AORN | GLOBAL SURGICAL CONFERENCE & EXPO

Skin In the Game: The Situation, Science & Solution

Susan M. Scott, MSN, RN, WOC Nurse

Amit Gefen, PhD

Terry Emerson, DNP, RN, CNOR, NEA-BC

ADVOCACY Take a Stand

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Faculty Disclosure

Speaker: Susan M. Scott, MSN, RN, WOC Nurse – Independent Consultant, and CEO Scott Triggers PLLC

- Speaker Bureau and Consultant Stryker, MoInlycke, Scott Triggers PLLC

Speaker: Amit Gefen, PhD – Full Professor with the Department of Biomedical Engineering, Faculty of Engineering of Tel Aviv University

- No conflicts to disclose

Speaker: Terry Emerson, DNP, RN, CNOR, NEA-BC – Nurse Manager, The Johns Hopkins Hospital

- No conflicts to disclose

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- Salary
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- Other (describe)

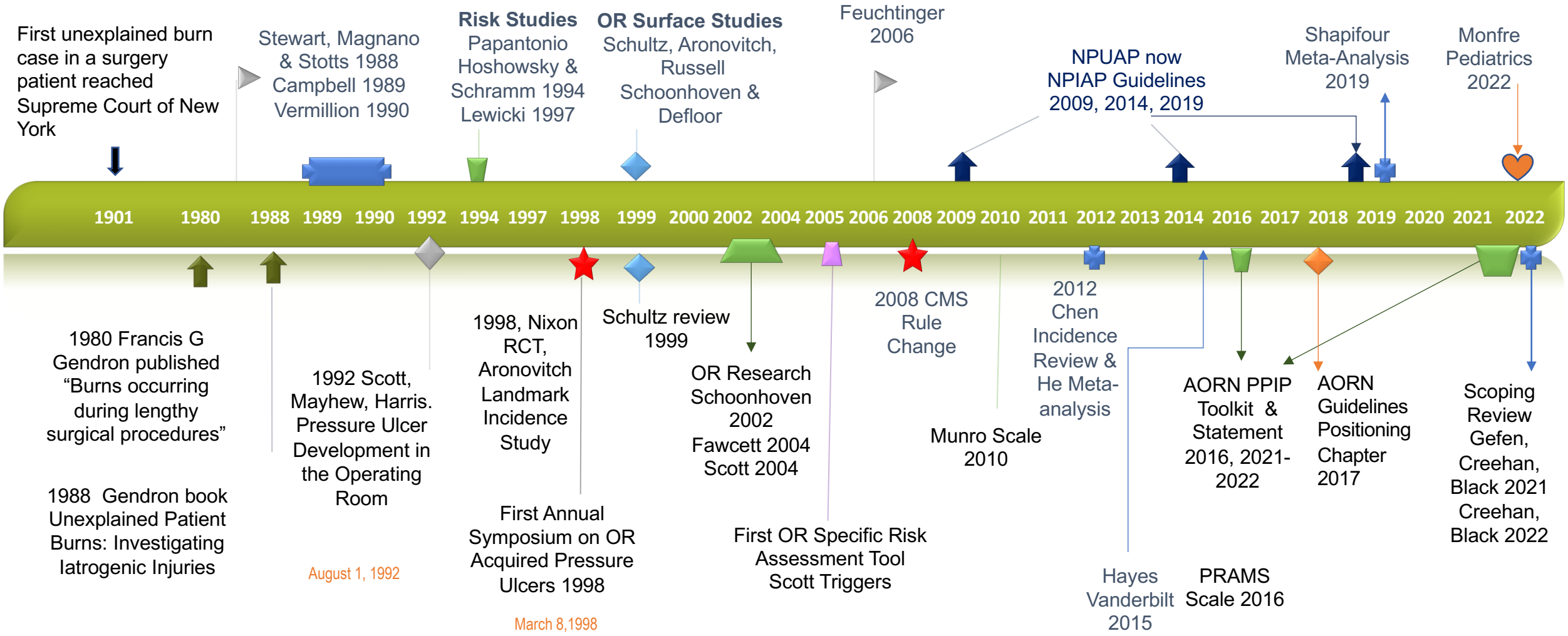
Learning Outcome(s)

- Identify trends in risk assessment, prevention, incidence, cost, and litigation for perioperative hospital acquired pressure injury (HAPI).
- Explore the science of biomechanics and the impact on tissue deformation in surgical positioning and use of medical devices.
- Illustrate an innovative strategy to reduce harm from pressure injury in the surgical population

The Situation

Susan M. Scott, MSN, RN, WOC Nurse

History of Perioperative Pressure Injury [1-32]



Current State Perioperative HAPI [22-28,32-39]

- Incidence
  - Range 4.5%-64.1%
  - Mean 18.96%
- Cost
  - 26.8 Billion
- Litigation
  - $250,000

- Risk Assessment tools
  - Braden
  - Scott Triggers
  - Munro Scale
  - PRAMS
  - Braden QD

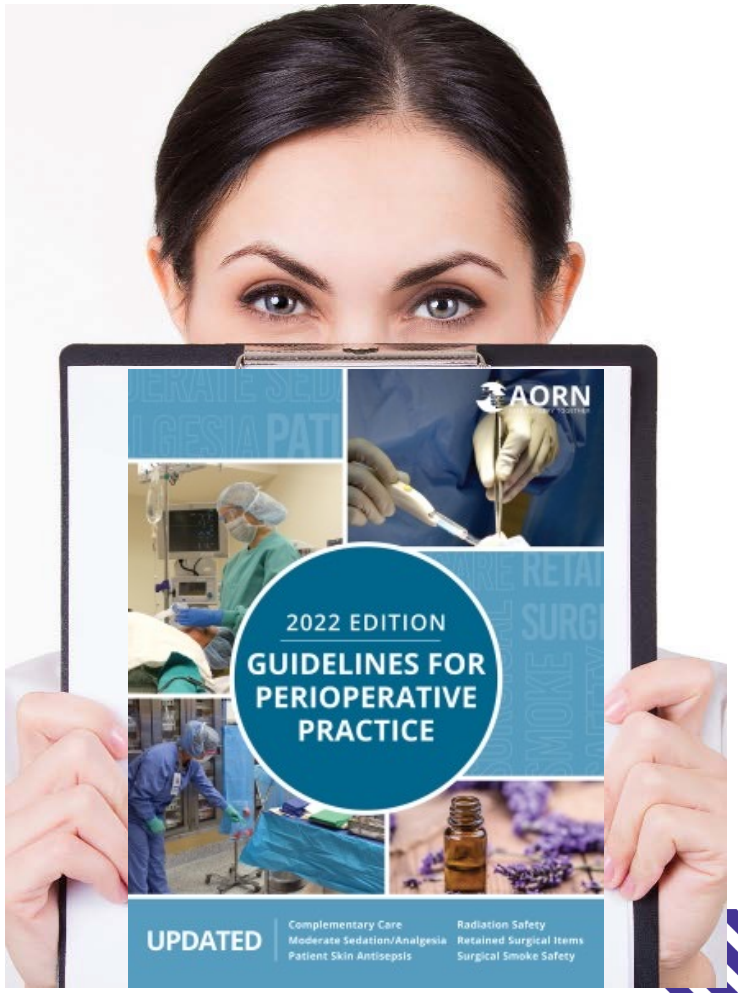
Barriers [40-44]

- Patient factors
- Budget constraints
- Lack of standardization
- Outdated equipment
- Siloed communication
- Out-patient surgery follow-up
- Competing priorities

Scott, S. Perioperative Pressure Injuries: Protocols and Evidence-Based Programs for Reducing Risk. *PSQH,* 2016;13(4), 20-28.

Desired State [28,31-32, 41-44]

- Gap Assessment
- Quality Improvement/RCA2
- Risk & Skin Assessments
- OR Skin Bundles
- Staff Education & Competency
- Equipment Standardization
- Interprofessional Collaboration



The Science

Amit Gefen, PhD

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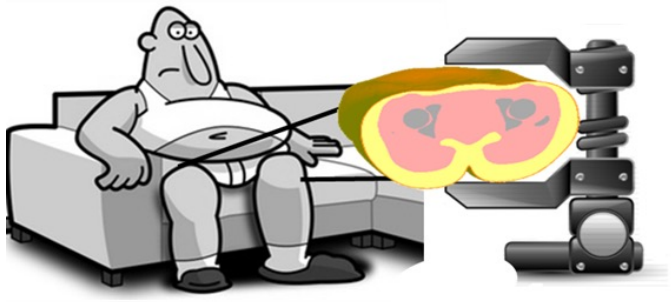
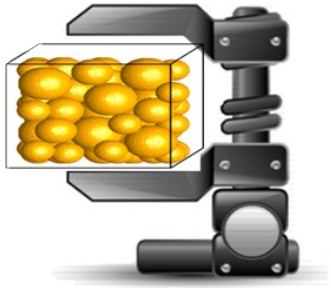
Cellular deformation and how this triggers the cascade toward cell death and pressure injury formation in the OR setting

