

# Validating the Brief Pain Inventory for Use With Surgical Patients With Cancer

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**Purpose/Objectives:** To examine the psychometric characteristics of the Brief Pain Inventory (BPI) for surgical patients with cancer and to compare the validity and reliability results between surgical and medical patients with cancer.

**Design:** Descriptive and correlational.

**Setting:** Inpatient units in two veterans hospitals.

**Sample:** 388 patients with cancer (medical  $n = 229$ , surgical  $n = 159$ ).

**Methods:** The BPI was administered to patients once, and a pain visual analog scale (VAS) was administered to patients three times. The VAS was correlated with individual items of the BPI and with the Pain Interference Subscale of the BPI; correlations were conducted separately for medical and surgical patients as a study of validity. Reliability was assessed using Cronbach's alpha for each group.

**Main Research Variables:** Pain at its worst and least, current pain intensity, average pain intensity, and pain relief.

**Findings:** Patients in both groups were predominantly male, older, and Caucasian. Means from both groups were similar for items on the BPI. Correlations between the Pain Interference Subscale and the other items on the BPI were similar for both groups. Correlations between the VAS and the Pain Interference Subscale of the BPI were equally high for the medical ( $r = 0.71$ ,  $p < 0.01$ ) and surgical ( $r = 0.73$ ,  $p < 0.01$ ) oncology groups. Reliability evaluated by the coefficient alpha was very high for the medical ( $r = 0.95$ ) and surgical ( $r = 0.97$ ) oncology groups.

**Conclusions:** The BPI is equally valid and reliable for medical and surgical male, Caucasian patients with cancer.

**Implications for Nursing:** Nurses working with patients with cancer can have confidence that the BPI will assist them in assessing and managing pain in both groups.

## Key Points . . .

- Limited research has been conducted on the use of the Brief Pain Inventory (BPI) in surgical patients with cancer.
- The BPI is valid for use with surgical patients with cancer.
- The patterns of pain in surgical patients with cancer must be examined.

postoperative patients continue to experience significant pain during their recovery period, including incisional pain (Melzack, Abbott, Zackon, Mulder, & Davis, 1987; Sriwattanakul et al., 1983; Tittle, Long, & McMillan, 1992).

Pain plays an important role in patients' responses to illness and overall sense of well-being. Pain control may be problematic for a variety of reasons, including the difficulties of objective assessment of this subjective symptom. Although physicians order analgesics, the drugs often are ordered as needed, leaving nurses to decide on the dose and schedule. This decision is usually dependent on nurses' perceptions of patients' pain. To provide appropriate pain management, accurate pain assessment is necessary. Research indicates that improving nurses' pain assessment will improve patients' pain management (Dobratz, Wade, Herbst, & Ryndes, 1991; Faries, Stephens, Goldsmith, Phillips, & Orr, 1991; McMillan, Williams, Chatfield, & Camp, 1988).

Nurses need reliable and valid instruments to use in pain assessment. These instruments must be easy to administer and easy for patients to understand, such as numeric and graphic rating scales. The Brief Pain Inventory (BPI) is a pain assessment instrument that has been used in a variety of populations; however, evidence of its validity and reliability specifically in

Pain is a common symptom faced by hospitalized patients. Several national and international institutions have taken positions on pain management. The American Pain Society developed Quality Assurance Standards for Relief of Acute Pain and Cancer Pain in Oncology Nursing Practice (Miaskowski & Donovan, 1992). The Oncology Nursing Society published a comprehensive position paper on pain management in 1990 (Spross, McGuire, & Schmitt, 1990a, 1990b, 1990c). The Agency for Health Care Policy and Research published guidelines for *Acute Pain Management* (1992) and *Management of Cancer Pain* (1994). Investigators have estimated that pain occurs in 38%–91% of hospitalized patients with cancer (Bonica, 1978; Brescia, Portenoy, Ryan, Krasnoff, & Gray, 1992; Daut & Cleeland, 1982; Donovan & Dillon, 1987; Foley, 1979; Rankin & Snider, 1984; Twycross & Fairchild, 1982). Several studies have confirmed that, in general,

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surgical patients with cancer is limited. The purpose of this study was to examine the psychometric characteristics of the BPI for surgical patients with cancer and compare the validity and reliability results between surgical and medical patients with cancer. Validity was studied via correlations of a visual analog scale (VAS) with items and subscales of the BPI. Reliability was studied using Cronbach's alpha.

