur currently with severe dysfunction or failure of other organ systems". In 2017, Jeffrey Levine defined it as "the state in which the tissue tolerance is so compromised that cells can no longer survive in zones of physiological impairment…" According to Levine, PI and SCALE could be a consequence of skin failure.		
30	Kennedy terminal ulcers and Trombley Brennan terminal tissue injuries: mistery solved? Melnychuck, 2024.	Characteristics of KTU: . Frequent locations: sacrum, buttocks . Shape: butterfly or pear shaped . Color: purple . Time of onset: sudden . Time to death: days to weeks		Characteristic of TB-TTI: . Frequent locations: sacrum, buttocks, legs . Shape: butterfly shaped in the sacrum; linear in the legs. . Color: bruise-like 4 Time of onset: sudden 5 Time to death: hours to days TB- TTI don't ulcerate, perhaps since patients die rapidly. The additional locations seen in TB-TTI may be due to speed and degree of hypotension.			In 1877, dr Jean-Martin Charcot described "decubitus ominosus", a pear shaped sacral skin ulcer which heralded death and he ascribed it to a neurotrophic theory.	

Table 3 (continued)

	TITLE, AUTHOR, YEAR	Kennedy Terminal Ulcer KTU	3:30 Syndrome	Trombley Brennan Terminal Tissue Injury TB-TTI	SCALE	Skin Failure	Decubitus Ominosus	Miller Pressure Equivalent Injuries (MPEI)
38	Early skin temperature characteristics of the Kennedy lesion (Kennedy terminal ulcer). Kennedy-Evans, 2023.	Kennedy Lesion is used instead of KTU because the term "terminal" may not always apply, due to the increased use of advanced technologies to sustain lives. KLs have some observable characteristic: intact skin discoloration that occur suddenly, mostly in the sacrococcygeal area, that can be yellow, purple, pink and black in color, are generally in the shape of a butterfly, a pear or horseshoe with irregular borders, and are generally associated with death within weeks or months.		Similar to KL with respect to color and sudden onset. Compared to KL, TB-TTI develop in a shorter time to death after first discoloration and skin remains intact; linear discoloration patterns are observed in the extremities.				
25	Avoidable & Inevitable? Skin Failure: the Kennedy Terminal Lesion. Lepak, 2012.	KTU, also known as terminal pressure ulcer. KTUs occurred at the sacrum or coccyx, were pear-shaped, had sudden onset and the color varied from yellow to black. Stage 3 or 4 and/or suspected deep tissue injury, according to the nomenclature NPUAP.					In the 1800 s, Jean Martin Charcot described this phenomenon with the term Decubitus ominosus.	
31	Kennedy Terminal Ulcer #383. Bateman, 2019.	KTU is a skin wound that occurs despite best preventative measures and results from the moribund status and underlying skin failure associated with the dying process. Often go underdiagnosed or may be misdiagnosed as a usual pressure ulcer. . TIMING: can develop within a matter of hours . LOCATION: sacral region, but also bony prominences . DESCRIPTION: the wound is usually irregularly shaped or butterfly shaped; >2 inches of diameter; may include red, yellow, black, purple discoloration.	KTU has been referred as the 3:30 syndrome for their sudden appearance. In the early a.m. clinicians note intact skin, hours later a small black spots appear that may resemble "specks of dirt", and by the midafternoon flat black blisters emerge.			Skin failure is a term used in literature to conceptualize the overall breakdown of the skin as an organ system that is associated with the end-stages of a chronic progressive illness and/or multi-organ failure, even when excellent skin care is provided.		

Table 3 (continued)

	TITLE, AUTHOR, YEAR	Kennedy Terminal Ulcer KTU	3:30 Syndrome	Trombley Brennan Terminal Tissue Injury TB-TTI	SCALE	Skin Failure	Decubitus Ominosus	Miller Pressure Equivalent Injuries (MPEI)
		. PATIENT: KTU occur primarily in adult or pediatric patients in the final 2 weeks of life. The most distinguishing factors of a KTU is the quickness of the wound development in the setting of terminal illness.						
22	Nursing care plan for the Kennedy terminal ulcer patient. Case report. Alarcón-Alfonso, 2022.	Appear mainly on sacrum or coccyx, as bilateral ulcer, shaped like a horseshoe or butterfly, with red, purple, yellow or black colorations and irregular borders. KTU starts as a category 2 ulcer or as a blister that will rapidly progress to category 3 or 4. **Differential diagnosis**: KTU are more superficial in onset and develop more rapidly in both size and depth compared to PUs.						
23	Kennedy's terminal ulcer and pressure injury: two different aspects of medical liability related to the same injury. Garcea, 2023.	KTU's incidence is higher than it is believed to be. Almost exclusively in the sacrococcygeal area and heel, but it is also been seen on calves, arms, elbows. It emerges in a few hours, that's why it's been called a "ah ah ulcer". KTU is the most observed and known lesion and it requires specific attention since it is constantly mistaken for a pressure injury.						
32	The Death of the Kennedy Terminal Ulcer. Miller, 2016.		The name is based on observations in which the a.m. evaluation did not identify any skin issues but at 3:30 p.m. the skin showed evidence of injury, which progressed. Life expectancy was found to be 8–24 h.					Miller Pressure Equivalent Injuries (MPEI): terminal status becomes a systemic stressor instead of a definitive cause for pressure-based tissue injuries.

