# Hospital-Acquired Pressure Injuries: 2019 Update

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# Speakers

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# Disclosures

Both Speakers have no financial disclosures to report.

No medications are discussed with off-label suggestions.

Both speakers are board members of the NPUAP

# Brief Outline of Topics

- Identify national and local trends in the prevalence of HAPI
- Codification and Nomenclature
- Discuss area-specific challenges
- Interventions and technological innovations designed to prevent formation or deterioration of HAPIs
- Assessment strategies specific to current and prior HAPIs
- Bundling  & Checklists
- When to consult?
- What is on the horizon?

# Trends in HAPI Reporting

- The report of data points has changed
- Clinical confusion of pressure injury definitions
- Documentation and codification challenges

# Increase in Stage 3 Pressure Injury Reporting

- Not just New York State, but Nationally
- Why are rates increasing?
  - 2009 Not Present-on-Admission after 5 days
  - 2015 Not Present-on-Admission after 4 days
  - 2017 Not Present-on-Admission after 3 days
- Composite rates of 11 Patient Safety Indicators (PSIs)
  - 2015 Unequal distribution – PSI03 ~6%

2018 PS1-90 shifted to equal proportion from all conditions

# Calculating the PSI 90 – Weighted Average

https://qualityindicators.ahrq.gov/News/PSI90_Factsheet_FAQ.pdf

- PSI 03 Pressure Ulcer Rate (~10%)
- PSI 06 Iatrogenic Pneumothorax Rate
- PSI 08 In-Hospital Fall with Hip Fracture Rate
- PSI 09 Perioperative Hemorrhage or Hematoma Rate
- PSI 10 Post-Operative Acute Kidney Injury Requiring Dialysis Rate
- PSI 11 Postoperative Respiratory Failure Rate
- PSI 12 Perioperative Pulmonary Embolism or Deep Vein Thrombosis Rate
- PSI 13 Postoperative Sepsis Rate
- PSI 14 Postoperative Wound Dehiscence Rate
- PSI 15 Unrecognized Accidental Puncture or Laceration Rate

# Codification & Nomenclature of Pressure Wounds

- National Pressure Ulcer Advisory Panel Terminology & Staging
  - Depth of Tissue Involvement
  - Medical Device
  - Mucosal

# Codification & Nomenclature of Pressure Wounds

- Deep Tissue Injury and Unstageable Pressure Injury
  - NPUAP vs. Bedside Definition
- Unique Names
  - Kennedy Terminal Ulcer
  - Trombley-Brennan
- Language & Descriptions
  - Avoidable vs. Non-avoidable
  - Skin Failure
  - ‘Palliative Wound’

# Coding (Documentation)

- Pressure injuries can be incorrectly coded
  - Or named differently by multiple observers
- Coded as PIs but are really another type of wound
- Other wound misinterpreted as caused by pressure
  - Moisture Associated Skin Damage (MASD)
- Difficult examinations
  - obese, surgical, comatose, dark skin tones
- John Hopkins Hospital reduced their pressure ulcer rate by 75% just by improving coding practices!

# Consider Hospital Real Estate

- Ambulance
- Emergency Room Department
  - Observation Units
- Operating Room
- Intensive Care Units
- Medical/Surgical

# Pre-Emergency Room: The Ambulance

Ambulance stretchers are not constructed with PI prevention

Patients are secured for safety preventing off-loading and repositioning.

Many hospital transports may exceed 30 minutes (even with short distances).

Patients may not be communicative in order to convey discomfort.

Pre-hospital personnel are not trained to have PI prevention as a priority.

Heels are vulnerable to high pressures/shear with acceleration and deceleration.

Ischial tuberosities are vulnerable to high pressure/shear when HOB is elevated.

The normal movement of a vehicle (acceleration, deceleration, swerving, motor vibration) as it relates to tissue tolerance, can contribute to shear forces.

# Emergency Room

- Surfaces not always ideal
- Prolonged ER stays (holding areas)
- Observation Stays

# Operating Room

Anticipation of prolonged surgical procedures

Temporary situation: surfaces not always ideal

Planning for delays in procedures or post-surgical

# Intensive Care Units

- Best opportunity for individualized care but…
- Clinical Risk Factors
  - Malnutrition
  - Head Elevation for feeding and pulmonary toilet
  - Lack of documentation of skin in documentation

Inability to turn patients

Medical device injuries

Area in the hospital where consistency in codification and nomenclature issues are common

# Pediatric Units or Hospitals

Medical Device Injuries


# S – SKIN Assessment

# S – Skin Assessment / Risk Assessment


- Inspection
  - Head-to-toe
  - Front and back
- On admission, daily, after transfers, and life threatening events
  - Consult with the provider (MD/NP/PA) to ensure documentation of pressure “present on admission”

http://www.mnhospitals.org/inc/data/tools/SafeSkin-Toolkit/mha-welcome-apold.ppt#540,11,Save Our Skin Awards

http://www.ascensionhealth.org/assets/docs/JCAHO_Eliminating_Facility_Acquired_Pressure_Ulcers_at_AH_shrink.pdf

# S – Skin Assessment: Technology

- Subepidermal moisture monitoring
- High frequency ultrasound
- Thermal imaging

# S – Skin Assessment: Technology

- Subepidermal Moisture (SEM) Monitoring

Higher readings indicate greater moisture (range: 0-70 tissue dielectric constant); values increase significantly with the presence of skin damage. SEM of 39 tissue dielectric constant units predicted 41% of future skin damage while visual ratings predicted 27%.


Bates-Jensen, B, et.al. Subepidermal moisture detection of pressure induced tissue damage on the trunk: The pressure Ulcer Detection Study (PUD) Outcomes. Wound Repair and Regeneration, 25 (3), May, 2017.

