The Braden Scale for Pressure Ulcer Risk: Evaluating the Predictive Validity in Black and Latino/Hispanic Elders

Courtney H. Lyder, Chang Yu, Jae Emerling, Rupinder Mangat, David Stevenson, Ophelia Empleo-Frazier, and Jim McKay

The purpose of this study was to examine the predictive validity of the Braden scale in predicting pressure sore risk and to determine the physiological and nonphysiological variables associated with the prediction of pressure ulcers in Black and Latino/Hispanic elders. A prospective clinical design was used to conduct the study. Among 74 patients aged 60 years or older, 24 patients (32%) developed either a stage 1 or stage 2 pressure ulcer. Black elders had a higher incidence rate (21%) than Latino/Hispanic elders (11%). A 2-tailed Fisher's exact test revealed that the Braden scale with a cutoff score of 18 was highly associated with predicting Black elders aged 75 years and older who were at risk of developing pressure ulcers (p < .011). Sensitivity was 81% and specificity was 100%. The female gender was also a highly significant factor in the development of pressure ulcers (χ² (1, N = 49) = 6.4, p < .011). Overall, the Braden scale was found to be a valid tool in predicting pressure ulcer risk in Black elders aged 75 years or older when a cutoff score of 18 is used.

Copyright © 1999 by W.B. Saunders Company

The frail elderly, especially those with conditions rendering them immobile and incontinent, are extremely vulnerable to the development of pressure ulcers. The incidence of pressure ulcers in acute care settings ranges from 3% to 11% (Allman, 1990). The cost to treat pressure ulcers is reported to be as high as $40,000 per ulcer (McKee, 1987).

The graying of America is occurring at an alarming rate. It is estimated that by the year 2030, more than 85 million people will be 65 years of age or older in the United States (Administration on Aging, 1997). Concurrent with the graying of White America is the increased graying of the elder ethnic minority population. Whereas the elder White population will increase 91% by the year 2030, the Black elder population will increase 159% and the Latino/Hispanic elder population by 570% (Administration on Aging, 1997). Clearly, Black and Latino/Hispanic elder populations are significantly increasing.

As previously stated, pressure ulcers can be a major health problem for elder adults. In a small pilot study (n = 36), Lyder, et al (1998) found a 38% (n = 14) incidence rate of pressure ulcers in Black and Latino/Hispanic elders in an acute care hospital. The rate reported in this study is much larger compared with most studies that report...
incidence rates of 3% to 11% in acute care hospitals (Allman, 1990). The few studies that were found appear to be inconclusive concerning how race and ethnicity influences pressure ulcer development and/or prediction. Spector, et al (1988) noted that non-Whites were more likely to have pressure ulcers when entering long-term care facilities. This finding may be attributable to the inability of health care professionals to detect erythema in darkly pigmented skin. Thus, until development of the condition into stage 2 (partial skin thickness loss) is noted, prevention and/or treatment is usually not implemented. Currently, only a few studies (n = 4) that include Black or Latino/Hispanic elders can be found in the literature. We found no studies that included a statistically significant number of Black or Latino/Hispanic elder subjects to draw any meaningful conclusions regarding pressure ulcer prediction. Moreover, no studies were found that examined how race/ethnicity affects physiologic variables that are commonly associated with pressure ulcers such as serum albumin, total protein, white blood cells, total lymphocyte counts, and glucose level.

The Braden scale for predicting pressure ulcer risk is one of the most widely used tools for predicting pressure ulcer risk. It is one of only two existing pressure ulcer prediction tools (the other being the Norton scale) that are recognized by the U.S. Agency for Health Care Policy and Research (U.S. Department of Health and Human Services, 1992). To date, there is little data to support the use of the Braden scale in either Black or Latino/Hispanic elder populations. Furthermore, no studies were found that evaluated predictive physiologic variables (i.e., serum albumin, total protein, hemoglobin, and hematocrit) in either of these ethnic minority elder populations (Lyder, 1996). Given the increasing numbers of Black and Latino/Hispanic elders, we must begin to examine the use of the Braden scale in both elder populations. Therefore, the purpose of this study was to evaluate the predictive validity of the Braden scale and determine the physiologic and nonphysiologic variables associated with the prediction of pressure ulcer risk in Black and Latino/Hispanic elders.