Table 3 (continued)

	TITLE, AUTHOR, YEAR	Kennedy Terminal Ulcer KTU	3:30 Syndrome	Trombley Brennan Terminal Tissue Injury TB-TTI	SCALE	Skin Failure	Decubitus Ominosus	Miller Pressure Equivalent Injuries (MPEI)
34	The Kennedy Terminal Ulcer – Alive and Well Schank, 2016.	1989: Kennedy presented her research on KTU, not being aware of Charcot's previous work. It often appears on the sacrum or coccyx, but also elsewhere. Two presentations: bilateral (death within 2 weeks to several months) or unilateral (onset to death of 24–48 h).					1877: Charcot described the phenomenon of Decubitus Ominosus.	
35	Pressure ulcers at the end of life. Mitchell, 2022.	Kennedy (1989) described these as pressure ulcers that developed during the dying process. Usually pear, butterfly or horseshoe shaped and primarily located on the coccyx or sacrum, these ulcers were described to appear suddenly and deteriorate rapidly.			It should be noted that this mnemonic is to describe the phenomenon and is not a risk assessment tool. SCALE is used to describe cellular or molecular dysfunction leading to tissue hypoxia. The main difference between SCALE and pressure ulcers is in aetiology. SCALE is associated with hypoperfusion due to multiorgan failure that leads to skin failure. SCALE is influenced more by intrinsic than extrinsic factors.	'Skin failure' described by La Puma (1991) was identified as a component of multiorgan failure.	1877, Charcot described a specific type of ulcer in a butterfly shape occurring over the sacrum. He termed these ulcers "debcubitus ominosus", as patients tended to die shortly after the appearance of these ulcers.	

Terminology related to terminal ulcers

Multiple types of skin changes may occur in patients at the end of life. These patients are prone to develop terminal ulcers during the preactive and active stages of dying [36]. Although it doesn't exist only one accepted definition, end-of-life is considered as a time frame of six or less months of estimated life, while it should last even less, such as days or hours [41]. According to the fact that dying is a process, patients entering this period, from months until few hours before death, are at great risk of terminal ulcers, which are considered unavoidable [36].

A synopsis of the terminology regarding terminal ulcers is outlined below:

1. *Decubitus Ominosus*: in 1877, Jean-Martin Charcot described a specific butterfly-shaped lesion which appeared on the buttocks of patients, shortly before dying and he termed it *decubitus ominosus* [7, 25, 27, 30, 34]. In Latin language, "*ominosus*" refers to something that brings misfortune, according to the observation that patients tended to die shortly after the occurrence of this ulcer. His observations have been basically forgotten until Kennedy raised the interest on this topic, describing the same kind of terminal wounds [27], not being aware of Charcot's previous work [34].
2. *Kennedy Terminal Ulcer* (KTU) is a term that was firstly coined in 1983 by Karen Lou Kennedy and that was presented for the first time at NPUAP in 1989 [24, 33]. She, along with her team, noticed that some patients used to suddenly develop a specific kind of pressure injury, typically on sacrum or coccyx, just few weeks before dying and started measuring this phenomenon. After 5 years of data examination, they noticed that 55,7% of patients died within 6 weeks from the ulcer's occurrence [42], leading to the conclusion that these skin changes were part of the dying process.
   In 2023, she started referring to this ulcer as "Kennedy lesion" (KL), since the term "terminal" was not suitable any longer, considering how long life could be prolonged with new technologies [38].
   To avoid confusion, this scoping review will refer to this kind of wound as KTU, since the majority of papers still use this terminology
   KTUs are considered a subset of pressure injuries (PI) [12, 18, 27], that's why they are also known as "terminal pressure injuries" [25] or "end-stage skin failure" [28]: indeed, this kind of ulcer is defined as "a pressure ulcer that some people develop as they are dying" [7].
   These ulcers are reported in adults as well as in pediatric patients, in the final weeks of life [31].
   They are indicators of imminent death [7, 19, 28, 37] thus, their proper identification may help clinicians in shift goals of care towards palliative care as soon as possible [19]. Death is estimated in days to weeks since the occurrence of the ulcer [28, 30].
   However, they are often mistaken for pressure injuries, leading not only to missed care but also to lack of prevalence data [12, 22, 23, 31].
   It seems that, at the moment, no validated assessment tools for KTUs are available [12, 37].
   KTUs usually develop in a matter of hours and for this reason they are also called "ah ah ulcer" [23]: this is the most peculiar characteristic, which may facilitate a proper diagnosis [31, 36].
   KTUs may have bilateral or unilateral presentations [12, 37]: in the first case, they are observed in the sacral and gluteal regions, as well as on calves, arms and elbows [23], and have a pear, butterfly or horseshoe shape with irregular borders; they appear suddenly with rapid and progressive deterioration [19–22, 25, 27, 28, 30, 35, 36]; color of the skin may vary from yellow, to purple, to black [25, 27, 30, 31].
   The unilateral presentation is known as a 3:30 syndrome [12], which will be detailed later.
   All the papers included assessed KTU according to the NPUAP nomenclature [43], reporting that KTUs often turn very quickly into a Stage 3 or 4 or deep tissue injury (DTI) [21, 22, 25].
   Nowadays, it has been reached a large consensus on the unavoidable nature of these lesions [12, 21] thus on the fact that they may occur despite the best preventative measures [31]. On the other hand, some authors consider pressure as a contributing factor, along with other physiological changes, such as hypoperfusion, that could eventually increase the effects of pressure [36].
3. 3:30 syndrome is considered a variant of KTU [7, 36], with unilateral presentation [12]
   The name is due to the rapid onset [31]: clinicians usually reported not to have identified any skin issue during the morning evaluation; instead, at 3:30 p.m., they used to note some evidence of skin injury, which would have progressed in the next hours [32].
   These lesions appear as small black spots that look like "specks of dirt", rapidly turning into flat black blisters [31, 36] or macular lesions of less than 1 cm^2, with purpuric or black irregular margins, without epidermal erosion [12].
   Life expectancy after the occurrence of these lesions is from 8 to 24 h [7, 12, 36]: prompt modification of the treatment plan would be possible with a correct diagnosis.
   This kind of ulcer seems to develop despite any pressure-relieving measures [20].

