The NEECHAM Confusion Scale: A Replication Study Testing Interrater Reliability and Predictive Validity

Masters' Research Project

by

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At the "Key Aspects" conference here in Chapel Hill you requested a copy of the "benediction" I presented. It is attached. Please recall that this is an anonymous prayer from a book on Prayers For THE Growing Old and it was published in England and is now out of print. I hope you can use it for the benefit of all of us who are aging.... Thank you for your response to it.

Laurel Archer Copp, Ph.D. Professor

'Lord, thou knowest better than I know myself that I am growing older, and will some day be old. Keep me from getting talkative, and particularly from the fatal habit of thinking I must say something on every subject and on every occasion. Release me from craving to straighten out everybody's affairs. Keep my mind free from the recital of endless details - give me wings to get to the point. I ask for grace enough to listen to the tales of others' pains. Help me to endure them with patience. But seal my lips on my own aches and pains - they are increasing and my love of rehearsing them is becoming sweeter as the years go by. Teach me the glorious lesson that occasionally it is possible that I may be mistaken. Keep me reasonably sweet: I do not want to be a saint - some of them are so hard to live with - but a sour old woman is one of the crowning works of the devil. Make me thoughtful, but not moody; helpful, but not bossy. With my vast store of wisdom, it seems a pity not to use it all - but thou knowest, Lord, that I want a few friends at the end. Amen.'

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CHAPTER ONE

Introduction and Statement of the Problem

Confusion complicates nursing care for a significant number of hospitalized elderly patients. We know this from direct observations of patients and caregivers in acute care medical/surgical nursing units, from discussions with nurse administrators, staff nurses, and from a review of nursing and related health care literature. The phenomenon commonly called acute or temporary confusion by both professionals and lay persons is labeled delirium in the Diagnostic and Statistical Manual of Mental Disorders, 3rd edition, revised (DSM-III-R) (1987). For purposes of this study the terms delirium, acute confusional state, and confusion have been used interchangeably; in general, the term confusion is used except when citing specific authors who use the term delirium in their work.

Foreman, Gilles, and Wagner (1989) found that 24% to 80% of the patients over the age of 60 demonstrate some form of cognitive impairment, which includes confusion as well as dementia, during their hospitalizations. While there is disagreement regarding labeling of the manifestations, possible etiologies, and the prevention and treatment modalities (Foreman, 1986; Hall & Buckwalter, 1987; Lipowski, 1983, 1989; Nagley & Dever, 1988; Warshaw et al., 1982; Williams, 1989b; Wolanin and Phillips, 1981) there is agreement that increased nursing surveillance and care is

required to ensure patient safety and compliance with nursing and medical plans of care. For example, confused patients are more apt to fall, get out of bed when instructed not to do so, pull out tubes, and not swallow oral medications than patients who are not confused.

Nurse researchers have studied confusion from several different aspects, including descriptions of behaviors identified as confusion, nursing interventions believed to alleviate or prevent confusion, and the prevalence and incidence of confusion (Champagne, Neelon, McConnell, & Funk, 1987; Chisholm, et al., 1982; Foreman, 1989; Nagley, 1984, 1986; Nagley & Dever, 1988; Neelon, Funk, Carlson, & Champagne, 1989; Vermeersch, 1986; Williams et al., 1979, 1985, 1989a,b). All indicate that confusion is diagnosed by nurses. All of the above except Foreman have designed tools for nurses to use in assessing the presence of confusion.

There is agreement among the researchers that an objective measurement tool is helpful in determining both the presence and the level of confusion. It is possible to accurately measure the level of confusion and differentiate it from other forms of mental impairment such as dementia; however, a valid, easily utilized tool to predict the development of confusion with a satisfactory level of sensitivity and specificity has not been fully developed. Williams et al. (1985) found that nurses and physicians were more accurate predictors of confusion than the models studied due to the fact that skilled clinicians responded to

inferences and factors in patient's histories not captured by the mechanistic models.

A major obstacle to the development of a tool with satisfactory predictive validity has been the identification of the core or essential predictors; these seem most likely to consist of a combination of mental function, physiological status, age, and activity level. Vermeersch (1986) found that nurses rely heavily on interactions with patients to accurately interpret their behavior and that a critical amount of time must be spent with the patient before the nurse can determine the presence and level of confusion. Neelon (personal communication, April 23, 1990) is currently studying the effectiveness of selected nursing assessments in identifying and predicting confusion.

The behavior problems of confused patients are of major concern to nurses since nurses are responsible for patient safety and for compliance with the medical plan of care. Confused, actively uncooperative patients pose a special challenge to nursing care planning and implementation. Patients' families are frequently upset by the behavioral manifestations of acute confusion in a heretofore alert and competent person; nurses and other health care staff assist families to understand the condition and make the necessary plans to care for the patient during hospitalization and following discharge.

Acute confusion is associated with lengthened hospitalization and the need for supplemental care following

discharge, all of which add up to increased costs for medical care for affected persons (Levkoff, Sofran, Cleary, Gallop, & Phillips, 1988). Untreated delirium can be life threatening (Francis, Martin, & Kapoor, 1990; Lipowski, 1983). Therefore, it is essential that nurses and physicians identify patients who have, or are at risk for developing, the problem, and deliberately plan nursing and medical care to incorporate those actions thought to prevent or lessen the impact of delirium (Lipowski, 1989). A confusion rating/prediction scale included in the nursing admission assessment, ideally for all adult patients but especially for those 65 or more years of age, could provide the necessary information to formulate an appropriate nursing care plan to alleviate the problem of confusional behaviors.

CHAPTER TWO

Review of the Literature

The descriptive and research literature written about confusion indicates the problem is multifaceted, has many precipitating factors, not all of which are well understood, and is known by an assortment of labels or descriptive terms. According to Foreman (1986) research has been limited because confused elderly do not command academic attention; they are perceived by health care workers and researchers as uninteresting, relatively unimportant, unworthy, and beyond help. Implementation of the Diagnosis Related Group (DRG) method of reimbursement for hospital care and the identification of a common terminology in the DSM-III-R within the past decade have stimulated increased research interest in delirium/acute confusion in recent years. Review of the subsequent literature focuses specifically on the areas of: (1) symptoms and etiology, (2) nursing interventions, (3) assessment and recognition, and (4) assessment tools.

Symptoms and Etiology

A comprehensive discussion of the medical and physiological aspects of transient cognitive disorders (acute confusional states) in the elderly, including the information that acute confusion usually heralds a physical illness and is the most prominent presenting feature of myocardial

infarction and pneumonia, is provided by Lipowski (1983). Predisposing factors were considered to be (1) the aging process accompanied by impaired vision, hearing, resistance to stress, cerebral blood flow, and glucose metabolism; (2) decreased acetylcholine synthesis which is necessary for normal memory, learning, attention, wakefulness, and the sleep/wake cycle; (3) high prevalence of chronic diseases; and (4) impaired mechanisms of drug metabolism. Lipowski suggested that organic factors could be identified in 80-95% of the cases, with drug intoxication being the single most common cause. Acute confusion is usually displayed by some combination of spatiotemporal disorientation, difficulty in thinking clearly, and memory impairment. In a more recent article dealing with delirium, Lipowski (1989) stated that there is global disruption of the main aspects of cognition -- thinking, perception, and memory; there is disturbance of the sleep-wake cycle with nocturnal exacerbation of symptoms. According to Lipowski, delirium can usually be resolved by appropriate treatment of the underlying etiology and usually lasts less than one month; untreated delirium can lead to death from the underlying cause.

Levkoff, et al. (1988) analyzed factors associated with the diagnosis of delirium in 1,285 elderly hospitalized patients and developed a model to classify the risk of developing delirium on the basis of clinical and diagnostic data. Four factors were identified that distinguished 80% of all cases of delirium: (1) a urinary tract infection (UTI) at

any time during hospitalization; (2) no UTI, but low serum albumin on admission; (3) neither UTI nor low serum albumin, but elevated white blood cell count on admission; (4) none of these risk factors, but proteinuria on admission. The development of a urinary tract infection at any time during hospitalization was the single most important factor associated with delirium. The model was supported by a study of 471 patients admitted during the subsequent year.

Other potential etiological/predictive factors influencing the development of confusion were identified as older age (>65), preinjury activity level, urinary elimination problems, mobility, pain, pain relief, and narcotic use (Williams, et al. 1985,1988).

Nurse researchers have included in their definitions of confusion the previously mentioned symptoms plus behaviors such as inappropriate or unusual-for-the-person verbalizations, inappropriate actions such as getting out of bed when instructed not to do so, or wandering into other patients' rooms or even off of the premises, and hallucinations or delusions (Chisholm, et al., 1982; Evans, 1987; Foreman, 1986; Hall & Buckwalter, 1989; Nagley, 1984, 1986; Nagley and Dever, 1988; Taft, 1989; Vermeersch, 1986; Williams, et al., 1979, 1985, 1989a,b).

Nagley and Dever (1988) stated that researchers have identified cognitive accessibility (memory, both short and long term; orientation to person, place, and time; and the ability to think logically) and social accessibility

(appropriate speech and cooperativeness) as components of confusion; both affect nurses' ability to interact with patients and assure optimal care. Wolanin and Phillips (1981) noted that in considering mental impairment or confusion, physicians focus on a patient's mental status while nurses are concerned with the patient's behavior, particularly the ability to cooperate with the medical and nursing plans of care. This difference of focus between medicine and nursing regarding the phenomenon of confusion is reflected in the literature.

Nursing Interventions

The burden of symptom management rests primarily on the nurse; goals should be to maintain and maximize existing function, to minimize demand on impaired function, to ensure patient safety and comfort, and to minimize the disruption of hospital routine and disturbances of other patients (Levkoff, Besdine, & Wetle, 1986). Treatment should be related to both the cause and the symptoms of delirium; adequate fluid and electrolyte balance, nutrition, and vitamin supply should be ensured; and reassuring, supportive nursing care is crucial. Additionally, important considerations are assisting the patient to reestablish orientation and providing an environment that neither over nor understimulates the senses (Lipowski 1989).

