6 Acute Pain in the Elderly

According to estimates of the National Center of Health Statistics (Havlik & Suzman, 1987), by the year 2020 the total population of the United States will be approximately 300 million and 17% or 51 million will be 65 years of age or older, almost an 80% increase in this age group since 1985. With the growing number of elderly, quality of life issues re-lated to longer lifespans are increasingly important. One concept that greatly influences quality of life and functional independence is pain. This chapter re-views the state of the science for acute and episodic pain in the elderly and addresses: 1) pain dimensions, 2) assessment, 3) management, 4) research needs and opportunities, and 5) recommendations for future re-search.

State of the Science

Pain is a significant health problem in the general population and a common symptom associat-ed with many disorders experienced by the elderly. Pain in the elderly is often the result of the age-related rising incidence and prevalence of chronic disorders, such as those of neuromusculo-skeletal origin (e.g., arthritis, low back pain), neuropathy (e.g., diabetes, herpes zoster), and peripheral vas-cular conditions (e.g., temporal arteritis, athero-sclerosis), as well as diseases, such as cancer (Enck, 1991). Acute pain related to conditions, such as de-generative skeletal joint conditions, fractures, and cancer, is more common in the elderly than in young-er age groups (Acute Pain Management Guideline Panel, 1992; Enck, 1991). Approximately 80% of the elderly are thought to have at least one chronic condition that involves pain (Nation & Warfield, 1989). A survey sample of 500 households randomly selected from a roster of a group family practice unit in the City of Burlington, Canada, reported that the prevalence of persistent pain was approximately 1.5 times higher in subjects over 60 years of age than in those 60 years or younger (Crook, Rideout, & Browne, 1984). Only a small number of additional studies (Ceccio, 1984; Ferrell, Ferrell, & Osterweil, 1990; Helling et al., 1987; Lavsky-Shulan et al., 1985; Morris et al., 1986; Ready, Chadwick, & Ross, 1987) have investigated the prevalence or incidence of pain in the elderly or have included age as a variable. Other studies, while including elderly subjects in their investigation of incidence and/or characteristics of pain experienced by medical-surgical patients (Cohen, 1980; Donovan, Dillion, & McGuire, 1987; Marks & Sachar, 1973), have not di-rectly examined or controlled the variable for the influence of age.

The elderly population comprises a wide range of ages; yet the elderly have been treated as a homogeneous group. The National Institute on Aging (1987), recognizing the vast range of ages categoriz-ing older individuals, established subcategories, such as "older adults" (65-74 years), "old-old adults" (75-84 years), and "oldest-old adults" (85+ years). The experiences of subjects in their eighties may differ from those in their sixties.

Age-related changes in the functioning of the peripheral nervous system have been reported among older individuals, such as a progressive negative relationship between increasing age and decreasing peripheral and central sensory nerve conduction (Dorfman & Bosley, 1979). Age-related differences in symptoms associated with disease also have been found. For example, chest pain was the myocardial infarction symptom reported approximately 70% of the time by all age groups except for the group that included individuals 80 years or older who reported chest pains only 46% of the time. Individuals who were 85+ years reported shortness of breath more frequently (43% versus 37%) than chest pain (Bayer, Chadha, Farag, & Pathy, 1986). Because little atten-tion has been directed to investigating differences in pain threshold and pain tolerance among subcategor-ies of ages of the elderly, further investigation is needed.

It is not uncommon for elderly individuals with chronic conditions to experience acute pain dur-ing exacerbations or surgical treatment of an existing chronic illness. In addition to their chronic pain, they may experience acute pain accompanying new ailments or injuries. In general, although research on pain has intensified, little attention has been directed to studies of pain assessment and management in the elderly.

Dimensions of Pain

Physiological Dimension

Pain threshold is defined as the least experience of pain which a subject can recognize, whereas pain tolerance is the greatest level of pain which a subject is prepared to tolerate (International Associa-

tion for the Study of Pain, 1986). Pain thres-hold is an indication of the sensory component of pain.

In order better to understand clinical pain, numerous cross-sectional studies have been conducted to determine if pain thresholds change with age (Table 6.1). Thus far, the findings are equivocal and the issue of whether pain thresholds increase with age remains unsettled. This may be the result of the different types of stimuli (e.g., radiant heat, electrical shock) used to induce pain experimentally, and variations in design, procedures, and outcome measures of the studies.

Some studies of pain induced by thermal heat (Hardy, Wolff, & Goodell, 1943; Schumacher, Goodell, Hardy, & Wolff, 1940) have reported no age-related changes in thermal sensory threshold, whereas other studies have reported an increase in thermal threshold with age (Chapman & Jones, 1944; Schludermann & Zubek, 1962; Sherman & Robillard, 1960, 1964). The increases in thermal pain threshold may be due to an age-related decrease in skin thick-ness, which facilitates the dispersion of heat through the blood supply (Procacci, Bozza, Buzzelli, & Della Corte, 1970).

When electrical shock was applied to the teeth to induce pain, no age-related changes in pain threshold were reported (Harkins & Chapman, 1976, 1977; Mumford, 1965). Although Collins and Stone (1966) reported lower pain thresholds in the elderly than in the young, most subsequent studies (Clark & Mehl, 1971; Procacci et al., 1970; Tucker, Andrew, Ogle, & Davison, 1989) reported higher pain thres-holds in older individuals than in the young.

In contrast to these studies (Table 6.1) reporting an age-related elevation in threshold for cutaneous pain induced by thermal stimuli, Woodrow, Friedman, Siegelaub, and Collen (1972) examined pain tolerance rather than threshold, because they believed the former had greater clinical relevance. They found that tolerance to deep pain, produced by mechanical pressure applied to the achilles tendon, decreased with age (Woodrow et al., 1972). This suggests that the differences in pain-induced findings may be due to the different pain tracts that various stimuli (e.g., heat, electric, pressure) activate.

Chapman and Turner (1986) have suggested that the variability in outcomes related to pain threshold testing in the elderly could be related to psychological influences, such as expectancy and pre-test instructions, as well as stimulus modalities with wide pre-pain intensity ranges. In addition, physiological changes and the subject's attitude and sociocultural background also could be factors affecting pain threshold in the elderly. Thus, criteria for defining pain also are contributing factors to the pain experience. Because pain induced in a laboratory setting under controlled, artificial conditions may not be compar-able to the pain experienced as a result of injury or disease, pain tolerance, which reflects both the per-ception of the noxious stimulus and the resulting distress, may have greater relevance to clinical prac-tice than pain threshold which reflects primarily the detection of pain (Chapman & Turner, 1986; Witte, 1989).

Sociocultural Dimension

Most investigations relating age to pain have used cross-sectional designs comparing young with older groups (Moore, Vilderman, Lubenskyi, McCans, & Fox, 1990; Ready et al., 1987; Sorkin, Rudy, Hanlon, Turk, & Stieg, 1990). Investigators using this type of design have not always reported whether they controlled for confounding factors, such as sociocultural learning and experiences, age-related pathology, socioeconomic status, and cognitive, atti-tudinal, and motivational factors, all of which are postulated to influence the pain experience over time (Harkins, Kwentus, & Price, 1984).

Studies were conducted of pain sensitivity related to ethnicity and gender. Zola (1964) reported that Italian-American patients complained of pain significantly more frequently than Anglo-Americans. Koopman, Eisenthal, and Stoeckle (1984) not only replicated Zola's (1964) study, but extended it to include the patients' reports of their emotional dis-tress, as well as requests for medical treatment. Similarly, Koopman et al. (1984) found that Italian-American patients complained of pain significantly more frequently than Anglo-Americans, but the dif-ferences were confined primarily to females over 60 years of age. The two groups were essentially simi-lar in their reports of low emotional distress which did not correlate with their reports of pain. These investigators concluded that women, especially older women, were more likely than men to carry on the role expectations and traditions of their culture. Further, the patients' reports of low emotional dis-tress were probably due to focusing on their physical problems, rather than psychological reactions to their problems. In contrast to the patients of Zola's (1964) study, the Italian-Americans in Koopman et al.'s (1984) study wanted both pain relief and explanations about their pain. Koopman et al. (1984) recommended that future research on ethnic differences related to pain should address the subjects' religious background, country of origin, generation in the current country, and degree of acculturation.

Both older men and women have shown decreased pain responses to thermal heat, but the basis for their responses differs (Clark & Mehl, 1971). Older men reportedly are as sensitive to pain as younger subjects, but have a higher pain criterion (i.e., a higher rating on a physical measurement of pain along a magnitude axis scaled to mcal/sec/ cm^3/d') and seldom report pain. On the other hand, older women are reportedly less sensitive to pain than younger women and also have a higher pain criterion (Clark & Mehl, 1971).

In a sample population of 41,119, Woodrow et al. (1972) investigated pain tolerance to mechanical pressure on the achilles tendon and reported the following: 1) pain tolerance to mechanical pressure decreased with age, 2) men had a higher tolerance for this type of pain than women, 3) Anglo-Americans tolerated more pain than African-Americans, and 4) African-Americans tolerated more pain than Asian-Americans. These racial differences for pain toler-ance were consistent across age groups, gender, and educational levels (Woodrow et al., 1972). As the ethnic diversity of the United States continues to grow, further investigations of cultural and ethnic influences on pain tolerance and pain manifestation are needed, especially in the elderly.

