Pressure Ulcer Prevention

The Ordinary and the Novel

Objectives

- Learn how to identify at risk patient populations and employ preventative measures to reduce pressure ulcer incidence
- Recognize the importance of patient repositioning
- Evaluate novel strategies for the prevention of sacral and heel pressure ulcers.

Identifying at risk patient populations

The Ordinary

Use of Braden Scale by Level of Risk

Levels of Risk	Score Ranges	Approximate PVP
Mild Risk	15-18	30-60%
Moderate Risk	13-14	50-75%
High Risk	10-12	60-90%
Very High Risk	9 and below	100%

Less Ordinary though hardly novel: Risk Assessment as Clinical Data

- Each subscale score serves as
  - an initial appraisal of patient's specific problems and functional deficits
  - A flag for assessments that need to be explored further
  - A guide to the types of interventions that should be used

- Total scores and levels of risk serve as
  - An estimate of the probability that a pressure ulcer will occur
  - A guide to the intensity of the interventions that should be used.

Example: Sensory Perception Subscale

Sensory Perception Ability to respond meaningfully to pressure-related discomfort	1. Completely limited: Unresponsive to painful stimuli due to Diminished level of consciousness or sedation OR limited ability to feel pain over most of body surface.	2. Very limited: Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness. OR Has a sensory impairment which limits the ability to feel pain or discomfort over ½ of body.	3. Slightly limited: Responds to verbal commands, but cannot always communicate discomfort or the need to be turned. OR Has some sensory impairment which limits abvility to feel pain or discomfort in 1 or 2 extremities	4. No Impairment: Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.

The Novel: Subscales as predictors

Lahmann & Kottner. Relation between pressure, friction and pressure ulcer categories: a secondary analysis of hospital patients using CHAID methods. International Journal of International Studies. 48 (2011) 1148-1494

- Settings:161 hospitals, all specialties and categories throughout Germany
- Subjects: 28,299 adult patients, average 65.4 and 55% female.
- Methods: controlling for age, subscales were entered into a special statistical method (Chi-square automatic interaction detection) to determine which subscales were predictive of superficial pressure ulcers and which were predictive of full-thickness ulcers (Stage III and IV).
- Friction and Shear was the strongest predictor of Stage II ulcers
- The mobility subscale score of 1 (completely immobile) was the strongest predictor of Stage III and IV ulcers

Another study of subscales as predictors:

Tescher, Branda, O'Byrne, Naessens. All at-risk patients are not created equal: Analysis of Braden Pressure Ulcer Risk Scores to identiy specific risks. JWOCN. May/June 2012, 39(3) 1-10

- Subjects and setting: 12566 adult patients in ICU or progressive care units within Mayo Clinic with scores of 18 or less
- 416 patients with HAPU stage 2-4 were studied
- Friction and shear subscale had the greatest predictive power
- Interesting interactions were noted
  - Patients scoring 1 on both activity and moisture had a 57% increase in risk (as compared to patients with a score of 1 on only one of those subscales.
  - Patients who scored the lowest (1) on both mobility and sensory perception subscales had a 67% increase in risk as compared to those with 1 on mobility but a higher sensory perception subscale score.

Really Novel!!

Cohen, et al. (2012) Exploring Predictors of Complication in Older Surgical Patients: A Deficit Accumulation Index and the Braden Scale. Aug 20, Journal of American Geriatric Society

- Studied 102 abdominal surgery patients who were over age 65
- Predictor variables were
  - first postoperative Braden Scale score (within 24 hours of surgery)
  - Deficit Accumulation Index (DAI) constructed based on 39 available preoperative variables.
- Outcome variable- presence/absence of complication within 30 days of surgery.
- **RESULTS**
- 64 experienced at least one complication, with wound infection being the most common.
- In models adjusted for age, race, sex, and open versus laparoscopic surgery, lower Braden Scale scores were predictive of:
  - 30-day postoperative complication; ($P \leq .001$)
  - discharge to an institution rather than home (OR = 1.23, 95% CI = 1.02-1.48).
  - The cut-off value for the Braden score with the highest predictive value for complication was ≤ 18 (OR = 3.63, 95% CI = 1.43-9.19; c statistic 0.744).
  - The DAI and several traditional surgical risk factors were not significantly associated with 30-day postoperative complications.

