An Integrative Review of Skin Failure in Intensive Care: 
What do we know and where are we going?

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DECLARATION OF FINANCIAL INTERESTS OR RELATIONSHIPS

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I have no financial interest or relationship(s) to disclose
AIM

• Understand the current evidence regarding acute skin failure within critically ill ICU patients.

• Outlining gaps within the literature and areas of high research need.

• Extent knowledge and understanding of skin failure in critically ill patients by synthesizing empirical evidence.
Disruption to skin integrity is multi-faceted.

Most commonly reported disruption to skin integrity in ICU patients, is PI development. (Norwicki et al, 2017)

ICU patients have a 3.5 times greater risk of developing a PI than non-ICU patients. (Coyer et al, 2017)

Increased risk suggestions there is an unidentified factor, specific to ICU population, that has yet to be recognised.
Cutaneous Microcirculatory changes in the Critically Ill

Blood flow velocity of septic rat decreased with the lapse of time (Takahashi et al, 2017).
So what is Skin Failure?

• Langemo and Brown 2006 – first definition of skin failure - An event in which the skin and underlying tissue dies due to hypoperfusion that occurs concurrent with sever dysfunctions or failure of other organ system.

• Levin definition – 2017 Skin failure is a state in which tissue tolerance is so compromised that cells can no longer survive in zones of physiological impairment that includes hypoxia, local mechanical stresses, impaired delivery of nutrients and build-up of toxic metabolic by-products.
Skin and underlying tissue die due to hypoperfusion concurrent with a critical illness.

An individual with few PI risk factors, undergo an event resulting in an extreme medical condition for an extended period of time. E.G. sepsis

• Skin and underlying tissue die due to hypoperfusion concurrent with an ongoing, chronic disease state.
• Occurs in a more steady fashion over time.

Skin and underlying tissue die due to hypoperfusion concurrent with the end of life.
• May not follow a continuum from acutely to chronically ill to skin failure. E.g. acute on chronic illness
Method

Study Design
- Integrative literature review – framework (Whittemore & Knafl, 2005) between inception-2018
- 6 Databases: Cochrane library, Joanna Briggs Institute, CINAHL, Google scholar, PUBMED and Medline

Search terms
- critically ill; intensive care; multiple organ dysfunction syndrome; multi organ failure; unavoidable pressure injury/ulcer; skin failure; and acute skin failure.

Inclusion
- Adult subjects
- Human studies
- Critical illness / critical care setting
- Experimental and non experimental studies

Exclusion
- Animal or paediatric subjects,
- Written in a language other than English,
- Unrelated to adult critical care or
- Unrelated to skin failure as a concept of pressure injury development.
RESULTS

**Identification**
- Records identified through database searching (n=991)
- Additional records identified through reference searching (n=6)
- Total number of records identified (n=997)

**Screening**
- Records after duplicates removed (n=801)
- Records screened (n=801)

**Eligibility**
- Full text records assessed for eligibility (n=19)
- Records excluded Non-English, animal studies, paediatric studies, unrelated to topic (n=782)
- Full text records excluded Grey literature, no mention of critical care (n=15)

**Included**
- Studies included in this review (n=4)
<table>
<thead>
<tr>
<th>Author/Citation</th>
<th>Design</th>
<th>Outcomes Measure</th>
<th>Settings</th>
<th>Sample</th>
<th>limitations</th>
<th>Key findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Langemo, D. K., &amp; Brown, G. (2006). Skin fails too: acute, chronic, and end-stage skin failure. Advances in Skin &amp; Wound Care, 19(4), 206-212</td>
<td>Systematic review</td>
<td>*nil outcome measure</td>
<td>*nil settings</td>
<td>*nil sample</td>
<td>Only one non-experimental, retrospective analysis within the skin failure review. The rest were editorials, opinion pieces or posters (unable to be source).</td>
<td>Three types of skin failure: 1. Acute skin failure: occurs concurrently with critical illness and is related to hypoperfusion. 2. Chronic skin failure: occurs due to hypoperfusion occurring during an ongoing disease state. 3. End-stage skin failure: occurs with hypoperfusion at the end of life. • Minimal Literature exists on skin failure</td>
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<td>Curry, K., Kutash, M., Chambers, T., Evans, A., Holt, M., &amp; Purcell, S. (2012). A prospective, descriptive study of characteristics associated with skin failure in critically ill adults. Ostomy Wound Manage.</td>
<td>Prospective, chart review</td>
<td>Once diagnosed with skin failure by certified wound care nurse a chart review occurred.</td>
<td>Single site large tertiary ICU.</td>
<td>29</td>
<td>Single site only - No control group - Small sample size - No definition of how the wound care nurse diagnosed acute skin failure.</td>
<td>- Failure of 2 or more organs was present in each patients identified as having skin failure. - More research needed</td>
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## Results

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- Includes elective cardiac surgery patients. Typically these patients are stable prior to surgery and rendered critically ill for only a short period of time. | Identified 5 significant risk factors for skin failure:  
1. Peripheral vascular disease  
2. Mechanical ventilation >72hrs  
3. Respiratory failure  
4. Liver Failure  
5. Sepsis  
- Further research needed |
- Reporting was voluntary  
- Different reporting systems used over time | - Pressure injury incidence have increased in ICU  
- Further research is necessary to comprehensively assess skin hypoperfusion and its association with PI development in critically ill patients. |
### Discussion

**Skin Failure Variables**

- Diagnosed through a process of elimination
- Liver/respiratory failure
- Peripheral arterial disease
- Mechanically ventilated for greater >72 hours
- Septic
- Organ failure of two or more

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[Hierarchy of Research Designs & Levels of Scientific Evidence](#)
DISCUSSION

• Very minimal research in this area.
• Focused solely on associated risk factors to skin failure as opposed to its underlying pathophysiology.
• Lack of definition on what skin failure is resulting in a lack of focus on this phenomenon.
• Lack of diagnostic criteria to assess skin failure - preventing improved understanding.
• Wound care community has heavily relied on field leaders to generate clinical opinion including consensus documents.
Where to from here?

• Confirm a definition.
• Create a reliable clinical algorithm to determine skin failure.
• Identify common mechanisms of skin failure that are shared with other organ systems eg endothelial dysfuction.
• Develop a biomarker.
REFERENCES


Thankyou

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