Fewer than half of the delirious patients in a study (N = 229) by Francis, et al. (1990) demonstrated disruptive

behavior, hallucinations, or delusions. The most common symptom was urinary incontinence; falls were more common in delirious than in non-delirious patients. When patients were actively agitated, noisy, getting out of bed without adequate assistance, and/or interfering with tubes or appliances, the most common nursing actions were the application of mechanical restraints and the administration of tranquilizers or sedatives, all of which are controversial.

According to MacLean et al. (1982) the use of restraints is an ethical issue and should be considered an interim, special-care measure accompanied by stringent policy and procedure guidelines. Since there is danger in any action, the nurse must consider whether the perceived danger (of falls) is related to patient safety or to staff priorities (Norman, 1987). Regan (1982, 1983) advised nurses to use as much restraint as necessary to ensure patient safety, while Robbins, Boyko, Lane, Cooper, and Jahnigen (1987) suggested that medical professionals should compare the costs in human dignity with the potential benefits when a dying person is restrained to prevent the dislodging of tubes and lines.

A survey of patients who had been restrained (Strumpf and Evans, 1988) found that their feelings ranged from resignation to anger concerning the restraints; patients offered many more alternatives to restraints than did their nurses. Evans and Strumpf (1990) identified myths about elder restraint and described how Scottish nurses, who view use of restraints as illegal, successfully used other interventions

in the categories of physiologic care, psychosocial care, activities, or environmental manipulation. These researchers found the use of restraint devices to be rare in Scotland; Geriatric and Buxton chairs were used only for selected patients with specific problems and for limited time periods.

The current, prevalent methods of dealing with confused behaviors may reflect lack of knowledge of precipitating factors or alternatives to the use of physical or chemical restraints. The frequency of restraint use may be due to insufficient nursing time to give thoughtful attention to problem solving the individual situation or spend therapeutic time with the patient, and the real threat of potential litigation if the patient sustains an injury from falling or wandering. The most desirable alternative to the use of restraints is prevention of the development of confusion; the second best alternative is the alleviation of confusion to the degree that patients are able to cooperate with nursing care and avoid behaviors that may be unsafe.

The amount and types of environmental stimuli in relation to the development or alleviation of confusion has been the subject of several studies. Reduction of stimuli was helpful in assisting anxious patients (Hall & Buckwalter, 1989) while increasing stimuli, especially in the form of group therapy activities, was suggested to overcome the comparative isolation found in acute care hospitals (Warshaw, et al., 1982). The use of orienting devices such as calendars, clocks, radio, and television has produced mixed

results, but generally is viewed as being helpful (Williams, 1979; Nagley, 1986). Foreman (personal communication, April 12, 1991) stated that active orientation by the nurse and direct reference to clocks and calendars may be critical factors in regaining and maintaining orientation.

Additional strategies for managing confusion by assisting patients to accurately perceive and understand their environment and to control their own unsafe or frightened behavior include: adapting communication techniques to accommodate the slower processing abilities and frequently impaired hearing of elderly patients; assuring use of functional vision and hearing aids, when applicable; listening carefully to patient's comments or descriptions to discern their meaning; non-judgemental reorientation; and reassurance (Campbell, Williams, & Mlynarczyk, 1986; Foreman, et al., 1989; Montgomery, 1987; Zachow, 1984; Zimberg & Berenson, 1990).

Several nurse researchers are currently working in the area of nursing interventions. According to Foreman (1990) effective interventions are specific to the causal agent(s) so accurate identification of the cause(s) is essential; he states that individualized interventions for acute confusion are part of a cluster of interdisciplinary studies to be conducted at six medical centers across the United States.

Neelon and Champagne (V. J. Neelon, personal communication, April 23, 1990) are conducting an intervention study designed to validate the pattern of specific

interventions they have developed for the purpose of preventing or reducing the adverse effects of confusion. The study at Good Samaritan Hospital, Portland, Oregon was followed by an intervention study in the same setting, conducted by a doctoral student at Oregon Health Sciences University (Miller, 1991). Each of these intervention studies was predicated on the accurate assessment of confusion. It is necessary to first of all determine the presence of or risk for developing confusion, preferably with a valid, reliable assessment tool that can be easily and quickly used by nurses. Secondly, the tool must be sensitive to varying degrees of confusion and must have little or no test effect when administered repeatedly.

Assessment and Recognition

Researchers agree that more subjects display signs of confusion during the course of their hospitalization than were noted to be confused on admission. Chisholm, et al.(1982) found 55 of 99 (55%) hospitalized patients aged 60 or more to have evidence of acute confusion, with only five of these being noted on admission. In a group of nonsurgical patients over age 60 (N = 71), 38% developed confusion by their sixth day of hospitalization (Foreman, 1989). Similarly, 51.5% of 170 patients with surgical repair of hip fractures became confused by the sixth day (Williams, et al., 1979).

Confusion affects the more critically ill who are likely to have both higher incidence and more severe impairment; it is frequently overlooked as a nursing care problem since many health professionals consider it a benign, expected aspect of aging, yet failure to diagnose and treat the underlying cause may lead to death (Foreman, 1986, 1989). If the nursing staff believe the condition is reversible they frequently act to prevent further deterioration; if they consider the condition to be irreversible the patient may be labeled a "senile old person" and attempts to find and treat the cause are not made (Roslaniec & Fitzpatrick, 1979; Lincoln, 1984). In order to prevent progression and correct the underlying causes of the confusion nurses must be aware of the importance of recognizing both the symptoms and the potential risks of confusion.

The systematic, routine use of comprehensive assessment tools to determine fluctuations in mental status would enable nurses to respond quickly to deteriorating conditions (Foreman, 1987). Cameron, Thomas, Mulvihill, and Bronheim (1987), found that physicians identified only 1 out of the 20 patients in their study who actually were delirious, as diagnosed by the researchers using DSM-III criteria. The researchers advocate routine screening of all hospitalized patients for delirium in order to identify affected patients and to implement corrective treatment as soon as possible.

In a different vein, Nagley (personal communication, February 21, 1990) and Williams (1989b) urged consideration

of the possibility that confusion may be a protective health seeking mechanism employed in response to overwhelming stimuli and stressors of age, illness, and hospitalization. Behavior that seems inappropriate or unsafe may be engaged in with a logical intent from a patient's point of view. It is important to understand the patient's rationale for the behavior before applying the label of "confusion". Wolanin and Phillips (1981) pointed out that reality, like beauty, is in the eye of the beholder; it can be difficult to determine whose reality is more valid. They explained that because a diagnosis of confusion affects the treatment a person receives socially, legally, medically, and psychologically it is imperative to accurately diagnose this complex phenomenon.

Assessment Tools

Foreman (1987) studied the reliability and content validity of three widely used mental status questionnaires: (1) the Short Portable Mental Status Questionnaire (SPMSQ) (Pfeiffer, 1975), (2) the "Mini-Mental State" examination (MMSE) (Folstein, et al., 1975), and (3) the Cognitive Capacity Screening Examination (CCSE) (Jacobs, Bernhard, Delgado & Strain, 1977). He found a high degree of intercorrelation between scores obtained with the three tests, with the CCSE being the most valid and reliable measure of mental status. These three, physician-developed tools assess cognitive functioning by testing short and long-term memory, attention, and recall. They require that

patients be able to speak and understand English and be able to attend to the interview task for 5 to 20 minutes, depending on the tool used and the patient's response time. Foreman recommended use of the MMSE (11 questions) in situations where persons were ill or otherwise unable to attend for the length of time necessary for administration of the CCSE (30 questions).

Physicians (Cameron, et al., 1987; Rockwood, 1989; Thomas, Cameron, & Fahs, 1988) have conducted prospective and retrospective studies to diagnose delirium using the DSM-III criteria which assess for (a) clouding of consciousness, (b) perceptual disturbances, (c) speech coherence, (d) sleep-wake cycle disturbances, (e) increased or decreased psychomotor activity, and (f) orientation and memory impairment (see NEECHAM Confusion Scale Part II. 5, Appendix C). They urged the prompt diagnosis and treatment of delirium since it is associated with chronic and acute problems, and identifies elderly at risk for death, longer hospitalization, and institutionalization.

Several nurse researchers have conducted studies directed toward developing valid, reliable, easy-to-use assessment tools for nurses to quickly identify confusion in their patients. Although nurses continually identify some patients as confused without use of a specific tool, a structured assessment device could assist nurses to identify confusion in a more consistent manner and perhaps at an

earlier stage, before the development of agitated, uncooperative behaviors.

Nagley (1984) developed a tool, the Clinical Assessment of Mental Status (CAMS), which requires nurses to consider a patient's memory; orientation; and interactional behaviors, such as eye contact, responsiveness, and body movement; and rate the degree of confusion on a visual analogue scale. Vermeersch (1986) constructed a confusion assessment tool utilizing input from nurses regarding factors they considered important in determining the presence of confusion; the Clinical Assessment of Confusion (CAC) consists of a check list of twenty five psychomotor behaviors and a visual analogue scale adapted from Nagley's CAMS tool to indicate the amount of confusion. The CAC was found to be reliable and valid for the sample of 24 registered nurses who evaluated 129 patients over a 14 day period (305 observations).