- **CONCLUSION:**
  - Further studies are needed to confirm this finding and to investigate other uses for this tool, which correlates well to phenotypic models of frailty

Patient Repositioning Intervals:

The Ordinary 2 hr interval

The Novel: 3-4 hour intervals

But First.....
Does Repositioning Work At All?

- Rich, et al (2011)
  - Retrospective study of 269 elderly hip fracture patients
    - 12 % of those repositioned frequently developed pressure ulcers
    - 10% of those repositioned **less** frequently developed pressure ulcers
    - Huh?????

- Use of chart review data to determine frequency of turning constitutes a serious limitation of these findings.

Why is Chart Review Data Suspect?

- Bates-Jensen, et al (2003)
  - found that nursing home personnel will record having completed repositioning every two hours 93-96% of the time.
  - monitored repositioning with thigh monitor in same nursing homes and found actual repositioning took place an average of every 5-6 hours.
  - Many patients with charting indicating q 2hr repositioning went as long as 11 hrs between actual turns

Biggest Question is Turning Interval

- Must repositioning take place every two hours?
- Can some patients tolerate longer intervals between turns?
- Is this interval affected by the mattress used?
- What factors differentiate those who can tolerate longer intervals from those who cannot?

Defloor, DeBacquer & Grypdonck (2005)

- Compared 4 different turning regimens.
  - The 4 experimental arms (65 per arm) were:
    - turning every 2 hour on a standard mattress (non-pressure reducing cold foam)
    - turning every 3 hours on a standard mattress
    - turning every 4 hours on a viscoelastic mattress that was 15 cm thick
    - turning every 6 h on the same type of viscoelastic mattress
  - Findings:
    - Those turned every 2 hrs on a standard mattress had an incidence of 14.2%
    - Those turned every 3 hours on a standard mattress had an incidence of 24.1%
    - Those turned every 4 hours on viscoelastic foam had a 3% incidence ($p=.002$)
    - Those turned every 6 hours on viscoelastic foam had a 15.9%
  - Outcomes statistically adjusted for level of risk.

Vanderwee, Grypdonck, DeBacquer & Defloor (2007)

- RCT comparing 4 hour and 2 hour repositioning in the 30 degree lateral position.
  - Experimental group (N=122) spent 2 hours in a 30 degree lateral position
  - Control group (N=113) spent 4 hrs. in the 30 degree lateral position.
  - Both groups spent four hours in the supine position (30 degree elevation of head of bed and foot of bed) before being turned to the lateral position
  - Both groups were lying on viscoelastic foam overlay (7 cm thick).
  - Viscoelastic foam wedges were used to support lateral turning,
  - Chair cushion and leg cushions sitting positioning and to free the heels from pressure.
- Findings
  - Both groups developed pressure ulcers (Stages 2-4) on the sacrum and heels (16.4% in the 2 hr group and 21.2% in the 4 hr group).
  - No statistically significant difference between groups.

Comments

- **Regardless of statistical differences……would any of us accept an incidence of either 16 or 21% as optimal for our patients????**
  - Defloor and colleagues reported a 3% incidence rate in an experimental group that was repositioned every 4 hours on an 15 cm thick mattress and using pillows as turning supports.
  - Vanderwee, et al reports 16.4% and 21.2% incidence in similarly aged geriatric patients that were nursed on a 7 cm thick overlay and left in the supine position for four hours before being repositioned.
- It is reasonable to consider that 7cm thick viscoelastic foam overlays are not as protective as the thicker viscoelastic mattress.