LITERATURE REVIEW

There is a paucity of research on the use of the Braden scale in either Black or Latino/Hispanic elders. The Braden scale is used to predict those elder adults who are at risk for pressure ulcer development. It is composed of six subscales (Figure 1). Three subscales are related to the intensity and duration of pressure (mobility, activity, and sensory perception), and three are related to tissue tolerance (moisture, nutrition, and friction/shear). Conceptually, these six subscales are related to either intrinsic or extrinsic clinical factors that are believed to be important in the formation of pressure ulcers. Each subscale, with the exception of friction/shear (which consists of three levels), is rated from 1 (most impaired) to 4 (least impaired). Thus, the potential scores can range from 6 to 23, with scores of 17 and above indicating less risk for pressure ulcer development (Bergstrom & Braden, 1992). However, due to the increasing frailty that occurs with advanced age and the number of elders with Braden scale scores above 16 who developed pressure ulcers, the optimal cutoff score was recommended to be 18, which increased the sensitivity and specificity (Braden and Bergstrom, 1994).

The predictive validity of the Braden scale has been tested in a variety of health care settings; however, its utility in Black and/or Latino/Hispanic elder populations is not well documented. In the original validation of the Braden scale, Bergstrom, Braden, Laguzza, and Holman (1987) noted in a sample of 60 subjects that only 10% (n = 6) were Black. Bergstrom & Braden (1992) noted in another study that included 200 subjects in a skilled nursing home that only 5% (n = 10) of their subjects were Black. In a more recent study to investigate the incidence of pressure ulcers and the relationship among risk, demographic characteristics, diagnoses, and prescription of preventative interventions, Bergstrom, Braden, Kemp, Champagne, and Ruby, 1996 found that 5% of Blacks and 0% of the "other" category developed a pressure ulcer. It was unclear from their analysis how many Blacks and/or other ethnic minorities were procured in the sample. Nonetheless, the researchers in this study concluded that Blacks were less likely to develop pressure ulcers (5% incidence rate) compared with Whites (15% incidence rate). (Bergstrom et al).

It has been well established that there are certain predictive variables that singularly or in combination may place an elder adult at risk for pressure ulcer development. The role of nutrition in pressure ulcer development has been well documented. More specifically, below normal values of serum
<table>
<thead>
<tr>
<th>Patient's name</th>
<th>Evaluator's name</th>
<th>Date of assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SENSORY PERCEPTION</td>
<td>1. Completely Limited: Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation. OR Limited ability to feel pain over most of body surface.</td>
<td>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 1/3 of body.</td>
</tr>
<tr>
<td>MOISTURE</td>
<td>1. Constantly Moist: Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.</td>
<td>2. Very Moist: Skin is often, but not always, moist. Linen must be changed at least once a shift.</td>
</tr>
<tr>
<td>ACTIVITY</td>
<td>1. Bedfast: Confined to bed.</td>
<td>2. Chairfast: Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheelchair.</td>
</tr>
<tr>
<td>MOBILITY</td>
<td>1. Completely Immobile: Does not make even slight changes in body or extremity position without assistance.</td>
<td>2. Very Limited: Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.</td>
</tr>
<tr>
<td>NUTRITION</td>
<td>1. Very Poor: Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 or fewer servings of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement. OR Is NPO and/or maintained on clear liquids or IVs for more than 5 days.</td>
<td>2. Probably Inadequate: Rarely eats a complete meal and generally eats only about 1/3 of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement. OR Receives less than optimal amount of liquid diet or tube feeding.</td>
</tr>
<tr>
<td>FRICTION AND SHEAR</td>
<td>1. Problem: 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. Spastically, contractures or agitation leads to almost constant friction.</td>
<td>2. Potential Problem: Moves feebly or requires minimum assistance. During 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.</td>
</tr>
</tbody>
</table>

Figure 1. The Braden Scale for Predicting Pressure Sore Risk. (Copyright © Barbara Braden and Nancy Bergstrom. Reprinted with permission.)