In a study to determine incidence, onset, and variables associated with the onset of confusion in 71 non-surgical patients over age 60, Foreman (1989) utilized the CAC developed by Vermeersch and a visual analogue scale (VAS-C) adapted from Nagley and Vermeersch, and compared them with scores of the MMSE. Concurrent validity among the three instruments was strong (Pearson's r .80 to .83, $p<.001$). The Vas-C and CAC were administered twice a shift and the Vas-C, CAC, and MMSE were administered if a change in alertness was observed. Subjects were classified as confused on the basis

of the combined criteria of the MMSE (<24) and CAC (exhibited one or more behaviors); he validated the scores obtained with the newer CAC tool by comparing them with the older, more thoroughly tested and widely accepted MMSE.

Utilizing the SPMSQ and a researcher-developed Confusion Rating Scale (CRS), Williams, et al. (1985, 1988) tested two models for predicting acute confusional states in elderly patients hospitalized for surgical treatment of traumatic hip fractures. The researchers stated that prediction needs to take into account: (1) the person's preexisting condition and characteristics; (2) features of the event causing hospitalization; and (3) events occurring during treatment and hospitalization. Their tool consisted of four categories: (1) orientation, (2) communication, (3) behavior, and (4) illusions/hallucinations; it was scored from 0 to 2 for each category each shift. Researchers also gathered daily clinical data such as self-reports of pain, pain relief, and confusion; visitors; use of time piece; use of radio or TV; use of vision or hearing correctives; narcotics use; and, mobility level.

When comparing the predictive accuracy of their model with the clinical assessment and predictions of nurses and physicians, the clinical predictions were found to be more accurate than the model, probably due to the fact that expert clinicians are not confined by a mechanistic model, but instead, use observations of behavior and informal questioning to assess patients whose conditions may change

rapidly and whose manifestations of cognitive problems may be subtle (Williams, et al., 1985, 1988). An infrequently occurring factor may be significant for an individual patient but not be statistically significant for the group being studied. These researchers concluded that the use of mental status tests at admission and at certain other times during hospitalization is highly appropriate and should be encouraged in order to identify patients at high risk for acute confusional episodes and to plan care appropriately. Use of structured, systematic behavioral observations is recommended in order to gain information about patients' mental status that is otherwise unobserved or unrecorded. They concluded that, in their study, behavioral observation alone underestimated cognitive impairment, when compared with the SPMSQ scores, since problems with attention, memory, and clouding of consciousness were not specifically assessed; these factors are considered essential to the definition of delirium in the DSM-III-R standards.

Because these important assessment factors are not included in the CRS and the correlations between the SPMSQ and CRS were low ($\underline{r}$ = .51 to .27, $p<.001$) the CRS was not selected for use in the present study. The MMSE was selected as the reference standard for the study, in preference to the SPMSQ, because it is more widely used and reported; comparisons of the psychometrics of the two tests resulted in somewhat more favorable results for the MMSE (Foreman, 1986).

Identification of the physiological factors and types of behavior that reflect the various dimensions of cognitive function would improve the predictive validity of assessment tools. Champagne and Neelon have developed an instrument for rapid and nonintrusive assessment of normal information processing, early changes in disturbed information processing, and for documentation of acute confusional behavior (Champagne, et al., 1987; Neelon, et al., 1989). The NEECHAM Confusion scale (see Appendix C) is currently being refined and the researchers are testing related nursing interventions. The NEECHAM utilizes usual nursing assessments, making maximum use of already collected data. There are nine scaled items divided into three subscales: (1) Responsiveness, including neurosensory, motor, and verbal; (2) Performance, including appearance/hygiene, motor, and verbal; and (3) Physiological Control, including stability of vital signs and oxygen saturation, and urinary continence control. Scoring can be completed at the bedside and yields a numerical result between 0 and 30; scores of 25 to 30 indicate normal functioning while those of 24-20 indicate mild to moderate impairment, and scores less than 20 are associated with severe confusion (Neelon, et al., 1989).

The NEECHAM has been used with 21 hospitalized medical patients and 14 nursing home patients over the age of 69 years (Champagne, et al., 1987) with high internal consistency (Chronbach's alpha = .85), high average interrater reliability (.96), and test-retest reliability

(.98) in stable subjects. The NEECHAM is highly correlated with the MMSE (.81) and is more sensitive to impending confusion; it can also be used to rapidly test very ill patients, a distinct advantage over the MMSE. There is minimal response burden and the test can be repeated frequently to monitor changes in a patient's status.

Neelon and Champagne have tentatively defined three patterns of the development of confusion: (1) early onset, environmentally provoked episodes; (2) rapid, fluctuating episodes in the physiologically unstable, and (3) progressively developing confusion in toxic provoked episodes (Williams, 1989a). In a sample of 158 medical patients over 64 years of age, NEECHAM scores were significantly related to key clinical indicators of acute confusion development and the test was sensitive to early onset of confusion (Neelon et al., 1989). A NEECHAM score of 24 or below predicted confusion with a sensitivity of .95 and a specificity of .78.

Little information has been published regarding the NEECHAM (Champagne, et al, 1987; Neelon, et al., 1989). However, due to the supplemental information that was made available to this researcher (Neelon, personal communication, April 23, 1990, & May 7, 1990; Williams, 1989a; Williams, personal communication, March 14, 1990), the NEECHAM instrument was selected for use in the proposed study. Because of its psychometric qualities and reported ease of application, the NEECHAM has promise for usefulness as a nursing assessment tool for confusion. Further testing of

the tool is needed, however; it is important to use the NEECHAM in other population samples for purposes of adding to the data base.

Larson (1986) states that screening tests are useful if they:(1) address an important health problem; (2) the problem can be detected in an early stage,(3) there is a useful treatment available; and (4) the test is simple, convenient, reliable, and cost effective. While Larson was primarily addressing epidemiological problems, her statements could apply to the confusion problem as well. Confusion among hospitalized elderly patients is a readily acknowledged problem and can be successfully treated through medical and nursing interventions. A screening test to detect those patients who have or are at high risk for developing confusion could be very useful to nurses in planning care to prevent or lessen the impact of confusion during the hospital stay.

Summary

This review of the literature about confusion reveals considerable descriptive and some quasi-experimental research. The phenomenon of confusion has been difficult to define and more difficult to assess, prevent, and/or treat due to its frequently transitory nature, variety of manifestations, and numerous precipitating or etiological factors. Confusion is so multidimensional that the National Conference on Nursing Diagnoses has eliminated confusion as a

nursing diagnosis and included the defining characteristics in the diagnoses of sensory-perceptual alterations, thought processes alterations, and altered levels of consciousness; the combination of these defining characteristics coincides with the DSM-III diagnosis of delirium.

Descriptive research reported in the past 10 to 12 years has resulted in considerable agreement regarding terminology (delirium/acute confusion) and acceptance of the importance of rapid diagnosis and treatment as opposed to the former attitude of inevitability and futility of intervention. There are currently accepted tests of cognitive function and medical diagnostic criteria; medically oriented risk factors have been developed. While reports of a satisfactory nursing assessment or prediction tool for confusion have not been fully published, preliminary reports regarding the NEECHAM Confusion Scale appear promising.

The primary differences between the physician-developed mental status tests and the nurse-developed confusion assessment tools are that the mental status tests examine only cognitive functions and require verbal responses while the confusion assessments consider behavioral manifestations not necessitating a verbal response, and, in the case of the NEECHAM, physiological parameters are included.

Of the nursing assessment instruments reported in the literature (Nagley's CAMS, Vermeersch's CAC, Williams' CRS, and Neelon & Champagne's NEECHAM) only the NEECHAM has been tested for predictive validity in the form of sensitivity and

specificity. Concurrent validity has been evaluated for all of these instruments; all researchers except Vermeersch (1986) utilized a mental status assessment tool such as the MMSE or the SPMSQ for comparison (CAMS/SPMSQ $\underline{r}$= .63 [Nagley, 1984]; CRS/SPMSQ $\underline{r}$= .51 [Williams et al., 1985]; NEECHAM/MMSE .81 [Champagne, et al., 1987] and .78 [Neelon, personal communication, April 23, 1990]). In the latter comparison, neither author indicated the statistical test used to determine the correlation between the NEECHAM and the MMSE. Vermeersch (1986) compared the CAC and visual analogue scores to find concurrent validity of 69% accurately classified as confused and 79% accurately classified as not confused; the NEECHAM is reported to have a sensitivity of .95 and a specificity of .78 (Neelon, et al., 1989).

The NEECHAM is a more comprehensive instrument than the others in that the physiological parameters of vital signs, oxygen saturation, and urinary continence are included along with the behavioral elements of responsiveness and performance. With its .81 correlation with the MMSE, and the ability of the vital function subscale to identify subjects at risk for developing physiological-type confusion, (Champagne, et al., 1987) the NEECHAM has demonstrated, in two prior studies, the ability to both detect and predict development of confusion. It has been tested on elderly persons in both hospital and nursing home situations. For these reasons the NEECHAM was selected for use in the current

study and was evaluated for reliability and predictive validity.

Conceptual Framework and Rationale for Study

Important concepts involved in the study of confusion are as follows:

1. Confusion occurs frequently in hospitalized elders (Chisholm, et al., 1982; Foreman, et al., 1989; Lipowski, 1983; Williams et al., 1979);
2. Delirium can be present without overt, disruptive behavioral manifestations (Francis, et al., (1990);
3. Delirium frequently is an indicator of a significant/potentially life-threatening medical problem (Lipowski, 1983, 1989);
4. Delirium is usually temporary, responding favorably to treatment of the underlying etiology (Lipowski, 1983, 1989);
5. The negative effects of delirium in terms of both human and monetary costs are very significant (Levkoff, et al., 1986, 1988); and
6. The presence or absence of risk factors and the occurrence of confusion can be assessed (Francis, et al., 1990; Levkoff, et al., 1988; Lipowski, 1989; Neelon, et al., 1989).

Because effective medical and nursing interventions are available to successfully treat, and perhaps prevent the development of confusion, the burden of responsibility lies with nursing and medical professionals to (a) collaborate to identify those patients who have acute confusion/delirium and those who are at risk for developing it, and (b) promptly institute measures to alleviate or prevent it.