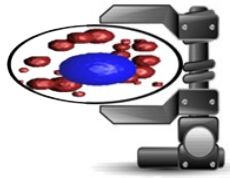
Professor Amit Gefen, PhD
Department of Biomedical Engineering,
Faculty of Engineering, Tel Aviv University
E-mail: gefen@tauex.tau.ac.il

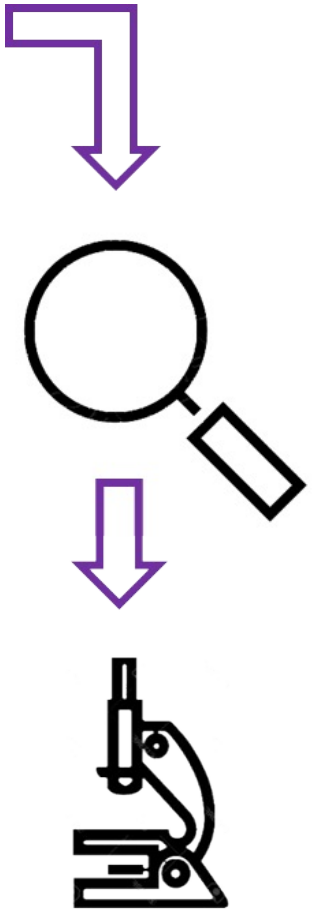
ADVOCACY Take a Stand

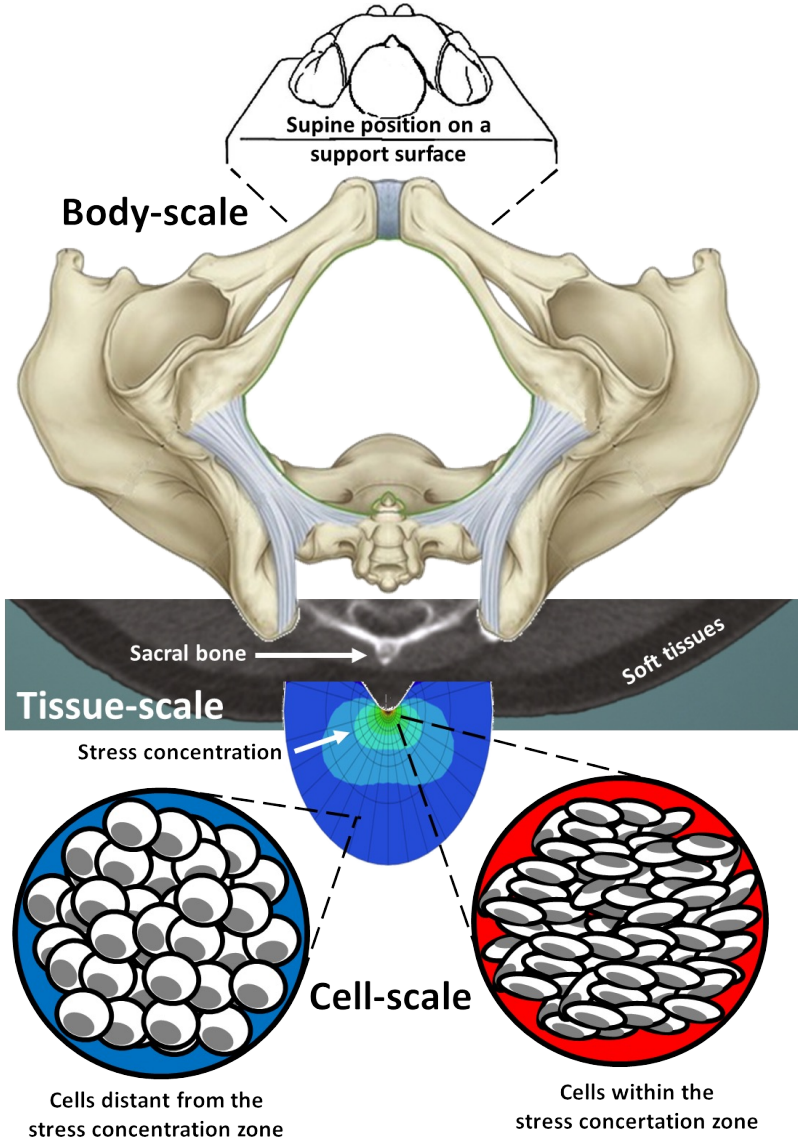
Our current understanding of pressure ulcer/injury etiology





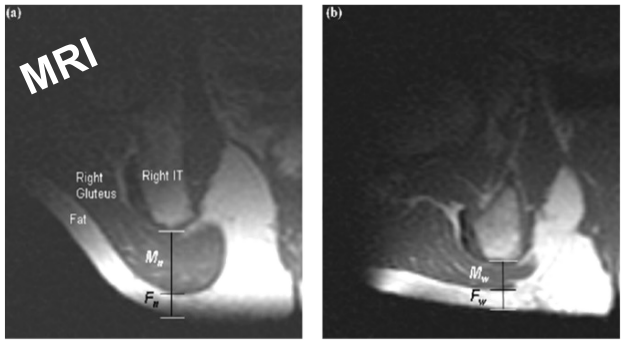


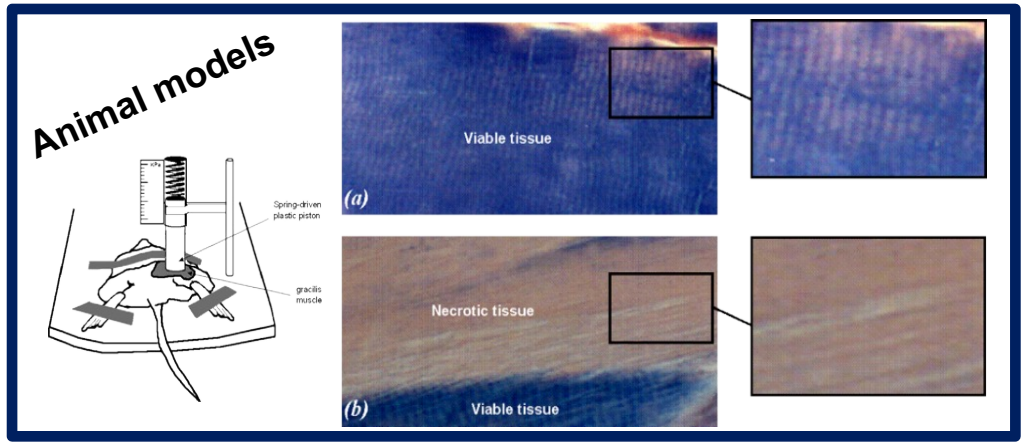


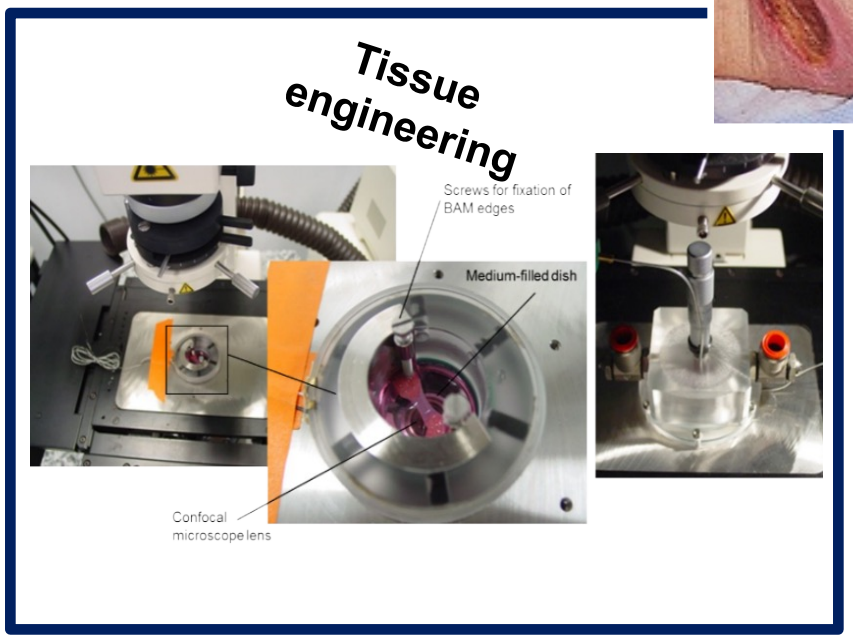


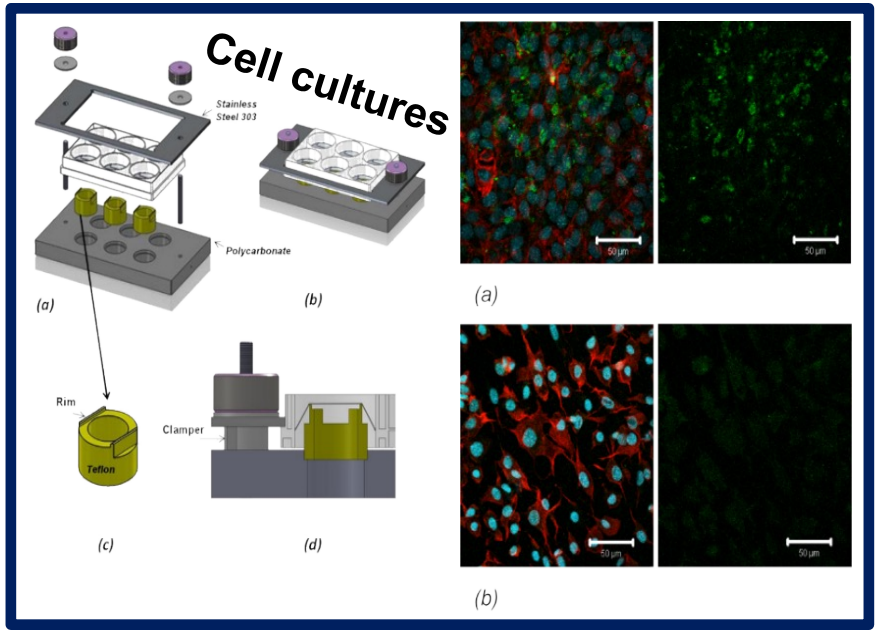
Shoham et al. *Biomechanics and Modeling in Mechanobiology* 2016
Gefen & Soppi *Wound Practice and Research* 2020