Socioeconomic status also may be a factor in pain sensitivity. When college students were com-pared to skilled and unskilled workers, the students exhibited less thermally-induced pain sensitivity. It was also shown that pain sensitivity remains relatively stable in individuals 12-59 years of age and is mark-edly lower in individuals 60-83 years of age. (Schlu-dermann & Zubek, 1962).

Behavioral Dimension

Although the data on pain threshold, sensitivity, and tolerance vary widely, data obtained from laboratory pain-induced studies suggest that the elder-ly demonstrate a response bias when reporting pain. Older individuals are more hesitant than younger ones to label low intensities of a stimulus as "painful" (Harkins & Chapman, 1976, 1977; Harkins et al., 1984; Harkins, Price, & Martelli, 1986; McMillan, 1989). However, results obtained from laboratory-induced pain studies should be extrapolated to clinical pain with extreme care.

The elderly may be reluctant to report pain because it may be thought of as an expected component of aging (Ferrell et al., 1990; Forman & Stratton, 1991). Moreover, their sociocultural learning and experiences may greatly influence how pain is manifested. The apparent under-reporting of pain by the elderly may be due to the following: 1) the be-lief that good patients do not complain about pain (Ward et al., 1993); 2) a reflection of stoicism or a greater cautiousness in reporting pain because of age-related changes in the processing of external stimuli (Nation & Warfield, 1989; Portenoy, 1987); 3) actual sensation of less pain than the young (Portenoy, 1987); 4) an experience of the same amount of pain as younger individuals but different coping, thus a higher pain tolerance; and/or 5) younger individuals experience the same amount of pain as the elderly but exaggerate its severity (McMillan, 1989). Further, the older individual may not report pain because he/ she may be afraid to find out the true "cause" of the pain, may think nothing can be done to relieve it, and/or does not want to inconvenience anyone (Fer-rell & Ferrell, 1989).

The elderly may present many diseases qualitatively differently from younger adults (Witte, 1989). Acute myocardial infarction, with little or no chest pain, has been widely reported in the elderly (Bayer et al., 1986; MacDonald, 1983; Pathy, 1967; Zoob, 1978). In a survey of 1,474 subjects who had experienced a myocardial infarction, MacDonald (1983) found that elderly patients reported less pain than younger patients. In fact, 30% of the subjects 70 years or older did not list pain as a chief presenting symptom compared with only 23% of those younger than 60 years. These findings were confirmed by Bayer et al. (1986), who found a lower frequency of reports of chest pain in patients over 75 years of age (n=409) than in younger ones and a higher frequency of reports of shortness of breath than chest pain in patients 85 years of age and older (n=88).

Similarly, pain associated with other serious conditions, such as acute abdomen, pancreatitis, and appendicitis, may not be reported or manifested by the elderly in a typical manner (Bender, 1989; Thomas, 1990, 1991). An investigation of the rela-tionship between age and symptom intensity in 105 cancer patients showed that the older group (n=51), consisting of patients 56 years and older, reported significantly less intense pain symptoms than the younger group (n=48), which consisted of indi-viduals 55 years and younger (McMillan, 1989).

Although pain sensitivity is generally thought to decrease with age, it is important not to stereotype older individuals. Early studies on pain threshold and aging have resulted in equivocal findings, while pain induced studies have suggested that older individuals are less likely to identify low levels of stimuli as painful, and may have a decreased tolerance to deep pain (Woodrow et al., 1972). Yet, many questions remain unanswered. Do older individuals actually experience less pain stimuli than younger individuals? Do they feel the same amount of pain stimuli but not perceive

the same level of pain intensity? And final-ly, do they perceive the same degree of pain intensity but tolerate it better and thus, are not inclined to report it until the intensity is much greater?

Studies (Kaiko, Wallenstein, Rogers, Grabinski, & Houde, 1982; Moore et al., 1990; Ready et al., 1987) showing that the elderly require smaller and/or less frequent doses of analgesics, may be indicative of alterations in drug metabolism and excretion rather than a higher pain threshold. Thus, current available research in this general area is sug-gestive of a relationship between pain and age, but further investigation is needed.

Sensory Dimension

Age-related changes in special senses, such as visual impairment and hearing loss, should be recognized and assessed. For example, hearing im-pairment increases markedly with aging; a significant loss of hearing is experienced by approximately 35% of individuals past the age of 65 years (Ruben & Kruger, 1983). The cause of hearing loss in older individuals is thought to be a normal consequence of aging and/or a pathological response over time to noise. Aging also is associated with degenerative eye changes. The prevalence of visual impairment (e.g., cataracts, glaucoma, and macular degeneration) as-sociated with aging is approximately eight times higher in individuals over 85 years than in individuals younger than 65 years of age (Wright & Henkind, 1983). Thus, impairments in the special senses (e.g., hearing and visual) must be considered in the as-sessment and management of the elderly's pain.

Cognitive Dimension

Intellectual ability, as indicated by tests of vocabulary, information, and comprehension, peaks between the ages of 20 to 30 years. In the absence of disease or injury, intellectual ability remains relatively stable until approximately the seventh decade of life. There is relatively no loss of stored information with aging. In contrast, generally a pro-gressive loss of speed of learning, processing, and responding to simple or complex tasks occurs (Katz-man & Terry, 1992). These changes should be taken into consideration when interacting with elderly individuals, especially when assessing older indi-viduals or providing health-care teaching. The pace of interactions should be evaluated to determine whe-ther it may need to be slowed down to provide suf-ficient time for elderly individuals (especially those 70+ years) to process and respond to information or communication.

Cognitive impairment is an alteration in normal thought processing resulting from the effects of drugs, injury, or disease. Acute confusional state (ACS), also called delirium, is a transient condition, which occurs abruptly and causes temporary cognitive impairment of relatively brief duration with symp-toms that tend to wax and wane (Foreman, 1986; O'Brian, 1989). The prevalence of ACS in hospitalized elderly patients has been estimated to be approximately 10 - 50% (Chisholm, Deniston, Igrisan, & Barbus, 1982; Foreman, 1986; Johnson, 1990; Welch-McCaffrey & Dodge, 1988).

Dementia, on the other hand, is a condition characterized by a gradual decline in cognitive functioning which may or may not be reversible. In the community, the overall prevalence rate for indi-viduals more than 65 years of age was 11.5 to 18.4% for mild dementia and 5 to 6% for severe dementia (Myers et al., 1984). Although dementia may be caused by many conditions (e.g., certain strokes), Alzheimer's disease is considered the major cause of moderate to severe cognitive impairment in older in-dividuals (Evans et al., 1990). In 1980, the overall prevalence estimate for Alzheimer's disease in in-dividuals 65 years and older in the United States was 11.3%. Probable Alzheimer's disease prevalence, when stratified by age, was assessed to be 3.9% for persons 65 to 74 years old, 16.4% for those 75 to 84 years old, and 47.5% for those over 85 years of age (Evans et al., 1989, 1990). The prevalence of chron-ic conditions involving cognitive impairment and possibly associated with pain increases with age; yet, little is known about how pain is experienced and communicated by cognitively impaired individuals.

Cognitive impairment can alter the clinical presentation of pain. Marzinski (1991) reported that a patient with Alzheimer's disease climbed out of bed several hours after major abdominal surgery and was found running down the hallway. Although pain should have been associated with such early post-operative strenuous activity, the patient did not exhibit any overt pain behavior. Because pain usual-ly is defined as a subjective sensation, this example of a confused patient failing to exhibit pain behavior has raised some questions. Do patients with Alz-heimer's disease, or other problems that render them unable to perceive, remember, interpret or report pain, not experience pain (Marzinski, 1991)?

Because little attention has been given to the study of pain in nonverbal and cognitively impaired individuals, elderly individuals who have difficulty expressing themselves due to language difficulties and/or sensory or cognitive impairment are at in-creased risk of not having their need for pain relief recognized.

Marzinski's (1991) interview survey of pain assessment in the confused, nonverbal elderly suggests that subtle changes in behavior and vocaliza-tions could be used as indices of pain, but further research is needed.

Affective Dimension

Findings related to anxiety associated with pain have been equivocal. For example, Bruegel (1971) reported that anxiety was not related to post-operative pain perceptions of 85 intra-abdominal surgical patients. These findings may be misleading, because: 1) the anxiety instrument measured char-acteristic trait anxiety rather than situational or state anxiety; and 2) the tool was administered only on the preoperative evening, while pain was rated by the patients only once, 32 hours after surgery. Even though older individuals were included in this study (Bruegel, 1971), no explicit age related findings were reported.