The current study contributes to the refinement of the NEECHAM, a nursing assessment tool designed to enable nurses to detect confusion, or its potential, sooner and more effectively than subjective measures or waiting for the patient to demonstrate overt confusional behaviors. Through replication of Neelon's study, interrater reliability and predictive validity testing of the instrument were assessed using a different patient population and a different group of nurse raters. Findings from this study may be used to improve this instrument for use in general practice.

The expedient identification of confusion coupled with appropriate nursing interventions has the potential to significantly improve the patient's health status and may improve patient safety, as well as spare the patient and family the mental distress of both the more severe physiological disruption and the overt confusional behaviors. Monetary factors associated with hospitalization and potential institutionalization are important considerations for the patient, the hospital, the extended care facility,

and the national cost of health care. Levkoff, et al., (1986) estimated that if early detection and proper management of the acute confusional state could decrease the average length of stay for each hospitalized elderly, confused patient by one day, the savings would be between $1 and $2 billion (in 1983 terms). The savings would be even greater if nursing home admission or hospital readmission could be averted.

Research Purpose and Questions

The purpose of this study was to replicate studies done by Neelon and Champagne in order to test the reliability and validity of the NEECHAM Confusion scale with a different patient population and with different nurse raters. Specifically, interrater reliability and predictive validity testing was the focus of the study.

The questions studied were:

1. To what extent do nurses agree in scoring the NEECHAM for specific patients?
2. To what extent do nurses agree in scoring the MMSE for specific patients?
3. To what extent does the NEECHAM, when compared with the MMSE, accurately identify patients who are confused?
4. To what extent does the NEECHAM, when compared with the MMSE, accurately identify patients who are not confused?

CHAPTER THREE

Methods

Design

This study was part of the research process, begun by Champagne and Neelon (Champagne, et al. 1987; Neelon, et al., 1989), to refine a nursing assessment tool that can be readily used by nurses to assess hospitalized elderly patients for the presence or risk of confusion. It was part of a larger study, Delirium in Elderly Patients at Good Samaritan Hospital, conducted by Georgene Siemsen, Colleen Lucas, and Judy Miller. The questions addressed by the larger study included: (1) the prevalence of delirium in hospitalized elderly on a medical nursing unit, (2) how assessments of cognitive function using measurement tools compare with current practices of nurses, (3) the relationship between the occurrence of delirium and selected demographic variables, and (4) significant factors associated with the incidence of delirium on the target unit that should be addressed in a plan of care designed to alleviate or prevent confusion.

This replication study assessed the interrater reliability and predictive validity of the NEECHAM in a different geographical setting with different raters. The MMSE was used as the comparison standard.

Subjects and Setting

Subjects were a convenience sample of 26 patients 65 or more years of age with medical diagnoses, with or without preexisting delirium/confusion, admitted to a medical nursing unit of Good Samaritan Hospital in Portland, Oregon. The General Medicine (4C) nursing unit was selected for the following reasons: (1) a large percentage of the patients are elderly and meet documented criteria for high risk of developing delirium, (2) staff nurses had identified that delirium is a problem, and (3) demonstrated nurse interest in the study. With the exception of patients known to be admitted for only 24 hours, all patients admitted to the target units who met the age and diagnoses requirements were identified by the unit secretary who alerted the nurse researchers of their presence. All potential subjects for whom signed consent to participate in the study was obtained within 48 hours of admission were included in the study. On a few occasions more potential subjects were admitted to the nursing unit than could be accommodated by the available data collectors. In those instances potential subjects were selected by a lottery process.

Protection of Human Subjects

All potential subjects were invited to participate in the study by one of the nurse researchers. A brief description of the purpose of the study (to furnish nurses with information that would help them to provide care that is

tailored to the needs of individual patients), and how participation would affect them were discussed prior to obtaining their signed consent (Appendix A). If a potential subject was unable to give written consent, his/her next of kin or guardian was contacted, whenever possible, and consent for the patient's participation requested from that person. More than one-third of the potential subjects were not included in the study because either they were too impaired to give consent, or their family members were unable to be contacted within the designated time frame.

It was anticipated that there would be minimal risk to subjects since all assessments were non-invasive and all, except the oxygen saturation measurement with the pulse oximeter and the writing and copying responses on the MMSE, were routine nursing assessments. Risk for the subject was limited to possible inconvenience associated with the time involved in administering the assessment tools and possible feelings of annoyance or frustration associated with one or two questions on the MMSE. Care was taken not to interfere with the patient's plan of care; the research assessments were stopped at any time the subject indicated a desire not to continue. Physicians were notified of the study by letter (Appendix B). There was high probability the patient would benefit from the study experience due to the additional, positive social contact with a nurse and the opportunity to discuss the hospital experience. It was anticipated that future patients will benefit as a result of the information

gained from this study being used to refine an assessment instrument to identify patients at risk for confusion.

Confidentiality was strictly maintained. The only documentation linking the patients' names and medical records numbers with their subject numbers was a code book which was kept in a file in the primary investigator's locked office. This code book will be destroyed following completion of the research study.

Instruments

The NEECHAM Confusion scale. The NEECHAM (Appendix C) is designed to permit rapid, bedside assessment of information processing and acute confusional behavior. It has been tested with over 1000 observations of elderly patients in both nursing homes and acute care hospitals (V. J. Neelon, personal communication to J. Miller, January 1990); Neelon, et al. (1989) indicated that one study population was comprised of 158 medical patients over 64 years of age.

The two-factor structure of the NEECHAM rates process-performance and identifies patients at risk for developing physiological-type confusion (Champagne, et al., 1987). Psychometric data are reported by Neelon (1990) as follows: inter-rater reliability (.96); test-retest in stable elderly subjects (.98); internal consistency for the total score (Chronbach's alpha =.86); and correlation with the MMSE (.78). Scores range from 8 (very confused) to 30 (no

indication of confusion); a NEECHAM score of 24 or below predicted confusion with a sensitivity of .95 and a specificity of .78 (Neelon, et al., 1989). The NEECHAM is still being refined by the original researchers who are interested in obtaining subject data from replication studies. Data from this study is being shared with the original investigators.

The NEECHAM scale involves both observation and the physiological assessment of vital signs and oxygen saturation. Blood pressure was measured with the equipment located on the nursing unit, wall-attached sphygmomanometers. A Diatek 600 electronic thermometer was used to measure temperature. The hospital-approved procedures for vital signs measurements were utilized. Oxygen saturation and pulse rate were measured with a Nellcor N-10 pulse oximeter, according to the manufacturers' directions. Protocols for both observation and physiological measurements are included in the Data Collection Resource Manual (Appendix D).

Both the electronic thermometer and the pulse oximeter provide digital displays which enhances the accuracy of the measurement readings, in the sense that the results are presented in numerical form on a lighted display or print-out rather than on a gauge or dial which requires reading and interpretation by the rater. Digital presentation of the results increases the intra and interrater reliability regarding temperature, pulse, and oxygen measurements, providing directions for use of the instruments are strictly

followed. The blood pressure and respirations measurements are more dependent upon rater skill; therefore, raters strictly adhered to the protocols for obtaining these measurements which were demonstrated, practiced, and tested for interrater reliability during the preparation for data collection. The sphygmomanometers and electronic thermometers are routinely checked for accuracy by the hospital's Biomedical Maintenance staff. The pulse oximeter has a self-check program which is part of the protocol for regular use. No routine service or calibration is required for this instrument; accuracy of oxygen saturation is reported to be 70%-100%: ±2 Digits, 50%-70%: ±3 Digits, 0-50%: unspecified, and pulse rate: ± bpm (Nellcor Incorporated, 1986).

Nursing Assessment of Mental Functioning. For purposes of this study, the NEECHAM was incorporated into a larger instrument, Nursing Assessment of Mental Functioning (NAMF) (Appendix C), developed by the researchers. In addition to the NEECHAM, the NAMF contains an identification of mobility restrictors and restraints, a self-report of mental clarity, and the DSM-III criteria assessment. Because compromised elderly persons may be sensitive to others' perceptions of their cognition, resulting in guarding or defensiveness with questions pertaining to mental status, consideration was given to phrasing the mental clarity questions in a manner unlikely to elicit distress. Williams, et al. (1979) used

similar questions in their study of confusion among hospitalized elderly patients who underwent hip surgery.

Mini-Mental State Examination. The Mini-Mental State examination (MMSE) (Folstein, et al., 1975) (Appendix C) is an 11-question, widely used tool for assessing cognitive functioning. The MMSE was found by the developers to be reliable on 24 hour or 28 day retest by single or multiple examiners, (Pearson coefficient of .887 for 24 hours, same examiner, and .827 for two examiners; r= .98 for 28 days in stable subjects). Concurrent validity in correlation with the Wechsler Adult Intelligence Scale (a standard test of cognition) was found to be (Pearson r) .776 with the Verbal IQ, and .660 with the Performance IQ.

The MMSE is designed to be an easily administered tool to quantify indicators of cognitive functioning. It requires about 10 minutes to administer, can be repeated with little practice effect, and demonstrates changes in cognitive function over time; scores of 20 or less were found to be indicative of dementia, delirium, schizophrenia, or affective disorder (Folstein, et al., 1975). According to Klein, et al. (1985), citing Anthony, et al. (1982), previous studies with medical patients over age 40 have shown that a cutoff point of 24 distinguishes cognitively impaired patients from nonimpaired patients with a sensitivity of 87% and specificity of 82%.

In comparing three frequently used mental status tools Foreman (1987) found psychometrics for the MMSE to be as

follows: internal consistency reliability = .957; content validity = 8 of 11 components of mental status measured; criterion-related validity, Spearman correlation coefficient .78 at $p<.001$; sensitivity = .82, predictive value of a positive test = .80, specificity = .80, and predictive value of a negative test = .82. Champagne, et al. (1987) found the NEECHAM to be correlated with the MMSE .81 and to be more sensitive to impending confusion.