albumin, total protein, and the amount of dietary intake (less than 50% per meal) greatly places the elder at risk for pressure ulcer development (Breslow, Hallfrisch, & Goldberg, 1991). Increasing age may also place an elderly adult at risk for several reasons. With increasing age, most elderly adults tend to have decreased activity and mobility. Moreover, there tends to be diminished tissue tolerance and increased risk of comorbidities (Braden & Bergstrom, 1987). Blood pressure has also been associated with pressure ulcer development. It has been hypothesized that low diastolic blood pressure causes decreased tissue perfusion; thus, rendering the tissue more susceptible to sustained pressure. A
study by Schubert (1991) found that low systolic pressure and normal diastolic blood pressure coupled with low hemoglobin and hematocrit placed elder adults at greater risk for pressure ulcer formation. No studies were found that examined additional risk factors such as age, nutrition, and other physiologic variables in Blacks and Latino/Hispanic elder populations. Given that some of these variables (i.e., nutrition) may differ in Black and Latino/Hispanic elders, it is important to examine these factors. Lyder (1996) noted that because type II diabetes mellitus is more prevalent in Black and Latino/Hispanic elders, there are more microvascular and macrovascular disease sequelae that may place this population at greater risk for pressure ulcer development. Moreover, given the increasing numbers in both ethnic populations who are achieving elder status in the next millennium, we can no longer ignore these understudied populations.

METHODS

Study Design

A prospective repeated measures study design was used to evaluate the predictive validity of the Braden scale in Black and Latino/Hispanic elders. This design allowed the researchers to develop the criteria and methods for rating risk in advance, assess the skin at specified intervals, and perform interrater reliability on Braden Scale scores and skin assessments (Lilienfeld & Lilienfeld, 1980).

Setting and Subjects

The setting for the study was a 650-bed urban teaching tertiary hospital in the Northeast. This facility was chosen because of its large size and the large number (30%) of Black and Latino/Hispanic elder populations admitted to the hospital annually. The subjects were selected from patients who were admitted to the general medical and surgical units at the hospital. All subjects meeting the admission criteria were enrolled by using a consecutive series design. The subjects were at least 60 years of age, self-reported as either Black or Latino/Hispanic, free of pressure ulcers on admission, and had an expected length of stay in the inpatient setting of 5 days or more.

Instruments

The Braden Scale for Predicting Pressure Sore Risk was used to predict which ethnic minority elders were at risk. This scale consists of six subscales. Three subscales are related to the intensity and duration of pressure (activity, mobility, and sensory perception), and three are related to tissue tolerance (moisture, nutrition, and friction/shear). A total score of 23 is possible. It should be noted that the Braden scale cutoff score varies depending on the age of the adult (16 if under 75 years of age or 18 if older than 75 years) (Vyhlidal, Moxness, Bosak, Van Meter, & Bergstrom, 1997). Correlations for pairs of raters ranging from \( r = 0.83 \) to \( r = 0.99 \) have been reported. Lyder, et al. (1998), in a small preliminary study investigating the predictability of the Braden Scale in Black and Latino/Hispanic elders noted correlations of \( r = 0.85 \) to \( r = 0.97 \). A sensitivity of 36% and specificity of 100% for a Braden scale score of 16 or below was also reported for Black and Latino/Hispanic elders (Lyder et al., 1998). These results are lower than those reported by Bergstrom et al. (1987), who noted that sensitivity for a Braden scale score of 16 or below ranged from 83% to 100% and specificity ranged from 64% and 90%, respectively (Bergstrom et al. 1987). In a more recent study, a Braden scale cutoff score of 18 or below was used in a nursing home population and yielded a sensitivity of 79% and specificity of 74% (Braden & Bergstrom, 1994).

Interrater reliability checks with the use of pressure ulcer pictures and completion of Braden scale and skin assessments on patients were completed every month. A Pearson correlation coefficient was computed to determine the interrater reliability between the research nurses and the principal investigator for the Braden scale. The research nurses achieved 100% for skin assessments and \( r = 0.99 \) (interclass correlation) for the Braden scale. It is noted that interrater reliability of the Braden scale following training and at monthly intervals has ranged from (interclass correlation) \( r = 0.95 \) to 1.0 (Bergstrom et al., 1996).

Skin Assessment

The skin assessment instrument was derived from the National Pressure Ulcer Advisory Panel (NPUAP, 1989) and the International Association of Enterostomal Therapy (IAET, 1987). The skin assessment instrument included a list of the most common sites for pressure ulcers: back of the head, scapula, iliac crest, trochanter, sacrum, ischium, lateral malleolus, lateral edge of the foot, and the
heel. The instrument also included a pressure ulcer staging system (1 = nonblanchable erythema for more than 24 hours; 2 = superficial break in skin (blisters/abrasion, epidermal/dermal layer exposed); 3 = break in skin exposing subcutaneous tissue, 4 = break in skin exposing muscle/bone. Two research nurses were required to complete a head-to-toe assessment indicating the absence or presence of pressure ulcers and their stage and size. Because there is no “gold standard” for assessing and/or identifying a stage 1 pressure ulcer in darkly pigmented skin, the research team developed a systematic approach based on an extensive literature review and clinical expertise of the principal investigator (Lyder, 1991).