In contrast, Chapman and Cox (1977) found that state anxiety and postoperative pain were significantly (p <0.01) and highly correlated (r not reported) on postoperative days one and three for patients (n=75) in three groups (kidney donors, kid-ney recipients, and general surgery patients). Anxiety and pain ratings were obtained preoperatively and daily after the surgical day for the duration of the hospitalization stay. The results showed trends that were quadratic rather than linear and differed across the groups. Like Bruegel's (1971) findings, no sig-nificant relationship was found between trait anxiety and immediate postoperative pain in the kidney donor group; but was found in the kidney recipient and gen-eral surgical groups.

Decreasing the perception of powerlessness may decrease the intensity of the pain experience (Walding, 1991). One method of decreasing anxiety and powerlessness may be to routinely assess the patient's pain and offer analgesics as indicated. Routinely assessing the pain of 14 patients (5 males and 9 females) recovering from hip surgery and offering them analgesics, Nelson, Taylor, Adams, and Parker (1990) found that the patients rated their pain inten-sity higher and took more analgesics, but had similar mobility when compared with patients who received analgesics only on request. Although the research question addressed in this study was good, the sample size was small, the subjects were not randomly sel-ected or randomly assigned to treatment and control groups, and information concerning gender and age composition of the groups was not reported. How comparable the groups were at the beginning of the study and the extent of incomplete data collection and how the data were handled statistically were not re-ported. The investigators acknowledged that data collection for the control group was more often in-complete; specifically, they had fewer opportunities to complete the visual analogue scale used to assess pain. This may have contributed to the control group's lower mean pain intensity score.

The relationship between pain and depression is not clear. Most of the research examining this relationship has focused on chronic or recurrent, benign pain. Lindsay and Wyckoff (1981) investi-gated the prevalence of depression in patients with recurring benign pain (n=150) and those with chron-ic pain (n=150), and found that 87% of all patients fit the criteria for depression. They next studied depressed patients (n=196) and found that 59% had some significant complaint of chronic pain; 83% of the patients with both chronic pain and depression received significant pain relief associated with the administration of several antidepressant medications. The authors suggested that the pain-depression syn-drome is best viewed as a single entity rather than each condition as a symptom of the other. Even though older individuals were included in these studies, age as a variable was not addressed.

Is the association of depression and pain limited to chronic pain? An investigation (Chapman & Cox, 1977) of depression and acute postoperative pain revealed no significant relationship, which was attributed to a lack of statistical power due to a small sample size. On the other hand, Williams and Schultz (1988) investigated depression and acute pain related to exacerbation of a physical illness and found a significant (p <0.05) though moderate (r=0.41) relationship. No significant association was found between these variables and age.

Assessment of Acute Pain

Acute pain is manifested by: autonomic nervous system changes, such as increased heart rate, arterial blood pressure, perspiration, and dilated pupils; behavioral expressions, such as crying, screaming, facial grimacing, immobility, muscle guarding, and clenched fists; and subjective reports of pain (Chapman & Bonica, 1983). Because no bio-logical or behavioral indices exist which accurately reflect the characteristics and intensity of a patient's pain, it is extremely important to assess an indivi-dual's subjective pain report. It is also important to ascertain how the patient usually describes, manifests or expresses pain. For example, McDaniel et al. (1986) developed an observation method for assessing pain behavior in rheumatoid arthritis patients, identi-fying guarding, passive rubbing of body parts, and self-stimulation as the most frequently observed behaviors that were related to pain intensity scores (r=0.55, p <0.05). Although

elderly subjects were included in this study, the influence of age was not examined.

Pain does not occur in isolation. It has a multidimensional impact not only on the individual's physiological, psychological and social makeup, but also on the individual's family and loved ones, as well as on society. The time orientation of a culture and the way the people of the culture express their pain affects the way pain is communicated (Martin-elli, 1987).

Although the findings have been equivocal, many studies have suggested that correlates of persistent pain include *depression* (Ferrell et al., 1990; Parmelee, Katz, & Lawton, 1991; Williams & Schultz, 1988), *anxiety* (Bruegel, 1971; Chapman & Cox, 1977; Chapman & Turner, 1986), *fatigue*, *sleep disturbances* (Cohen, 1980), *limited mobility, social isolation* (Engelking, 1988; Ferrell et al., 1990; Marzinski, 1991; Witte, 1989), and *loneliness* (Rod-gers, 1989). Most of the studies of correlates of pain have focused on chronic rather than acute pain, and did not include age as a variable. The question is raised whether these correlates also are associated with acute pain, and whether age is an influential factor.

Strategies for the assessment and management of pain should be individualized and multidimensional for each patient because the pain experience varies greatly in the elderly. In a community setting, an investigation of elderly indi-viduals with painful conditions indicated that pain should not be assessed in isolation from other related factors, such as anxiety, depression, loneliness, cognitive deficits, and social isolation (Walker, Akinsanya, Davis, & Marcer, 1990). Pain assess-ment in the elderly should explore their: 1) ability to cope with pain and understand their condition; 2) in-volvement in self-care, social, and recreational activities; 3) dynamic relationships with family; 4) sociocultural background; and 5) other stressful problems (Enck, 1991; Walker et al., 1990). The assessment process may indicate that some elderly patients may need to be taught the importance of communicating their pain.

Whether in a community setting, nursing home, or hospital, a baseline description of the pain experience should be obtained. This must include physical, cognitive, psychological, behavioral, and functional evaluations. Specific, rather than general, questions should be asked. Because generally a pro-gressive loss of speed of learning, processing, and responding to simple or complex tasks occurs with aging (Katzman & Terry, 1992), assessments of older individuals may take longer. Therefore, when gath-ering information, it is important to allow sufficient time for their responses so that they do not feel rushed (Herr & Mobily, 1991). If sensory deficits or language problems exist, strategies should be aimed at facilitating the communication process. In ad-dition, pain assessments should be performed at regular intervals and systematically. If the older patient's recall is hindered by cognitive or sensory impairments or altered moods, family and friends or caregivers may be needed as additional sources of information (Ferrell, 1991; Ferrell & Ferrell, 1989). Although the value of the above suggestions is gen-erally accepted for pain assessment, little research has been conducted to validate their effectiveness, possibly due to challenges related to design and low researcher interest.

Verbal and sensory impairments associated with aging should be taken into consideration when assessing an individual's pain. If patients are nonverbal, but not cognitively impaired, they should be encouraged to communicate their pain in non-verbal ways, such as writing and gesturing. Large print, nonglare colored paper, written instructions, simple pain scales (e.g., visual analogue scales), pain "thermometers", body diagrams to indicate pain loca-tion, and facial expression pain scales are a few ex-amples of the tools that can aid in nonverbal pain assessment (Herr & Mobily, 1991).

Assessment of pain in older individuals who are cognitively impaired or nonverbal, may present a challenge requiring different assessment tools. An assessment of an individual's ability to understand and process information is important. Many tools, including the Wechsler Adult Intelligence Scale-Revised (WAIS-R), Folstein Mini-Mental State Scale, and Short Portable Mental Status Questionnaire, are available for use in assessing mental status (Fraser, 1988; Kallman & May, 1989). Whether these instru-ments can be used to ascertain the individual's ability to report pain, however, has not been extensively studied. Ferrell et al. (1990) reported finding little correlation between pain and the Folstein Mini-Mental State Scale score.

If the patient is cognitively impaired, to what extent does that impairment influence the individual's self-report of pain? Could nonverbal behavioral expressions of pain be used as a reliable indication of pain? The findings of four studies conducted by McDaniel et al. (1986) suggested that behavioral observations of pain behaviors were a reliable, valid, and relatively objective method of assessing pain in rheumatoid arthritis patients. Because the subjects in these studies were less than 65 years of age, similar studies are needed in individuals older than 65 years of age.

If observations are to be used as an indi-cation of pain, an assessment of the cognitively impaired individual's usual behavior would be neces-sary to alert caregivers to changes in vocalizations and behavior (e.g., changes in gait, facial expres-sions, posture, ability to concentrate) suggestive of pain. Marzinski (1991) reported an anecdotal account of the ability of experienced nurses in a nursing home to recognize pain based on subtle changes in Alz-heimer's disease patients' behavior. This suggests that detection of behavioral and vocalization changes may be used as indices of pain in nonverbal or cogni-tively impaired individuals. However, these methods require systematic and rigorous validation.

Turk and Flor (1987) found that behavioral manifestations of pain can be sources of communication. They cautioned that overt behavior is only one aspect of a complex experience. Additional information is needed about other factors, such as types of pain and pathology, the setting in which the individual is observed, the function of the pain be-havior, and when possible, the individual's beliefs and appraisal of the pain experience.

It should not be assumed that an elderly individual's report of pain is a reflection of an existing chronic condition without evaluation. Any abrupt changes in pattern and/or intensity of pain or pain-related limitation of functional activities must be assessed carefully. Careful examination of the loca-tion of the pain also is important (Portenoy 1987). Because the neurological and musculoskeletal systems change with age, these systems should be thoroughly examined for signs of deficits, disease, or injury (Enck, 1991; Ferrell, 1991).