4. *Trombley-Brennan Terminal Tissue Injuries (TB-TTI)* were introduced in 2012 by a team of palliative care nurses who recognized a type of injury different from KTU, but still occurring at the end of life and despite any evidence-based interventions [36].
   Together with KTUs, TB-TTIs are counted as part of terminal ulcers, thus are considered unavoidable [26, 28], prognosticators of death and not related to pressure [12, 20, 28].
   Life expectancy from identification of the injury is 36 h, with the 75% of patients who died within 72 h of these skin changes noticed [7, 36], or from 20 min to several days [28].
   They have been reported in patients aged from 35 to 95 years old [28].
   Clinical characteristics of TB-TTIs are similar to those of KTUs regarding colors and sudden onset; in particular, they appear as pink, purple, or maroon discoloration [36].
   However, TB-TTIs develop in a shorter time to death after first discoloration and skin remains intact. Compared to KTU, an additional location where the ulcers may occur is the extremities, with linear discoloration patterns, similar to linear striations [28, 30, 36, 38].
   These lesions could be confused with a DTI [7] since the skin remains intact and they never turn into a deep wound [12, 28, 37]. It has been hypothesized that TB-TTIs don't ulcerate because of the patient's rapid death [30].

5. *Skin Failure* is a broad concept that includes many multiple similar phenomena, such as KTU, TB-TTI, SCALE and others [7, 12, 39]. This term unifies all kinds of breakdowns that skin, as an organ, may go through, although the best quality of care is provided [31].
   Talking about failure, multi-organ failure is described as the "presence of altered organ function in acutely ill patients such that homeostasis cannot be maintained without interventions. It usually involves two or more organs" [7]. As all the other organs, skin can fail as well.
   There are two subsequent definitions of skin failure that deserve to be mentioned: in 2006, Langemo described 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" [44]. Later, Levine defined it as "the 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 buildup of toxic metabolic byproducts" [11].
   Literature reports that pressure is not a necessary component of skin failure [7].
   Three types of skin failure are listed in literature [7, 28, 36]: acute (associated with acute illness) [24], chronic (associated with a chronic condition) and end stage, that occurs during the last period of life, such as days or weeks [7, 36].
   While for other organs biomarkers or screening tools are disposable, for the diagnosis of "skin failure" it doesn't exist any classification system, as well as diagnostic tools for clinical signs [27] or biomarkers diagnostic nor blood test [11, 36, 39].

6. *SCALE*: In 2008, an international panel of experts met to define a set of ten statements called Skin Changes At Life's End, known with the mnemonic of SCALE; its aim is to describe a group of clinical manifestations and it's not to be considered as a risk assessment tool [27, 35].
   SCALE is a broad term that includes "all the physiological changes that occur as a result of a dying process and affect the skin color, turgor or integrity, or as subjective symptoms such as localized pain, regardless of whether they are avoidable" [24, 37].
   The term SCALE doesn't only include KTUs and TB-TTIs, but it also encompasses fungating wounds, ischemic wounds, pressure injuries, skin tears and many more [36].
   To sum up, it's possible to claim that SCALE could be considered as a consequence of skin failure, according to the previous seen definition by Levine [37]. However, it should be considered that not everyone with SCALE has skin failure or multi-organ failure, since the death process affects skin with different degrees [7]. Likewise, we still miss detailed diagnostic criteria to fully understand the extent of skin failure [7] which would have been very useful for a deeper understanding of this issue.