## Literature Review

Most patients experience pain at some point during hospitalization; thus, assessment is an important part of managing patients' pain. Many factors influence the perception and reporting of pain by patients and the assessment of pain by nurses. In a literature review, Allcock (1996) identified a number of factors in relation to their effect on pain. Patient characteristics included socioeconomic status, illness severity, gender, age, evidence of pathology, and ethnic variations. Nurse characteristics included experience, age, ethnic backgrounds, personal experience of pain, and educational experience.

Consistency is important in communicating and evaluating pain intensity among healthcare professionals. A variety of instruments are available. Dalton and McNaull (1998) identified the current instruments used, including the VAS, graphic rating scales, numeric rating scales, verbal descriptor scales, and the faces scale. Some of these scales are scored from 0–10, and others are scored from 0–5. Some use a number for words or faces. Dalton and McNaull suggested that standardization be implemented so that healthcare professionals and patients can avoid any confusion related to pain assessment.

A study by de Rond et al. (1999) suggested that daily pain assessment is important and practical for nurses. Professional compliance with daily pain assessment of patients and the value of daily pain assessment were studied. Data were collected from nurses and patients on medical and surgical wards. Fifty percent of the sample was comprised of patients with cancer. Results indicated that nurses' compliance with daily pain assessment was 74% and daily pain assessment was feasible and valued. Nurses from the medical ward were more compliant than nurses from the surgical ward in assessing pain in the morning; however, no difference was found in compliance in the evening. Approximately 75% of the patients were positive about daily pain assessment and felt that assessing pain twice a day was sufficient.

The BPI was developed as a pain assessment tool for use with patients with cancer (Cleeland & Ryan, 1994). Initially called the Wisconsin Brief Pain Questionnaire (Daut, Cleeland, & Flanery, 1983), the BPI measures intensity of pain, the sensory dimension, and the interference of pain in a patient's life (i.e., the reactive dimension). The instrument's questions ask patients about pain relief, pain quality, and their perceptions of the cause of pain. The BPI has been used in studies of the epidemiology of cancer pain, routine clinical assessment of pain, efforts to ensure the quality of pain management, and conduct of clinical trials examining the effectiveness of cancer pain treatments.

Validation of the BPI has been conducted with a variety of populations, including Taiwanese (Ger, Ho, Sun, Wang, & Cleeland, 1999), German (Radbruch et al., 1999), Hindi (Saxena, Mendoza, & Cleeland, 1999), Phillipine, French,

Chinese (Serlin, Mendoza, Nakamura, Edwards, & Cleeland, 1995), and Japanese (Uki, Mendoza, Cleeland, Nakamura, & Takeda, 1998). These studies indicate the utility of the BPI across different cultures. The studies were conducted with both inpatients and outpatients with a cancer diagnosis; however, the studies primarily were conducted with medical patients with cancer. Often, if patients had surgery within one month, they were excluded from the study.

Zalon (1999) compared pain measures specifically in postoperative patients. The BPI, the McGill Pain Questionnaire Short Form, and two VASs (one for pain at rest and one for pain on movement) were administered to 115 patients at two points in time after surgery. The correlations among the VASs, BPI, and McGill Pain Questionnaire ranged from 0.33–0.76 and thus provided evidence of validity for postoperative patients.

Determining the usefulness of the BPI in all oncology populations is necessary. Limited research has been performed using the BPI in samples of surgical patients with cancer. The current study builds on the work of Zalon (1999) and examined the validity and reliability of the BPI for surgical patients with cancer and compared the validity and reliability results between surgical and medical patients with cancer.

## Methods

This was a cross-sectional, descriptive study that was conducted as part of a larger, ongoing project. The larger project is an intervention study designed to improve cancer pain outcomes among veterans. This article reports evidence of validity and reliability of the BPI in surgical and medical patients with cancer. Data for the larger project currently are being analyzed.