Some of the most prevalent chronic ailments in the elderly that may be associated with intermittent acute pain are: 1) cancer, 2) arthritic degenerative joint disease, and 3) vascular disease (Thienhaus, 1989). Prostate cancer is a common cancer in males (African-Americans more than Caucasians) and oc-curs most frequently around the age of 70 years. The pain associated with prostate cancer is usually the result of metastasis to the bone (Nocks, 1989). The type of cancer most responsible for causing pain in women is adenocarcinoma of the breast (Stillman, 1989). Arthritis (rheumatoid, osteoarthritis, gout, spondyloarthropathies, etc.) is a widespread, dis-abling chronic degenerative joint disease that afflicts approximately 37 million Americans of whom one-third are over 65 years of age (cited in Lambert & Lambert, 1987). Giant cell arteritis, also called temporal arteritis, is a painful inflammatory vascular disease, usually restricted to cranial vessels, which is more prevalent in individuals over 50 years of age (DiBartolomeo & Brick, 1992; Lamey, Taylor, & Devine, 1988).

Davis, Cortez, and Rubin (1990) reported that the pain experience associated with osteo- and rheumatoid arthritis did not differ significantly between 31 individuals older than 65 years (m=72 yrs) and 52 individuals younger than 65 years (m=49 yrs); nor did their report of experiences of physical well-being and depression. Although the types of pain management techniques were essentially similar, the younger group used a greater number; for ex-ample, the younger group used two more pain man-agement techniques and found guided imagery and meditation more helpful than did the older group.

Pain originating in an area of injured or diseased tissue may be referred to other areas of the body and can also confuse pain assessment (Cohen & Sherman, 1988; Guyton, 1987). For example, pain associated with acute myocardial infarction may be referred to the jaw, neck, across the shoulders, down one or both arms, beneath the sternum or in the epigastric region. Referred pain in the epigastric area may be interpreted by the individual as "heartburn" rather than angina. Referred pain occurs across age groups, and thus the location of pain is not sufficient information for determining its cause.

Several qualitative and quantitative tools have been developed to assess pain. Descriptive rat-ing scales, diaries or logs, visual analogue scales, and pain graphs have been proposed to measure the indi-vidual's subjective report of pain intensity and quality. Recently, an investigation of selected pain assessment tools for use with the elderly was con-ducted (Herr & Mobily (1993). The investigators reported that when the relationships were examined among a verbal descriptor scale (VDS), a pain ther-mometer (PT) which is a verbal descriptor scale placed along the side of a diagram of a thermometer, a horizontal visual analogue scale (h-VAS), a vertical visual analogue scale (v-VAS), and a vertical nu-merical rating scale (NRS) statistically significant (p<.001) correlations were found, ranging from r= 0.84 to 1.00. The highest correlations were between the VDS and PT (r=1.00) and the lowest between h-VAS and v-VAS (r=0.84). While the correlation between the VDS and v-VAS was not reported, the v-VAS and PT was 0.87. The VDS had the highest percentages of subjects identifying it as the easiest, best, and most preferred pain assessment tool. The failure rates (i.e., percentage of incorrect responses to tool) for these tools were 4.1% for the VDS and 8.2% for the VAS which are within the range re-ported for general populations. An examination of pain intensity estimates revealed differences among many of the tools with the exception of the estimates obtained using the v-VAS which did not differ sig-nificantly from estimates of the other tools. The investigators suggested that

the five tools that were examined may be appropriate for assessing pain in-tensity in the elderly population since they were strongly and significantly correlated and had acceptable failure rates. They encouraged consideration of several factors, such as the elderly subject's preference and educational level when selecting a pain assessment tool. While the VDS was most preferred, the increased sensitivity of the VAS led the investigators to suggest that the VAS, especially the v-VAS could be a useful pain assessment tool for the elderly (Herr & Mobily, 1993). While the findings of this study are very interesting, their generalizability is limited due to the nonrandom sample selection and small (n=27) sample size. Ad-ditional research is needed on the reliability and sensitivity of pain intensity tools for the elderly. Unfortunately, most articles regarding pain assess-ment tools used with the elderly are clinical reviews rather than data-based research reports.

Stress responses (Melzack, 1980; Orshan, 1988) and several mood states, such as depression (Kwentus, Harkins, Lignon, & Silverman, 1985; Sorkin et al., 1990; Thomas, 1990, 1991), fatigue (Beecher, cited in Woodrow et al., 1972), and anxiety (Thomas, 1990; Walding, 1991) are as-sociated with pain, primarily chronic pain. Therefore, in addition to measuring pain, in-struments that measure stress responses and these mood states con-tribute to the multi-dimensional picture of the individual's pain experience. In spite of the variety of methods and tools used to measure pain, little research has been conducted to ascertain their accuracy and appropriateness in clinical practice for as-sessing acute pain in the elderly. The rationale for the choice of an assessment tool should be based on the intended purpose of its use (i.e., research or clinical practice) and health status (mental and physical) of the individual in pain. In clinical practice, a pain assessment tool could be used to establish baseline measurements, and determine the extent and severity of pain, pain patterns and changes in pain over time. It could be used also to evaluate the effectiveness of pain management interventions.

Pain Management

One of the factors that has been studied is undertreatment of pain. Studies of nurses' decisions concerning plans for pain management have shown wide variation among clients from different age groups (Burke & Jerrett, 1989; Faherty & Grier, 1984). A retrospective study by Faherty and Grier (1984), utilizing chart reviews, indicated that the older surgical patients had less analgesic medications prescribed (r=-.58; p <.001) and less administered (r=-.53, p <.001) during the first 24 hours post-operatively. More than 50% of the patients who were 55 years and older received less than half of the prescribed analgesic dose. In addition, women re-ceived less medication than men regardless of age. On the other hand, Short, Burnett, Egbert, and Parks (1990) found that the amount of narcotics adminis-tered to elderly surgical patients depended upon the type of surgery and the setting where the received care (i.e., the Surgical Intensive Care Unit (SICU) or a surgical ward). In general, the amount of analgesic the elderly patients received was approximately 24% of the prescribed dose. Although there were no significant differences in the amount of nar-cotic analgesic ordered by the physicians or in the types of their sur-geries, the SICU pa-tients received more of the prescribed medication than the surgical ward patients.

There are few, if any, prospective studies in which confounding variables, such as sociocultural factors, pre-existing medical problems, and attitudes about pain have been considered. Questions exist that need to be addressed in further research. Did the elderly in the studies previously discussed receive less pain medication because they experienced less pain; or did they experience the same amount of pain, but reported it less frequently? Could they have needed less analgesic to obtain pain relief because they were more sensitive to the medication or because the effects of the medication lasted longer? And finally, did they receive less pain medication because the staff believed that the elderly have decreased pain sensitivity?

The selection of pain management strategies by student nurses may vary with the ages of both the patients and the nurses. More pain management options were identified for those patients similar in age to the nurses than for patients who were either much younger or older than the nurses (Burke & Jerrett, 1989). The results of this study did not always correspond with what the student nurses had been taught; thus, the investigators concluded that the students' personal beliefs about pain had a stronger influence than curriculum content (Burke & Jerrett, 1989). More attention should be given to examining whether nurses' verbalized perceptions of the best pain-management technique reflect their practice.

Davitz and Davitz (1981) reported that although the age of patients was not a significant factor in nurses' (n=65) inferences of patients' phy-sical pain, it played a major role in their inference of patients' psychological distress. For example, nurses inferred that older (65+ yrs) patients with cancer ex-perienced lower psychological distress than adoles-cents and young adults, but not as low as that of children (4-12 yrs). When interaction effects of age-by-gender and age-by-degree of severity were ex-amined, the smallest

differences were reported for older adults and children and the greatest differences for adolescents and young adults.

The influence of culture on the treatment of postoperative pain of 270 patients undergoing cholecystectomy has been reported by Streltzer and Wade (1981). Cultural bias of nurses was suspected when more pain medication was administered to Cau-casians and Hawaiians than to Filipinos, Japanese, and Chinese. However, the investigators were un-sure whether the ethnic differences reflected under-treatment of the pain by the nurses or more stoic behavior and lower perception of pain by the Fili-pinos, Japanese, and Chinese. Consistent with the findings of other studies, an age-related decrease in the amount of pain medication administered was found (Streltzer & Wade, 1981).

Litman (1974) suggested that the family is the most important context within which illness occurs and is resolved. The responsibility for care of frail or impaired individuals who need assistance with one or more activities of daily living increasingly falls on the family (Bunting, 1989). Estimates sug-gest that by the year 2030 approximately 22% of the American population will be 65 years and older, and an increasing number over 85 years of age (Institute of Medicine, 1990). Most older individuals live in the community; approximately one-third live alone and widowed females predominate (Wilson, Kovar, & Havlik, 1987).