TURN Study

Bergstrom N, et al J Am Geriatr Soc. 2013 Oct; Vol. 61 (10), pp. 1705-13;

- **Purpose and design:** Multi-site randomized clinical trial to determine optimal turning frequency in 952 NH residents at moderate or high risk for PU's.
- **Settings:** Nursing homes in U.S. (20) and Canada (7) using high density foam mattresses
- **Intervention:** Consenting participants, 65 or older, were randomly assigned 2,3, or 4 hr turning schedules and stratified according to level of risk.
- **Results:** No significant difference in PU incidence according to repositioning group nor between moderate and high risk groups.
  - 2 hour group – 8/321 or 2.5%
  - 3 hour group – 2/326 or 0.6%
  - 4 hr group – 9/295 or 3.1%

What do we take from these studies?

- When it comes to support surfaces, thickness and quality of foam are important.
- Q 3 hour turns are probably pretty safe in moderate to high risk elderly patients who are stable and are being nursed on high density foam mattresses
- No information on very high risk patients or those who sufficiently ill to be hospitalized.

- Here's the real head scratcher in the TURN study. Those turned q 2hrs had a much higher incidence of PU than those turned q 3 hr.
- Could we be injuring patients 2 hour turning, specifically by increasing exposure to friction and shear.

Should you change turning schedules in your institution

- Depends……
  - Might be OK in nursing homes with good support surfaces and stable patients who are not at very high risk
  - General guidelines advise individualized turning schedules based on patient characteristics and needs, but do you have the kind of staff who can make individualized judgments?
  - Do you put yourself at legal risk if q 2 hr turning schedules remain the standard of care?
  - Do you achieve "consistency" if every patient has a different prescription?

Decreasing the Possibility of Injury During Turning

Lift sheets: The Ordinary

Manual Repositioning Devices: The Novel

Safety Concerns in Repositioning For the patient and the nurse

- Guidelines advise use of manual repositioning devices/lift sheets to reduce friction and shear
- Guidelines also warn against leaving the handling devices in place unless they are specifically designed for use in that way.
- Optimal design for leaving under patients
  - Fabric is breathable
  - Does not interfere with support surface, either in terms of pressure redistribution or movement of air.
  - Design also takes into consideration ergonomics for nurse or caregiver.
  - Decreased dynamic friction on patient side, increased static friction on support surface side

Other Novel Interventions to Address Friction and Shear

Mimura, et al (2009)

- In a series of positions with interface pressure measurements:
  - Found that raising the knees 20 degrees shifted body weight to the posterior side of the thigh, thus lowering pressure and shear at the coccyx.
  - Concluded that the knees should be raised before the head of the bed is raised.
- Checked patients in several positions related to natural bending points
  - Patients should be positioned so that their natural bending points at the hips and knees were in conformity with the bending points of the bed or slightly higher.
  - Being positioned with their natural bending points lower than the bending points of the beds created higher pressure and shear forces and care should be taken to avoid this position in bed.
- After first raising the knees and then raising the head of the bed, it was also recommended that the patients be turned to their side briefly, to release the surface pressure and shear forces.

Silicone Sacral Dressings

- Clark M; Black J; Alves P; Brindle C; Call E; Dealey C; Santamaria N, International Wound Journal, 1742-481X, 2014 Jan 29
  - This systematic review concluded sacral "dressings may help reduce pressure ulcer incidence associated with medical devices especially in immobile intensive care unit patients. There is no firm clinical evidence at this time to suggest that one dressing type is more effective than other dressings."
- Black J; Clark M; Dealey C; Brindle CT; Alves P; Santamaria N; Call E, International Wound Journal [Int Wound J], ISSN: 1742-481X, 2014 Mar 3
  - After review of literature, an expert consensus panel concluded that there is adequate evidence to recommend the use of a five-layer silicone bordered dressings and 3 layer heel dressings for pressure ulcer prevention in the sacrum, buttocks and heels in high-risk patients.
- Somewhat different conclusions one month later about dressing type, but both recommend use of dressings to decrease skin injury.

