

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

Lizanne Dalgleish<sup>1,2</sup>, Jill Campbell<sup>1,3</sup>, Kathleen Finlayson<sup>1</sup>, Andre Van Zundert<sup>1,2</sup>, Fiona Coyer<sup>1,4</sup>

1. Queensland University of Technology, Brisbane, Australia. 2. Department of Anaesthetics, The Royal Brisbane and Women's Hospital, Brisbane, Australia. 3. Skin Integrity Service, The Royal Brisbane and Women's Hospital, Brisbane, Australia. 4. Intensive Care Unit, The Royal Brisbane and Women's Hospital, Brisbane, Australia

# DECLARATION OF FINANCIAL INTERESTS OR RELATIONSHIPS

**Speaker Name: Lizanne Dalgleish**

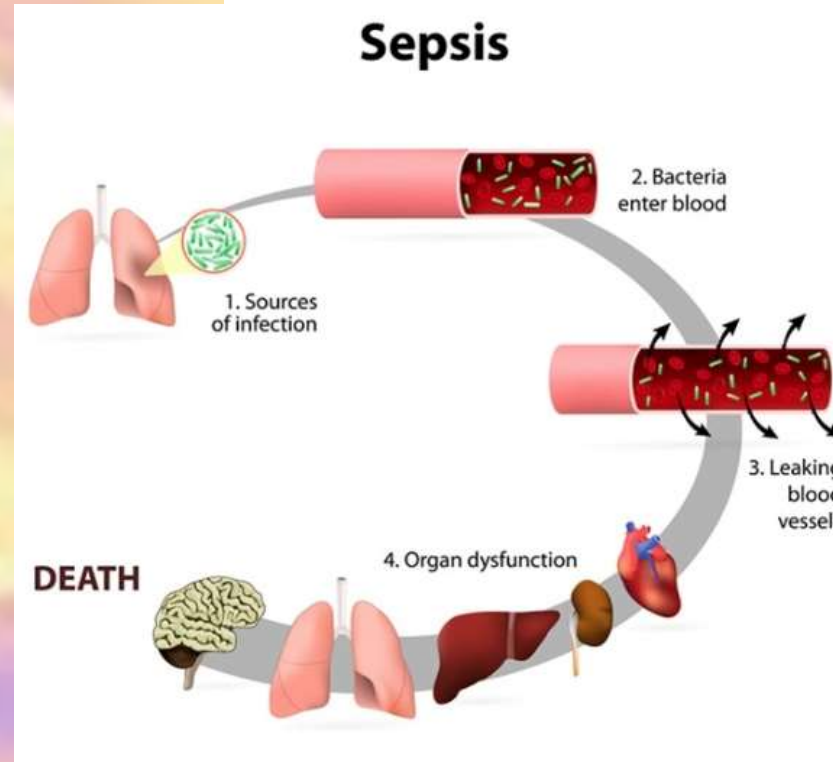
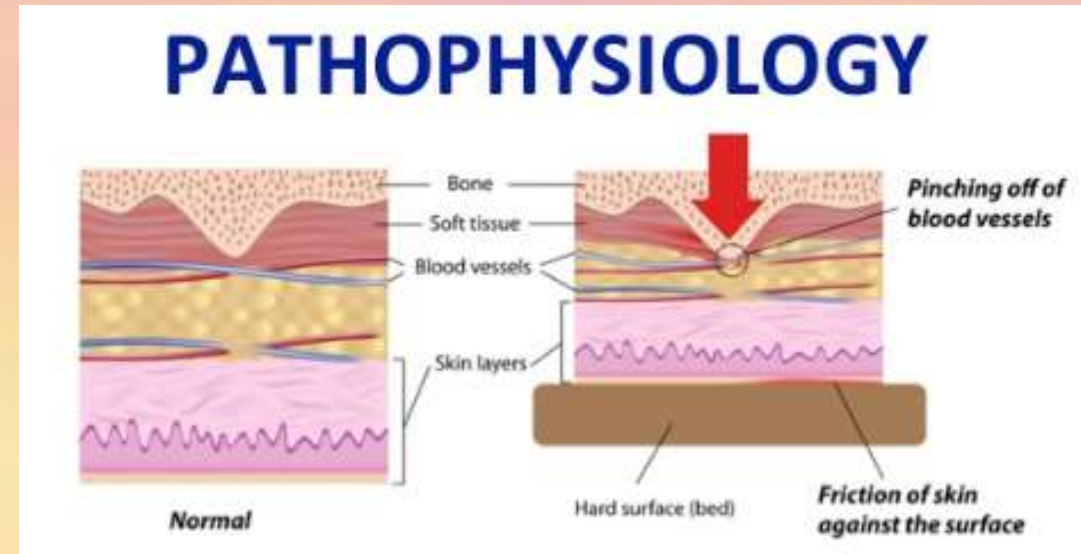
**I have no financial interest or relationship(s) to disclose**