The majority of the impaired elderly live with family members (Stone, Cafferata, & Sangl, 1987). There is a great deal of interest in examining issues related to providing eldercare, as well as investigating the effects on the caregivers of pro-viding care to elder family members (Anastas, Gibeau, & Larson, 1990; Bunting, 1989; Dellasega, 1990; Malonebeach & Zarit, 1991). Stone et al. (1987) reported that only 11% of impaired elderly live alone; thus, it is likely that the majority of older individuals in the community experiencing pain live with family members. Issues that have not received a great deal of attention are the role and influence of the family on pain behavior and pain management in the elderly. The few available studies have focused on chronic pain. Snelling (1990) concluded from a review of the literature that patients with pain tend to have family members who also have pain or illness and that spouses may play a role in enhancing or minimizing pain behaviors in their partners.

Very little research has focused on pain management strategies in the elderly. When planning management strategies, cognitive, psychosocial, cul-tural and physiological factors must be considered, because they influence the older person's perception of pain (Faherty & Grier, 1984; Walker et al., 1990). Nurses play an important role in planning inter-ventions to prevent, alleviate or minimize the older patient's pain. Pain perception is influenced by higher cortical centers; thus, it is important to ascertain the patient's thoughts about his/her pain and the meaning attributed to it. Because anxiety usually intensifies the pain, the nurse should endeavor to decrease the patient's anxiety by: 1) providing infor-mation that corrects misperceptions and decreases un-certainty, and 2) projecting a positive attitude that the client's pain can be relieved.

Nonpharmacological Interventions

Because acute pain is a complex phenomenon, Chapman and Turner (1986) reported that nonpharmacological approaches such as psycho-logical and behavioral interventions are important components of pain management strategies. They suggested the following interventions for acute pain: 1) provide procedural and sensory information about impending events; 2) use pain descriptors (e.g., use "feels like intense heat" instead of "it's a burning pain") when describing sensations; 3) promote relaxa-tion; 4) provide positive patient examples and avoid situations in which the patient may see another patient in extreme discomfort; 5) administer medications for pain that do not impair cognitive abilities needed for coping; and 6) promote a sense of personal control by teaching coping strategies, etc.

In addition to psychological interventions, other nonpharmacological strategies for pain manage-ment include self-management techniques, such as distraction, humor, meditation, and imagery (Cogan, Cogan, Waltz, & McCue, 1987; Swinford, 1987); re-laxation (Horowitz, Fitzpatrick, & Flaherty, 1984); cutaneous stimulation using cold, heat, massage, or transcutaneous electrical stimulation (TENS); music (Buckwalter cited in Buckwalter, Hartsock, & Gaffney, 1985); biofeedback; and self-hypnosis (Thomas, 1990; 1991).

Neary (1981) investigated the effects of TENS on 100 of 200 patients with abdominal and thoracic postoperative pain and found that in the TENS group the 60-79 year old cholecystectomy patients received slightly less total Demerol than the 40 to 59 age group. Little information was reported about the number of patients in each diagnosis and age category of the control and treatment groups. In another study of the effect of the Jacobson relaxation technique on postoperative pain in 20 elderly patients with fractured hips, the subjects in the treatment group not only reported lower levels of pain and distress, but also used less analgesics during the first 24 hours after surgery than the control group (Ceccio, 1984). There is a dearth of

research on the effectiveness of nonpharmacological pain management interventions in the elderly. Although older in-dividuals may be included in a study sample, age as a variable often is not addressed (Table 6.2). The two studies (Ceccio, 1984; Neary, 1981) listed in Table 6.2 that did include age as a variable had small sample sizes and the varied methodologies. More studies and replication of studies are needed to determine the validity and generalizability of findings related to the effectiveness of nonpharmacological interventions.

Pharmacological Interventions

Because older patients are more likely to have multi-system diseases requiring many different medications, they have a greater potential for drug-drug interaction and central nervous system (CNS) side effects than younger patients (Harkins et al., 1984). Further, a significant positive correlation has been reported for age and analgesia (intramuscular morphine injections) in postoperative patients (Bellville, Forest, & Miller, 1971); older individuals reported greater reduction in pain intensity with analgesics than did younger patients (Nation & Warfield, 1989). Results from the National Hospice Study of terminally ill cancer patients showed an inverse relationship between age and analgesic consumption (Goldberg, Mor, Wiemann, Greer, & Hiris, 1986). The amount of pain patients experience is often inferred from the amount of analgesics they receive (Morris et al., 1986), but this may be mis-leading because many other factors can influence the amount of analgesics consumed. It is unclear whe-ther older patients are more sensitive to analgesics or whether the effect lasts longer because of the meta-bolic changes associated with aging.

The age-related difference in the effectiveness of analgesics is postulated to be due to the decreasing clearance of narcotics with aging, which thereby prolongs the duration of the relief analgesia provides. For example, Kaiko et al. (1982) reported that a markedly increased duration of pain relief was experienced by older patients in response to mor-phine, as though the older patients received four times the analgesic dose as the younger adult patients. Further, the investigators found an inverse relation-ship between the exponential rate of decline of plas-ma morphine levels and age. The clearance of mor-phine from the plasma of subjects more than 50 years old was only 50% of that observed in subjects less than 50 years old. Thus, McCaffery (1985) conclud-ed that age may be used to predict the approximate length of time that morphine analgesia remains in the elderly, but not necessarily to predict an appropriate dose level. Therefore, caution must be exercised in prescribing and administering analgesics.

Physiological changes that are postulated to cause increased bio-availability of medications in the elderly include: 1) alterations in drug distribution due to changes in body composition wherein lean body mass decreases and adipose-tissue mass increas-es in relation to total body weight, and 2) alterations in the kidney and liver which slow down the meta-bolism and excretion of medications (Roch-Weser, Greenblatt, Sellers, & Shader, 1982; Thienhaus, 1989; Yuen, 1990).

The results of current research have not indicated with any certainty that older individuals have a higher threshold for pain or perceive less pain. However, narcotic analgesics have been re-ported more effective in managing their pain adminis-tered in smaller doses (Kwentus et al., 1985; Ready et al., 1987) or less frequently (Moore et al., 1990) than would be prescribed for younger patients. Be-cause the duration of the effects of narcotic medi-cations and, thus, the risk of analgesic toxicity increase in the elderly, a stepwise approach has been suggested to designing a pain protocol for an older individual (Egbert, 1991; Enck, 1991). The first step would be to use nonopioid analgesics, such as non-steroidal anti-inflammatory drugs (NSAID) and acetaminophen for mild to moderate pain. Egbert (1991) recommended choosing NSAIDs, such as Motrin, which have a short to intermediate half-life, produce effective analgesia, and have minimal side effects. If the pain is moderate to severe, the next step is to choose narcotic analgesics which have a short half-life (i.e., relatively rapid clearance) and few long acting active metabolites. In any pain protocol, the elderly patient must be monitored carefully, the analgesic should be started at low doses and increased until the patient experiences acceptable relief, and the medication should be given on a regu-lar time schedule and not PRN. When appropriate, a prophylactive bowel regimen should be started and special attention given to the patient's diet. If a narcotic is used, it may be possible to reduce the dosage by the addition of a NSAID. The drug re-commended for moderate pain is acetaminophen with codeine; morphine or hydromorphone are suggested for severe pain. Adjuvant medications such as antidepressants may be given in combination with nonnarcotic and narcotic analgesics to enhance effectiveness (Egbert, 1991; Kwentus et al., 1985).

Some older individuals can be involved in the pain management strategies used to relieve their acute and/or chronic pain. In fact, patient-controlled analgesia (PCA) methods are an example of patients having a primary role in their pharmacological pain management. Egbert, Parks, Short, and Burnett (1990) conducted a randomized, experimental study comparing PCA and conventional analgesic therapy in 83 elderly subjects and concluded that PCA was an improved

method of postoperative analgesia in high-risk elderly men with normal mental status. The investigators emphasized the importance of assessing the patients to be sure they have normal cognitive function so that they can be taught how to participate in PCA therapy. McCaffery (1987) argued that PCA should encompass any drug administration method that allows patients to exercise control if they are willing and able to do so. While PCA using oral analgesics was reported (McCaffery, 1987), the in-fluence of age was not addressed.

Most research on the effectiveness of pharmacological pain management (narcotics and NSAID) in the elderly has focused on examining the pharmacokinetics of the analgesics, evaluating their effectiveness and feasibility, and investigating new systems of analgesic delivery, such as epidural indwelling catheter and PCA (e.g., Table 6.3). Phar-macologic studies comparing young and old subjects often are conducted for very short periods of time and do not provide information on the effects of prolonged therapy (Roth, 1988). Additional research on pharmacological pain management strategies, which include age as a variable, is warranted. In addition, like research on nonpharmacological pain management, replication studies are needed to es-tablish the validity and generalizability of the research findings. Few studies have examined the effective-ness of combining pharmacological and nonpharmaco-logical pain interventions in the elderly.

Research Needs and Opportunities

It is proposed that effective management of the elderly client's acute pain can result in improved overall functions (Kwentus et al., 1985), such that psychological well-being may bring about earlier re-covery; this hypothesis awaits research for validation.