# S – Skin Assessment: Technology

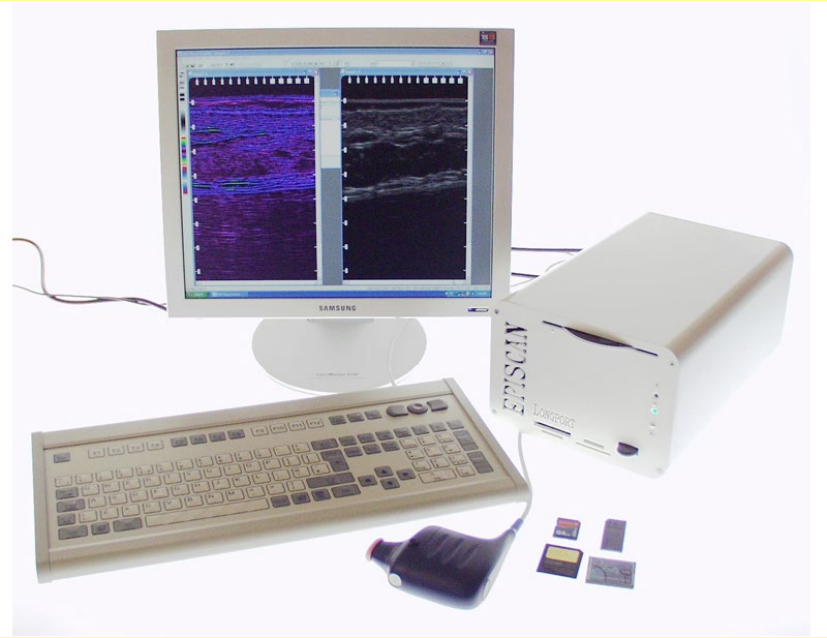
- Subepidermal Moisture (SEM) Monitoring
  - All PUs preceded by abnormal SEM
  - Mean time to PU detection 6 days (SD: 2 days) earlier using SEM)



Bates-Jensen, B, et.al. Subepidermal moisture detection of pressure induced tissue damage on the trunk: The pressure Ulcer Detection Study (PUD) Outcomes. Wound Repair and Regeneration, 25 (3), May, 2017.

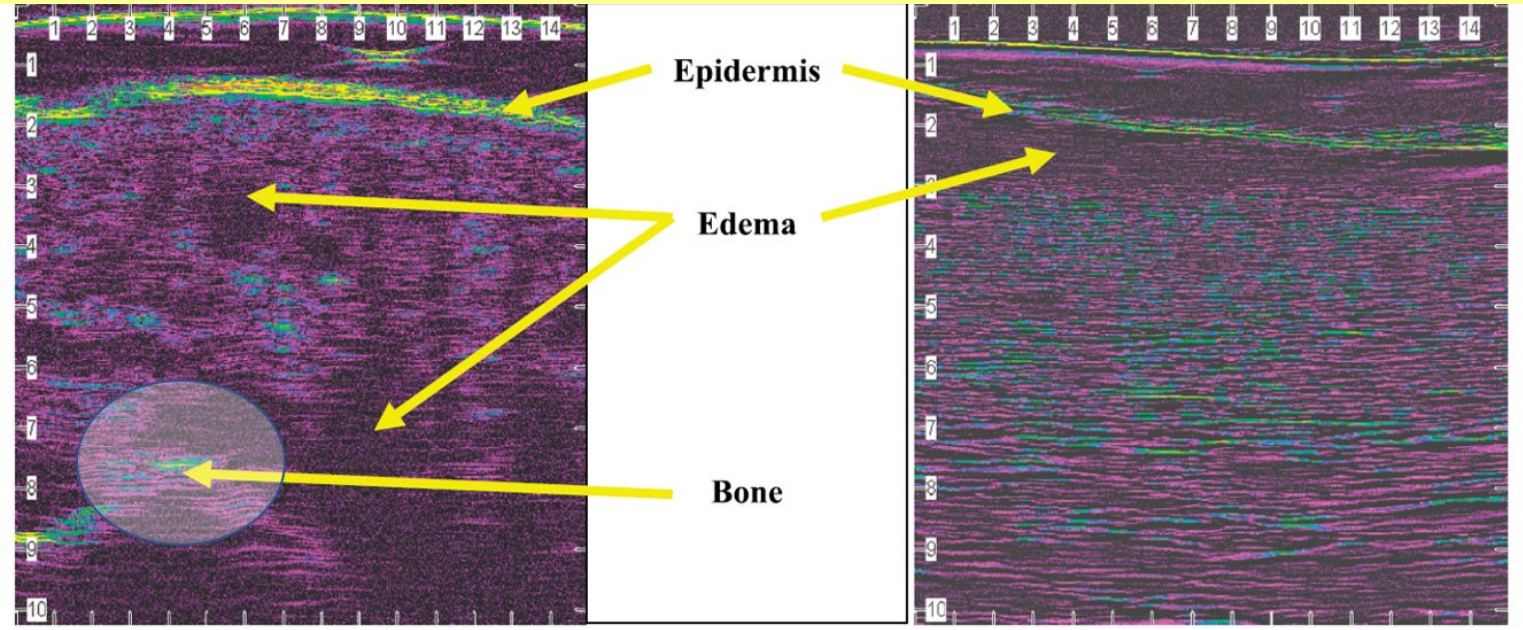
# S – Skin Assessment: Technology


- High Frequency Ultrasound
  - Uses the echoes of sound waves to create images of soft tissue anatomy
  - A probe transmits sound waves into the body at frequencies of 20 – 50 mHz → high resolution



# S – Skin Assessment: Technology

- High Frequency Ultrasound (Quintavalle, 2006)
  - If the wave encounters dense tissue, it creates a bright reflection known as hyperechoic area (NB: bone)