Exposure to sustained deformations kills cells and tissues fast, much faster than ischaemia

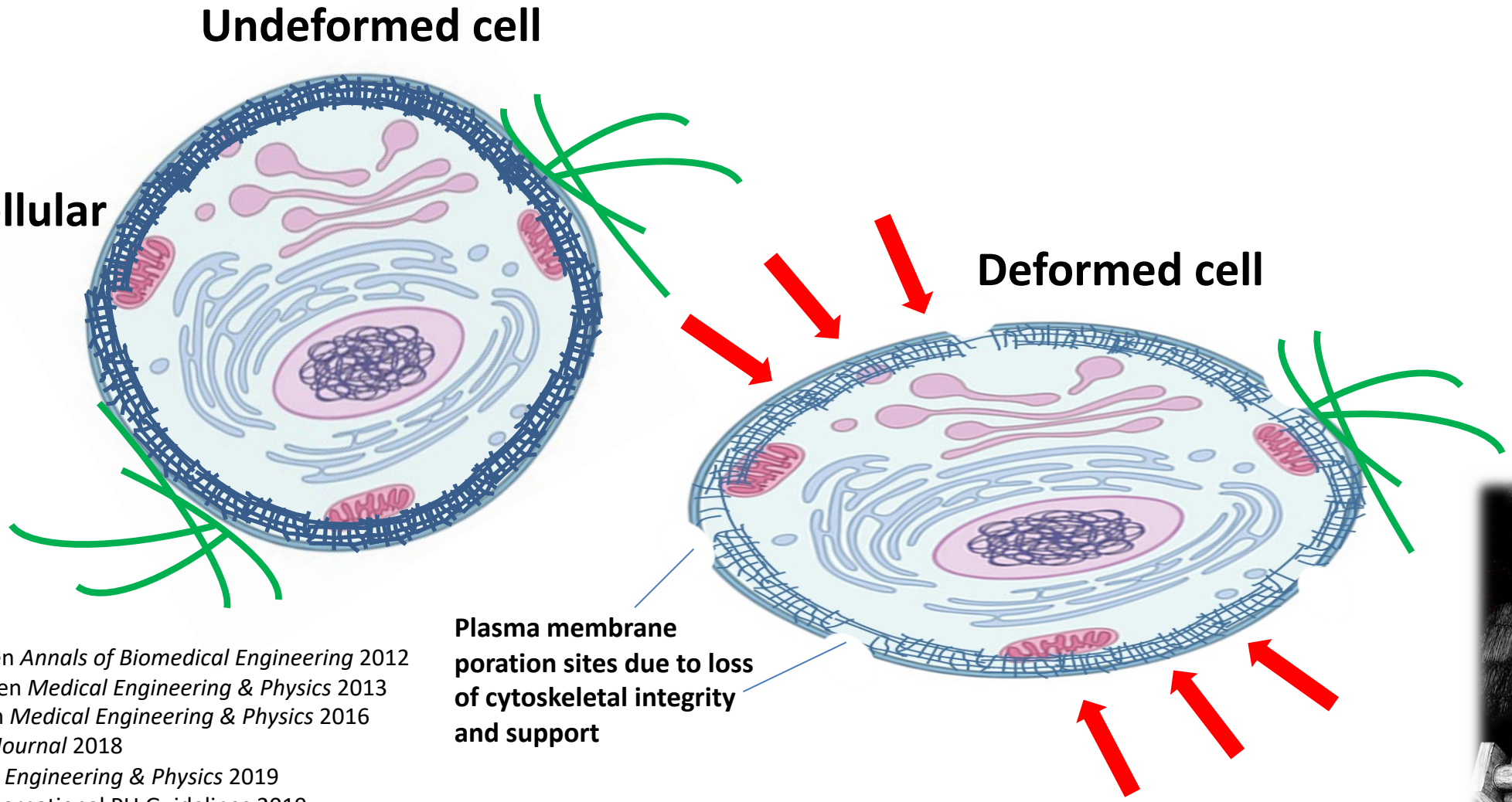








What happens to cells at a forming pressure ulcer/injury site?



Slomka & Gefen *Annals of Biomedical Engineering* 2012
Leopold & Gefen *Medical Engineering & Physics* 2013
Weihs & Gefen *Medical Engineering & Physics* 2016
Gefen *EWMA Journal* 2018
Gefen *Medical Engineering & Physics* 2019
Gefen et al. International PU Guidelines 2019
Gefen et al. International Consensus Document on Prevention of Device-Related Pressure Ulcers *Journal of Wound Care* 2020

Current understanding of pressure ulcer/injury etiology (Cont.)