Although there are many similarities across age groups in the experience of pain, additional studies are required to examine possible age-related differences in: the "meaning" of pain, the manifestations of pain (e.g., behaviors and pain reports), accuracy and appropriateness of pain assessment methodologies and tools, responses to pharmacologic-al treatment strategies, and responses to nonphar-macological treatment strategies, responses to com-binations of pharmacological and nonpharmacological treatment strategies.

Most studies of pain assessment tools have been conducted on young to middle-aged adults or have not included age as a variable; thus, the reli-ability of existing pain instruments must be estab-lished in the elderly. Pain management and treatment strategies must also be tested in this population. Further, the interaction of age, gender, and socio-cultural factors on pain experience and pain relief should also be addressed. Consideration must be given to the age-related prevalence of acute con-fusional state and dementia in the elderly and its effects on the ability of these older individuals to identify and remember pain. Thus, more research is needed on the sensory and cognitively impaired and nonverbal elderly. Although 95% of Americans 65 years or older live in their own communities (Thienhaus, 1989), pain management of elderly in different settings, such as nursing homes, must also be investigated.

Recommendations

Future pain studies should be theory-based and include age as a variable. A theory-driven study will promote generalizability of the findings. Repli-cation of the studies is another means of validating and promoting the generalizability of findings. Nurs-ing research on pain in the elderly should focus on pain assessment issues, the consequences of pain, and the effectiveness of nonpharmacological and pharmacological management strategies. McCaffery (1990) reported that nurses can make a significant contribution to pain control by using a combination of nonpharmacological techniques (e.g., distraction, cutaneous stimulation, relaxation) to augment traditional pain relief methods and investigating their effectiveness.

Strategies and techniques for providing effective pain education is another area where nurses can make an important contribution. Although under-treatment of pain is the consequence of a number of factors, one major contributing factor identified by the NIH Consensus Conference on Pain was the need for pain education by both professional health care workers and the general public (NIH, 1986). In ad-dition, there is a need to examine the factors influ-encing health care workers' and/or the caregivers' (often a family member) responses and decision-making related to treating patients' reports of pain.

Based on the assessment of the research needs and opportunities, the Panel has made the fol-lowing recommendations concerning acute pain in the elderly:

- Test assessment tools to determine if they are cognitively appropriate, practical, reli-able, and valid.
- Identify behavioral indices of pain in cognitively impaired elderly.

· Develop and test measures of the effectiveness of nonpharmacological pain manage-ment strategies in the elderly and the effects of combined nonpharmacological and phar-macological interventions.

· Develop and test methods to examine age-related differences in the meaning of pain.

· Identify factors in caregivers' (spouse, family members, friends, significant others) at-titudes and knowledge about pain that influ-ence their management of the individual's pain and the pain behavior of the individual.

· Develop assessment tools that are applicable to various ethnic groups.

· Develop a research base on the effects of acculturation on various ethnic groups and whether the length of time immigrants spend in this country influences their pain exper-ience and manifestations.

· Develop nursing care strategies in pain assessment issues; effectiveness of pharma-cological interventions, nonpharmacological interventions, alone and in combination; and pain education for patients, caregivers, and patients' families.

References

Acute Pain Management Guideline Panel. (1992). Other patients with special needs: Elderly patients. *Acute pain management: Operative or medical procedures and trauma. Clinical practice guidelines* (pp. 57-59). AHCPR Pub. No. 92-0032. Rockville, MD. Agency for Health Care Policy & Research, Public Health Services, U.S. Department of Health and Human Services.

Anastas, J. W., Gibeau, J.L., & Larson, P. J. (1990). Working families and eldercare: A national perspective in an aging America. *Social Work, 35*(5), 405-411.

Bayer, A. J., Chada, J. S., Farag, R. R., & Pathy, J. (1986). Changing presentation of myocardial infarction with increasing old age. *Journal of the American Geriatrics Society, 34*, 263-266.

Bellville, J. W., Forest, W.H., Jr., & Miller, E. M. (1971). Influence of age on pain relief from analgesics. *Journal of the American Medical Association, 217*, 1835-41.

Bender, J.S. (1989). Approach to the acute abdomen. *Medical Clinics of North America, 73*(6), 1413-1422.

Bruegel, M.A. (1971). Relationship of preoperative anxiety to perception of postoperative pain. *Nursing Research, 20*(1), 26-31.

Buckwalter, K., Hartsock, J., & Gaffney, J. (1985). Music therapy. In G. M. Bulechek & J.C. McCloskey (Eds.). *Nursing interventions: Treatments for nursing diagnoses.* Philadelphia: W.B. Saunders.

Burns, J.W., Hodsman, N.B.A., McLintock, T.T.C., Gillies, G.W.A., Kenny, G.N.C., & McArdle, C.S. (1989). The influence of patient characteristics on the requirements for postoperative analgesia. *Anaesthesia, 44*, 2-6.

Bunting, S. M. (1989). Stress on caregivers of the elderly. *Advances in Nursing Science, 11*(2), 63-73.

Burke, S.O., & Jerrett, M. (1989). Pain management across age groups. *Western Journal of Nursing Research, 11*(2), 164-180.

Ceccio, C. M. (1984). Postoperative pain relief through relaxation in elderly patients with fractured hips. *Orthopaedic Nursing, 3*(3), 11-19.

Chapman, C. R., & Bonica, J. J. (1983). *Current Concepts: Acute Pain.* Upjohn Co.

Chapman, C.R., & Cox, G.B. (1977). Anxiety, pain, and depression surrounding elective surgery: A multivariate comparison of abdominal surgery patients with kidney donors and recipients. *Journal of Psychosomatic Research, 21*, 7-15.

Chapman, W.P., & Jones, C.M. (1944). Variations in cutaneous and visceral pain sensitivity in normal subjects. *The Journal of Clinical Investigation, 23*, 81-91.

Chapman, C. R., & Turner, J. A. (1986). Psychological control of acute pain in medical settings. *Journal of Pain and Symptom Management, 1*(1), 209-215.

Chisholm, S.E., Deniston, O.L., Igrisan, R. M., & Barbus, A. J. (1982). Prevalence of confusion in elderly hospitalized patients. *Journal of Gerontological Nursing, 8*(2), 87-96.

Clark, W. C., & Mehl, L. (1971). Thermal pain: A sensory decision theory analysis of the effect of age and sex on d', various criteria, and 50% pain threshold. *Journal of Abnormal Psychology, 78*, 202-212.

Cohen, F. (1980). Postsurgical pain relief: Patients' status and nurses' medication choices. *Pain, 9*, 265-274.

Cohen, D.H., & Sherman, S.M. (1988). The somatosensory system. In R.M. Berne & M.N. Levy (Eds), *Physiology,* 2nd Edition (pp. 135-157). St. Louis, Missouri: C.V. Mosby.

Cogan, R., Cogan, D., Waltz, W., & McCue, M. (1987). Effects of laughter and relaxation on discomfort thresholds. *Journal of Behavioral Medicine, 3*, 139-144.

Collins, G., & Stone, L.A. (1966). Pain sensitivity, age, and activity level in chronic schizophrenics and in normals. *British Journal of Psychiatry, 112*, 33-35.

Crook, J., Rideout, E., & Browne, G. (1984). The prevalence of pain complaints in a general population. *Pain, 18*, 299-314.

Davis, G.C., Cortez, C., & Rubin, B.R. (1990). Pain management in the older adult with rheumatoid arthritis or osteoarthritis. *Arthritis Care and Research, 3*(3), 127-131.

Davitz, J.R., & Davitz, L.L. (1981). Age of the Patient. *Inferences of patient's pain and psychological distress: Studies of nursing behaviors* (pp. 28-32). New York: Springer Publishing Co.

Dellasega, C. (1990). Coping with caregiving: Stress management for caregivers of the elderly. *Journal of Psychosocial Nursing, 28*(1), 15-22.

DiBartolomeo, A.G., & Brick, J.E. (1992). Giant cell arteritis and polymyalgia rheumatica. *Postgraduate Medicine, 91*(2), 107-109, 112.

Donovan, M., Dillon, P., & McGuire, L. (1987). Incidence and characteristics of pain in a sample of medical-surgical patients. *Pain, 30*, 69-78.

Dorfman, L.J., & Bosley, T. M. (1979). Age-related changes in peripheral and central nerve conduction in man. *Neurology* (Minneapolis), *29*, 38 - 44.

Egbert, A. M. (1991). Helping for the hurting elderly. *Postgraduate Medicine, 89*(4), 217-228.

Egbert, A. M., Parks, L. H., Short, L. M., & Burnett, M. L. (1990). Randomized trial of postoperative patient-controlled analgesia vs. intramuscular narcotics in frail elderly men. *Archives of Internal Medicine, 150*, 1897-1903.

Engelking, C. (1988). Comfort issues in geriatric oncology. *Seminars in Oncology Nursing, 4*(3), 198-207.

Enck, R. E. (1991). Pain control in the ambulatory elderly. *Geriatrics, 46*(3), 49-60.

Evans, D.A., Funkenstein, H.H., Albert, M.S., Scherr, P.A., Cook, N. R., Chown, M.J., Hebert, L. E., Hennekens, C.H., & Taylor, J. O. (1989). Prevalence of Alzheimer's disease in a community population of older persons. *Journal of the American Medical Association, 262*(18), 2551-2556.