### Settings

This study was conducted in two veterans hospitals in adjacent counties in Florida. Both were medical-surgical hospitals; one had an average inpatient census of 570, and the other had an average inpatient census of 526. Three medical-surgical units were matched according to number of patients, patient mix, and staffing ratio; these matched units were used in both institutions to allow for a cross section of medical and surgical patients with cancer.

### Sample

The convenience sample for the study consisted of adult patients with cancer from the two settings. To be included in the study, patients had to have a cancer diagnosis and have pain as an identified problem on the written nursing care plan. Patients had to be admitted for 48 hours or more to allow for pain management intervention by the nurses. Pain could be from any source, including postoperative, and patients' cancer could be treated medically or surgically. Patients who were disoriented, comatose, or unable to give consent were excluded from the study.

### Instrumentation

Two instruments were used to measure pain. Demographic data were collected to describe the patient sample.

**Visual analog scale:** Pain intensity was measured using the VAS, which consists of a 100 mm line printed on a sheet of

paper. At the left side of the line are the words, “no pain,” and at the right side are the words “worst pain imaginable.” Patients were asked to mark a point on the horizontal line that best represented their pain at that moment. The mark on the line is measured in millimeters, and patients’ pain is recorded as the number of millimeters. Scores can range from 0–100 mm (Downie et al., 1978).

The validity and reliability of the VAS have been studied extensively. Results of studies indicate that the VAS is a valid and reliable measure of pain intensity. Test-retest is reported to range from  $r = 0.97$ – $0.99$  (Price, McGrath, Rafii, & Buckingham, 1983; Revill, Robinson, Rosen, & Hogg, 1976).

**Brief Pain Inventory:** The BPI is used to assess pain (Cleeland & Ryan, 1994). Consisting of 23 items, the tool takes about 15 minutes to complete and provides information on pain intensity, relief, quality, and patients’ perception of the cause. Rating their pain on a numeric scale from 0–10, patients assess their pain right now and at its worst, least, and average over the prior 24 hours. A higher score indicates higher pain intensity. The BPI also asks how much the pain interferes with mood, walking and other physical activity, work, social activity, relations with others, and sleep. Again, a 0–10 scale is used, with 0 indicating “no interference” and 10 indicating “interferes completely.” For this study, an item asking about interference with work was eliminated because it was deemed inappropriate for hospitalized patients. This study examined the reliability and validity of the BPI without this item.

Validity and reliability of the BPI has been the subject of several studies. Correlations between the BPI and other measures of pain interference ranged from 0.58–0.62 (Daut et al., 1983; Ger et al., 1999; Radbruch et al., 1999). Test-retest reliability ranged from 0.79–0.97 for the pain severity scale and 0.81–0.97 for the Pain Interference Subscale of the BPI (Ger et al.; Radbruch et al.). Alpha coefficients ranged from 0.81–0.91 for the Pain Interference Subscale and 0.81–0.89 for the severity scale of the BPI (Ger et al.; Radbruch et al.; Saxena et al., 1999).

## Procedures

This study was approved by the research and development committees at each of the veterans hospitals and by the institutional review board of an affiliated university. Patients gave informed consent prior to participation in the study.

Trained data collectors reviewing patient care plans on the units at each hospital identified patients in pain. The data collectors explained the study to patients and asked them to participate. After giving informed consent, patients completed the BPI and then reported their level of pain using the VAS. The assessment with the VAS was repeated twice at convenient intervals during a 24-hour period. Data were collected no less than two hours apart, and no data were collected during the hours of sleep. Data from the three VAS assessments were averaged to determine daily pain intensity.

## Data Analysis

Frequencies, percentages, means, and standard deviations were used to describe the sample. Cronbach’s alpha was used to examine the reliability of the BPI in medical and surgical patients with cancer. Validity was estimated using Pearson correlation coefficients between tools and items.

# Results

## Sample

The convenience sample consisted of 159 surgical and 229 medical patients with cancer. Of the 159 surgical patients, the majority was male (91%) and Caucasian (84%). The mean age of this group was 63.9 years (range = 38–91). A variety of cancer diagnoses was reported, with head and neck (23%) and colorectal cancer (22%) comprising the largest percentages (see Table 1).