Post Discharge Chart Audit. A retrospective chart review was done to identify clinical notations regarding subjects' mental status (Appendix C). These data were collected following the subject's discharge in order that the researchers remain blind to this information while the confusion assessments for the given subjects were being completed. The recorded indicators of mental status were intended to be compared with NEECHAM and MMSE scores; however, insufficient chart data concerning mental status was available to permit this analysis.

Procedures

The study was conducted by four nurse researchers and one research assistant. While the author was actively involved in all phases of the research, her areas of primary responsibility were: (1) preparation of instructional materials for training the data collectors, (2) testing and analyzing interrater reliability, (3) analyzing the NEECHAM and MMSE scores to determine the predictive validity of the

NEECHAM scale in this study population, (4) writing a report of the interrater reliability and predictive validity analyses for publication in a professional nursing book; and completing data validation documents to be sent to V. J. Neelon.

Data collection preparation. Prior to the start of data collection all raters participated in two three-and-one-half-hour training sessions designed to ensure complete familiarity with all aspects of the data collection process. Consistency among all raters in the use of the assessment tools was a major focus.

Preparations for the training included: (1) compilation of a "Data Collection Resource Manual" (Appendix D), which includes the study protocol, descriptions and directions for use of the Nursing Assessment of Mental Function (NAMF), and the Folstein Mini-Mental State (MMSE) worksheet, as well as detailed procedures for checking the physiological measurements; (2) formatting the NAMF and MMSE tools for use in this study; (3) videotaping three examples of the primary investigator using the NAMF and MMSE with three different subjects; (4) obtaining assurances that the electronic and mechanical assessment equipment is routinely checked for accuracy by the Biomedical Department; (5) arranging to have all necessary equipment and supplies on hand, including safe storage arrangements; and (6) identification of data collectors.

All raters, five RNs, participated in the preparatory sessions to ensure familiarity with the research protocols, the measurement tools, and the environmental aspects (location of equipment and supplies, patient's rooms, work space, and other pertinent factors) of the study. Since consistency in interrater scoring of both the NEECHAM and MMSE was a major concern for reliability, special attention was given to the techniques for assessing the subjects and scoring the tools. There were particular concerns with the scoring of the subjective portions which rely entirely upon the raters' interpretations of the observed behavior. Morrison, et al. (1990) noted that systematic rater training procedures decrease the effect of rater variability. Such procedures often involve: training to a measurement standard; extensive instruction and observation guides; supervised practice using the instrument; and routine, intermittent, and random rechecking and retraining, if necessary.

A major focus of the preparatory sessions was ensuring that all researchers and assistants were thoroughly familiar with the data collection instruments. Research project raters viewed a videotape of one of the researchers using the NAMF which included the NEECHAM and Self-Perceived Mental Clarity) and MMSE with a patient similar to the subjects of the study. Raters practiced scoring the instruments for the videotaped patient and non-subject patients. This was followed by focused discussions related to scoring decisions. Discrepancies among raters were addressed with development

and refinement of procedures and techniques for consistent and appropriate scoring of items across subjects. Interrater reliability was assessed prior to data collection and mid-way during the six-week collection period.

Data collection schedule. Data were collected twice each week day throughout the study period. In order to assess for differences between levels of confusion or sundowning behaviors that occur at different times of the day (Evans, 1987, Lipowski, 1989), the NAMF was administered to each subject twice a day between the hours of 7 and 11 a.m., and 3:30 and 9 p.m.. The MMSE was administered twice during the first four days of hospitalization. The MMSE was always administered after the NAMF. This was an important effort to avoid criterion contamination, since the same rater administered both the NAMF and the MMSE.

Raters received daily a written schedule, prepared by one of the researchers, of subjects to assess with an indication of whether or not the MMSE was to be administered. Assignment schedules and other supplies were located in a locked drawer on the study unit. The time involved in assessing each subject was 20 to 30 minutes per session, depending upon whether or not the MMSE was administered. Additional time, three-five minutes, was required to ensure that all the necessary information had been recorded. Raters placed the completed data forms in a locked drawer accessible only to the research group.

Data Analysis

Data Analysis was accomplished using CRUNCH (1987), a statistical analysis software package used at the Oregon Health Sciences University School of Nursing (OHSU). Assistance with data analysis was provided by staff from the Office of Research Development and Utilization at OHSU.

Interrater reliability. There were two areas of concern related to interrater reliability. One related to the issue of the reliability of the NEECHAM Confusion Scale when it was used in a different setting by different raters; the other was related to the consistency of the data collection by all raters in this study. To assess the reliability of the NEECHAM scale, Pearson's correlation coefficient was used to compute the correlation between scores for a minimum of 30 observations, same time, same subject, made by the same two raters. A correlation of at least 90% was designated to indicate acceptable reliability. Since it was anticipated that subjects display more signs of confusion on different days of their hospitalizations, an effort was made to do the interrater reliability paired-assessments on different days of hospitalization. For example, 10 subjects were rated on their first day, 10 subjects on their second day, and 10 subjects on their fourth day of hospitalization.

The process used to ensure interrater reliability among the raters was as follows:

1. The NAMF and MMSE were reviewed and discussed in detail; opportunity was provided for clarification of any aspect of the tools or process;
2. Demonstrations of the use of the electronic thermometer, blood pressure equipment, and pulse oximeter were provided; all raters practiced using this equipment in accordance with the study protocols;
3. One of the videotaped examples of a researcher using the tools was viewed, after which raters scored both the NAMF and MMSE; following completion of the trial rating, scores were verbally compared and discussed; techniques for obtaining accurate and consistent scores were clarified;
4. Raters scored a non-sample patient and returned to the classroom to compare scores; informal comparison of scores identified troublesome areas regarding use of the assessment tools; all areas of concern for consistency were clarified;
5. All scores were analyzed for percent agreement according to criteria previously agreed to by the researchers (the acceptable item levels of agreement were: 70% of the item scores were expected to be identical, 20% of the scores may vary by one point, 10% of the scores may vary by 2 points; raters must agree on all dichotomous items; 90% of the raters must agree on each item);

6. A communication book for sharing information pertinent to the study was available for raters throughout the data collection period;
7. Midway through the data collection period, the raters convened for a follow-up interrater reliability assessment; four study subjects were assessed and rated simultaneously by all raters; the percent agreement on item scores was determined for each subject.

Concurrent validity. Concurrent validity of the NEECHAM was calculated by determining the correlation between total scores of the NEECHAM and the MMSE. Pearson product moment correlation was used for these calculations.

Predictive validity. Validity as sensitivity and specificity was calculated according to the method of Lilienfeld and Lilienfeld (1980) and Larson (1986). Sensitivity is the ability of the tool to identify correctly the critical attribute (delirium/acute confusion); specificity is the ability of the tool to correctly identify the absence of the critical attribute. Sensitivity would be supported if all subjects who scored 24 or below on the NEECHAM had documented behavioral indications of delirium/acute confusion in their clinical records and corrrespondingly low scores (<24) on the MMSE. Specificity would be supported if subjects with NEECHAM scores 25 or above had no indication of confusional behavior noted in their clinical records and had scores above 23 on the MMSE.

The predictive validity of the NEECHAM in this study was determined by the sensitivity and specificity calculations.

Neelon, et al. (1989) indicated a sensitivity of .95 and specificity of .78 for the NEECHAM. These levels are within an acceptable range. The author had hoped for a higher specificity which would indicate greater accuracy in eliminating those actually not at risk. However, since the greater personal risk to the patient is in not identifying confusion and its etiology, it is preferable that the tool identify a higher percentage of those who have confusion, or are at high risk for developing it, than to gain a higher than .78 specificity and miss identifying more (than 5%) of those persons who have the problem.

From an ethical point of view it would seem to be in the best interests of patients, families, and caregivers to prevent the development or treat the causes of confusion whenever possible and lessen the likelihood of needing to use chemical or mechanical restraints, actions that have raised serious ethical concern. There may be ethical concerns regarding labeling a patient confused or to be at-risk for developing confusion; however, one believes these concerns would be minimal providing the caregivers understood the importance of preventing confusion or detecting its presence in order to determine and treat the etiology. If tests yield false-positive scores a patient could undergo diagnostic tests or consultations, to determine the etiology of the confusion, and incur costs that were not necessary. If tests

yield false-negative scores the ultimate cost could be death; however, this would probably not occur because it seems most likely that nursing and medical care givers would be exercising their clinical judgement and not be persuaded by the results of only one test.

CHAPTER FOUR

Results and Discussion

Products of Master's Research Project

It was agreed by the author's Master's Research Project committee that the final products of this project to test the reliability and predictive validity of the NEECHAM Confusion scale would be as follows:

1. A training manual or guide for the research assistants (see Appendix D);
2. Analysis of data for interrater reliability and predictive validity (see Results section);
3. Participation in the presentation of the research results to others, focusing on the training for data collection, interrater reliability, and predictive validity (see Appendix E, Conference Participation, and Appendix F, Research Poster);
4. A written report in the form of an article suitable for publication (see Appendix G, refer to Results section for this author's contribution to the total manuscript); and
5. Submission of validation data to original researchers for each time the NEECHAM Confusion Scale was administered.

The NEECHAM Confusion Scale was used in this study with the permission of a co-developer of the tool, Virginia Neelon, of the School of Nursing of the University of North

Carolina at Chapel Hill. In return for use of the NEECHAM it was requested that validation forms be completed and forwarded to Neelon for each time the instrument was administered during the Study of Delirium in Elderly Patients. A copy of the validation report letter to Virginia Neelon, the "Interpretation of Data Report Form", and a sample "Data Validation" form are found in Appendix H.