Evans, D.A., Scherr, P.A., Cook, N. R., Albert, M.S., Funkenstein, H.H., Smith, L. A., Hebert, L.E., Wetle, T.T., Branch, L.G., Chown, M.J., Hennekens, C.H., & Taylor, J. O. (1990). Estimated prevalence of Alzheimer's disease in the United States. *The Milbank Quarterly, 68*(2), 267-288.

Faherty, B. S., & Grier, M. R. (1984). Analgesic medication for elderly people post-surgery. *Nursing Research, 33*(6), 369-372.

Ferrell, B.A. (1991). Pain management in elderly people. *Journal of American Geriatrics Society, 39*(1), 64-73.

Ferrell, B.A., & Ferrell, B.R. (1989). Assessment of chronic pain in the elderly: The Sepulveda GRECC Method No. 40. *Geriatric Medicine Today, 8*(5), 123-134.

Ferrell, B. A., Ferrell, B.R., & Osterweil, D. (1990). Pain in the nursing home. *Journal of the American Geriatrics Society, 38*(4), 409-414.

Foreman, M.D. (1986). Acute confusional states in hospitalized elderly: A research dilemma. *Nursing Research, 35*(1), 34-37.

Forman, W. B., & Stratton, M. (1991). Current approaches to chronic pain in older patients. *Geriatrics, 46*(7), 47-52.

Fraser, M. C. (1988). Measuring mental status and level of consciousness. In M. Frank-Stromberg (Ed.), *Instruments for clinical nursing research* (pp.47-78). Norwalk, CT: Appleton & Lange.

Goldberg, R.J., Mor, V., Wiemann, M., Greer, D.S., & Hiris, J. (1986). Analgesic use in terminal cancer patients: Report from the National Hospice Study. *Journal of Chronic Disease, 39*(1), 37-45.

Guyton, A.C. (1987). Somatic sensations: Pain, visceral pain, headache, and thermal sensations. *Human physiology and mechanisms of disease,* 4th Edition (pp. 381-382). Philadelphia: W.B. Saunders.

Hardy, J.D., Wolff, H.G., & Goodell, H. (1943). The pain threshold in man. *The American Journal of Psychiatry, 99*, 744-751.

Harkins, S. W., & Chapman, C. R. (1976). Detection and decision factors in pain perception in young and elderly men. *Pain, 2*, 253-264.

Harkins, S. W., & Chapman, C. R. (1977). The perception of induced dental pain in young and elderly women. *Journal of Gerontology, 32*(4), 428-435.

Harkins, S. W., Kwentus, J., & Price, D. D. (1984). Pain in the elderly. In C. Benedict, C.R. Chapman, & G. Morica (Eds.), *Recent advances in the management of pain* (pp. 103-121). New York: Raven Press.

Harkins, S. W., Price, D. D., & Martelli, M. (1986). Effects of age on pain perception: Thermonocioception. *Journal of Gerontology, 41*(1), 58-63.

Harkins, S. W., & Warner, M. H. (1980). Age and pain. *Annual Review of Gerontology and Geriatrics, 1*, 121-131.

Havlik, R.H., & Suzman, R. (1987). Health status -- mortality. In R.H. Havlik, B.M. Liu, M.G. Kovar, R. Suzman, J.J. Feldman, T. Harris, & J. Van Nostrand (Eds). *Health statistics on older persons, United States, 1986.* Vital and Health Statistics (pp. 5-15). Series 3 , No 25. DHHS Pub. No. (PHS) 87-1409. Public Health Service, Washington. U.S. Government Printing Office.

Helling, D.K., Lemke, J.H., Semla, T.P., Wallace, R.B., Lipson D.P., & Coroni-Huntley, J. (1987). Medication use characteristics in the elderly: The Iowa 65+ rural health study. *Journal of the American Geriatrics Society, 35*, 4-12.

Herr, K. A., & Mobily, P. R. (1991). Complexities of pain assessment in the elderly, clinical considerations. *Journal of Gerontological Nursing, 17*(4), 12-19.

Herr, K. A., & Mobily, P.R. (1993). Comparison of selected pain assessment tools for use with the elderly. *Applied Nursing Research, 6*, 39-46.

Horowitz, B. R., Fitzpatrick, J.J., & Flaherty, G.G. (1984). Relaxation techniques for pain relief after open heart surgery. *Dimensions of Critical Care Nursing, 3*(6), 364-371.

International Association for the Study of Pain (IASP). (1986). Pain terms: A current list with definitions and notes on usage. *Pain, 3*, S216-221.

Institute of Medicine. (1990). R. L. Berg & J. S. Cassells 2(Eds.). The second fifty years: Promoting health and preventing disability. Washington, D.C., National Academy.

Johnson, J.C. (1990). Delirium in the elderly. *Emergency Care of the Elderly, 8*(2), 255-265.

Kaiko, R. F. (1980). Age and morphine analgesia in cancer patients with postoperative pain. *Clinical Pharmacology and Therapeutics, 28*(6), 823-826.

Kaiko, R. F., Wallenstein, S. L., Rogers, A. G., Grabinski, P. Y., & Houde, R. W. (1982). Narcotics in the elderly. Symposium on Clinical Pharmacology of Symptom Control, *Medical Clinics of North America, 66*(5), 1079-1089.

Kallman, H., & May, H.J. (1989). Mental status assessment in the elderly. *Primary Care, 16*(2), 329-347.

Katzman, R., & Terry, R. (1992). Normal aging of the nervous system. *Principles of Geriatric Neurology, 38*, 18-58. Philadelphia: F.A. Davis Co.

Koch-Weser, J., Greenblatt, D. J., Sellers, E. M., & Shader, R. I. (1982). Drug disposition in old age. *The New England Journal of Medicine, 306*(18), 1081-1088.

Koopman, C., Eisenthal, S., & Stoeckle, J. D. (1984). Ethnicity in the reported pain, emotional distress and requests of medical outpatients. *Social Science and Medicine, 18*(6), 487-490.

Kwentus, J. A., Harkins, S. W., Lignon, N., & Silverman, J. J. (1985). Current concepts of geriatric pain and its treatment. *Geriatrics, 40*(4), 48-57.

Lambert, V.A., & Lambert, Jr., C.E. (1987). Coping with rheumatoid arthritis. *Nursing Clinics of North America, 22*(3), 551-558.

Lamey, P.J., Taylor, J.A., & Devine, J. (1988). Giant cell arteritis. A forgotten diagnosis? *British Dental Journal, 164*, 48-50.

Lavsky-Shulan, M., Wallace, R. B., Kohout, F. J., Lemke, J. H., Morris, M. C., & Smithon, I. M. (1985). Prevalence and functional correlates of low back pain in the elderly: The Iowa 65+ Rural Health Study. *Journal of the American Geriatrics Society, 33*, 23-28.

Lindsay, P.G., & Wyckoff, M. (1981). The depression-pain syndrome and its response to antidepressants. *Psychosomatics, 22*(7), 571-577.

Litman, T.J. (1974). The family as a basic unit in health and medical care: A social behavioral overview. *Social Science Medicine, 8*, 495-519.

MacDonald, J. B. (1983). Coronary care in the elderly. *Age and Aging, 12*, 17-20.

Malonebeach, R. R., & Zarit, S. H. (1991). Current research issues in caregiving to the elderly. *International Journal of Aging and Human Development, 32*(2), 103-114.

Marks, R. M., & Sachar, E. J. (1973). Undertreatment of medical inpatients with narcotic analgesics. *Annals of Internal Medicine, 78*(2), 173-181.

Martinelli, A. M. (1987). Pain and ethnicity. *AORN Journal, 46*(2), 273-281.

Marzinski, L.R. (1991). The tragedy of dementia: Clinically assessing pain in the confused, nonverbal elderly. *Journal of Gerontological Nursing, 17*(6), 25-28.

McCaffery, M. (1985). Narcotic analgesia for the elderly. *American Journal of Nursing, 85*(3), 296-298.

McCaffery, M. (1987). Patient controlled analgesia: More than a machine. *Nursing 87, 17*(11), 62-64.

McCaffery, M. (1990). Nursing approaches to nonpharmacological pain control. *International Journal of Nursing Studies, 27*(1), 1-5.

McDaniel, L. K., Anderson, K. O., Bradley, L. A., Young, L. D., Turner, R. A., Agudelo, C. A., & Keefe, F. J. (1986). Development of an observation method for assessing pain behavior in rheumatoid arthritis patients. *Pain, 24*, 165-184.

McMillan, S. C. (1989). The relationship between age and intensity of cancer related symptoms. *Oncology Nursing Forum, 16*(2), 237-241.

Melzack, R. (1980). Pain mechanisms and stress. *Stress, 1*, 18-23.

Moore, A. K., Vilderman, S., Lubenskyi, W., McCans, J., & Fox, G. S. (1990). Differences in epidural morphine requirements between elderly and young patients before abdominal surgery. *Anesthesia and Analgesia, 70*, 316-320.