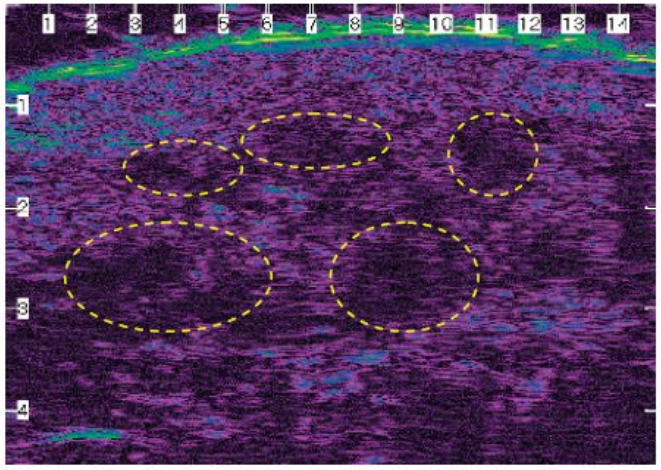



2A. Pattern 1. Example of deep edema extending from the bone and extending upward, most likely caused by pressure.

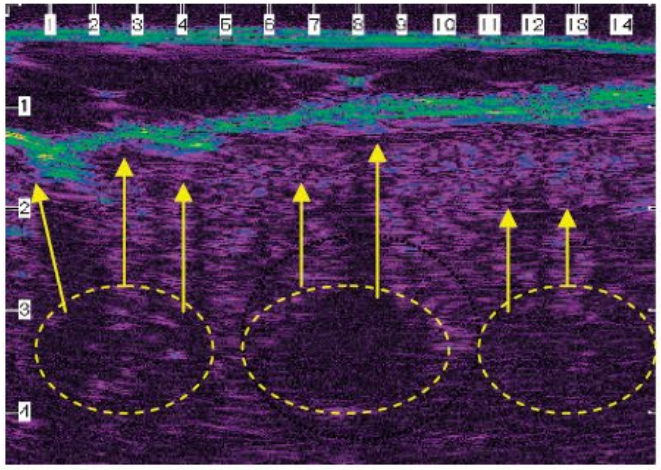
2B. Pattern 2. Example of superficial edema, most likely caused by friction or incontinence.

# S – Skin Assessment: Technology

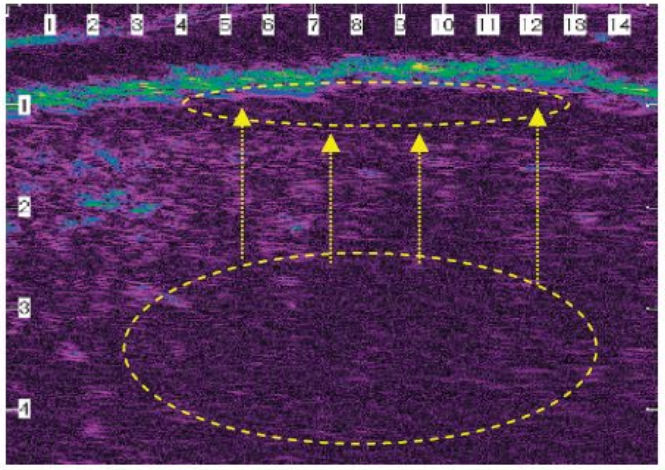
- High Frequency Ultrasound (Quintavalle, 2006)
  - If the sound wave encounters fluid, it will be absorbed creating a dark area in the image (hypoechoic or nonechoic)



3A. Subgroup 1. Pressure ulcer development with pockets of edema in the subcutaneous tissue but with no dermal involvement.



3B. Subgroup 2. Pressure ulcer development with edema extending from the subcutaneous tissue into the dermis.



3C. Subgroup 3. Pressure ulcer development with edema extending from the subcutaneous tissue via the dermis to the dermal/epidermal junction where it has pooled.

# S – Skin Assessment: Technology

- Thermography
  - Quantifies body surface temperature by capturing the thermal radiation emitted by the body.
  - Radiation is converted to an electrical signal, forming a gray or color image.
  - Thermogram shows colors on body surface, allowing for evaluation / quantification of temperature changes in tissues and skin related to inflammatory processes caused by tissue damage pathways

# The Evidence: Thermography

| Author/Date/ Design/Intervention | Country | Setting | Sample | Measurement | Results |
|---|---|---|---|---|---|
| Farid K, et. Al, 2012 Using temperature of pressure-related intact discolored areas of skin (PRIDAS) to detect deep tissue injury: an observational, retrospective, correlational study. | USA | Academic medical center | N=85<br>-N=55 Cool – center PRIDAS<br>-N = 30 Warm-center PRIDAS | - Presence/absented of blanching erythema<br>- Difference between the temperature of central PRIDAS and adjacent skin<br>- Development of skin necrosis at 7 – 14 days | 29/55 PRIDAS with lower temperature than adjacent skin (average: -1.2° C) [p<0.001] After combining presence/absence of capillary refill and PRIDAS temperature:: 0 of 26 patients with blanching erythema and warm PRIDAS vs. 65% of 26 patients with non-blanching erythema and cool PRIDAS developed skin necrosis |

Farid, et.al. Using temperature of pressure related intact colored areas of skin (PRIDAS) to detect deep tissue injury: an observational, retrospective, correlation bstudy. Ostomy Wound Managemewnt 2012; 58(8):20-31

# The Evidence: Thermography

| Author/Date/ Design/Intervention | Country | Setting | Sample | Measurement | Results |
|---|---|---|---|---|---|
| Cox J, et.al.2016. A prospective observational study to assess the use of thermography to predict progression of discolored skin to necrosis among patients in skilled nursing facilities. | USA | Nursing homes (7) | N = 67 | Assessment at initial presentation of discolored area and after Day 7 and Day 14 | - Most frequently discolored area: heel (27, 40%)<br>*Mean temperature*<br>- At site of discolored skin: 33.6˚C (SD 3)<br>-At adjacent skin:<br>33.5˚C (SD 2.5)<br>*Mean size of discolored area:*<br>11 $cm^2$ (SD 21)<br>*Initial presentation:*<br>- *Capillary refill absent:* 49 (72%)<br>- *Demarcation of discolored borders:* 45 (66%)<br>Day 7<br>- Resolution: 30/67 (45%)<br>- Skin necrosis significantly associated with absent capillary refill at initial presentation (p=0.04)<br>- Cooler center than adjacent skin more likely to develop skin necrosis (OR 18.8, p = 0.05, CI:104 – 342.44) |

Cox, et.al. A prospective observational study to assess the use of thermography to predict progression of discolored skin to skin necrosis among patients in skilled nursing facilities. Ostomy Wound management 2016; 26(10):14-33.