# AIM

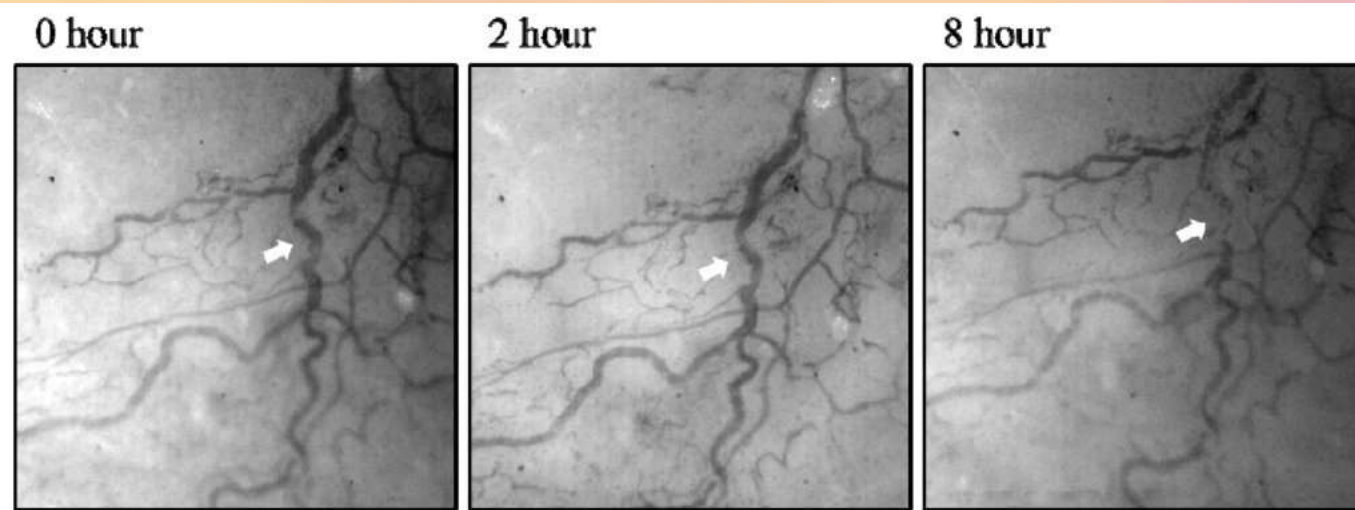
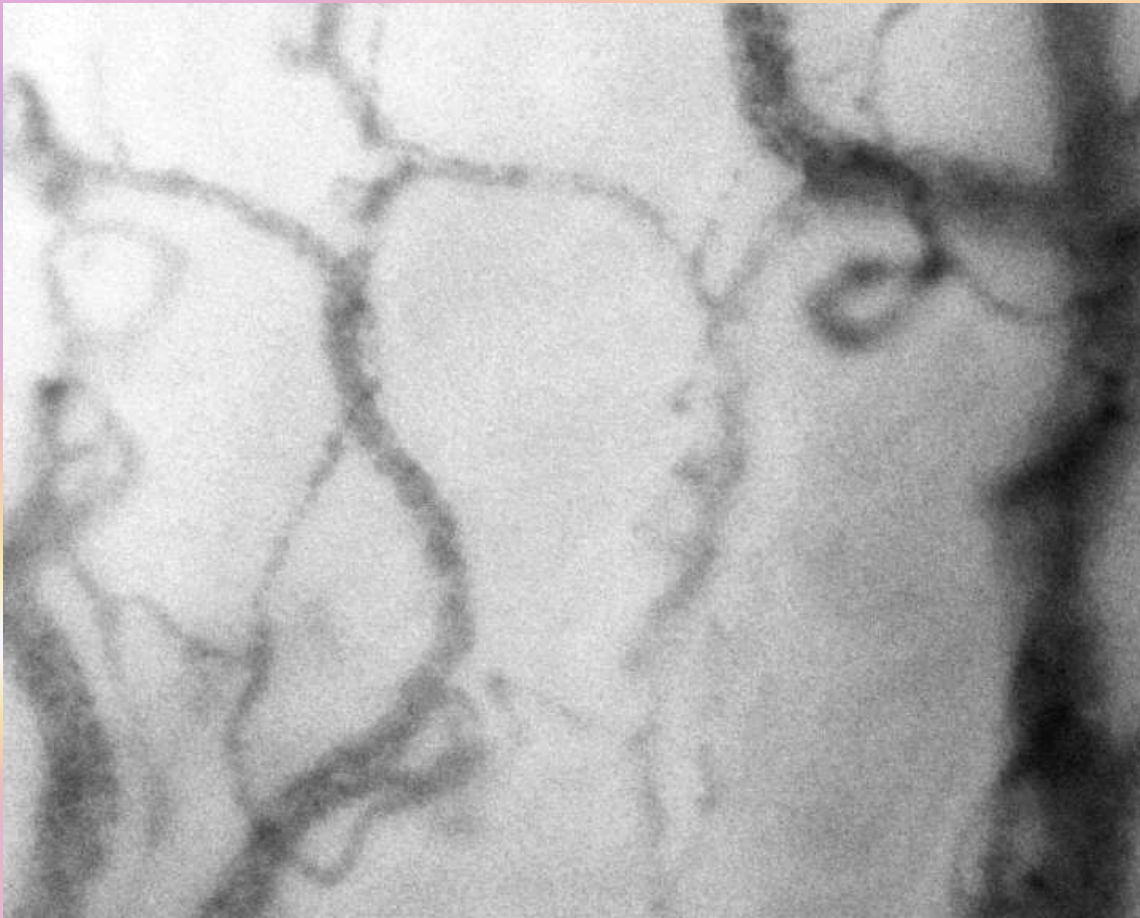
- Understand the current evidence regarding acute skin failure within critically ill ICU patients.
- Outlining gaps within the literature and areas of high research need.
- Extent knowledge and understanding of skin failure in critically ill patients by synthesizing empirical evidence.