Signs and symptoms of SCALE are recognized as follows [24]:

- Muscle weakness and mobility impairment
- Loss of appetite, loss of weight, sarcopenia, dehydration
- Reduced skin perfusion
- Loss of skin integrity (due to incontinence, devices…)
- Reduced immunity, leading to an increased risk of infection
- Loss of vascular supply to extremities

SCALEs are encompassed in the unavoidable skin ulcers and are often the result of multiorgan failure [12, 40]. For this reason, pressure-relieving interventions could not be effective in maintaining skin integrity [12].
The most significant risk factor for SCALE is the diminished tissue perfusion, thus in some cases, pressure ulcer can be markers of SCALE [27, 35, 37].

7. *Miller Pressure Equivalent Injuries (MPEI)*: In 2016, Miller proposed the concept of MPEI, assuming that multiorgan failure due to systemic disease should have an equal effect on all the body [12, 32].
Miller argued that if it is true that systemic diseases have systemic effects (as a cardiac disease affects the entire body, for instance) and that if it is true that pressure is equally distributed (since patients are regularly positioned), then the presumption that the terminal status itself will result in a pressure-related injury cannot be considered valid, mostly if the injury develops only in one area, usually in the sacrum [32]. Thus, he considered the terminal status as a systemic stressor, instead of a definitive cause for pressure-based tissue injuries [12, 32]. There's not a unique consensus on Miller's assumptions [7].

Diagnostic criteria and assessment tools

When an ulcer occurs, especially in vulnerable patients at the end of life, nurses and health care professionals may experience a sense of guilt or may feel blamed, since the wound is often attributed to poor quality of care and it will probably lead to financial or legal issues [29].

However, at the best of our knowledge, we miss a unified classification system for terminal ulcers, with clinical signs and symptoms, that could be useful for reporting these wounds differently from other kinds of ulcers [20]. This classification is even more complicated by the fact that end-of-life wounds may occur together with PIs [29], and we still miss standardized diagnostic criteria to differentiate between the two [20].

As clinicians, who spend most of our time at the bedside, it's true that the first diagnostic criterion for assess a terminal ulcer is the recognition that the patient is dying [11]: we must always recall that, before evaluating wounds, we are taking care of people, so we have to consider the overall health conditions in order to perform a correct differential diagnosis [37].

Research, although still limited, is mainly focused on the validation of an assessment tool [26, 39] and diagnostic criteria [19, 38].

As an assessment tool, in 2023, a Delphi panel of 16 international experts in terminal ulcers found a consensus around the "End-of-life wound assessment tool". The aim of this tool is to gain a better identification of terminal ulcers but also to decrease legal controversy and improve wound care and palliative care for these patients [26]. The tool doesn't discriminate between end-of-life wounds and PIs, but it should be used if the health care professional suspects that the ulcer is indeed a terminal one. At the moment, a moderate interrater reliability of this tool has been achieved and a larger study is needed [45].

A "Skin failure indicator scale" has also been proposed, which considers the serum albumin level, a diagnosis related to impaired blood flow, the presence of sepsis or multiple organ dysfunction syndrome, the use of vasopressor or inotrope medication and the mechanical ventilation as predictors of skin failure; the tool still needs to be validated but it may represent an effective way to predict skin failure [39].

Concerning diagnostic criteria that can be used to assess a terminal ulcer, a case study published in 2025 reported the use of ultrasound as a complement to the clinical examination done by nurses [19]: it was observed a mild oedema in the subcutaneous tissue of the perilesional skin and a cobblestone-like tissue in the lesion bed; both sites showed absence of blood flow. For the future, it is possible to figure out that the use of ultrasound will become more frequent and that this will help in assessing the wounds, differentiating between terminal and pressure injuries.

Another new diagnostic criterion proposed in literature consists in skin temperature changes, since it's known that, for PIs, areas of inflammation or hyperemia are warmer than the surrounding skin and areas of ischemia are cooler. Only one of the studies included in this scoping review reported assessing this parameter [38]: skin temperature was evaluated within 24 h from a newly identified area of discoloration. The study stated that the Relative Temperature Differential (RTD) between the discolored area and a control point of intact skin was not normal if it was $> +1.2$ °C or < -1.2 °C, based on previous literature. While for PIs skin temperature used to decrease or increase compared to the control point, for KTUs it doesn't seem to happen.

More research on this topic is needed to fully understand the pathophysiology of KTUs and thus to explain why the early skin temperature doesn't change in the first 24 h, but it could be an interesting starting point, since it could help in differentiating PIs from terminal ones.

