Andrea Martinez Chung

# Project Objectives

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## Situation Impact Statement

*"Design a system to be used by acute care nurses to **monitor** patients that are at risk of developing pressure ulcers such that the system increases the patient's Braden scale score to greater than or equal to 18 without causing patient discomfort."*

## What are Bed Ulcers?

Bed ulcers are painful sores that are developed mainly due to the lack of mobility. It is very common with wheelchair and bed ridden patients, especially in bony areas. While of course they would not feel these ulcers, they will sometimes never go away and is damaging to their bodies.

## The Braden Scale

The Braden scale is a scale that measures the risk of a patient developing a bed ulcer. It ranges from 1 to 23 where 23 means the patient has very low risk of developing a bed ulcer. The Braden scale is assessed based on 6 categories each of which is given a score ranging from 1 to 4 (except for shear and friction which is measured from 1 to 3), where 4 means that the patient passes that category. A patient can have a 4 in one category and 1s in all the other ones and still be at risk. The score on the Braden scale is as follows: 9 or less - very high risk, 10 to 12 - high risk, 13 to 14 - moderate risk, 15 to 18 - mild risk, 19 to 23 - no risk. The assessment follows the table below:

BRADEN SCALE FOR PREDICTING PRESSURE ULCER RISK

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Sensory Perception***<br><br>Ability to respond meaningfully to pressure related discomfort | 1. Completely Limited:<br>Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation,<br>*OR*<br>Limited ability to feel pain over most of body surface. | 2. Very Limited:<br>Responds only to painful stimuli<br>Cannot communicate discomfort<br>Except by moaning or restlessness,<br>*OR*<br>Has a sensory impairment, which limits the ability to feel pain or discomfort over 1/2 of body. | 3. Slightly Limited:<br>Responds to verbal commands but cannot always communicate<br>discomfort or need to be turned,<br>*OR*<br>Has some sensory impairment, which limits ability to feel pain or discomfort in 1 or 2 extremities. | 4. No Impairment<br>Reponds to verbal command. Has no sensory deficit which would limit ability to feel or voice pain or discomfort | | | | | |
| ***Moisture***<br><br>Degree to which skin is exposed to moisture | 1. Constantly Moist:<br>Perspiration, urine, etc keep skin moist almost constantly. Dampness is detected every time patient is moved or turned. | 2. Moist:<br>Skin is often but not always moist. Linen must be changed at least once a shift. | 3. Occasionally Moist:<br>Skin is occasionally moist, requiring an extra linen change approximately once a day. | 4. Rarely Moist:<br>Skin is usually dry; linen requires changing only at routine intervals. | | | | | |
| ***Activity***<br><br>Degree of physical activity | 1. Bedfast<br>Confined to bed. | 2. Chairfast:<br>Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheel chair. | 3. Walks Occasionally:<br>Walks occasionally during day but for very short distances, with or without assistance. Spends majority or each shift in bed or chair. | 4. Walks Frequently:<br>Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours. | | | | | |
| ***Mobility***<br><br>Ability to change and control body position | 1. Completely Immobile:<br>Does not make even slight changes in body or extremity position without assistance. | 2. Very Limited:<br>Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently. | 3. Slightly Limited:<br>Makes frequent though slight changes in body or extremity position independently. | 4. No Limitations:<br>Makes major and frequent changes in position without assistance. | | | | | |
| ***Nutrition***<br><br>Usual food intake pattern | 1. Very Poor:<br>Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement,<br>OR<br>Is NPO and/or maintained on clear liquids or IV for more than 5 days. | 2. Probably Inadequate:<br>Rarely eats a complete meal and generally eats only about 1/2 of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement,<br>OR<br>Receives less than optimum amount of liquid diet or tube feeding. | 3. Adequate:<br>Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally will refuse a meal, but will usually take a supplement if offered,<br>OR<br>Is on a tube feeding or TPN regimen, which probably meets most of nutritional needs. | 4. Excellent:<br>Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation. | | | | | |
| ***Friction and Shear*** | 1. Problem:<br>Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures, or agitation leads to almost constant friction. | 2. Potential Problem:<br>Moves feebly or requires minimum assistance. During a move skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down. | 3. No Apparent Problem:<br>Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times. | | | | | | |
| | | | | TOTAL SCORE<br>(Addressograph) | | | | | |

## Functional Requirements

We will be tracking the 6 categories and following the table above.

***Note:** We are not qualified nurses. We are not allowed to say that a patient is at risk, but we can monitor data so a nurse can make a proper assessment.

- **Sensory Perception Tracker:** The ability to respond meaningfully to pressure related discomfort.
- **Moisture Tracker:** Degree to which skin is exposed to moisture.
- **Activity Tracker:** Degree of physical activity.
- **Mobility Tracker:** Ability to change and control body position.
- **Nutrition Tracker:** Usual food intake pattern.
- **Friction and Shear Tracker:** If the patient is mobile, it is their ability to move without causing friction to their skin and shearing it.

The end goal is to have all this tracking into one product and have it communicate with a smartphone using BLE with an app for Android and iOS. That way a nurse can check the app and input necessary data and have a rough idea of the patient's state in all the categories, and then they can make a proper assessment.