# The Evidence: Thermography

| Author/Date/ Design/Intervention | Country | Setting | Sample | Measurement | Results |
|---|---|---|---|---|---|
| **Ulcerations** | | | | | |
| Yamamoto T, et. al., 2013 Handy thermography for bedside evaluation of pressure ulcer | Japan | Not stated | N=5 Patients with sacral pressure ulcers | Temperature difference between ulcer (PU) region and adjacent tissue | 3/5 patients: low temperature PU as compared to surrounding tissue; ulcer progressed; size and depth increased by Day 7<br>2/5 patients: no temperature difference; gradual improvement; decreased size and depth of ulcers by Day 7. |

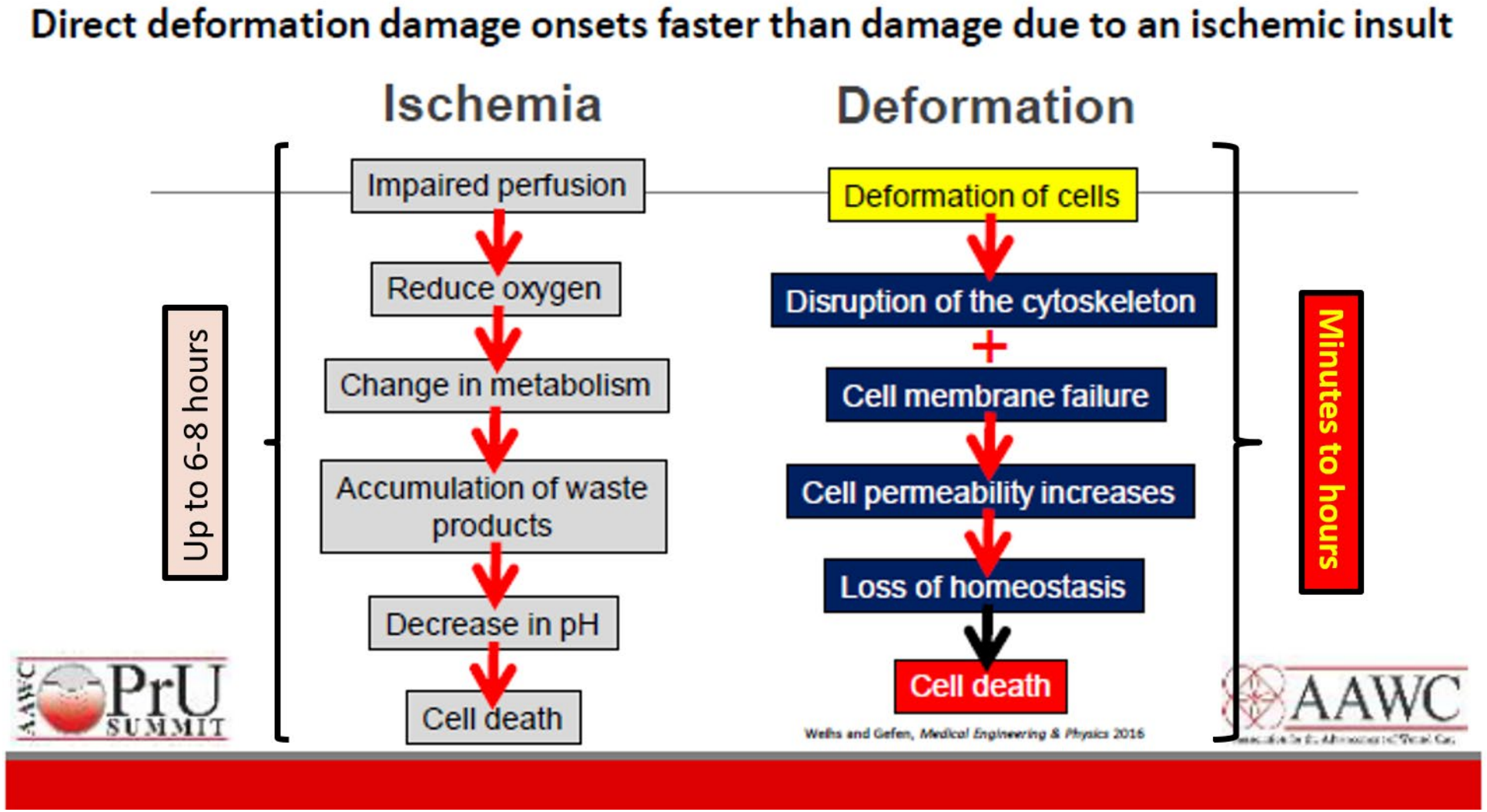
Yamamoto, T, et.al. Handy thermography for bedside evaluation of pressure ulcers. JPRAS 2013;66:e205-e206.