Aetiology

The main point to be considered when talking about SCALE is that these kinds of ulcers don't stem from external stressors but, instead, from internal factors [20]: it's often the result of hypoperfusion and multi-organ failure, rather than pressure and shear, and thus it should be considered an unavoidable phenomenon, as said [40].

The most widely accepted aetiology for the onset of these lesions is related to the concept of hypoperfusion linked to multiple organ failure: in crisis situations, the body reacts by diverting blood flow from the skin to vital organs, thereby reducing skin perfusion. The consequence of this is that hypoxia and a slowdown in normal metabolic processes will occur at the skin and subcutaneous levels [20, 21, 24, 25, 27, 29, 30, 33–35, 37].

However, starting from this assumption, the question remains as to why only some people develop terminal lesions, despite hypoperfusion being associated with the end-of-life period in almost all patients [30]. Furthermore, as seen, in 2016 Miller levelled significant criticism at this line of thinking, asserting that the terminal condition alone could not explain the onset of such lesions. From his perspective, if the skin fails as an organ, lesions should be found everywhere and not just in specific areas [32].

Consequently, other contributing causal factors have been proposed, and alternative hypotheses have been advanced.

Since the validation of predictive criteria to identify which patients may develop a pressure ulcer or a SCALE ulcer is currently not possible [24], literature describes the following factors as contributing causes:

- Use of vasopressors or inotropes [19, 21, 30, 35, 37–40]: in order to remain viable, the skin requires from 25% to 33% of cardiac output [21]; since vasopressors divert the blood flow to vital organs, skin becomes more prone to breakdown and death. This type of medication is often used in ICUs or for cardiological patients.
- Respiratory, renal or circulatory insufficiency [35, 37, 40].
- Insufficiency of two or more organs [21, 38–40].
- Co-morbid conditions, such as cardiovascular diseases, smoking, sepsis or pneumonia, diabetes [21, 38, 39].
- Hypoalbuminemia [21, 35, 37, 39, 40]: serum albumin level less than 3,5 g/dl [39].
- Hypoxemia [21, 35, 37, 40].
- Hypotension [30, 38].
- Alteration of elimination of toxic metabolites [35, 37, 40].
- Decreased defensive capacity of the skin [35, 37, 38, 40]: in particular, aging could be considered associated with altered immune responses and changes in vascular structure (38).
- Loss weight, loss appetite, cachexia, poor nutrition [35, 37, 38, 40].
- Reduced mobility or immobility [35, 38, 40].
- Anatomic arterial aberrancies [30]: the researchers' observations moved from the fact that many patient characteristics don't explain why just some of them manifest terminal ulcers. However, they wanted to find out the peculiar feature that could explain why someone, and not everyone, develops terminal injury. Looking at the anatomy of the human body, they speculated that changes or agenesis of specific arteries (median sacral artery, lateral sacral artery and sciatic artery, that may be persistent, instead of regressing by the third month of embryonic development) could lead to the occurrence of ulcers, but only in case of hypotension, since otherwise a collateral circulation would prevent it.
  At the same time, the authors refused the "angiosomal hypothesis": an angiosome is a vascular territory that is supplied by a specific blood vessel. The human body has 40 angiosomes. Considering the most frequent locations where terminal ulcers usually appear (sacrum, coccyx…), the authors considered that the angiosomal hypothesis could not explain it [30].
- Reperfusion, in cases of recurrent hypotension [30]: in case of recurrent hypoperfusion, the skin can go through different alterations, that are linked to the typical manifestations of terminal ulcers. It may move into a whitish change, indicating ischemic necrosis, or it can move into a purplish discoloration, due to the accumulation of red blood cells caused by damaged blood vessels. The process of the reperfusion injury may vary based on factors such as the degree and duration of the hypotension, the size of the blood vessel involved, the characteristic of the vessel itself, the existence of a collateral arterial supply [30].
  It is known that commonly, capillary refill is a good way to assess skin perfusion: it has to be considered that the capillary refill could appear for the first 12 h after skin death, because of the blood remaining in the area for the capillary collapse; for this reason it could be difficult to evaluate skin failure exactly at the moment of its occurrence [25].
- Use of mechanical ventilation [38, 39].
- Abnormal white cell counts [38].
- Anemia [38].

Alternative hypotheses that have been advanced are the existence of some catabolic patterns that may have something in common with other systems' failure or there may be some genetic factors at the basis of vascular responses

to ischemia. These factors, if studied and understood, could lead to personalized therapies for both preventing and managing this kind of ulcer [11].

It could be interesting to note that age, Braden score and Body Mass Index were found not to be significant predictors of skin failure [39].

Prevention and management

Since terminal ulcers are considered solid prognosticators of imminent death, the goals of care need to shift from curative to palliative care, in order to avoid therapeutic obstinacy [19], dismiss aggressive interventions and tests [28, 37] and to guarantee comfort and a dignified dying process [12, 20, 22, 37]. Thus, the main objective of the new treatment plan isn't wound healing any longer [40], while it should be providing the patient with the best quality of life [36], managing wound symptoms and psychological issues [25].