**Procedures**

Research nurses were trained on the use of the Braden scale, the skin assessment instrument, and staging pressure ulcers. It should be noted, however, that each research nurse was assigned solely to either completing the Braden scale or performing the skin assessment.

A computerized list identifying age, gender, and race was generated daily from the admissions office at the hospital. On obtaining written consent from the patient or family member, an initial Braden score and skin assessment were completed. Any patient who was identified as having existing pressure ulcers was immediately excluded from the study. After initial assessments (Braden score and skin assessment), subjects were assessed within 24 to 48 hours of being admitted to the study. All skin assessments were completed on Mondays, Wednesdays, and Fridays until discharge. Subjects who had only one assessment postadmission to the study were excluded.

At each assessment interval, three research nurses were used. Research Nurse 1 obtained all demographic data (blood pressure, hemoglobin, hematocrit, serum albumin, total protein, total lymphocyte, white blood cell count, percentage of time spent in chairs or beds, and urinary and fecal incontinence) and computed a Braden scale score. Research Nurse 2 completed a melanocentric skin assessment (observing for changes in hue (purple), temperature, induration, and the use of natural lighting) noting pressure ulcer as either positive or negative. Research Nurse 3 also completed a skin assessment but was not trained to look for purple hues or the use of natural lighting. The method for Research Nurse 3 was representative of current nursing practice at the hospital. The three research nurses remained blinded throughout the study. All subjects observed with a pressure ulcer were cross-validated by the principal investigator or the wound/skin care clinical nurse specialist at the hospital or both. This cross-validation was believed to be critical because there is no “gold standard” for assessing nonblanchable erythema in darkly pigmented elder adults.

**Data Analysis**

Descriptive statistics were used to describe the sample. To determine the validity of the Braden scale, the last score before the time of pressure ulcer formation was used in the data analysis. For those subjects who did not develop a pressure ulcer, the last recorded Braden scale score was used in the analysis. Stage 1 pressure ulcers were included in the analysis only if they were present for a minimum of 24 hours from the time of initial observation.

A chi-square test was used to determine the association between the Braden scale score and race. A Fisher’s exact test was used when the cells in the tables fell below five observations. The chi-square test and Fisher’s Exact test were calculated for optimal Braden cutoff scores (i.e., where the error rate is minimized) of 16 (74 years of age or younger) and 18 (75 years of age or older) for both races. Sensitivity, specificity, and the predictive value of a positive and negative test were computed for the Braden scale (Figure 2). A Logistic regression analysis was used to determine whether age, Braden score, principal diagnoses, blood pressure, serum albumin, white blood cell count, total lymphocyte count, glucose, hemoglobin, hematocrit, chairfast greater than 50%, bedfast greater than 50%, urinary incontinence, and fecal incontinence were predictors of pressure ulcer development in the sample.

**RESULTS**

A total of 84 subjects were identified as being at risk for pressure ulcer development. Of the original cohort of 84 subjects, 10 were excluded from the analysis due to having only one completed assessment before discharge. This reduction resulted in a final sample of 74 subjects (Table 1). The subjects ranged in age from 60 to 99 years ($\bar{x} = 72, SD 8.3$).
Figure 2. Definitions of measures of predictive validity for the Braden Scale to predict who will and will not develop pressure sores. FN, false negative; FP, false positive; PS+, patients will develop pressure sores; PS-, patients will not develop pressure sores; TN, true negative; TP, true positive.