# Background

- 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 severe 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.

# Acute

- 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

# Chronic

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

# End stage

- 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

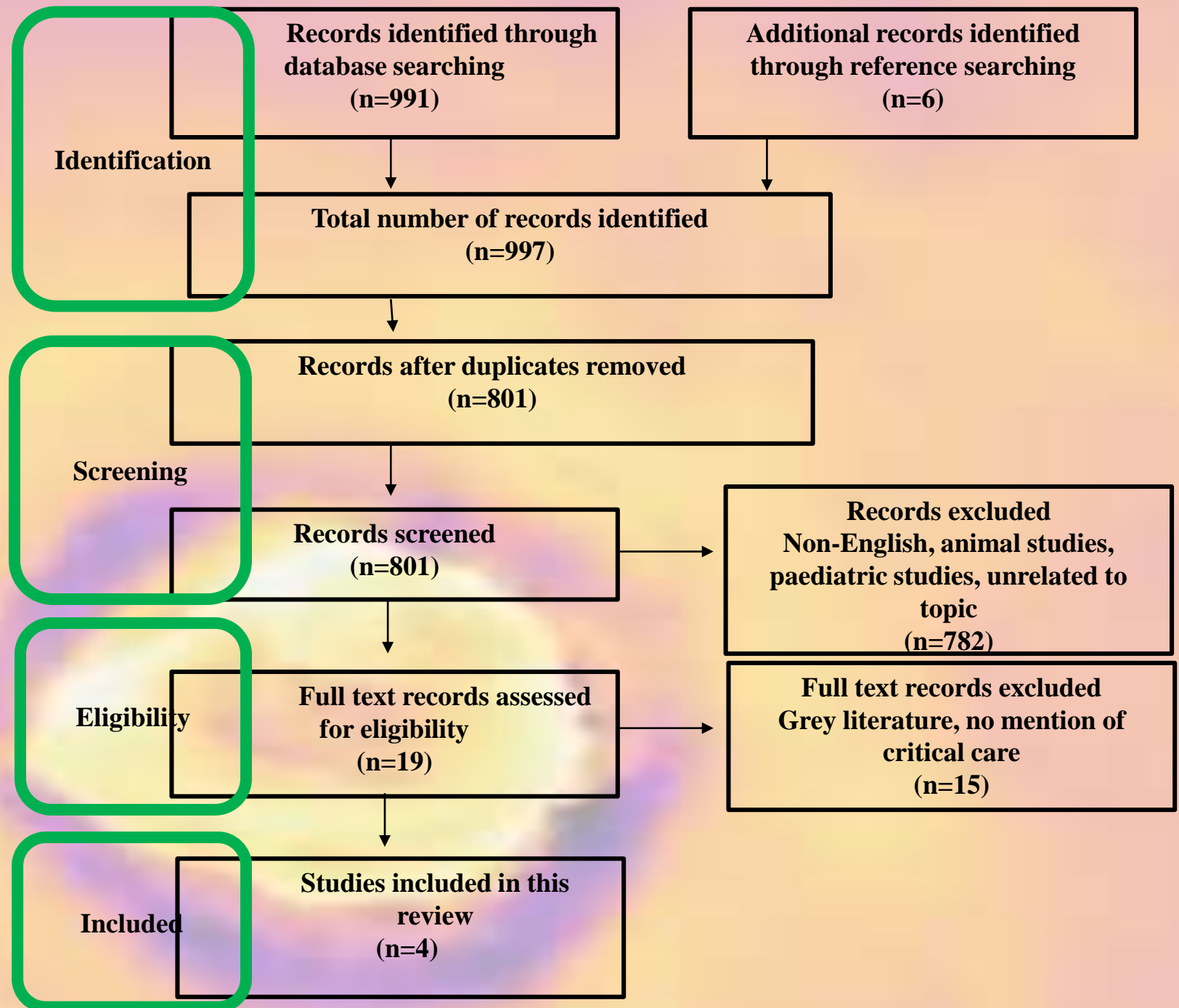
- Adult subjects
- Human studies
- Critical illness / critical care setting
- Experimental and non experimental studies

## 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



# Results

Author/Citation	Design	Outcomes Measure	Settings	Sample	limitations	Key findings
Langemo, D. K., & Brown, G. (2006). Skin fails too: acute, chronic, and end-stage skin failure. <i>Advances in Skin &amp; Wound Care</i> , 19(4), 206-212	Systematic review	*nil outcome measure	*nil settings	*nil sample	Only one non-experimental, retrospective analysis within the skin failure review. The rest were editorials, opinion pieces or posters (unable to be source). -	Three types of skin failure: <ol style="list-style-type: none"> <li>1. Acute skin failure: occurs concurrently with critical illness and is related to hypoperfusion.</li> <li>2. Chronic skin failure: occurs due to hypoperfusion occurring during an ongoing disease state.</li> <li>3. End-stage skin failure: occurs with hypoperfusion at the end of life.</li> </ol> <ul style="list-style-type: none"> <li>• Minimal Literature exists on skin failure</li> </ul>
Curry, K., Kutash, M., Chambers, T., Evans, A., Holt, M., & Purcell, S. (2012). A prospective, descriptive study of characteristics associated with skin failure in critically ill adults. <i>Ostomy Wound Manage</i>	Prospective, chart review	Once diagnosed with skin failure by certified wound care nurse a chart review occurred.	Single site large tertiary ICU.	29	<ul style="list-style-type: none"> <li>- Single site only</li> <li>- No control group</li> <li>- Small sample size</li> <li>- No definition of how the wound care nurse diagnosed acute skin failure.</li> </ul>	<ul style="list-style-type: none"> <li>- Failure of 2 or more organs was present in each patients identified as having skin failure.</li> <li>- More research needed</li> </ul>