Even if terminal ulcers are considered unavoidable, prevention interventions need to be implemented not to exacerbate existing ones. The literature agrees on the fact that prevention of terminal ulcers is similar to the one for pressure ulcers [22, 31]. Strategies to mitigate the risk may include optimizing nutritional support, using appropriate pressure redistribution surfaces, effectively managing moisture and frequent repositioning [21].

Although pressure is not a causative factor for terminal ulcers [29], pressure-relieving support surfaces could be useful for a conservative approach [21, 24, 31, 35], as well as regular repositioning [20, 21, 36]. However, pressure-relieving support surfaces are not always comfortable for patients, and they could even worsen pain and nausea or reduce the ability of independent movement, if still present [24]. Furthermore, frequent repositioning may cause unnecessary pain [36]. Before their implementation, these interventions should be accurately evaluated and discussed with patients and families, in order to establish the best treatment according to patients' preferences and wishes [24, 33, 36, 40].

The decision regarding whether and how often to reposition such a vulnerable person should be taken under individual judgement, considering the patient's clinical conditions, and the need of premedication with an analgesic before the procedure [31].

Jakobsen et al. (2020) did not find a significant correlation between the incidence of SCALE and the use of pressure redistribution equipment [46].

Great importance is given to the communication with patients and family members, as well as caregivers [12, 20, 40], in order to help them cope better with the situation [22]. Emotional support and education concerning terminal ulcers are often needed to better understand the situation, to get awareness of the terminality and to know how to assist the person [24, 31, 37], having realistic expectations for wound healing [36]. Especially in this phase of life, patients' cultural preferences and families' expectations should be taken into account and respected [35]. Caregivers should be involved in the care plan [33].

Since it's not always simple to properly diagnose terminal ulcers, and they are often misdiagnosed as pressure injuries, it is important to clearly document all the interventions, providing evidence of the quality of care administered [20, 24, 31].

From the perspective of the law, even a correct diagnosis of a terminal lesion, if possible, doesn't fully protect against legal disputes. Therefore, it becomes mandatory to provide proper evidence for every single choice, for example, the decision of reducing mobilizations to avoid unnecessary pain. If possible, it would be useful an informed consent, possibly signed by the patient [23] or considering a written Advance Care Planning.

Charting by exception has been proposed as a good method of documentation [27]. This type of charting assumes that the patient manifests normal responses to all the interventions performed. The only responses that are documented are the ones that deviate from the standard or from what it is expected [47].

Wound care nurses should be involved in the care team as soon as an ulcer is recognized as a terminal one [12, 24]. It is recommended that only advanced clinical specialists undertake the assessment of terminal lesions so that an appropriate individual care plan could be set [12].

The SCALE Statement [27] has proposed a list of five P's for determining appropriate intervention strategies. The five P's mnemonic consists of:

1. Prevention: since the skin goes through decreased oxygen availability during the last part of the life, it's important to consider reducing pressure, moisture and other risk factors, as well as ameliorating nutrition and mobility, according to the patient's clinical conditions. The aim of prevention is to improve well-being and quality of life.
2. Prescription: this point comprehends all the interventions that are considered appropriate for the treatment of wounds that are considered healable, even in this phase of life.
3. Preservation: this point refers to the interventions suitable when maintenance is considered a proper goal, despite limited possibilities of gaining complete healing.
4. Palliation: this section involves the interventions to be implemented when the goal of the treatment is managing symptoms, such as pain or odor, and achieving the best quality of life possible, rather than healing or maintenance of the wound.
5. Preference: this last P reminds clinicians to always include patient's preferences and wishes in the