Of the 229 medical patients, the majority was male (95%) and Caucasian (73%). The mean age of the group was 64.7 years (range = 33–90). Several different cancer diagnoses were found, with lung cancer (25%) being most prevalent in this group, followed by head and neck, colorectal, and prostate cancers.

## Means and Standard Deviations on All Pain Scores

Marked similarities existed between the two groups on all BPI pain scores (see Table 2). Pain at Its Worst was slightly higher in the surgical patients with cancer, whereas Average Pain was slightly higher in the medical patients with cancer. Pain Right Now also was higher in the surgical patients, but the differences in all cases were less than two points on an 11 point scale. On the BPI Pain Interference Subscale scores, which could range from 0–60, the differences found were minimal between the two groups. On the 100 point VAS, the score was slightly higher ( $\bar{X} = 50.6$ ) for surgical patients with cancer compared to medical patients with cancer ( $\bar{X} = 43.1$ ).

## Correlations With the Visual Analog Scale

The Pearson correlations between the VAS and the pain items on the BPI were similar for the two groups with one notable exception. Average Pain was significantly correlated with VAS scores for the medical patients but showed no relationship for the surgical patients. The correlations between the VAS and the total Pain Interference Subscale score of the

**Table 1. Sample Characteristics**

Demographic Variable	Medical Patients (n = 229)		Surgical Patients (n = 159)	
	n	%	n	%
<b>Gender</b>				
Men	218	95	145	91
Women	11	5	14	9
<b>Ethnicity</b>				
Caucasian	168	73	134	84
African American	18	8	14	9
Hispanic	12	5	10	6
Asian	1	< 1	—	—
Missing or other	30	13	1	1
<b>Most common cancers</b>				
Lung	57	25	13	8
Head and neck	29	13	37	23
Colorectal	25	11	35	22
Prostate	24	11	26	16
Renal or bladder	18	8	12	8
Leukemia, lymphoma, or multiple myeloma	14	6	—	—
Other	62	27	36	23

*Note.* Because of rounding, percentages may not total 100.

**Table 2. Brief Pain Inventory Item Scores and Visual Analog Scales for Medical and Surgical Patients With Cancer**

Item	Medical Patients (n = 229)		Surgical Patients (n = 159)	
	$\bar{X}$	SD	$\bar{X}$	SD
<b>Brief Pain Inventory</b>				
Pain at Its Worst	6.7	3.5	8.3	2.8
Pain at Its Least	2.8	2.5	3.0	2.0
Average Pain	3.5	2.6	1.6	2.2
Pain Right Now	4.4	3.2	5.2	2.6
Pain Relief	5.4	3.1	5.2	2.6
<b>Visual analog scale</b>	43.1	30.0	50.6	25.0

*Note.* Brief Pain Inventory scores ranged from 0–10, and visual analog scale scores ranged from 0–100.

BPI for the medical and surgical oncology groups also were very similar (see Table 3).

### Correlations Between the Visual Analog Scale and Pain Interference Subscale Items

The Pearson correlations between the VAS and Pain Interference Subscale scores were remarkably similar for the two groups with one notable exception. The correlation between pain intensity (VAS) and walking ability was somewhat higher for surgical patients ( $r = 0.70$ ,  $p < 0.01$ ) than for medical patients ( $r = 0.60$ ,  $p < 0.01$ ). Small differences were found in the remaining correlations, with the surgical patients with cancer exhibiting slightly higher correlations on all items (see Table 4).

### Correlations Between Pain Interference Subscale Scores and Brief Pain Inventory Pain Items

The Pearson correlations between the total Pain Interference Subscale scores from the BPI and the pain items from the BPI were similar in all areas but one. Correlations with Average Pain were moderate for medical patients with cancer ( $r = 0.49$ ,  $p < 0.01$ ) and near zero for surgical patients with cancer ( $r = 0.01$ ,  $p =$  not significant).