Morris, J. N., Mor, V., Goldberg, R. J., Sherwood, S., Greer, D. S., & Hiris, J. (1986). The effect of treatment setting and patient characteristics on pain in terminal cancer patients: A report from the National Hospice Study. *Journal of Chronic Diseases, 39*(1), 27-35.

Myers, J.D., Weissman, M.M., Tischler, G., Holzer III, C.E., Leaf, P.J., Orvaschel, H., Anthony, J.C., Boyd, J.H., Burke, Jr., J.D., Kramer, M., & Stoltzman, R. (1984). Six-month prevalence of psychiatric disorders in three communities. *Archives of General Psychiatry, 41*, 959-967.

Mumford, J. M. (1965). Pain perception threshold and adaptation of normal human teeth. *Archives of Oral Biology, 10*, 957-968.

Nation, E. M., & Warfield, C. A. (1989). Pain in the elderly. *Hospital Practice, 24*(7), 113-118.

National Institute on Aging. (1987). *Research advances in aging 1984-1986*. Bethesda, MD: National Institutes of Health.

Neary, J. M. (1981). Transcutaneous electrical nerve stimulation for the relief of post-incisional surgical pain. *Journal of the American Association of Nurse Anesthetists, 49*(2) (April), 151-155.

Nelson, L., Taylor, F., Adams, M., & Parker, D. E. (1990). Improving pain management for hip fractured elderly. *Orthopaedic Nursing, 9*(3), 79-83.

NIH (National Institutes of Health). (1986). The integrated approach to the management of pain. *Consensus Development Conference Statement, 6*(3), 1-8.
Nocks, B. (1989). Pain in male genitourinary system. In K.M. Foley & R. M. Payne (Eds.). *Current Therapy of Pain* (pp. 295-302). Toronto: B.C. Decker, Inc.

Nyska, M., Shapiro, Y., Klin, B., & Drenger, B. (1989). Epidural methadone for analgesic management of patients with conservatively treated proximal femoral fractures. *Journal of the American Geriatric Society, 37*(10), 980-982.

O'Brian, J.G. (1989). Evaluation of acute confusion (Delirium). *Primary Care, 16*(2), 349-360.

Orshan, S. A. (1988). Pain and stress management in nursing: Controversy and theory. *Holistic Nursing Practice, 2*, 9-16.

Parmelee, P. A., Katz, I. R., & Lawton, P. M. (1991). The relation of pain to depression among institutionalized aged. *Journal of Gerontology, 46*(1), 15-21.

Pathy, M.S. (1967). Clinical presentation of myocardial infarction in the elderly. *British Heart Journal, 29*, 263-266.

Portenoy, R. K. (1987). Optimal pain control in elderly cancer patients. *Geriatrics, 42*(5), 33-44.

Procacci, P., Bozza, G., Buzzelli, G., & Della Corte, M. (1970). The cutaneous pricking pain threshold in old age. *Gerontology Clinics, 12*, 213-218.

Ready, B. L., Chadwick, H. S., & Ross, B. (1987). Age predicts effective epidural morphine dose after abdominal hysterectomy. *Anesthesia and Analgesia, 66*, 1215-1218.

Rodgers, B. L. (1989). Loneliness. Easing the pain of the hospitalized elderly. *Journal of Gerontological Nursing, 15*(8), 16-21.

Roth, S. H. (1988). Pharmacologic approaches to musculoskeletal disorders. *Clinics in Geriatric Medicine, 4*(2), 441-461.

Ruben, R.J., & Kruger, B. (1983). Hearing loss in the elderly. In R. Katzman & R. Terry (Eds.), *The neurology of aging* (pp. 123-147). Philadelphia: F.A. Davis Co.

Schludermann, E., & Zubek, J. P. (1962). Effect of age on pain sensitivity. *Perceptual & Motor Skills, 14*, 295-301.

Schumacher, G.A., Goodell, H., Hardy, J.D., & Wolff, H.G. (1940). Uniformity of the pain threshold. *Science, 92*, 110-112.

Sherman, E. D., & Robillard, E. (1960). Sensitivity to pain in the aged. *Canadian Medical Association Journal, 83*, 944-947.

Sherman, E.D., & Robillard, E. (1964). Sensitivity to pain in relation to age. *Journal of the American Geriatric Society, 12*, 1037-1044.

Short, L. M., Burnett, M. L., Egbert, A. M., & Parks, L. H. (1990). Medicating the elderly: How do nurses make their decisions? *Journal of Gerontological Nursing, 16*(7), 12-17.

Snelling, J. (1990). The role of the family in relation to chronic pain: Review of the literature. *Journal of Advanced Nursing, 15*, 771-776.

Sorkin, B. A., Rudy, T. E., Hanlon, R. B., Turk, D. C., & Stieg, R. L. (1990). Chronic pain in old and young patients: Differences appear less important than similarities. *Journal of Gerontology, 45*(2), 64-68.

Stillman, M.J. (1989). Pain in breast cancer. In K.M. Foley & R. M. Payne (Eds.). *Current Therapy of Pain* (pp. 361-376). Toronto: B.C. Decker, Inc.

Stone, R., Cafferata, G.L., & Sangl, J. (1987). Caregivers of the frail elderly: A national profile. *The Gerontologist, 27*(5), 616-626.

Streltzer, J., & Wade, T. C. (1981). The influence of cultural group on the undertreatment of postoperative pain. *Psychosomatic Medicine, 43*(5), 397-403.

Swinford, P. (1987). Relaxation and positive imagery for the surgical patient: A research study. *Perioperative Nursing Quarterly, 3*(3), 9-16.

Thienhaus, O. (1989). Pain in the elderly. In K.M. Foley & R. M. Payne (Eds.). *Current Therapy of Pain* (pp. 82-89). Toronto: B.C. Decker, Inc.

Thomas, B. L. (1990). Pain management for the elderly: Alternative interventions Part I. *AORN Journal, 52*(6), 1268 -1272.

Thomas, B. L. (1991). Pain management for the elderly: Alternative interventions Part II. *AORN Journal, 53*(1), 126-132.

Tucker, M.A., Andrew, M.F., Ogle, S.J., & Davison, J.G. (1989). Age-associated change in pain threshold measured by transcutaneous neuronal electrical stimulation. *Age and Aging, 18*, 241-246.

Turk, D. C., & Flor, H. (1987). Pain > pain behaviors: the utility and limitations of the pain behavior construct. *Pain, 31*, 277-295.

Walding, M.F. (1991). Pain, anxiety, and powerlessness. *Journal of Advanced Nursing, 16*(4), 388-397.

Walker, J.M., Akinsanya, J.A., Davis, B.D., & Marcer, D. (1990). The nursing management of elderly patients with pain in the community: Study and recommendations. *Journal of Advanced Nursing, 15*, 1154-1161.

Ward, S.E., Goldberg, N., Miller-McCauley, V., Mueller, C., Nolan, A., Pawlik-Plank, D., Robbins, A., Stormoen, D., & Weissman, D.E. (1993). Patient related barriers to management of cancer pain. *Pain, 52*, 319-324.

Welch-McCaffrey, D., & Dodge, J. (1988). Acute confusional states in elderly cancer patients. *Seminars in Oncology Nursing, 4*(3), 208-216.

Williams, A.K., & Schultz, R. (1988). Association of pain and physical dependency with depression in physically ill middle-aged and elderly persons. *Physical Therapy, 68*(8), 1226-1230.

Wilson, B., Kovar, M.B., & Havlik, R.H. (1987). Health status and determinants--marriage, living alone, and risk of institutionalization. In R.H. Havlik, B.M. Liu, M.G. Kovar, R. Suzman, J.J. Feldman, T. Harris, & J. Van Nostrand (Eds). *Health statistics on older persons, United States, 1986.* Vital and Health Statistics (pp. 25-36). Series 3 , No 25. DHHS Pub. No. (PHS) 87-1409. Public Health Service, Washington. U.S. Government Printing Office.

Witte, M. (1989). Pain control. *Journal of Gerontological Nursing, 15*(3), 32-37.

Woodrow, K. M., Friedman, G. D., Siegelaub, A. B., & Collen, M. F. (1972). Pain tolerance: Differences according to age, sex, and race. *Psychosomatic Medicine, 34*(6), 548-556.

Wright, B.E., & Henkind, P. (1983). Aging changes and the eye. In R.Katzman & R. Terry (Eds.), *The neurology of aging* (pp. 149-165). Philadelphia: F.A. Davis Co.

Yuen, G.J. (1990). Altered pharmacokinetics in the elderly. *Clinical Pharmacology, 6*(2), 257-267.

Zola, I. K. (1964). Illness behavior of the working class: Implications and recommendations. In A. Shostak & W. Gomberg (Eds.), *Blue collar world - Studies of the American worker* (p. 350). Englewood Cliffs, NJ: Prentice-Hall.

Zoob, M. (1978). Differentiating the causes of chest pain. *Geriatrics, 33*, 95-101.