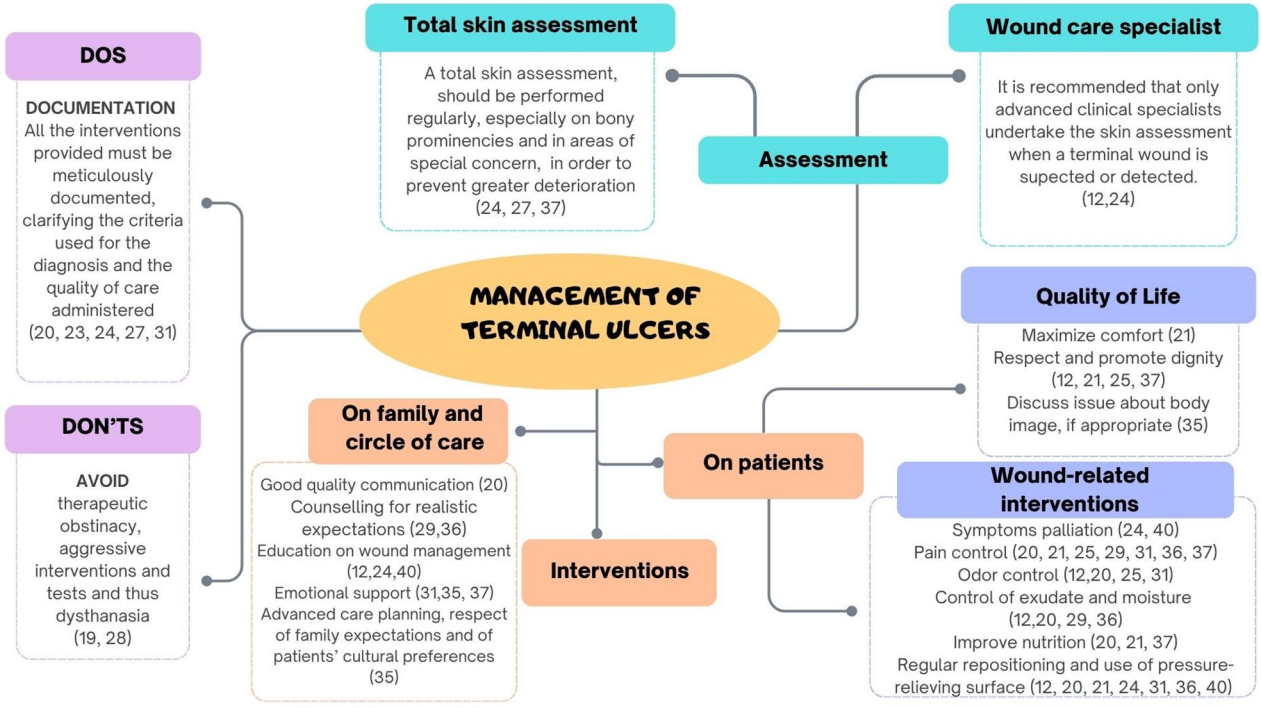

Fig. 2 Management of terminal ulcers

decision-making process; the document gives importance to patient's circle of care's opinion as well.

A more detailed overview of the interventions suggested by literature is provided in Figure2.

Health professionals' education

Literature reveals that there's an issue of misclassification of terminal ulcers that are often reported as pressure injuries [29]. This leads to wrong treatment, bad quality of life for the dying person, that probably won't receive the proper palliative care, emotional and practical burden for caregivers.

In this field, nurses are responsible for the correct management and treatment of terminal lesions, together with the avoidance of possible complications [23]. But how could it be possible if nurses don't even know how to recognize them? This matter involves ethical issues, concerning quality of care and the principles of beneficence and non-maleficence; moreover, the proper identification of a terminal ulcers can have a potential impact on reimbursement [21].

Healthcare professionals are the ones expected to facilitate communication and collaboration, both across care settings and disciplines [27], and towards patients and their circle of care: however, they often show a limited awareness of the skin changes that happen at life's end [12, 27, 29].

Moreover, it is possible that in certain settings such as ICUs, clinicians are not so prone to accept the terminology "terminal ulcer" for a cultural issue based on seeing death as something that must be overcome at all costs [11].

On the other hand, it is paramount that clinicians are educated about terminal ulcers: this will help them to support dying patients and their families and to have open discussions not only regarding the ulcer itself, but also on the impending death, which is quite a difficult topic, if not well-prepared [12].

As many of the studies included in this scoping review involve the settings of palliative care or long stay units, it should be considered that maybe this professional's lack of awareness means that terminal ulcers are completely underdiagnosed outside of these settings [37].

One of the main problems that could explain this difficult situation is having so many terms to describe this kind of ulcer: it can be confusing and it may impede a good communication, even among clinicians [7].

Educational topics that deserve to be implemented in order to better recognize terminal ulcers concern the skin prevention and wound treatment [19], and training of healthcare professionals in the management of ulcers that are different from pressure ulcers [22].

Discussion

Terminal ulcers involve people at the end of their life, at any age, affected by many different clinical conditions: as said, the onset is often very rapid so that both patients and families could feel unprepared and hopeless facing this new reality. We, as health care professionals, cannot consider merely the theme of reimbursement or legal disputes when referring to this topic, but we have to focus on providing our patients and their circle of care with the best possible care, trying to achieve the goal of a dignified dying process.

The prevalence of pressure injuries is considered a solid indicator of the quality of nursing care, thus the nursing staff should be able to recognize this kind of ulcer and to distinguish it from all the others [24]. Moreover, the occurrence of pressure ulcers is seen as patient safety incidences and is linked with the concept of "inadequate care" [9]. That's why, regarding healthcare professionals' awareness, it appears of paramount importance that nurses can correctly recognize, report and manage terminal ulcers.

There still exists a big concern around the real prevalence and incidence of this phenomenon, mostly because it is often misdiagnosed as pressure injury: an Italian multicentric study found an incidence of 2.7% in palliative settings [46], while other studies noted that a differentiation between KTUs and PIs was missing in intensive care units [48].