# Results

Author/Citation	Design	Outcomes Measure	Settings	Sample	limitations	Key findings
<p>Delmore, B., Cox, J., Rolnitzky, L., Chu, A., &amp; Stolfi, A. (2015). Differentiating a pressure ulcer from acute skin failure in the adult critical care patient. <i>Advances in Skin &amp; Wound Care</i>, 28(11), 514-524.</p>	Retrospective case control	Pressure injury formation	Dual site 55 bed tertiary urban ICU. 18 bed suburban teaching ICU.	450 + 102 patient for validation study	<ul style="list-style-type: none"> <li>- Retrospective design</li> <li>- Includes elective cardiac surgery patients. Typically these patients are stable prior to surgery and rendered critically ill for only a short period of time.</li> </ul>	<p>Identified 5 significant risk factors for skin failure:</p> <ol style="list-style-type: none"> <li>1. Peripheral vascular disease</li> <li>2. Mechanical ventilation &gt;72hrs</li> <li>3. Respiratory failure</li> <li>4. Liver Failure</li> <li>5. Sepsis</li> </ol> <ul style="list-style-type: none"> <li>• Further research needed</li> </ul>
<p>Nowicki, J.L., Mullany, D., Spooner, A., Nowicki, T.A., Mckay, P.M., Corley, A., Fulbrook, P. and Fraser, J.F., (2017). Are pressure injuries related to skin failure in critically ill patients?. <i>Australian Critical Care</i>.</p>	Retrospective case series from 2006-2015	clinical characteristics and outcomes of ICU patients reported as having a HAPI,	Single site, public hospital	726 intensive care patients	<ul style="list-style-type: none"> <li>- Retrospective</li> <li>- pressure injury stages undated on site in 2012</li> <li>- Reporting was voluntary</li> <li>- Different reporting systems used over time</li> </ul>	<ul style="list-style-type: none"> <li>- Pressure injury incidence have increased in ICU</li> <li>- Further research is necessary to comprehensively assess skin hypoperfusion and its association with PI development in critically ill patients.</li> </ul>