Conventional thinking

Ischemia

Impaired perfusion

Reduce oxygen

Change in

Several hours

...iation of waste products

Decrease in pH

Cell death

Current understanding

Deformation

Deformation of cells

...uption of the cytoskeleton

10s of minutes

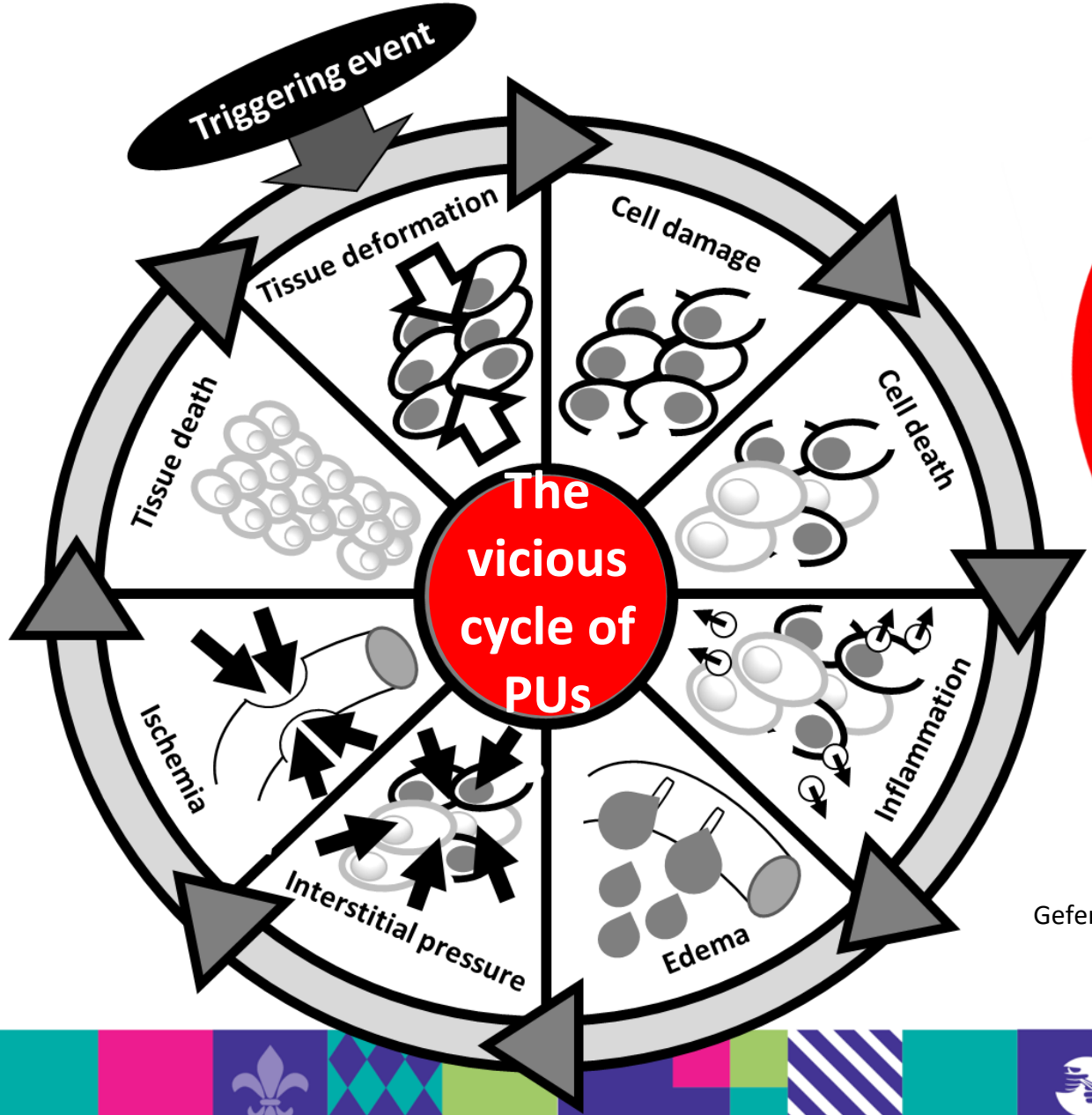
Cell permeability increases

Loss of homeostasis

Cell death

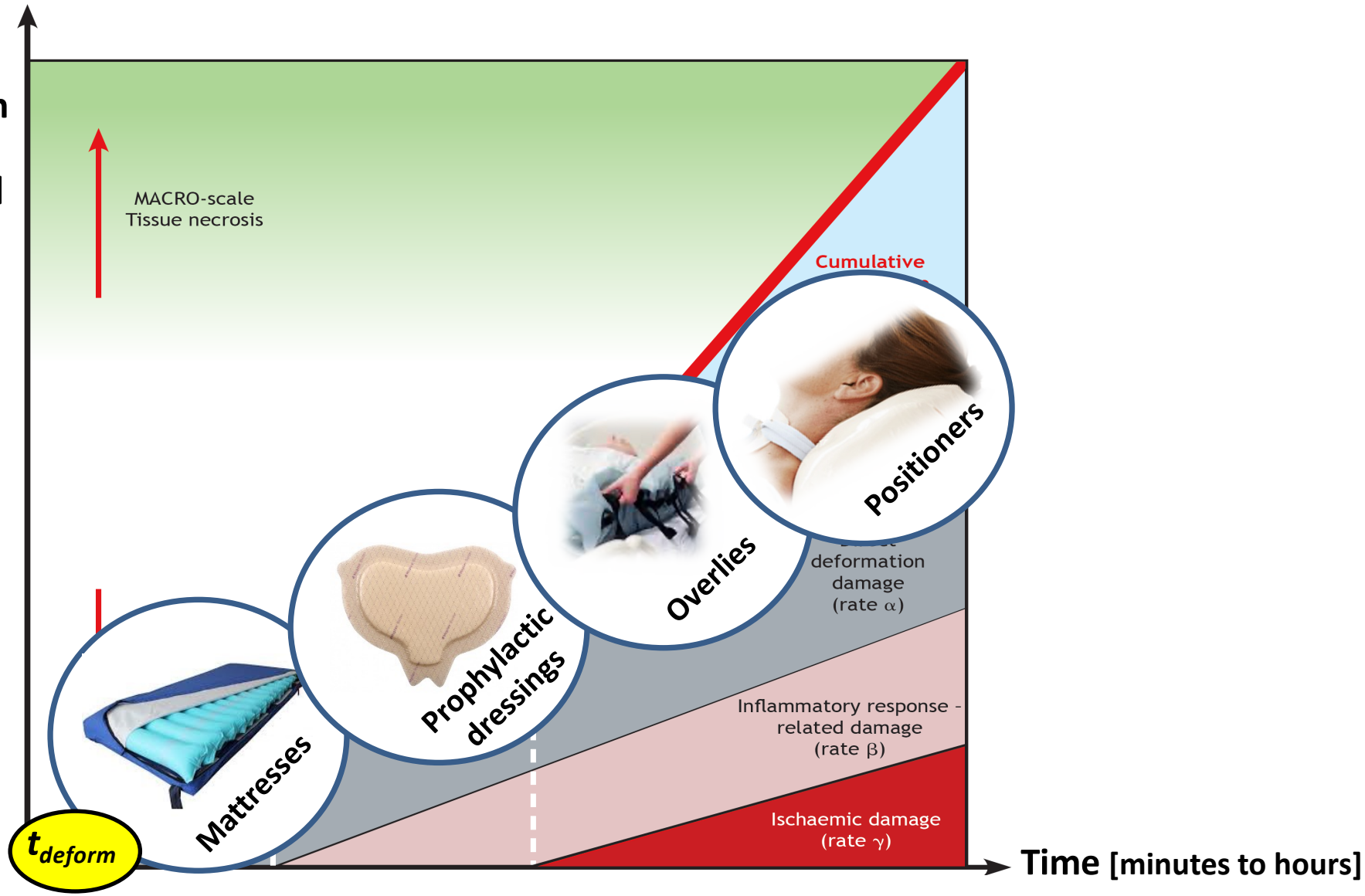
Gefen *British Journal of Nursing* 2017 & International PU Guideline 2019

The vicious cycle of pressure ulcer/injury formation & progression



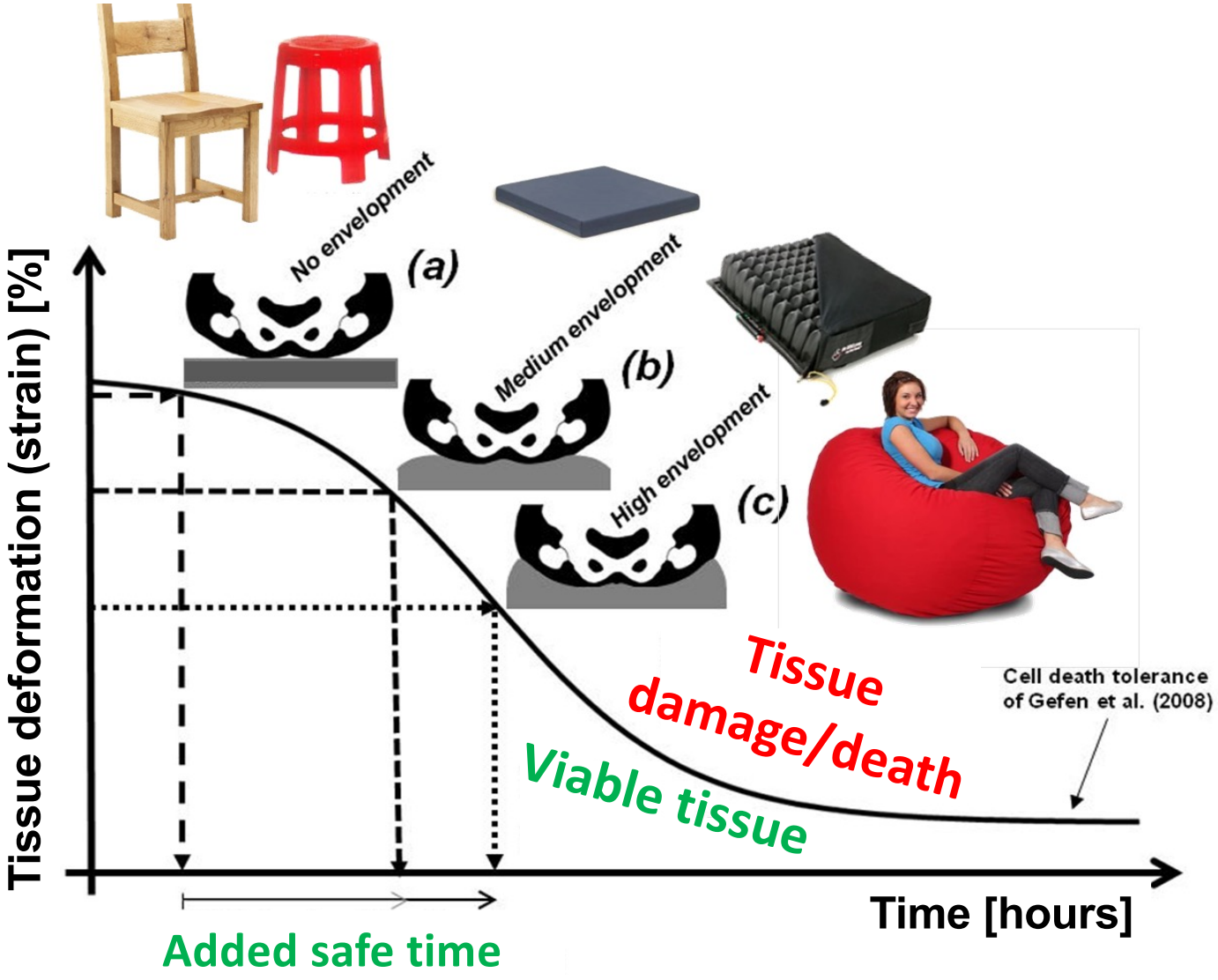
Slomka & Gefen *Annals of Biomedical Engineering* 2012
Leopold & Gefen *Medical Engineering & Physics* 2013
Weihs & Gefen *Medical Engineering & Physics* 2016
Gefen *EWMA Journal* 2018
Gefen et al. Clinical Practice Guideline 2019
Gefen & Ousey, Update to International Consensus Document on DRPUs *Journal of Wound Care* 2020

What makes a technology effective in primary PU/PI prevention?