# The Evidence: Thermography

| Author/Date/ Design/Intervention | Country | Setting | Sample | Measurement | Results |
|---|---|---|---|---|---|
| ***Ulcerations*** | | | | | |
| Kanazawa T, et.al., 2016 Lower temperature at the wound edge detected by thermography predicts undermining development in pressure ulcers: a pilot study<br>- Retrospective cohort study | Japan | | N=22 Patients with stage 3,4, unstageable PUs | Temperature at wound edge versus wound bed using thermography | - 9/11 Pus without lower temperature at wound edge did not develop undermining<br>- 8/11 with lower temperature did develop undermining<br>- Relative risk of undermining development after 1 week in PU with lower temperature at the edge was 4.00 (95% confidence intervals:1.08 - 14.7). The sensitivity, specificity, positive predictive value and negative predictive value were 0.80, 0.75, 0.73, and 0.81. |

Kanazawa, T, et.al. Lower temperature at wound edge detected by thermography predicts undermining development in pressure ulcers: A pilot study. International Wound journal 2016; 13(1);454-460


# S – Surfaces




From: Gefen A. Cells put to the torture rack: Why is sustained deformation lethal to tissues. Pressure Ulcer Summit, 2-8-2018 (*used with permission*)

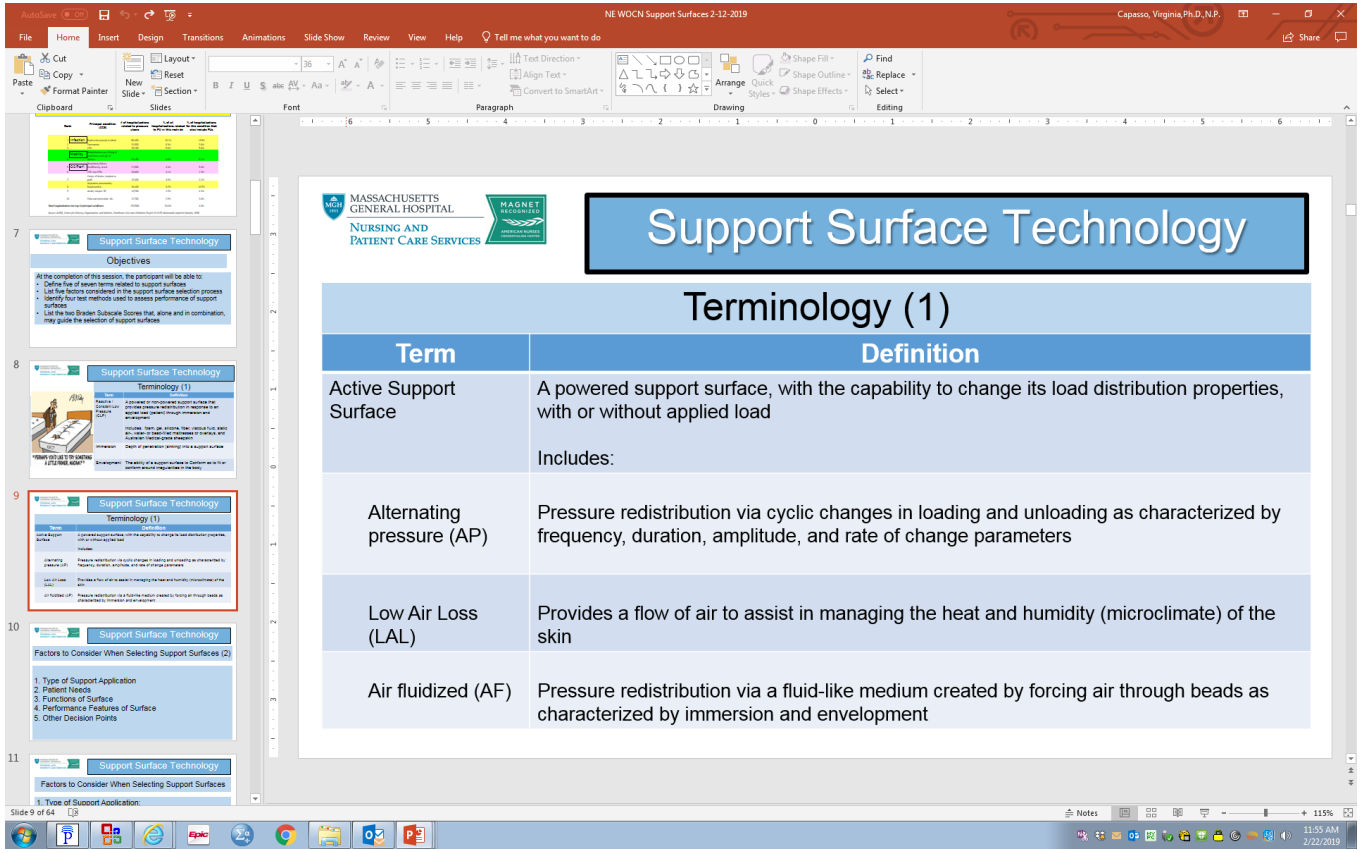
# Support SurfaceTerminology (1)

(Source unknown)

| Term | Definition |
|---|---|
| Reactive/Constant low pressure (CLP) | A powered or non-powered support surface that provides pressure redistribution in response to an applied load (patient) through immersion and envelopment<br><br>Includes: foam, gel, silicone, fiber, viscous fluid, static air-, water-or bead-filled mattresses or overlays, and Australian Medical-grade sheepskin Immersion |
| Immersion | Depth of penetration (sinking) into a support surface |
| Envelopment | The ability of a support surface to Conform so to fit or conform around irregularities in the body |

1. National Pressure Ulcer Advisory Panel Support Surfaces Standard Initiative. Terms and Definitions. Version 1/29/2007. Available at: http://www.npuap.org/wp-content/uploads/2012/03/NPUAP_S3I_TD.pdf (Accessed 2-24-2019)

# Support SurfaceTerminology (1)



# Factors to Consider when Selecting Support Surfaces (2)

1. Type of Support Application
2. Patient Needs
3. Functions of Surface
4. Performance Features of Surface
5. Other Decision Points