# Discussion

## Skin Failure Variables

Diagnosed through a process of elimination

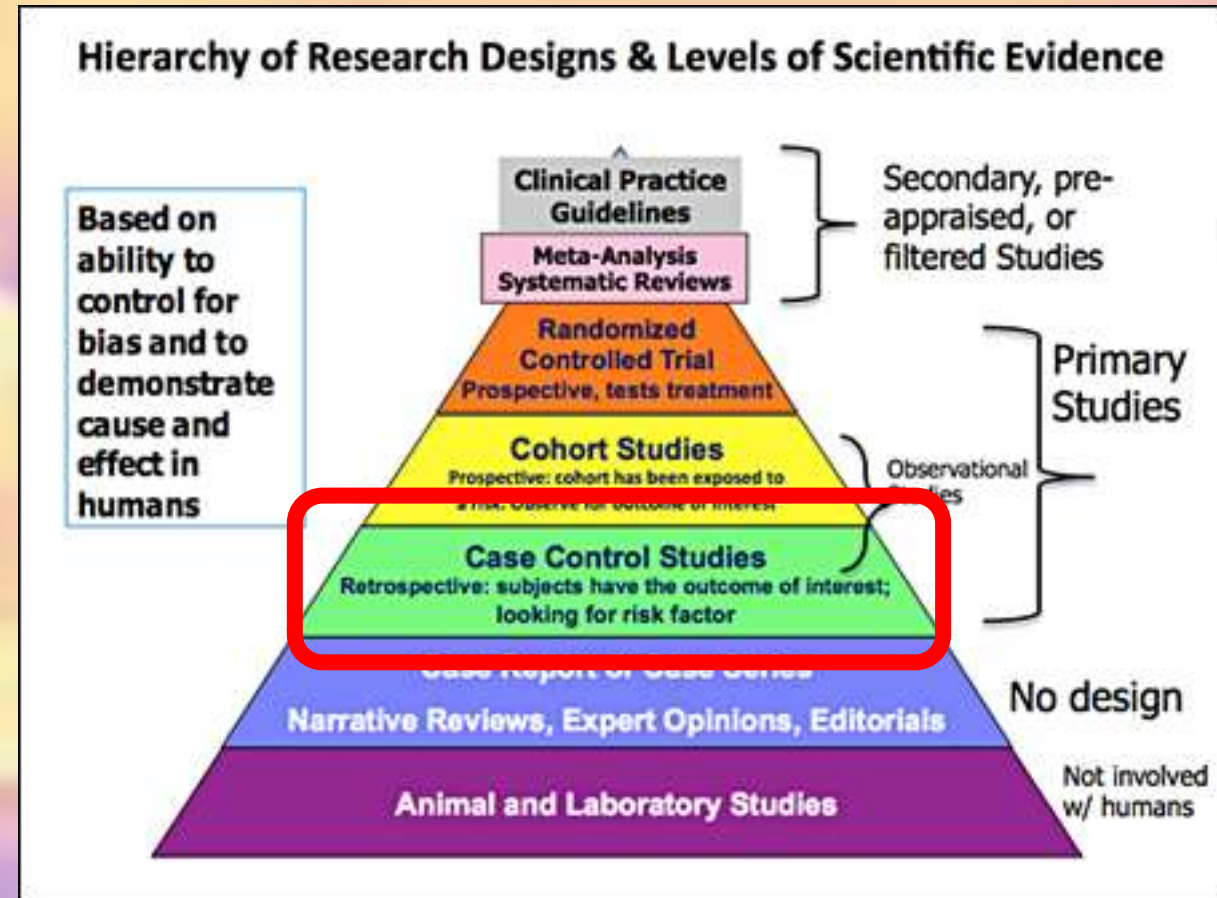
Liver/respiratory failure

Peripheral arterial disease

Mechanically ventilated for greater >72hours

Septic

Organ failure of two or more



# 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 dysfunction.
- Develop a biomarker.



# REFERENCES

- Bentov, I., & Reed, M. J. (2015). The effect of aging on the cutaneous microvasculature. *Microvascular research*, 100, 25-31.
- Coyer, F., Miles, S., Gosley, S., Fulbrook, P., Sketcher-Baker, K., Cook, J. L., & Whitmore, J. (2017). Pressure injury prevalence in intensive care versus non-intensive care patients: A state-wide comparison. *Australian Critical Care*, 30(5), 244-250.
- Curry, K., Kutash, M., Chambers, T., Evans, A., Holt, M., & Purcell, S. (2012). A prospective, descriptive study of characteristics associated with skin failure in critically ill adults. *Ostomy Wound Manage*, 58(5), 36-43.
- Delmore, B., Cox, J., Rolnitzky, L., Chu, A., & Stolfi, A. (2015). Differentiating a pressure ulcer from acute skin failure in the adult critical care patient. *Advances in Skin & Wound Care*, 28(11), 514-524.
- Whitemore, R., & Knafl, K. (2005). The integrative review: updated methodology. *Journal of advanced nursing*, 52(5), 546-553.
- Langemo, D. K., & Brown, G. (2006). Skin fails too: acute, chronic, and end-stage skin failure. *Advances in Skin & Wound Care*, 19(4), 206-212
- Levine JM. Skin Failure: A New Paradigm. *Advanced skin and wound care* 2017; 17: 666-669.
- Nowicki, J.L., Mullany, D., Spooner, A., Nowicki, T.A., Mckay, P.M., Corley, A., Fulbrook, P. and Fraser, J.F., (2017). Are pressure injuries related to skin failure in critically ill patients?. *Australian Critical Care*.
- Takahashi, M., Kurata, T., Ohnishi, T., & Haneishi, H. (2017, February). Quantitative evaluation of blood flow obstruction in microcirculation with sidestream dark-field images. In *Imaging, Manipulation, and Analysis of Biomolecules, Cells, and Tissues XV* (Vol. 10068, p. 100680A). International Society for Optics and Photonics.

*Thankyou*

[lizanne.dalgleish@gmail.com](mailto:lizanne.dalgleish@gmail.com)