Results

The primary purpose of this study was to examine the NEECHAM as a structured tool that staff nurses could use to assess for confusion in hospitalized elderly patients. Of particular interest were: (1) the reliability of the NEECHAM when used by several raters, that is, could several nurses use the scale and obtain similar scores when independently observing the same patient at approximately the same time; and (2) the accuracy (predictive validity) of the NEECHAM as a screening tool for confusion when compared with the more widely used Mini-Mental State Exam (MMSE), or, said another way, what percentage of patients who were confused, according to the MMSE, had NEECHAM scores that indicated they were confused; and what percentage of patients who were not confused, according to the MMSE, had NEECHAM scores in the non-confused range?

Raters for this study were five clinically experienced registered nurses. A seven hour multiphasic program provided instruction in the research protocol and practice in using

the NEECHAM, MMSE, and other assessment tools in videotaped and live patient settings. Prior to data collection the item-score percent agreement for all raters scoring one practice subject using the NEECHAM was 67%. There were no two-point item-score disagreements. Thirty-three percent of the item-scores differed by one point, that is, all raters agreed on scoring for six of the nine NEECHAM items and disagreed by one point on three items. Immediately following the comparison of scores, all raters discussed their rationale for the scoring discrepancies and agreed on a consistent approach to these issues. Data collection was then begun since the item percent agreement was close to the target percentage agreement and the identified problems had been addressed.

A mid-study reliability check, at the end of the first three weeks of data collection, of five raters using the NEECHAM to assess four subjects found an interrater correlation of .99. The percent agreement on all item-scores, a more conservative measure of reliability, was 70%. Raters varied by as many as four points on total scores for one subject whose condition deteriorated during the assessment period.

Table 1

Reliability Assessment of Items within the NEECHAM Confusion Scale

Items		Item Correlation
Processing - neurosensory (attention, alertness)		r = .87
Processing - motor (recognition, interpretation, action)		r = .89
Processing - verbal (orientation, short-term memory)		r = .92
Performance - appearance, hygiene		r = .62
Performance - motor		r = .78
Performance - verbal		r = .80
Vital function stability		r = .91
Oxygen saturation stability		r = 1.00
Urinary continence control		r = 1.00
# of observations = 30	total	r = .97
# of raters = 2	for all items	$p<0.001$

Thirty paired observations made by two raters during the initial three-weeks of the study were highly correlated for the NEECHAM total scores (Pearson's product moment correlation, r = .97, $p<0.001$) (see Table 1), and consistent with reported interrater reliability (Champagne, Neelon, McConnell, & Funk, 1987). The percent agreement for total scores was 100% in relationship to the cut-off score of 24 or less indicating confusion. For all but one item, scoring agreement ranged from r =.78 to r = 1.00. The most problematic item was "Performance - appearance, hygiene" with an interrater correlation of r = .62. The lower correlation on this item and the other two performance items may have been due to a greater degree of subjective judgement required to score performance and the tendency of less-experienced

to score performance and the tendency of less-experienced raters to score high by awarding points for the best observed behavior rather than for the most impaired (V. J. Neelon, personal communication, 12/10/90). Information regarding the need to score performance items at the lowest observed level was subsequently provided to all raters approximately two-thirds of the way through the two-month data collection period. Reliability was not checked following this correction.

Interrater agreement for the MMSE prior to beginning data collection was 94% for all raters. Six paired assessments during the study had a high correlation (Pearson's product moment, $r = .97$, $p<0.001$), comparing favorably with the reported reliability of this instrument (Folstein, Folstein, & McHugh, 1975).

NEECHAM as a Screening Tool. The concurrent and predictive validity of the NEECHAM, a form of criterion-related validity, was examined using Folstein's MMSE as the reference criterion. The purpose was to determine to what extent the NEECHAM total scores when compared with the MMSE total scores, obtained at approximately the same time, identified subjects as being either confused or not confused. It is recognized that there was potential for criterion contamination since the same raters administered both the NEECHAM and the MMSE. This was compensated for by always using the NEECHAM first; scores were not totaled until all data for the study were collected.

Sensitivity is the ability of the NEECHAM to correctly identify the individuals who were confused and specificity is the ability to correctly identify the individuals who were not confused. The predictive value of a positive test is the probability that when a test is positive, confusion is truly present. Conversely, the predictive value of a negative test is the probability that when a test is negative, confusion is truly absent (Larson, 1986). When using an assessment tool to make treatment decisions for a patient it is important to have information about the tool's ability to accurately discriminate between individuals with and without the condition to be treated. Correct identification of patients who were confused, or had an indication of developing confusion, would assist in the implementation of appropriate care.

The selection of a cut-off score to designate the presence or absence of confusion represents a considered decision to balance the effects of false negative and false positive results. NEECHAM scores of 24 or less indicate confusion, while MMSE scores of 23 or less indicate cognitive impairment. Neelon (V. J. Neelon, personal communication, 4/13/91) reported that subjects with NEECHAM scores of 27 or higher on admission did not develop confusion unless there was some catastrophic occurrence.

Table 2

Sensitivity and Specificity of the NEECHAM Confusion Scale

	NEECHAM <24	NEECHAM 25+		
MMSE <23	9	21	30	Sensitivity = 30% Specificity = 92%
MMSE 24+	2	24	26	Predictive value of a positive test = 81% Predictive value of a negative test = 53%
	11	45	56	

Using the MMSE as the reference criterion, this study found sensitivity of the NEECHAM to be 30% and specificity to be 92% (see Table 2). This is in contrast to the reported sensitivity of 95% and specificity of 78% of the NEECHAM, using an undesignated reference criterion (Neelon, Funk, Carlson, & Champagne, 1989).

These differences may be due to use by Neelon, et al. of additional reference criteria other than the MMSE, a different subject population, the small sample size in this study, or different raters. Because the greater personal risk to the patient lies in not identifying confusion and properly treating its etiology, it is preferable that the screening tool identify a higher percentage of those who have confusion, or some degree of cognitive impairment (risk having more false positives) than to set the cut-off to obtain a higher percentage of specificity (fewer false positives).

Sensitivity and specificity were examined at various levels of scores to consider if a cut-off point other than 24 seemed more appropriate for this sample. Results of these calculations are shown in Table 3. A NEECHAM cut-off score of 26 or less for confusion, and the MMSE as the only reference criterion, would yield a sensitivity of 53% and a specificity of 88%, with the predictive validity of a positive test being 84% and the predictive validity of a negative test being 62%. The suggested change in cut-off score would have resulted in more individuals who scored in the confused range on the MMSE to have scores in the confused range on the NEECHAM and would have resulted in fewer false negative NEECHAM scores in this study.

Table 3

Sensitivity and Specificity in Percentage of the NEECHAM Confusion Scale

NEECHAM Score	Sensitivity	Specificity	Predictive value of positive test	Predictive value of negative test
≤29	80	31	61	80
≤28	90	62	73	84
≤27	77	73	73	77
≤26	53	88	84	62
≤25	40	92	86	48
≤24	30	92	81	53
≤23	20	100	100	52

The MMSE was selected as the reference standard because it is well known by physicians and is widely used by psychiatrists and other mental health specialists as a

structured assessment for cognitive impairment. It many not be the most appropriate reference criterion for the NEECHAM. Neelon (1991) has found the NEECHAM to be more strongly correlated with medical and nursing records of patients' mental status problems. A retrospective review of subjects' charts in this study, however, found few notations by nurses or physicians regarding mental status, indicating a need for structured assessments and consistent documentation.

Both the NEECHAM and MMSE can be administered at the bedside and require about 10-15 minutes to complete. The NEECHAM measures verbal, neural, and motor processing and performance, as well as vital sign stability and peripheral oxygen saturation; it is sensitive to perceptual disturbances and can be administered during the course of usual nursing care, requiring little response effort by the subject. The MMSE measures thinking functions of orientation, registration, attention and calculation, recall, and language ability; completion of all items requires that the subject be able to see and communicate verbally and in writing. Although both tools measure mental status by assessing some common factors, they also measure different factors and may complement rather than substitute for each other.

Discussion

This study found the incidence of delirium ranged from 27% on admission to 37% throughout hospital stay when structured assessment tools were used. These rates were

somewhat lower than those reported by other researchers Chisholm, et al., 1982; Foreman, 1989; Williams, et al., 1979), possibly due to the fact that it was not possible to obtain consent for study inclusion, within 48 hours after admission, from the families of many cognitively impaired patients. Because confusion is associated with more severe illness, longer hospitalization, higher medical costs, and more discharges to extended care facilities, this study has several implications for nurses. Nurses can identify delirium on admission and during hospitalization and can act directly or collaboratively with other health caregivers to prevent or alleviate it.

The NEECHAM was found to be clinically useful in that all subjects could be assessed with it during the course of normal nursing activities without added response burden to the subject and with little or no additional nursing time involved. The MMSE was not administered to eight subjects (30%) who were too ill or otherwise unable to cooperate with the response requirements.

Use of the NEECHAM requires nursing judgement and discrimination of observed behaviors. It should be administered by experienced clinical nurses who have had sufficient training and practice in using the tool to ensure consistent scores (intra- and interrater). This is especially important if medical and nursing treatment decisions are to be based on NEECHAM results. This study found that the performance items, particularly "appearance-

hygiene", required additional clarification to obtain scoring consistency. This situation might have been improved by doing training assessments of subjects who had marked variations in mental status in order for the raters to clarify scoring for a wide range of behaviors prior to beginning data collection.

The low sensitivity of the NEECHAM when compared with the MMSE may have been the result of limited preparation of the raters and subsequent high scores. Retraining during the data collection period seemed to have corrected this problem; however, no further interrater checks were done. It would be desirable to compare NEECHAM scores with chart notations regarding mental status since clinical judgements have been found by Neelon, et al. to correlate most highly with this tool. The lack of sufficient chart documentation of mental status found during this study identifies another area where nurses can improve the quality of care for patients by consistently documenting their assessments.