Gefen *EWMA Journal* 2018
Gefen *Medical Engineering & Physics* 2019
Gefen et al. Clinical Practice Guideline 2019

How do conventional support surface technologies mitigate deformation?



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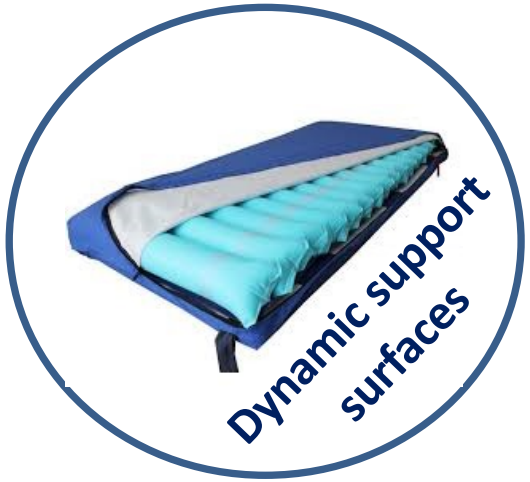
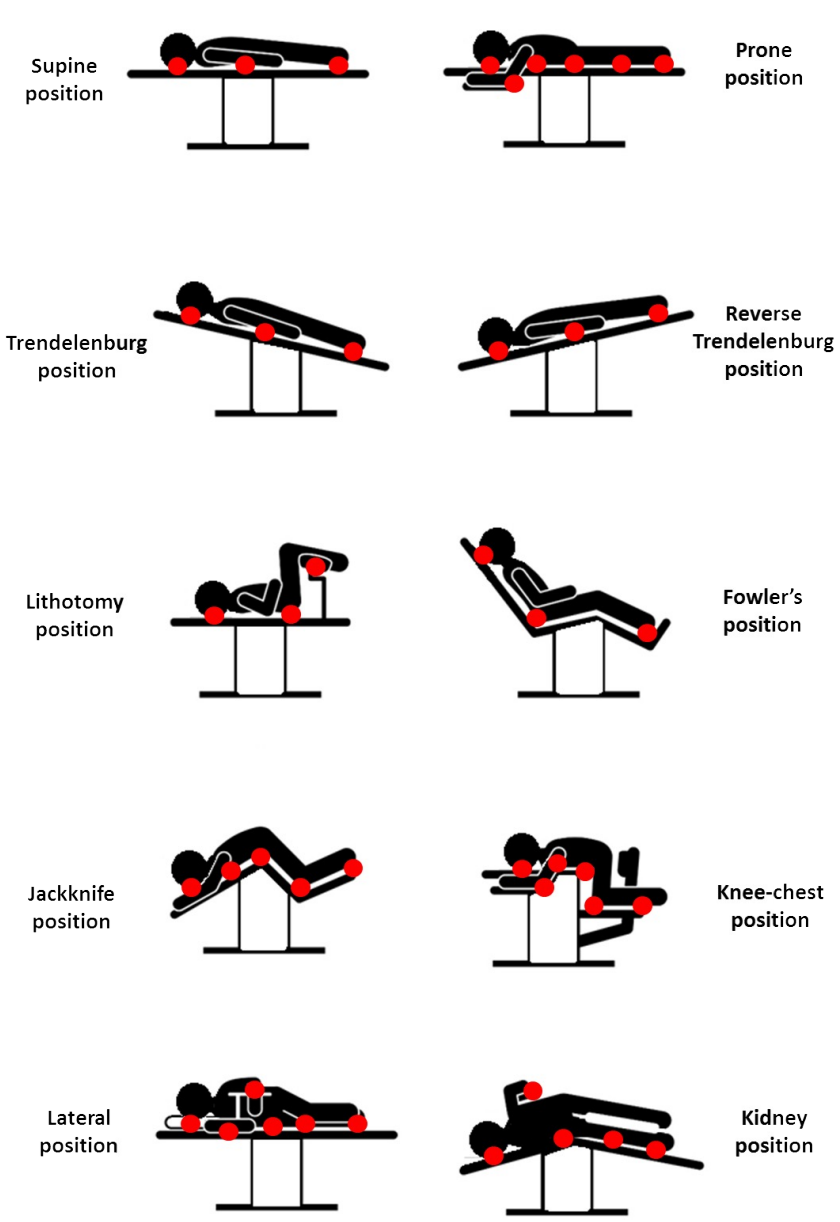
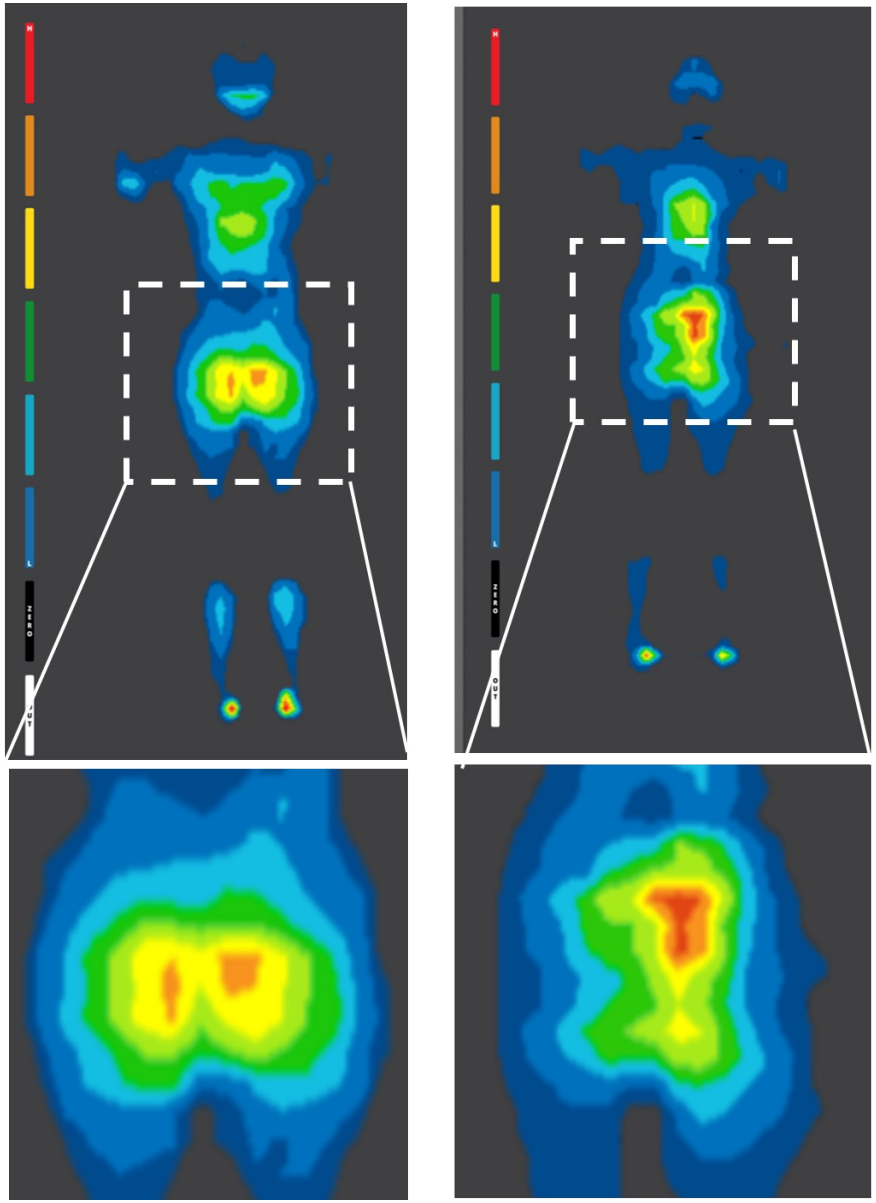


Linder-Ganz et al.*Journal of Biomechanics* 2006
Gefen et al. *Journal of Biomechanics* 2008
Shabshin, Gefen et al.
Journal of Rehabilitation Research & Development 2010

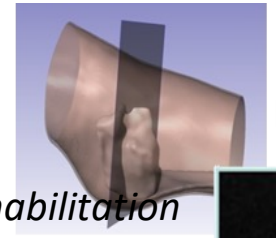
The uniqueness of the operating room (OR) setting