<table>
<thead>
<tr>
<th>Positive test</th>
<th>TP</th>
<th>FP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative test</td>
<td>FN</td>
<td>TN</td>
</tr>
</tbody>
</table>

Sensitivity: Those with pressure sore whose scores are equal to or less than the cutoff

\[
\text{Sensitivity} = \frac{TP}{TP + FN} \times 100
\]

Specificity: Those without pressure sores whose scores are greater than the cutoff

\[
\text{Specificity} = \frac{TN}{TN + FP} \times 100
\]

Predictive value of a positive test: Those with scores equal to or less than the cutoff with pressure sores

\[
\text{Predictive value of a positive test} = \frac{TP}{TP + FP} \times 100
\]

Predictive value of a negative test: Those with scores higher than the cutoff who do not have pressure sores

\[
\text{Predictive value of a negative test} = \frac{TN}{TN + FN} \times 100
\]

The sample consisted of a disproportionate number of women (n = 49, 66%) compared with men (n = 25, 34%). The sample also consisted of a disproportionate amount of Blacks (n = 52, 70%) compared with Latino/Hispanics (n = 22, 30%). Most subjects had no prior history of a pressure ulcer (n = 69, 93%). The majority of subjects were obtained from the medical units (n = 56, 76%), with the remaining subjects (n = 18, 24%) coming from general surgical units. The most common diagnoses on admission were end-stage renal disease (n = 10, 14%), pneumonia (n = 7, 9%), venous stasis ulcer (n = 6, 8%), chronic obstructive pulmonary disease (n = 6, 8%), and cellulitis (n = 6, 8%).

A review of the skin assessment data completed by the two “blinded” research nurses revealed that Research Nurse 2, who performed the melanocentric skin assessment, correctly identified 78% of the true pressure ulcers. This skin assessment technique was an improvement from the 58% correctly identified by Research Nurse 3 by using the traditional skin assessment.

A univariate analysis was conducted on those subjects that developed pressure ulcers (Table 2). This analysis revealed that the incidence rate for pressure ulcers was 21% for Black elders and 11% for Latino/Hispanic elders. Of the 24 subjects that developed pressure ulcers, Black women (n = 12, 50%) and Latino/Hispanic women (n = 8, 33%) were more likely to develop pressure ulcers than their male counterparts. The majority of ulcers were stage 1 (n = 19, 79%). End-stage renal disease and insulin-dependent diabetes mellitus were

Table 1. Demographic Characteristics of Study Subjects (n = 74)

| Age, y | x = 72 (60-99) |
| Race | n (%) |
| Black | 52 (70) |
| Latino/Hispanic | 22 (30) |
| Gender | |
| Male | 25 (34) |
| Female | 49 (66) |
| History of Pressure Ulcer | 5 (7) |
| Primary Diagnoses (Most Common) | |
| End-stage renal disease | 10 (19) |
| Pneumonia | 7 (8) |
| Venous stasis ulcer | 6 (8) |
| Chronic obstructive pulmonary disease | 6 (6) |
| Cellulitis | 6 (6) |

Table 2. Demographic Characteristics of Subjects with Pressure Ulcers (n = 24)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Black Elders n (%)</th>
<th>Latino/Hispanic Elders n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>3 (12.5)</td>
<td>0</td>
</tr>
<tr>
<td>Female</td>
<td>12 (60)</td>
<td>8 (33)</td>
</tr>
<tr>
<td>Stage 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3 (13)</td>
<td>0</td>
</tr>
<tr>
<td>Female</td>
<td>8 (33)</td>
<td>8 (33)</td>
</tr>
<tr>
<td>Stage 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Female</td>
<td>5 (21)</td>
<td>0</td>
</tr>
<tr>
<td>Primary Diagnoses</td>
<td>ESRD = 3 (19)</td>
<td>ESRD = 3 (37.5)</td>
</tr>
<tr>
<td>IDDM = 2 (12)</td>
<td>IDDM = 3 (37.5)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>10 (69)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: ESRD, end-stage renal disease; IDDM, insulin-dependent diabetes mellitus.

*Unable to determine gender of one subject.
the most common primary diagnoses for both Black and Latino/Hispanic elders.

Chi-square analyses were computed for both Black and Latino/Hispanic elders by using optimal cutoff scores of the Braden scale (16, ≤74 years and 18, ≥75 years). Table 3 illustrates the predictive validity of the Braden scale. A 2-tail Fisher’s exact test revealed that for Black elders aged 75 years or older (optimal cutoff score, 18), the Braden scale was significantly associated with pressure ulcer development (p ≤ .011). Its sensitivity was 81% and specificity was 100% (Table 3). However, a chi-square analysis revealed that however for Blacks aged 74 years or younger (optimal cutoff score, 16), the Braden scale was not significant (p ≤ .123). Sensitivity was 77% and specificity was 50%. Analyses were also computed for Latino/Hispanic elders. The Fisher’s exact test revealed that for Latino/Hispanic elders aged 74 years or younger the Braden scale was not significant (p = 1.000). However, its sensitivity was 90% and specificity was 14%. Due to the small number of Latino/Hispanic elders aged 75 years or older in the study (n = 2), a chi-square analysis could not be conducted.