# Factors to Consider when Selecting Support Surfaces (2)

1. Type of Support Application:
   - Bed
   - Replacement mattress
   - Overlay
   - Seat cushion

# Factors to Consider when Selecting Support Surfaces (2)

2. Patient Needs:
   - Setting / acuity
     acute care, critical care,
     long-term care,
     residential / home care
   - Body habitus
   - Moisture
   - Mobility

# Factors to Consider when Selecting Support Surfaces (2)

3. Functions of Surface
   - Continuous low pressure (CLP)
   - Alternating pressure (AP)
   - Low air loss (LAL)
   - Other integrated functions:
     Percussion, Vibration
     Lateral Rotation

# Factors to Consider when Selecting Support Surfaces (2)

4. *Performance Features:*
   - Pressure redistribution
   - Friction / shear
   - Heat withdrawal / evaporation

*Friction:* the action of one surface or object rubbing against another

*Shear:* a strain in the structure of a substance produced by pressure, when its layers are laterally shifted in relation to each other

# Factors to Consider when Selecting Support Surfaces (2)

1. Type of Support Application
   - *Bed*
2. Patient Needs
3. Functions of Surface
4. Performance Features of Surface
5. Other Decision Points

Critical Care Pressure Redistribution Bed with Integrated Functions (Active, Powered, AP, LAL, Percussion, Vibration, Lateral Rotation, Drive, Scale)

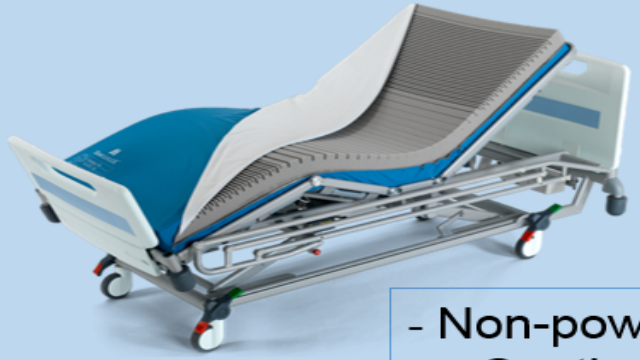
Bariatric Pressure Redistribution Bed: Choice of Surface (foam, LAL, CLRT)

Combination Air Fluidized Bed with LAL,
Electric HOB to Address Respiratory Needs,
Hi/Lo Bed Adjustment for Easier Egress

E.D. Observation: Stretcher with Pressure Redistribution Support Surface, bed alarm, drive function, scale

# Factors to Consider when Selecting Support Surfaces (2)

1. Type of Support Application
   - *Replacement mattress*
2. Patient Needs
3. Functions of Surface
4. Performance Features of Surface
5. Other Decision Points



- Non-powered
- Continuous low pressure
- Reactive
  - high quality polyurethane foam
- Any setting

# Factors to Consider when Selecting Support Surfaces (2)

1. Type of Support Application
   - *Replacement mattress*
2. Patient Needs
3. Functions of Surface
4. Performance Features of Surface
5. Other Decision Points

- Non-powered
- Continuous low pressure
- Reactive
  - Self Adjusting Technology (SAT)
- Any setting

# Factors to Consider when Selecting Support Surfaces (2)

1. Type of Support Application
   - *Replacement mattress*
2. Patient Needs
3. Functions of Surface
4. Performance Features of Surface
5. Other Decision Points

- Powered
- Continuous low pressure
- Active
  - Cyclic inflation / deflation every 12 minutes
- Any setting

# K – Keep Moving / Turning


- High risk: Braden Scale
  - Total Score < 12
  - Activity Subscale Score: 1 or 2
  - Mobility Subscale Score: 1 or 2
- A study of “nursing home residents supports turning moderate- and high-risk residents at intervals of 2, 3, or 4 hours when they are cared for on high-density foam replacement mattresses. Turning at 3-hour and at 4-hour intervals is no worse than the current practice of turning every 2 hours.”

Bergstrom N, Horn SD, Rapp MP, Stern A, Barrett R, Watkiss M, Krahn M. Preventing pressure ulcers: a multisite randomized controlled trial in nursing homes. Ont Health Technol Assess Ser [Internet]. 2014 October;14(11):1-32

# K – Keep Moving / Turning


- Technology
  - Ceiling lifts
  - Continuous pressure monitoring
  - Wearable position monitoring system

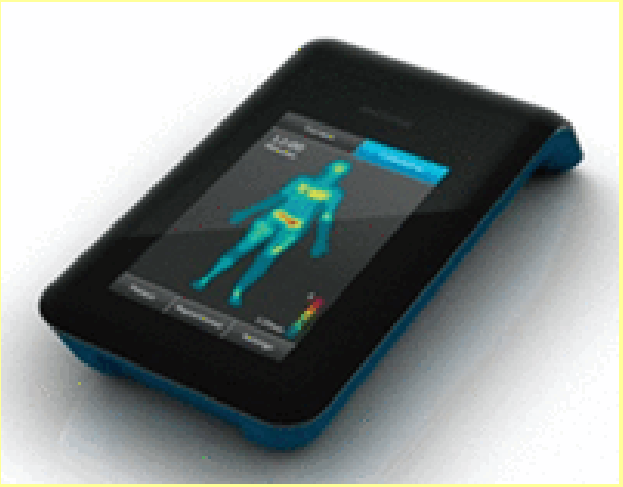
# K – Keep Moving / Turning

- Technology
  - Ceiling lifts

# K – Keep Moving / Turning

## Continuous pressure monitoring

- By positioning a “smart” M.A.P. coverlet with built-in pressure sensors on a sleep surface, the M.A.P.: identifies areas of pressure and produces a color-coded, live image on an easy-to-read bedside monitor
- monitors the buildup of pressure over time at preset intervals alerts caregivers when repositioning is due.



https://www.psqh.com/news/wellsense-unveils-first-ever-bedside-patient-pressure-mapping-system-designed-to-assist-caregivers-in-effectively-repositioning-patients