Further study of the NEECHAM to address the unresolved issue of rater training would be desirable. Support for the NEECHAM's sensitivity may be obtained by using a reference criterion other than the MMSE, for example, professional clinical assessment records of mental status. It is probable that structured assessments of confusion, such as the NEECHAM, may provide the most accurate information for planning care when combined with other data such as the patients' and caregivers' perceptions of mental status.

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Appendix A

NURSING STUDY

INFORMED CONSENT

I have been asked to be involved in a study to assist the nurses to provide better care at Good Samaritan Hospital.

I understand this would involve a 20-30 minute visit by a registered nurse coming to see me twice daily while I am in the hospital. The nurse will spend 20-30 minutes with me to check my blood pressure and pulse, vital functioning, and to talk with me about how I am doing. Care will be taken not to inconvenience me.

I understand I am free to refuse to participate or to withdraw from participation in this study at any time and it will in no way affect my relationship with, or treatment at Good Samaritan Hospital and Medical Center.

_____ _____

Patient/or Guardian Date

_____ _____

Witness Date

_____, 1990

Dear Physician:

Beginning September 1, 1990, a Nursing Research Study will be conducted on 4 Center and 6 SW. The purpose of this study is to explore the incidence, progression, and outcomes of delirium in elderly patients at Good Samaritan Hospital.

This work involves the assessment of patients' cognitive status twice daily over length of stay using the NEECHAM Confusion Scale. The instrument involves observation of the patient, measurement of vital signs, and non-invasive measurement of oxygen saturation using pulse oximetry. Intermittent mental status testing will also be done using the Folstein Mini Mental Exam. There will be no additional cost to the patient.

The project has been approved by the Nursing Research Committee and the Institutional Review Board. The study will be complete by October 31, 1990.

Sincerely,

Georgene Siemsen, MS, RNC
Clinical Nurse Specialist, Gerontology
229-7866 Beeper 1191

Colleen Lucas, MN, RN, CS
Medical-Surgical Clinical Nurse Specialist
229-8004 Beeper 1911

Appendix C

NEECHAM Confusion Scale

NeechF89 Page 1 PT ID _____ Date _____

(Neelon/Champagne/McConnell - 1985)
PERMISSION REQUIRED FOR REPRODUCTION
(rev:2-5-88)

1. PT ID ___ ___ ___ (1 2 3)
2. Card # 0 2 (4 5)
3. Data Type F (6)
4. Date _____ (mo/day/yr) ___ ___ ___ ___ ___ ___ (7 8 9 10 11 12)
5. Time (military) ___ ___ ___ ___ (13 14 15 16)

NEECHAM CONFUSION SCALE
(to be completed by the researcher)

PART I:

Categories:

1. Level of Responsiveness-Information Processing:

PROCESSING--NEUROSENSORY: (Attention-Alertness-Recognition) ___ (17)

POINTS (Circle point level)

_4_ Full attentiveness/alertness: responds immediately and appropriately to calling of name or touch -- eyes, head turn; fully aware of surroundings, attends to environmental events appropriately.

_3_ Short or hyper attention/alertness: either shortened attention to calling, touch or environmental events, or hyper alert, over-attentive to cues/objects in environment.

_2_ Attention/alertness inconsistent or inappropriate: slow in responding, repeated calling or touch required to elicit/maintain eye contact/attention; able to recognize objects/stimuli, though may drop into sleep between stimuli.

_1_ Attention/alertness disturbed: eyes open to sound or touch; may appear fearful, unable to attend/recognize contact, or may show withdrawal/combative behavior.

_0_ Arousal/responsiveness depressed: eyes may/may not open; only minimal arousal possible with repeated stimuli; unable to recognize contact.

NeechF89 Page 2 PT ID _____ Date _____

PROCESSING--MOTOR: (Recognition-Interpretation-Action) ___/18

_5_ Able to follow a complex command: "Turn on nurse's call light". (Must search for object, recognize object, perform command.)

_4_ Slowed complex command response: requires prompting or repeated directions to follow/complete a complex command. Performs complex command in "slow"/over attending manner.

_3_ Able to follow a simple command: "Lift your hand or foot Mr...". (Only use 1 object.)

_2_ Unable to follow direct command: follows command prompted by touch or visual cue - - drinks from glass placed near mouth. Responds with calming affect to nursing contact and reassurance or hand holding

_1_ Unable to follow visually guided command: responds with dazed or frightened facial features, and/or withdrawal-resistive response to stimuli, hyper/hypoactive behavior; does not respond to nurse gripping hand lightly.

_0_ Hypoactive, lethargic: minimal motor/reponses to environmental stimuli.

PROCESSING--VERBAL: (Orientation, short-term memory, thought/speech content) ___/19

_5_ Oriented to time, place, and person: thought processes, content of conversation or questions appropriate. Short-term memory intact.

_4_ Oriented to person and place: mild memory/recall disturbance, content and response to questions generally appropriate; may be repetitive, requires prompting to continue contact. Generally cooperates with requests.

_3_ Orientation inconsistent oriented to self, recognizes family but time and place orientation fluctuates. Uses visual cues to orient. Thought/memory disturbance common, may have hallucinations or illusions. Passive cooperation with requests (cooperative cognitive protecting behaviors).

_2_ Disoriented and memory/recall disturbed: oriented to self, recognizes family. May question actions of nurse or refuse requests, procedures (resistive cognitive protecting behaviors). Conversation content/thought disturbed. Illusions and/or hallucinations common.

_1_ Disoriented, disturbed recognition: Inconsistently recognizes familiar people, family, objects. Inappropriate speech/sounds.

_0_ Processing of stimuli depressed : minimal response to verbal stimuli.

2. Level of Behavior:

PERFORMANCE--APPEARANCE/HYGIENE: ___/20

_2_ Controls posture, maintains appearance, hygiene: appropriately gowned or dressed, personally tidy, clean. Posture in bed/chair normal.

_1_ Either posture or appearance disturbed: some disarray of clothing/bed or personal appearance, or some loss of control of posture, position.

_0_ Both posture and appearance abnormal: disarrayed, poor hygiene, unable to maintain posture in bed.

PERFORMANCE--MOTOR: ___/21

_4_ Normal motor behavior: appropriate movement, coordination and activity, able to rest quietly in bed. Normal hand movement.

_3_ Motor behavior slowed or hyperactive: overly quiet or little spontaneous movement (hands/arms across chest or at sides) or hyperactive (up/down, "jumpy"). May show hand tremor.

_2_ Motor movement disturbed: restless or quick movements. Hand movements appear abnormal--picking at bed objects or bed covers, etc. May require assistance with purposeful movements.

_1_ Inappropriate, disruptive movements: pulling at tubes, trying to climb over rails, frequent purposeless actions.

_0_ Motor movement depressed: limited movement unless stimulated; resistive movements.

NeechF89 Page 4 PT ID _____ Date _____

PERFORMANCE--VERBAL: ___ 22

_4_ Initiates speech appropriately: able to converse, can initiate and maintain conversation. Normal speech for diagnostic condition, normal tone.

_3_ Limited speech initiation: responses to verbal stimuli are brief and uncomplex. Speech clear for diagnostic condition, tone may be abnormal, rate may be slow.

_2_ Inappropriate speech: may talk to self or not make sense. Speech not clear for diagnostic condition.

_1_ Speech/Sound disturbed: altered sound/tone. Mumbles, yells, swears or is inappropriately silent.

_0_ Abnormal sounds: groaning or other disturbed sounds. No clear speech.

3. Level of Integrative Physiological Control:

Recorded Values:	Normals:				
Temperature	(36-37°)	___ 23	___ 24	.___ 25	___ 26
Systolic BP	(100-160)		___ 27	___ 28	___ 29
Diastolic BP	(50-90)		___ 30	___ 31	___ 32
Pulse	(60-100)		___ 33	___ 34	___ 35
Irreg Pulse (don't count infrequent PC's) 1=yes, 2=no					___ 36
Respirations Count for one minute	(14-22)			___ 37	___ 38
Periods of apnea/hypopnea present: 1=yes, 2=no					___ 39
Longest # of seconds present between breaths: (code 88 if not applicable)				___ 40	___ 41
O2 Sat range during apnea/hypopnea cycle: FROM: (Code 88 if not applicable)		___ 42	___ 43	.___ 44	___ 45
	TO:	___ 46	___ 47	.___ 48	___ 49

NeechF89 Page 5 PT ID _____ Date _____

O2 SAT (≥93) 50 51 52 53
(Code 11.1 if oximeter alarms low perfusion)
Patient position_____

Receiving O2: 1=yes, 2=no 54

Oxygen on now: 1=yes, 2=no 55

VITAL FUNCTION STABILITY: 56

_2_ BP, P, TEMP, RESPIRATION within normal range with regular pulse

_1_ Any of above in abnormal range(count SBP and/or DBP as one; count increase/decrease and irregular pulse as one; count apnea/hypopnea and increase/decrease in resp. as one)

_0_ Two or more in abnormal range

OXYGEN SATURATION STABILITY: 57

_2_ O2 sat in normal range

_1_ O2 sat 90 to 92 or is receiving oxygen

_0_ O2 sat below 90

URINARY CONTINENCE CONTROL: 58

_2_ Maintains bladder control

_1_ Incontinent of urine in last 24 hours or has condom cath

_0_ Incontinent now or has indwelling or intermittent catheter or is anuric.