To determine whether any variables were associated with pressure ulcer development, each variable was entered into a chi-square model. Only gender was positively associated with pressure ulcer development (χ²(1, n = 49) = 6.4, p ≤ .011). A logistic model was also fitted to the data to examine any potential predictive variables. This logistic model included age, Braden scores, principal diagnoses, lymphocyte count, white blood cell count, glucose, blood pressure, serum albumin, hemoglobin, hematocrit, time spent in a chair, time spent in bed, and urinary and/or fecal incontinence. These variables were chosen because the literature supports them as principal predictors of pressure ulcers (Braden & Bergstrom, 1994; Allman, 1990; Bergstrom et al., 1996). The logistic model was not significant (χ² = 6.44, p ≤ .598) and was 73.8% predicted. A second logistic model was fitted without laboratory values. This logistic model was also not significant (χ² = 10.7, p < .098), with 71.8% predicted.

**DISCUSSION/IMPLICATIONS**

The purpose of this study was to evaluate the predictive validity of the Braden scale and to determine the physiological and nonphysiological variables associated with the prediction of pressure ulcers in Black and Latino/Hispanic elders. The Braden Scale was highly significant for predicting pressure ulcers in Black elders aged 75 years or older by using the optimal cutoff score of 18. The Braden scale was not predictive for Black elders aged 74 years or younger or for Latino/Hispanic elders aged 74 years or younger by using the optimal cutoff score of 16 as suggested by Braden & Bergstrom (1994).

The Braden scale for Black elders aged 75 years or older had the best overall sensitivity (81%) and specificity (100%) and was statistically significant (p ≤ .011). For Black elders 74 years or younger, the sensitivity was 77% with a specificity of 50%. The Latino/Hispanic subjects 74 years or younger had a higher sensitivity (90%) but lower specificity (14%). There is no optimal percentage rate for sensitivity in prediction tools of this nature. Thus, a sensitivity of more than 66% should be desired (Braden & Bergstrom, 1994). Based on the data collected in this study, the Braden scale may be useful for both Blacks and Latino/Hispanics 74 years or younger despite the data being statistically insignificant.

The Braden scale is only one variable for assessing pressure ulcer development and does not lead to dangerous, painful, or excessively expensive treatments; therefore, one is more concerned with sensitivity (true positives) and less concerned with specificity (false positives) (Braden & Bergstrom, 1994). Because prevention can be relatively expensive, an effort should be made to decrease false positives.

It is unclear from our results why the five subjects

<table>
<thead>
<tr>
<th>Table 3. Predictive Validity of Braden Cutoff Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Blacks ≥75 y</td>
</tr>
<tr>
<td>Blacks ≤74 y</td>
</tr>
<tr>
<td>Latino/Hispanics ≤74 y</td>
</tr>
</tbody>
</table>

**NOTE:** Due to insufficient data for Latino/Hispanics aged ≥75, the predictive validity (sensitivity, specificity, PVP, PVN) could not be tabulated.

**Abbreviations:** PVP, predictive value of a positive test; PVN, predictive value of a negative test.
with cutoff scores above 18 developed pressure ulcers. The literature does note that there may be some differences in the mechanical properties, structure, and physiological resistance to tissue ischemia in ethnic minorities (Lyder, 1996). Research that examines how these variables interface to cause or prevent pressure ulcers in ethnic minorities is significantly missing from the literature.

The physiological and nonphysiological variables that were chosen for the study did not predict the development of pressure ulcers in these populations. The only nonphysiological variable that was significant for pressure ulcer development was gender. Ethnic minority women were disproportionately at risk for developing pressure ulcers even when the imbalance of men to women in the study was statistically controlled. Perhaps the decrease in estrogen receptor sites in the dermal layer renders the skin of ethnic minority elder women more vulnerable to breakdown. No studies were found that examined the role of gender in Black or Latino/Hispanic elders and the incidence of pressure ulcers. Clearly, additional research is needed in this area. There has also been an association between medical diagnoses (circulatory diseases, neoplasm, fractures) and the development of pressure ulcers (Versluyen, 1986). We were unable to demonstrate an association between principal diagnoses and pressure ulcer development. Bergstrom et al. (1996) found that diagnoses did not fully represent the range of disability and/or immobility; thus, the Braden scale was a better predictor of pressure ulcers. Clearly, further research is needed in this area to determine the association of diagnoses and the development of pressure ulcers in both ethnic elder populations.