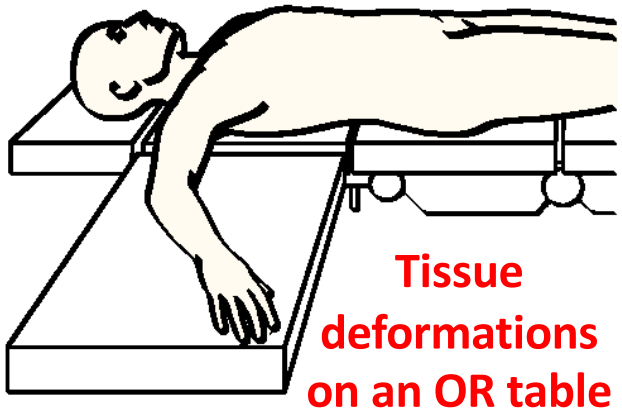


Gefen et al. *International Wound Journal* 2020

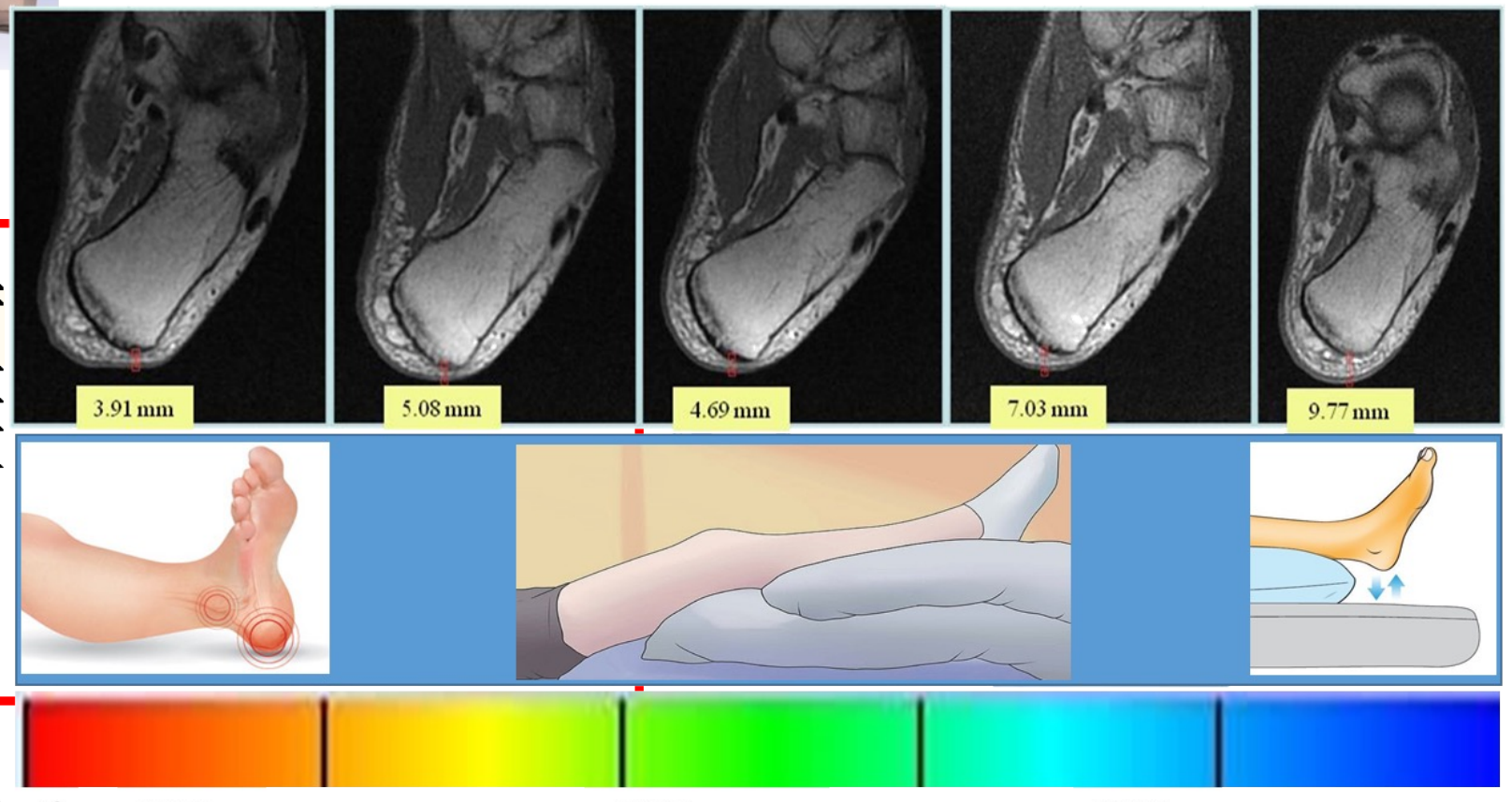
Tissue deformations in the OR: The example of the heels

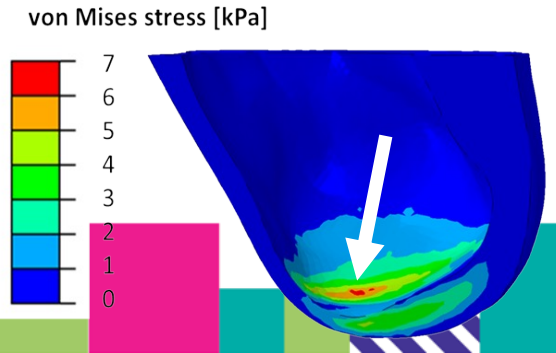


Tenenbaum, Gefen et al. *Journal of Rehabilitation Research and Development* 2013
Sopher et al. *Journal of the Mechanical Behavior of Biomedical Materials* 2011



Tissue deformations on an OR table

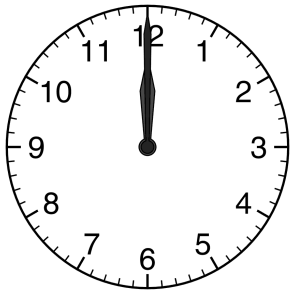




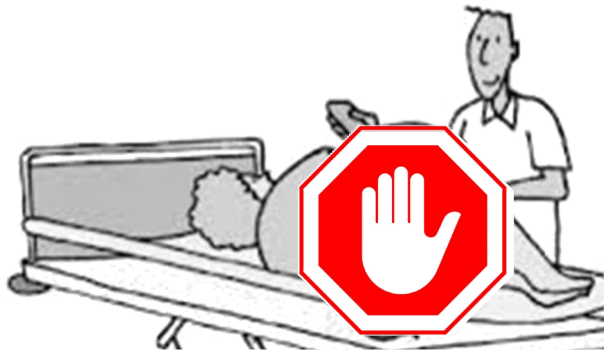
Discussion: A biomechanical perspective on the uniqueness of the OR setting

In addition to the intense tissue deformations, the OR setting imposes serious constrains to tissue protection:

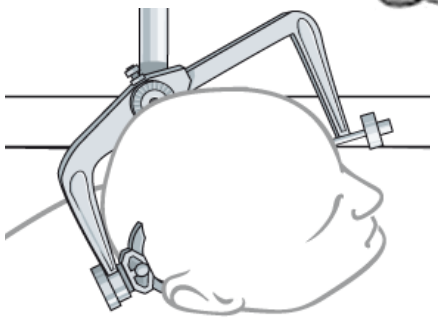
- Long (3-4 hours) immobilization periods due to anesthesia (& over 6 hours for neurosurgery)



- Whole-body repositioning is not feasible (patients are anesthetized & ventilated)



- Precision procedures (e.g. neurological, cardiac, vascular, tumor removal) require body stability



Gefen *Ostomy Wound Management* 2008, Gefen *Wounds International* 2020 & Gefen, *Journal of Elasticity* 2021

The Solution

Terry Emerson, DNP, RN, CNOR, NEA-BC

Innovation

- Why?
  - Patients undergoing surgical procedures are at risk for pressure injury
    - **Comorbidities**
    - **Nutritional status**
    - **Age**
    - **Length of surgery**
    - **ASA**
    - **BMI**
    - **Position and positioning aids**
  - .Regulatory Requirements/Reimbursement

Innovation

- How?
  - Communication and Collaboration
  - 5 M Fishbone
  - Education
  - Practice Change

Innovation

- Interventions
  - Pressure Injury Prevention Risk Assessment Tool
  - Positioning Templates
  - Electronic Medical Record Support

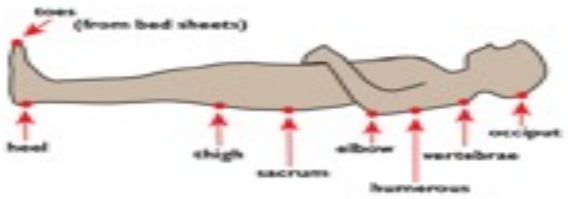
Innovation

PRESSURE INJURY PREVENTION

- PREOP/INTRAOP/POST OP SKIN ASSESSMENT AND DOCUMENTATION
- RN TO RN HAND OFF PRE AND POST OP
- RISK ASSESSMENT
- APPROPRIATE TRANSFER DEVICES AND SUPPORT (MIN 4)
- PNDS DOCUMENTATION
- GEL POSITIONING AIDS TO PAD VULNERABLE ANATOMY
- UPON TRANSFERRING THE PATIENT TO/FROM OR TABLE, INITIATE "SAFE SKIN SCAN"
  - ASSESS SKIN INTEGRITY
  - DOCUMENT
  - PLACE HERO