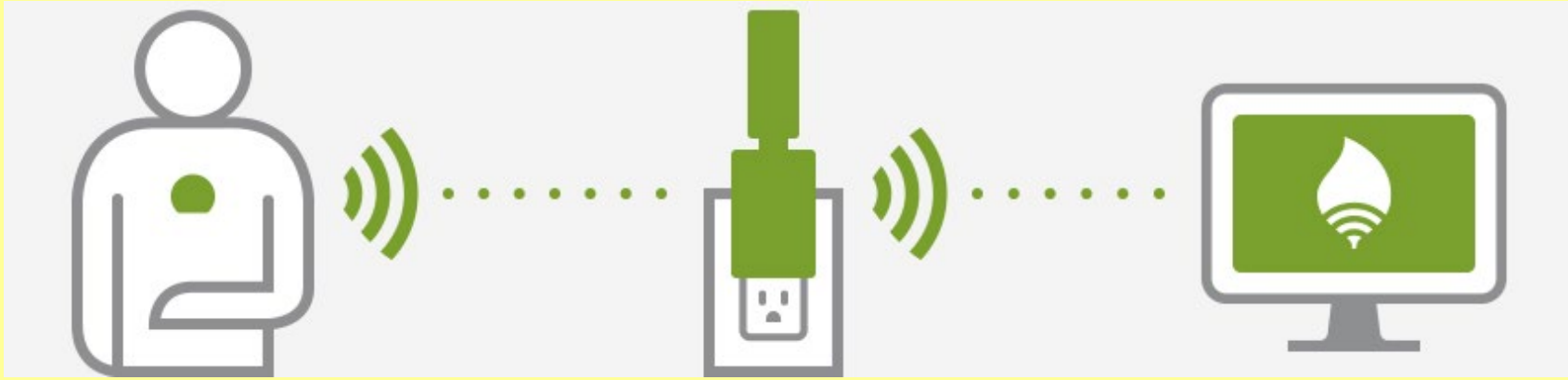
# K – Keep Moving / Turning

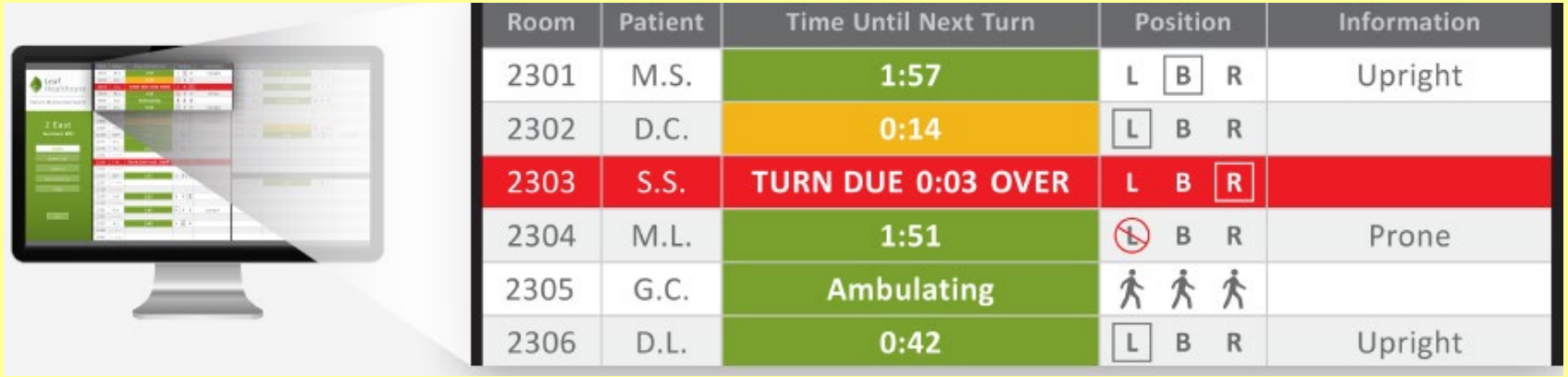
## Wearable Position Monitoring System

- Wireless system for visual cuing that monitors patient/resident position and movement designed to help prevent facility-acquired pressure injuries and other immobility related conditions
- Includes wearable sensor on patient's upper chest
- Sensor activated by removal of cover
- Generates data from a single individual
- PM software displays patient's positional history and current status are displayed by TC software on monitors (e.g. nurses' station)

# K – Keep Moving / Turning

## Wearable Position Monitoring System





| Room | Patient | Time Until Next Turn | Position | Information |
|---|---|---|---|---|
| 2301 | M.S. | 1:57 | L [B] R | Upright |
| 2302 | D.C. | 0:14 | [L] B R | |
| 2303 | S.S. | TURN DUE 0:03 OVER | L B [R] | |
| 2304 | M.L. | 1:51 | ⊘ B R | Prone |
| 2305 | G.C. | Ambulating | 🚶 🚶 🚶 | |
| 2306 | D.L. | 0:42 | [L] B R | Upright |

From: Pressure Injury Prevention. Available at: http://leafhealthcare.com/solution.cfm (Accessed 2-10-2019)

# K – Keep Moving / Turning


- **Chair**
  - < 2 hours per session
  - Pressure redistribution every 15 minutes
  - Consider immersion / envelopment of chair pad

# I – Incontinence Management

- Toileting every 1-2 hours
  Offer assistance to the bathroom/commode
- Inspect perineum
  Incontinence care, as needed
- Wipes with dimethicone
- Skin protectants /sealants
  (e.g. when lactulose ordered)