This scoping review revealed that, currently, there are only a few diagnostic criteria for these wounds, and these are neither well-known nor specific. As long as we miss detailed diagnostic criteria, we won't be able to understand the real dimension of the issue. As seen, new technologies, like ultrasound [19], are reaching out as important milestones for assessing this kind of ulcer, along with the clinical examination. On the other hand, we still miss a specific and validated terminal ulcer assessment tool and a proper staging system [29]: actually, while an assessment tool has been proposed in the last few years, literature demonstrates that all the terminal ulcers are documented with the same classification system used for pressure injuries.

The aetiology is the main difference between pressure injuries and SCALE: the first ones are due to external factors such as pressure and shear and the latter are associated to hypoperfusion and multi-organ failure, thus we can say that the root cause is completely different [35, 40]. The differential diagnosis is further complicated by the fact that the two of them may occur at the same time [36].

Moreover, the bilateral presentation of KTU could eventually be misdiagnosed with Moisture-Associated Skin Damage (MASD), especially if the patient has incontinence or some other risk factors [35, 40] or if the lesions begin as numerous superficial spots, that are going to merge in a larger ulcer in a brief period of time [35]. Some examples of MASD, PI and terminal ulcer are provided in Figs. 3, 4 and 5.

Thus, the correct identification of terminal ulcers is complicated by the similar manifestations, the classification system equal to the one used for PIs but also by the available terminology.

As highlighted in the results, the terminology employed to describe end-of-life wounds is extensive and, at times, complicated. In 2019, Levine introduced the concept of potential defensive bias for the terminal ulcer terminology: since the incidence of PIs is considered as an indicator of the quality of nursing care, with thousands of lawsuits each year, talking about "terminal ulcers" relies on the unavoidability of death and, in some way, seems to relieve caregivers from the responsibility of providing quality care. Levine proposes to replace this terminal ulcer terminology with a more prognosis-neutral nomenclature, in line with the one concerning other organs, such as "skin failure" [49].

Limitations

Since the literature review is updated by March 2025, we are aware that relevant literature may have been published later.

We also recognize that it has been difficult to accurately choose the sources of evidence, since the studies were very often focused only on the topic of KTU and, moreover, because information regarding terminal ulcers were strictly embedded in the larger topic of pressure ulcers.

A large part of the studies included in this scoping review have been conducted with a poor methodological quality, as many of them are editorials or are based on the opinion of experts. Furthermore, according to the methodology used, a critical appraisal of the included studies wasn't performed. Therefore, we suggest using these evidences with caution and awareness.

Conclusions

Some patients, during the end-of-life period, experience a specific kind of wound that is related to hypoperfusion and multi-organ failure: these terminal ulcers, which include a broad number of injuries, usually develop very quickly, with typical patterns. They are considered unavoidable, since they occur despite all pressure-relieving interventions are implemented and the best quality of care is provided.

However, these ulcers are often misdiagnosed as pressure injuries, since nurses and health care professionals are often found to be not so well-prepared on this topic: thus, we miss prevalence data and, even more important, we avoid providing effective palliative care and palliative wound care.

The goals of end-of-life wound management should be focused on comfort care, for the patient, which includes pain relief and conservative management of all the wound's symptoms such as odour or exudate; moreover, other goals for both patients and their circle of care include communication and emotional support regarding the imminent death.

Fig. 3 Moisture-Associated Skin Damage in home care setting

Fig. 4 Pressure injuries in home care setting

Fig. 5 Terminal ulcer in home care setting, the onset was during the night and the patient died a few days later

This scoping review has highlighted several points that warrant further investigation, including the role of pressure in the occurrence of these lesions, some hypotheses regarding their aetiology, the validation of effective assessment tools as well as the definition of solid diagnostic criteria and the issue of healthcare professionals' education. The authors hope that more research will address all these topics in order to further improve the quality of care for dying people and for their families.

Abbreviations

KTU	Kennedy Terminal Ulcer
KL	Kennedy Lesion
TB-TTI	Trombley-Brennan Terminal Tissue Injury
PI	Pressure Injury
SCALE	Skin Changes At Life's End
MASD	Moisture-Associated Skin Damage
DTI	Deep Tissue Injury
MPEI	Miller pressure equivalent injury
NPUAP	National Pressure Ulcer Advisory Panel
RTD	Relative Temperature Differential

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Authors' contributions
The conception and design of the study were undertaken by IS, RB and PF.IS, RB and PF developed the search strategy and conducted the literature search. The screening of the articles was conducted by IS, DC and DC, with the supervision of PF.IS, DC and DC completed data charting, followed by data synthesis.The initial draft of the manuscript was prepared by IS.All authors contributed to successive iterations of the manuscript, and the final version was approved by all.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

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Author details
[1]Department of Biomedical, Metabolic and Neural Sciences, University of Modena and Reggio Emilia, Modena, Italy

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