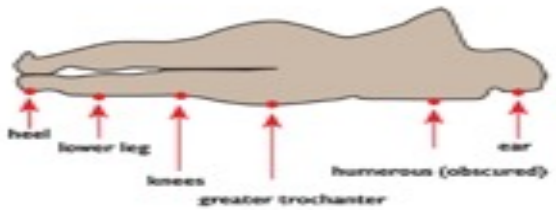
Supine

Occiput
Scapulae
Arms
Elbows
Thoracic vertebrae
Lumbar area
Sacrum/coccyx
Heels



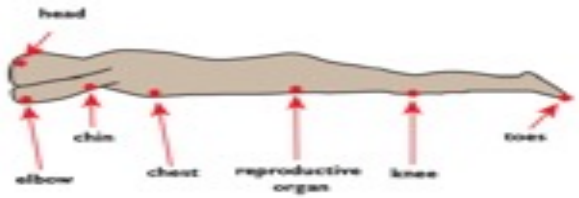
Lateral / Park Bench

Dependent side of face and ear
Dependent shoulder
Arms
Dependent axilla
Dependent hip
Legs
Dependent knee
Ankles
Feet



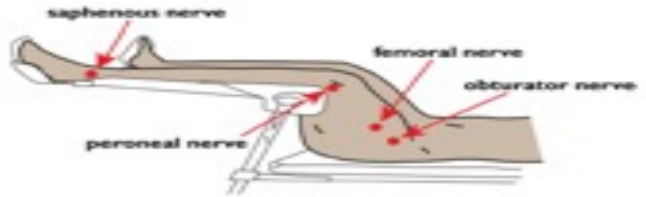
Prone

Forehead, eyes, ears, chin
Anterior shoulders
Breasts
Iliac crest
Genitalia
Knees
Shins
Dorsum of feet
Toes

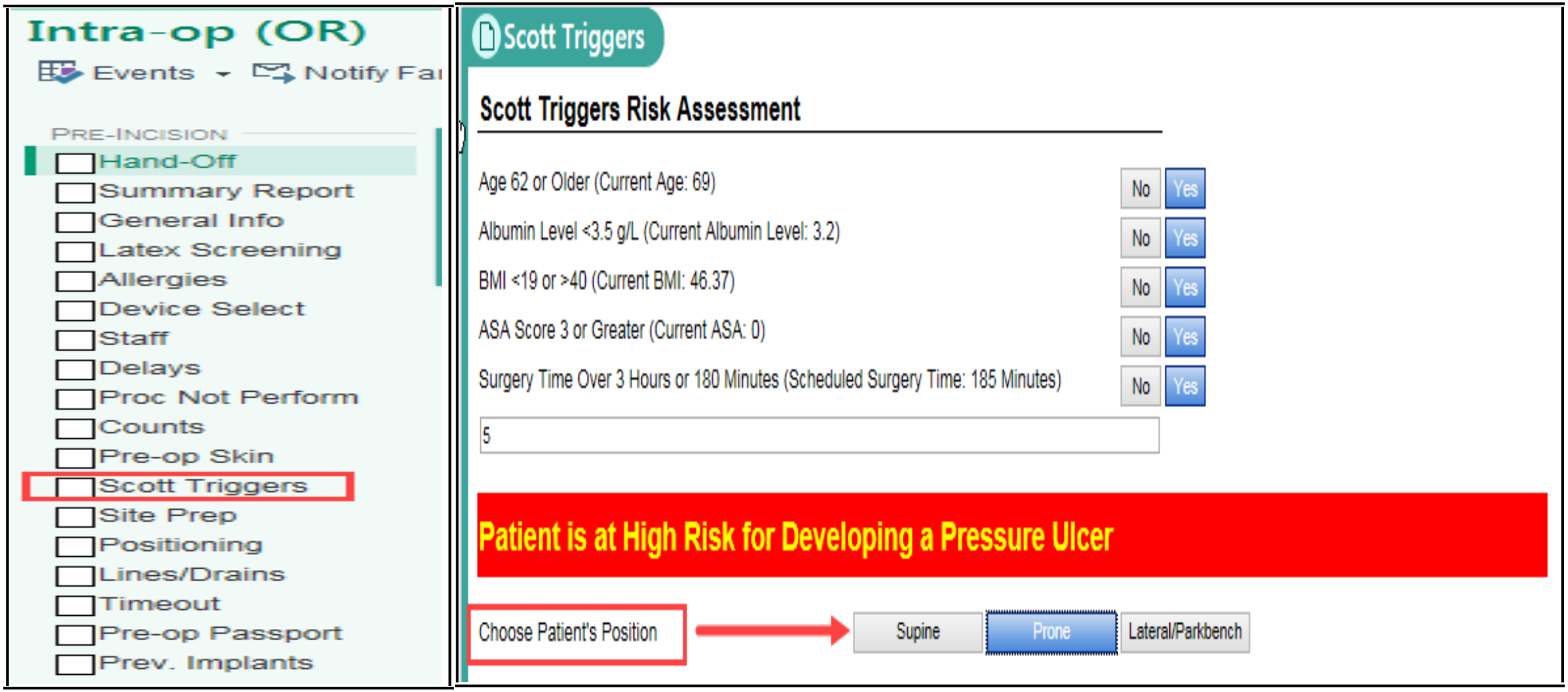


Lithotomy

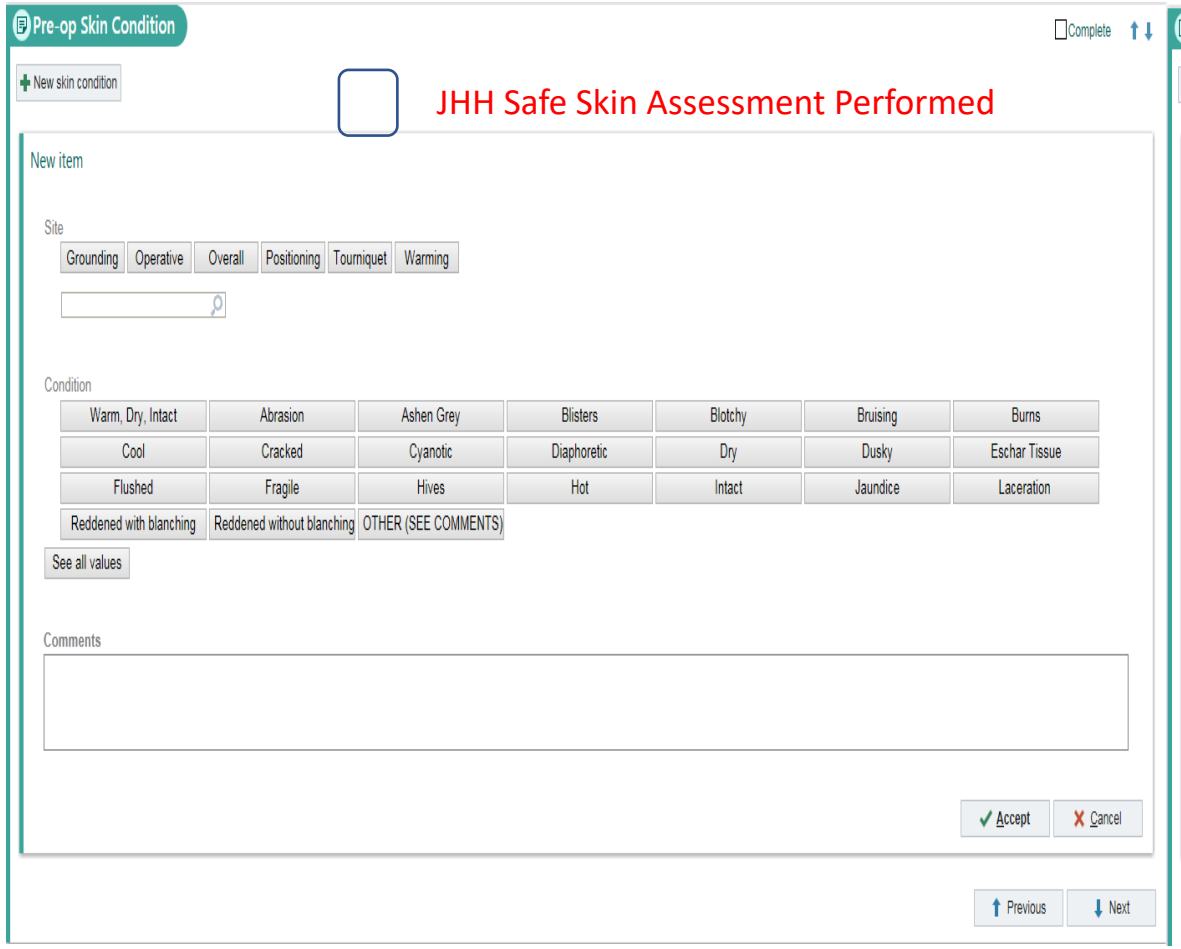
Occiput
Scapulae
Arms
Elbows
Thoracic vertebrae
Lumbar area
Sacrum/coccyx
Heels
Nerve injury