### Reliability

Reliability of the Pain Interference Subscale, minus the work item, was measured with Cronbach's alpha. The alpha

**Table 3. Pearson Correlations Between Scores on Brief Pain Inventory Pain Items and Visual Analog Scale Scores for Medical and Surgical Patients With Cancer**

Item or Subscale of Brief Pain Inventory	Medical Patients (n = 229)		Surgical Patients (n = 159)	
	r	p	r	p
Pain at Its Worst	0.78	< 0.01	0.72	< 0.01
Pain at Its Least	0.73	< 0.01	0.58	< 0.01
Average Pain	0.51	< 0.01	0.01	NS
Pain Right Now	0.83	< 0.01	0.65	< 0.01
Pain Relief	−0.14	0.04	−0.07	NS
Pain Interference Subscale total	0.71	< 0.01	0.73	< 0.01

NS—not significant

coefficient for the medical patients was 0.95 and 0.97 for the surgical patients.

## Discussion

### Sample

The medical and surgical oncology samples were similar in gender, ethnicity, and age. They also were similar in major cancers represented with the four major types varying in prevalence between the two groups. This variation was probably the result of differences in standard treatments used for specific cancers. For example, more patients with prostate cancer may be available in a surgical oncology group because surgery is a common form of treatment; other nonsurgical forms of treatment (i.e., radiation and hormone therapy) more likely would be provided on an outpatient basis.

A limitation of the study is that it was conducted in one geographic region using only veterans. Women are underrepresented in the sample because of the setting of the study. This certainly biased the study and limits the generalizability of results. Another limitation to generalizability is the ethnicity of the sample as the majority of the subjects were Caucasian.

### Means and Standard Deviations

The similarities in the mean scores between the two groups of patients were remarkable. The mean Pain at Its Worst score was higher for the surgical patients with cancer. This may be related to postoperative pain. In contrast, Average Pain was reported to be slightly worse for the medical patients with cancer. Pain may have decreased over time for surgical patients as incisions heal and patients become more mobile. With medical patients, the level of pain remained unchanged.

What is distressing in this data are the relatively low Pain Relief scores. Pain Relief was scored as a percentage of relief that was converted to a 0–10 scale for convenience. Pain Relief scores of 54% (5.4) and 52% (5.2) do not speak well for pain management for either medical or surgical patients with cancer in these inpatient units. On the medical units, 120 patients (52%) reported pain relief at a level of five or less. On the surgical units, the numbers were smaller with only 63 patients (40%) reporting this low level of relief. All patients had been on the units for a minimum of 48 hours so that the nurses would have had sufficient time to manage their pain. For many patients, pain management appears to be unsuccessful, especially on the medical units. Zalon (1999) found that nurses underassess more severe pain and overassess mild pain in postoperative patients. Underassessment of pain may lead to poor pain management for patients.

### Correlations With the Visual Analog Scale

One common approach to the study of validity is correlating the target scale (in this case, the BPI) with other scales that measure similar or related constructs. Of interest was the extent to which the correlations between scales were similar for medical and surgical patients with cancer. First, the 100 mm pain VAS was correlated with the pain items and Pain Interference Subscale of the BPI. The VAS scores may be expected to correlate most strongly with the Pain Right Now scores, which was found to be true for the medical patients with cancer. However, for the surgical patients with cancer, the correlation between the VAS (which measured pain intensity during a 24-hour period) and Pain Right Now from the

**Table 4. Pearson Correlations Between Pain Visual Analog Scale and Items on the Brief Pain Inventory Pain Interference Subscale for Medical and Surgical Patients With Cancer**

Item	Medical Patients (n = 229)		Surgical Patients (n = 159)	
	r	p	r	p
General activity	0.66	< 0.01	0.71	< 0.01
Mood	0.65	< 0.01	0.67	< 0.01
Walking ability	0.60	< 0.01	0.70	< 0.01
Relationships	0.66	< 0.01	0.68	< 0.01
Sleep	0.61	< 0.01	0.64	< 0.01
Enjoyment of life	0.65	< 0.01	0.70	< 0.01