Novel Fabrics

- **Twersky** J; Montgomery T; Sloane R; Weiner M; Doyle S; Mathur K; Francis M; Schmader K, Ostomy/Wound Management: 1943-2720, 2012 Dec; Vol. 58 (12), pp. 18-24;
  - A randomized controlled trial of elders in VA nursing home.
    - Experimental Group: silk-like textile sheets and high absorbency adult incontinence briefs
    - Control Group: plain weave cotton/polyester bed sheets and usual adult incontinence briefs
  - Overall incidence and incidence of PU greater than Stage I was significantly lower in the experimental group.
  - Most dramatic difference in terms of location was with heel ulcers (6 vs 0).
  - Small study (N=60) but 3 larger studies (2 prospective controlled cohort and 1 retrospective) in high risk groups reported significantly fewer pressure ulcers in those nursed on silk-like sheets.

New and Really Novel

- In development
  - Fabrics that deliver drugs or other substances like lubricants or fungicides
  - Tests that measure the friction coefficients that develops between fabric and skin.
  - Fabrics that wick moisture and decrease bacterial transfer from fingerpads of caregivers.

Protecting the Heels

The Ordinary: Pillows

The Novel: Fabric Technology and Optimal Design in Heel Protectors

Heel elevation

- Donnelly, et al (2011)
- RCT comparing commercial heel suspension device to standard care for prevention of heel ulcers
  - 239 subjects admitted to a fracture trauma unit with hip fractures that occurred in the past 48 hours randomized to intervention (n=120) and standard care groups (n=119)
  - Standard care was pressure redistribution mattress and both groups were nursed on these surfaces.
  - No heel ulcers developed in the intervention group and 29 occurrences were noted in the standard care group ($p<.001$)

Heel protection devices

- Gilcreast, et al (2005)
  - randomized 338 patients to three heel protection devices (bunny boot, egg crate heel lift positioner and foot waffle air cushion device.
  - In the 240 patients completing the study, the incidence of heel ulceration was 3.9% for the bunny boot, 4.6 % for the egg crate heel lift positioned and 6.6% for the foot waffle air cushion device.
  - They found no statistically significant differences in outcome for the three devices.

What is best?

- Junkin and Gray
  - systematic review of methods for preventing heel ulcers
    - outlined a variety of issues with each of these studies
    - concluded that there was insufficient evidence determine which surface or heel protection device should be used in clinical practice.

  - So…..without evidence, should we do nothing?

NPUAP/EPUAP Guidelines on prevention of heel ulcers

- Ensure that heels are free of the surface of the bed.
- Heel-protection devices should elevate the heel completely in such a way as to distribute the weight of the leg along the calf without putting pressure on the Achilles tendon. The knee should be in slight flexion.
- If using a pillow under the calf, be sure the heels are elevated off the bed.

Optimal Design

- The Achilles tendon is not the only part of the foot and leg that must be protected from pressure.
- A heel protection device must also protect from pressure injury:
  - Dorsum and lateral edge of the foot
  - The lateral or medial malleoli
  - Peroneal nerve

Additional clinical considerations in selecting optimal design of heel protectors

- Lyder (2011)
  - Heel elevation
  - Prevention of foot drop and external rotation of the hip
  - Ability to decrease friction and shear (through fabric technology)
  - Allows patient to be ambulated
  - Ability to stay in place while patient is moving leg
  - Ease of cleaning
  - Decreases heat to heel
  - cost

Additional considerations

- Device should
  - Allow visual inspection of the heel without removing the device
  - Accommodate sequential compression devices or other devices related to negative pressure wound therapy, traction, etc.
  - Breathable and wick away moisture.

We've Come a Long Way, Florence and We're Not Done Yet!

Questions?