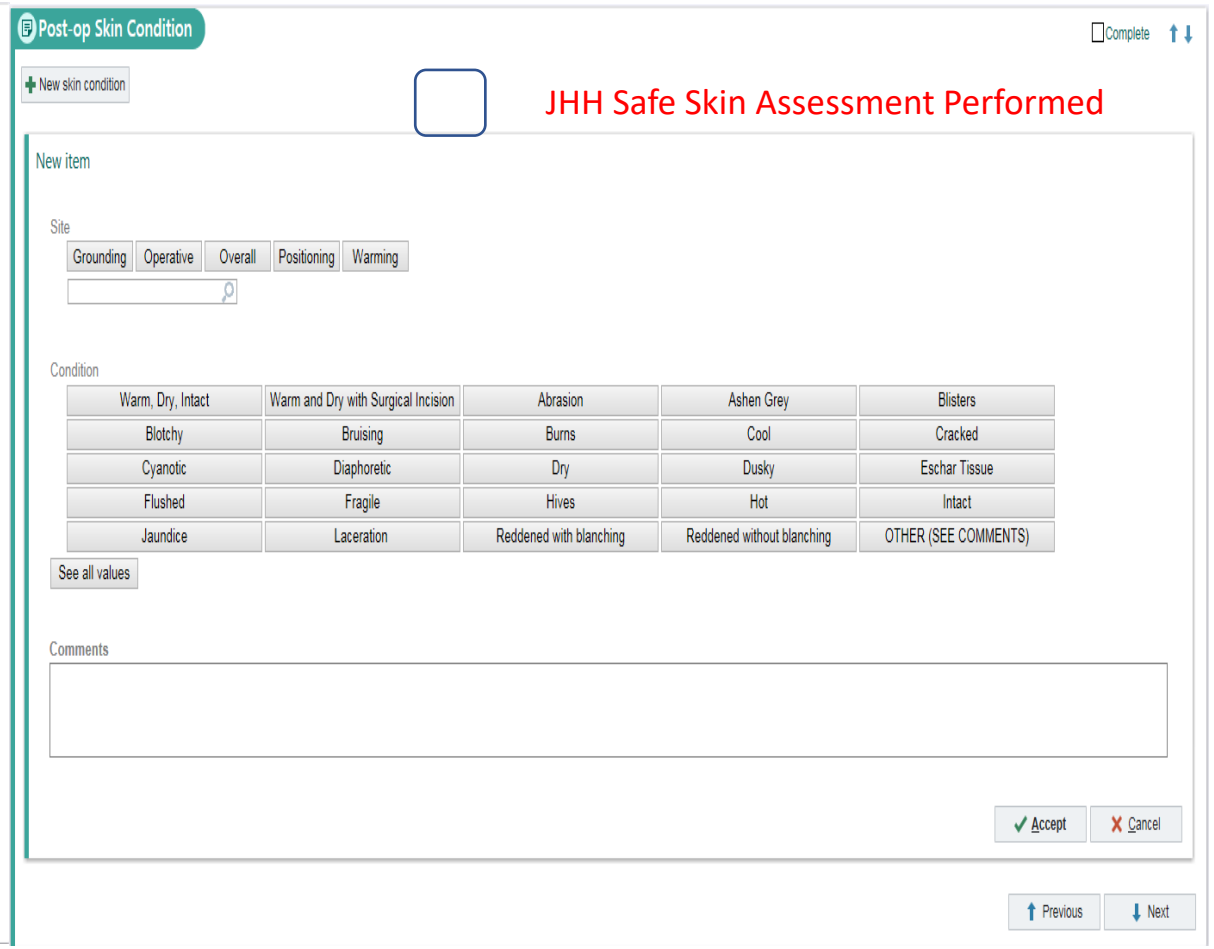


Innovation

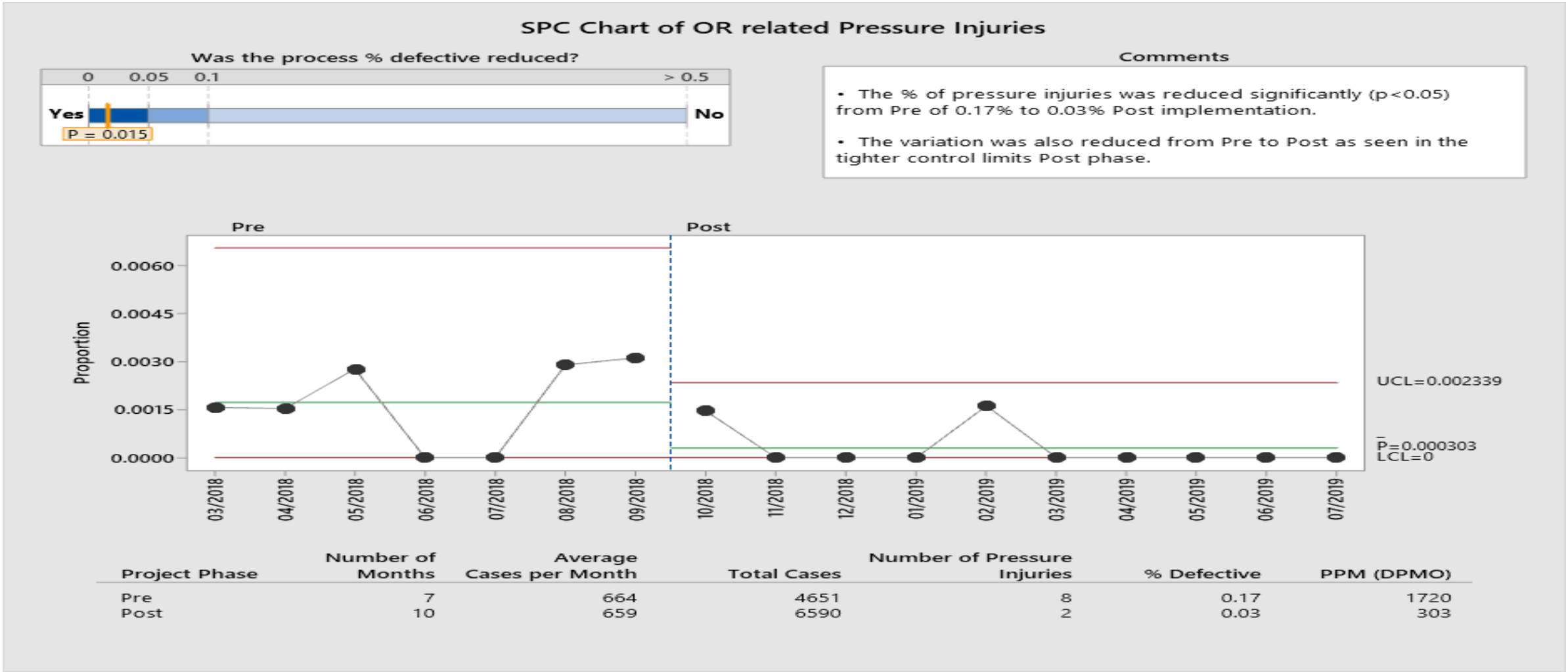

Intra-op (OR)
Events
Notify Fa
PRE-INCISION
Hand-Off
Summary Report
General Info
Latex Screening
Allergies
Device Select
Staff
Delays
Proc Not Perform
Counts
Pre-op Skin
Scott Triggers
Site Prep
Positioning
Lines/Drains
Timeout
Pre-op Passport
Prev. Implants
Scott Triggers
Scott Triggers Risk Assessment
Age 62 or Older (Current Age: 69)
No
Yes
Albumin Level <3.5 g/L (Current Albumin Level: 3.2)
No
Yes
BMI <19 or >40 (Current BMI: 46.37)
No
Yes
ASA Score 3 or Greater (Current ASA: 0)
No
Yes
Surgery Time Over 3 Hours or 180 Minutes (Scheduled Surgery Time: 185 Minutes)
No
Yes
5
Patient is at High Risk for Developing a Pressure Ulcer
Choose Patient's Position
Supine
Prone
Lateral/Parkbench

Innovation


Pre-op Skin Condition
Complete
New skin condition
JHH Safe Skin Assessment Performed
New item
Site
Grounding
Operative
Overall
Positioning
Tourniquet
Warming
Condition
Warm, Dry, Intact
Abrasion
Ashen Grey
Blisters
Blotchy
Bruising
Burns
Cool
Cracked
Cyanotic
Diaphoretic
Dry
Dusky
Eschar Tissue
Flushed
Fragile
Hives
Hot
Intact
Jaundice
Laceration
Reddened with blanching
Reddened without blanching
OTHER (SEE COMMENTS)
See all values
Comments
Accept
Cancel
Previous
Next


Post-op Skin Condition
Complete
New skin condition
JHH Safe Skin Assessment Performed
New item
Site
Grounding
Operative
Overall
Positioning
Warming
Condition
Warm, Dry, Intact
Warm and Dry with Surgical Incision
Abrasion
Ashen Grey
Blisters
Blotchy
Bruising
Burns
Cool
Cracked
Cyanotic
Diaphoretic
Dry
Dusky
Eschar Tissue
Flushed
Fragile
Hives
Hot
Intact
Jaundice
Laceration
Reddened with blanching
Reddened without blanching
OTHER (SEE COMMENTS)
See all values
Comments
Accept
Cancel
Previous
Next

Results



Project Phase	Number of Months	Average Cases per Month	Total Cases	Number of Pressure Injuries	% Defective	PPM (DPMO)
Pre	7	664	4651	8	0.17	1720
Post	10	659	6590	2	0.03	303

Summary

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Questions