BPI was slightly lower, although both were significant and strongly positive. Why this difference would occur is unclear. Other discrepancies existed between the medical and surgical oncology groups in the strength of the correlations. Most notable was the correlation with Average Pain; the correlation for the medical oncology group was an acceptable 0.51 ( $p < 0.00$ ), whereas no correlation was found for the surgical oncology group. The reason for this large discrepancy is unclear; however, the surgical patients may have greater fluctuations in their pain levels depending on administration of as-needed medications and the amount of movement as well as healing of the incision. These patients may find characterizing their pain as an average level of intensity more difficult. This result suggests that this specific item may not be as useful for surgical patients as for medical patients with cancer. The Pain at Its Worst correlations were almost equal between the two groups, and the correlation between the VAS and the total Pain Interference Subscale scores were very similar between the two groups. The similarities in these results support the validity of the BPI pain scale for use with surgical patients with cancer.

As expected, all the correlations between the VAS and individual BPI Pain Interference Subscale items were moderately strong and significant for both groups. This supports the validity of the Pain Interference Subscale for use with surgical patients with cancer.

**Table 5. Pearson Correlations Between Brief Pain Inventory (BPI) Interference Total Scores and Other BPI Items for Medical and Surgical Patients With Cancer**

Brief Pain Inventory	Medical Patients (n = 197)		Surgical Patients (n = 110)	
	r	p	r	p
Pain at Its Worst in Past 24 Hours	0.80	< 0.01	0.80	< 0.01
Pain at Its Least in Past 24 Hours	0.64	< 0.01	0.52	< 0.01
Average Pain in Past 24 Hours	0.49	< 0.01	−0.01	NS
Pain Right Now	0.68	< 0.01	0.68	< 0.01
Pain Relief	−0.08	NS	0.10	NS

NS—not significant

*Note.* Data are missing for 32 medical patients and 49 surgical patients.

## Correlations Between Pain Interference Subscale and Brief Pain Inventory Pain Items

The correlations between the total Pain Interference Subscale scores and each of the pain items on the BPI showed marked similarities between medical and surgical oncology groups except for one remarkable difference (see Table 5). The correlation with Average Pain in the prior 24 hours was moderately correlated ( $r = 0.49$ ,  $p < 0.01$ ) for the medical patients with cancer but showed an almost zero correlation for the surgical patients with cancer. This may further indicate the lack of reliability of the Average Pain item with surgical patients. This also may be the result of standard nursing care for surgical versus medical patients. Patients often decrease activity and movement as a way of guarding against pain; however, surgical patients with cancer are encouraged strongly to get up and move around as part of their routine nursing care and frequently are medicated for pain prior to such activity. The same encouragement seldom is given to medical patients with cancer. If remaining still helps to decrease their pain, they are permitted to do so.

## Reliability

Reliability of the Pain Interference Subscale of BPI was excellent. The fact that it was equally high for both groups indicates that the scale is reliable with medical and surgical patients with cancer. Zalon (1999) also found that the BPI is reliable for use with postoperative patients. A limitation of the study was that no reliability study was conducted of the pain items on the BPI. This would have required evaluation of interrater reliability, something that should be included in future studies.

## Implications

Nurses caring for patients with cancer assess and manage their pain. The ability of nurses to control patients' pain is based on their accurate pain assessments. Nurses must know that the instruments they use to assess pain are valid and reliable. Results of this study indicate that nurses can feel confident that using the BPI with surgical patients with cancer will provide an accurate measure of pain. Nurses should be taught to use the BPI along with other types of pain measures.

Continued research is necessary in the area of pain assessment. Few women and minorities were included in this study; therefore, this study should be replicated with a larger female and minority sample. Additional research is needed about the patterns of pain that surgical patients with cancer experience. Also, the impact of undermanaged pain on complications in this sample should be explored.

## Conclusions

Oncology nurses in all settings must have valid and reliable methods of assessing patients' pain. Results of this study strongly support the use of the BPI for use with medical and surgical patients with cancer. However, caution should be used in interpreting Average Pain because of the fluctuations in pain intensity that are likely to occur in postoperative patients.

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### For more information . . .

- Cancer-Pain.org  
www.cancer-pain.org
- Talarian Map  
www.talaria.org
- World Health Organization Cancer Pain  
www.whocancerpain.wisc.edu

Links can be found using ONS Online at [www.ons.org](http://www.ons.org).