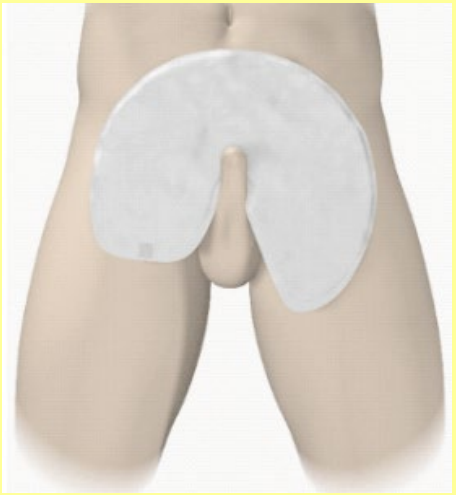
# I – Incontinence Management

- Innovation
  - Female external (suction) incontinence device

https://www.crbard.com/medical/en-US/Products/PUREWICK-Female-External-Catheter

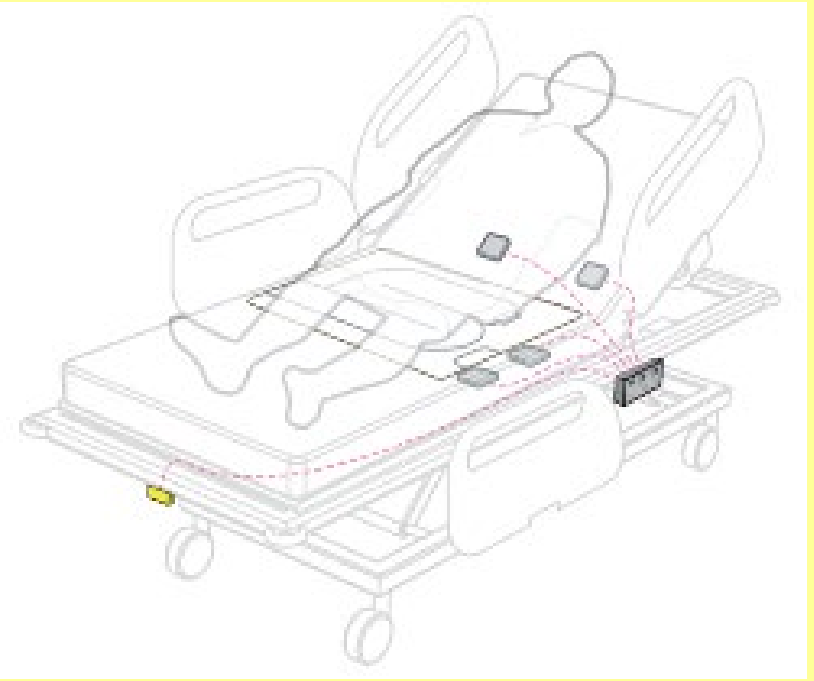

  - Male incontinence wrap

*https://quickchange.com/*



# I – Incontinence Management

- Innovation
  - Electronic incontinence monitoring embedded in the bed and linked to nurse call system



https://direct.hill-rom.com/hillromUS/en/Products/Miscellaneous-Products/WATCHCARE/p/F71C60E4-D64E-4B60-A68E-96E901680E90

# N– Nutrition

- Assume that all hospitalized patients are at nutritional risk
- Weight loss, inability to chew, dehydrated, infection, diabetes mellitus
- If there is a skin issue = Automatic Dietician Consultation
- Calories 30-35 Kcal/kg/day
- Protein 1.25 1.5 gm/kg/day

Posthauer ME; Banks M; Dorner B, FAND; Schols J. Advances in Skin & Wound Care: April 2015 28(4): 175-188

# Risk Assessments

- Assessment Strategies
  - Parameters
    - Reliable from Person to Person
    - Validity as a Risk Assessment Tool
  - Braden Scale/Norton Scale/Waterlow Score
    - Subsections
    - Mobility, Moisture, Nutrition, Sensory Perception, Friction/Shear
  - Risk assessments are just one piece of the process of identifying the at-risk patient.
  - These assessments do not replace clinical judgement.
  - ***A patient that had a pressure injury in the past is at risk!***

# Bundling & Checklists

- Literature to Support both Prevention & Treatments of PIs
  - http://www.ihi.org/ihi/topics/criticalcare/intensivecare/improvementstories/whatisabundle.htm
  - Hardwiring what is beneficial for prevention/treatment into care plans, into processes of care

# Bundling & Checklists

- Comparative Effectiveness of Quality Improvement Interventions for Pressure Ulcer Prevention in Hospitals.
  - Padula W, Makic M, Mishra M, et. al. Journal of WOCN 41: May 2014
- Five QI Initiatives
  - Leadership Initiatives
  - Visual Tools
  - HAPU Staging
  - Skin Care
  - Patient Nutrition

# Bundling & Checklists

- Checklists
  - Report Card for Bundling
- Sample List
  - Risk Assessment with Braden Scale
  - Repositioning
  - Nutrition
  - Support Surfaces
  - Moisture & Incontinence
  - Continual Nursing Education Related to Guidelines

# Bundling & Checklists

- Moderate-quality evidence from a review of 26 implementation studies showed that multicomponent interventions can improve skin care and reduce pressure ulcer rates in both acute and long-term care settings

- Sullivan N, Schoelles KM. Preventing in-facility pressure ulcers as a patient safety strategy: a systematic review. Ann Intern Med. 2013;158:410-6.

# When you should consult?

- Can the consultant be helpful?
  - Surgeon for debridement
  - Palliative Care
  - Wound Center Transition
  - Develop a care plan?
  - Medical plan?
- Medical/Legal Concerns
  - Avoidable vs. Nonavoidable
- Transition
  - Ownership of wound and the consequences

# Innovations in Treatment

- Noncontact low frequency ultrasound (NCLU) for deep tissue injury (DTI)
- Negative Pressure Wound Therapy with instillation (Veraflo) for high grade pressure injuries

# Near Horizon

- Documentation and Coding
  - Telemedicine
- International Guidelines
  - November 2019
- Biomarkers of degradation
  - Adipose grafts

# Questions

Inquiries can be sent in for review

www.npuap.org