The cumulative incidence rate of pressure ulcers found in this study was 32%. The hospital refused to release incidence rate. This rate is significantly higher than the hospital’s rate and national standards that have purported 11% for acute care settings. Two studies were identified that noted positively that non-Whites were more at risk for pressure ulcer development (Fuhrer, et al., 1993; Spector, et al., 1988). Both studies noted that socioeconomic factors such as less access to health care may cause Blacks to enter the health care system late and with worsening pressure ulcers. Additionally, the difficulty in identifying the stage 1 pressure ulcer (nonblanchable erythema) in darkly pigmented skin may also cause this population to progress to subsequent stages before being detected. Thus, the lack of education among health care professionals in assessing the stage 1 pressure ulcer in darkly pigmented older adults may place them at greater risk. Spector, et al. (1998), in a study of 4,951 newly admitted nursing home residents (from the National Health Corporation data system), found that non-Whites were more likely to enter the nursing home settings with pressure ulcers than Whites (who comprised 91% of the study).

Despite the studies conducted by Fuhrer, et al. (1993) and Spector, et al. (1988), there remains much debate concerning which racial subset is more at risk for pressure ulcer development. Two studies conducted by Bergstrom, et al. (1996) and Manley (1978) concluded that non-Whites were less at risk for pressure ulcer development. One explanation for the conclusions put forth by Bergstrom, et al. (1996) and Manley, et al. (1978) may be derived from the methodology used to detect/assess color changes (stage 1 pressure ulcers) in darkly pigmented elder adults.

It has been established that the stage 1 pressure ulcer is quite difficult to detect in darkly pigmented adults (Lyder, 1996). Thus, it is possible that more non-White elders with stage 1 pressure ulcers are being discharged from acute care settings than previously noted. The use of melanocentric skin assessment, in which shades of purple are assessed rather than traditional erythema, may be quite advantageous in these two ethnic populations. It is apparent that further research is needed in this area of pressure ulcer detection in darkly pigmented skin.

Clinical Implications

Based on the data, this study clinically determined that a Braden scale cutoff score of 18 is quite meaningful for predicting pressure ulcers in Black elders 75 years of age or older. Although the study was unable to achieve statistical significance for any other racial and/or age cohort, based on the high sensitivity of the Braden scale, nurses should use this tool until further studies are conducted. Nurses should be sensitive to elder ethnic women because they are most likely to develop pressure ulcers. Further, given the high incidence rates of pressure ulcers in both elder ethnic populations, nurses should be cognizant of race and ethnicity in their skin assessments. A skin examination for
purple hues as opposed to erythema in darkly pigmented skin may provide some clinical guidance in detecting pressure ulcers in their earliest stages.

**Limitations**

This study had several inherent limitations. First, generalizability is limited to our study sample of Black and Latino/Hispanic elders. Future studies need to be conducted with larger Black and Latino/Hispanic elder adult populations. Moreover, additional studies need to include other ethnic minority groups such as Asians and Pacific Islanders. It is predicted that by the year 2030 approximately 25% of the U.S. elderly population will be composed of Black, Latino/Hispanic, Asian, and Pacific Islander populations (Administration on Aging, 1997). Second, this study did not capture prevention strategies that were used by the hospital staff. These data may have aided in an explanation of the high incidence of pressure ulcers in these two populations.

**CONCLUSION**

Future studies are greatly needed to further understand how race and ethnicity may play a role in the prediction and subsequent prevention of pressure ulcers. Currently, few studies contain sufficient elder ethnic minority sample sizes to draw any meaningful conclusions. Given the increasing number of ethnic minorities achieving elder adult status, we must continue to explore the influences of race and pressure ulcers.

**ACKNOWLEDGMENT**

The authors gratefully acknowledge Jane Ryzewski, MSN, CRNP and the nursing staff at Yale New Haven Hospital for their clinical support. This research study was supported by the Yale University School of Nursing Intramural Grant Program.

**REFERENCES**