TOTAL LEVEL 1 (0-14 points) 59 60

TOTAL LEVEL 2 (0-10 points) 61 62

TOTAL LEVEL 3 (0-6 points) 63

TOTAL NEECHAM (0-30) 64 65

NOTES:

NeechamF Page 6 PT ID _____ Date _____

1. PT ID ___ ___ ___ (1 2 3)
2. Card # 0 3 (4 5)
3. Data Type F (6)

PART II: (complete with NEECHAM SCALE but do not add to score)

4. Level of Self Report:

A. REPORT OF CONFUSION: (mixed up feelings, etc.) ___ (7)

3=Does not report feelings of confusion
2=Reports some feelings of confusion
1=Reports high level of confusion
0=No response
If other than no confusion, would you describe how you feel?

B. REPORTS DISTURBED DREAMS IN WHICH THE DREAM SEEMED REAL OR CAUSED AWAKENING: ___ (8)

1=Yes
0=No
8=Unable to respond

5. Presence of DMS-III criteria:
(code if present) 1=yes, 0=no

I. Clouding of consciousness:
(reduced clarity of awareness of the environment) with reduced capacity to shift, focus and sustain attention to environmental stimuli? ___ (9)

II. Any of the following present?

A. Perceptual disturbance?
(misinterpretations, illusions or hallucinations) ___ (10)

B. Speech that is at times incoherent? ___ (11)

C. Disturbance of sleep-wakefulness cycle, with insomnia or daytime drowsiness? ___ (12)

D. Increased or decreased psychomotor activity? ___ (13)

NeechamF Page 7 PT ID _____ Date _____

III. Disorientation and memory impairment ___ 14

IV. Change in behavior or mentation developed over a short period of time (hours to days), symptoms fluctuate over the course of a day? ___ 15

V. Evidence from history, physical exam, or laboratory tests of a specific organic factor judged to be etiologically related to the disturbance. ___ 16

1.	Patient I.D.	___ ___ ___
2.	Date	__/__/__ mo day yr
3.	Start time	__ __ __ __ (military)
4.	R.A. #	__ __
5.	(Code #)	_____

NURSING ASSESSMENT OF MENTAL FUNCTIONING
(NAMF)

AS YOU ENTER THE ROOM, TAKE THE FIRST 30 SECONDS TO OBSERVE THE PATIENT.

Cue: *"Hello, I am (name), and I've come to check how you are doing."*

6. Mobility Restrictors: devices that are required for treatment of the underlying medical disorder but so restrict the patient's mobility (circle all that apply. Enter the number circled.) ___ 6
IV lines; 02 mask, or cannula; Foley or condom catheter; N/G tube; chest tubes; inhalation treatments; gastrostomy tube; drainage tubes (if connected to bedside drainage) continuous passive movement (CPM); other (describe)
_____
_____
_____

7. Restraints: devices that restrict a patient's mobility not directly related to a medical disorder. (Circle all that apply. Enter the number circled). ___ 7
Wrist; mitten; chest or vest; waist; wheelchair (W/C) locked or geri-chair braced against a wall; commode or W/C or geri-chair with an overbed table in front; four bedrails up; other (describe)_____
_____.

NEECHAM CONFUSION SCALE

ENGAGE PATIENT IN CONVERSATION. IF PATIENT DOES NOT RESPOND READILY, KEEP CONVERSATION GOING TO ELICIT RESPONSE.

Points (Circle point level)

Processing--neurosensory: (Attention-Alertness-Recognition) ___ 8

4 **Full attentiveness/alertness:** responds immediately and appropriately to calling of name or touch--eyes, head turn; fully aware of surroundings, attends to environmental events appropriately.

3 **Short or hyper attention/alertness:** either shortened attention to calling, touch or environmental events, or hyper alert, over-attentive to cues/objects in environment.

2 **Attention/alertness inconsistent or inappropriate:** slow in responding, repeated calling or touch required to elicit/maintain eye contact/attention; able to recognize objects/stimuli, though may drop into sleep between stimuli.

1 **Attention/alertness disturbed:** eyes open to sound or touch; may appear fearful, unable to attend/recognize contact, or may show withdrawal/combative behavior.

0 **Arousal/responsiveness depressed:** eyes may/may not open; only minimal arousal possible with repeated stimuli; unable to recognize contact.

NAME PAGE 2 PT. ID_____ DATE_____

Processing–motor: (Recognition-Interpretation-Action) ___/9

5 Able to follow a complex command: "Turn on nurse's call light". (Must search for object, recognize object, perform command.)

4 Slowed complex command responds: requires prompting or repeated directions to follow/complete a complex command. Performs complex command in "slow"/over attending manner.

3 Able to follow a simple command: "Lift your hand or foot Mr....." (Only use 1 object.)

2 Unable to follow direct command: follows command prompt by touch or visual cue–drinks from glass placed near mouth. Responds with calming affect to nursing contact and reassurance or hand holding.

1 Unable to follow visually guided command: responds with dazed or frightened facial features, and/or withdrawal-resistive response to stimuli, hyper/hypoactive behavior; does not respond to nurse gripping hand lightly.

0 Hypoactive, lethargic: minimal motor/responses to environmental stimuli.

PROCESSING–VERBAL: (Orientation, short-term memory, though/speech content). ___/10

DETERMINE PATIENT'S GENERAL SENSE OF TIME THROUGH CONVERSATION, DO NOT ASK TIME, PLACE, PERSON QUESTIONS SPECIFICALLY.

5 Oriented to time, place, and person: thought processes, content of conversation or questions appropriate. Short-term memory intact.

4 Oriented to person and place: mild memory/recall disturbance, content and response to questions generally appropriate; may be repetitive, requires prompting to continue contact. Generally cooperates with requests.

3 Orientation inconsistent: oriented to self, recognizes family but time and place orientation fluctuates. Uses visual cues to orient. Thought/memory disturbance common, may have hallucinations or illusions. Passive cooperation with requests (cooperative cognitive protecting behaviors).

2 Disoriented and memory/recall disturbed: oriented to self, recognizes family. May question actions of nurse or refuse requests, procedures (resistive cognitive protection behaviors). Conversation content/thought disturbed. Illusions and/or hallucinations common.

1 Disoriented, disturbed recognition: inconsistently recognizes familiar people, family, objects. Inappropriate speech/sounds.

0 Processing of stimuli depressed: minimal response to verbal stimuli.

PERFORMANCE–APPEARANCE/HYGIENE: ___/11

2 Controls posture, maintains appearance, hygiene: appropriately gowned or dressed, personally tidy, clean. Posture in bed/chair normal.

1 Either posture or appearance disturbed: some disarray of clothing/bed or personal appearance, or some loss of control of posture, position.

0 Both posture and appearance abnormal: disarrayed, poor hygiene, unable to maintain posture in bed.

NAME PAGE 3 PT. ID_____ DATE_____

PERFORMANCE–MOTOR:

4 **Normal motor behavior:** appropriate movement, coordination and activity, able to rest quietly in bed. Normal hand movement. ___ 12

3 **Motor behavior slowed or hyperactive:** overly quiet or little spontaneous movement (hands/arms across chest or at sides) or hyperactive (up/down, "jumpy"). May show hand tremor.

2 **Motor movement disturbed:** restless or quick movements. Hand movements appear abnormal–picking at bed objects or bed covers, etc. May require assistance with purposeful movements.

1 **Inappropriate, disruptive movements:** pulling at tubes, trying to climb over rails, frequent purposeless actions.

0 **Motor movement depressed:** limited movement unless stimulated; resistive movements.

PERFORMANCE–VERBAL: ___ 13

4 **Initiates speech appropriately:** able to converse, can initiate and maintain conversation. Normal speech for diagnostic condition, normal tone.

3 **Limited speech initiation:** responses to verbal stimuli are brief and uncomplex. Speech clear for diagnostic condition, tone may be abnormal, rate may be slow.

2 **Inappropriate speech:** may talk to self or not make sense. Speech not clear for diagnostic condition.

1 **Speech/Sound disturbed:** altered sound/tone. Mumbles, yells, swears or is inappropriately silent.

0 **Abnormal sounds:** groaning or other disturbed sounds. No clear speech.

LEVEL OF INTEGRATIVE PHYSIOLOGICAL CONTROL:

Recorded Values:	Normals:	
Temperature	(36-37•)	___ 14
Systolic BP	(100-160)	___ 15
Diastolic BP	(50-90)	___ 16
Pulse	(60-100)	___ 17

Irreg Pulse (don't count infrequent PC's) 1=yes 2=no ___ 18

Respirations (14-22)
(count for one minute) ___ 19

Periods of apnea/hypopnea present: 1=yes 2=no ___ 20

Longest # of seconds present between breaths:
(code 88 if not applicable) ___ 21

NAME PAGE 4 PT. ID_____ DATE_____

O2 Sat range during apnea/hypopnea cycle:
FROM: (code 88 if not applicable) From: ___.__ 22

To: ___.__ 23

O2 Sat (≥93)
(Code 11.1 if oximeter alarms low perfusion) Patient position_____. ___.__ 24

Receiving O2: 1=yes 2=no ___ 25

Oxygen on now: 1=yes 2=no ___ 26

VITAL FUNCTION STABILITY:

2 BP, P, TEMP, RESPIRATION within normal range with regular pulse

1 Any of above in abnormal range (count SBP, and/or DBP as one; count apnea/hypopnea and increase/decrease in resp. as one) ___ 27

0 Two or more in abnormal range

OXYGEN SATURATION STABILITY:

2 O2 sat in normal range

1 O2 sat 90 to 92 or is receiving oxygen

0 O2 sat below 90 ___ 28

URINARY CONTINENCE CONTROL: ___ 29

2 Maintains bladder control

1 Incontinent of urine in last 24 hours or has condom cath

0 Incontinent now or has indwelling or intermittent catheter or is anuric.

NOTES:

_____

_____

_____

_____

DO NOT WRITE IN THIS BOX

TOTAL LEVEL 1 (0-14 POINTS) ___ 30

TOTAL LEVEL 2 (0-10 POINTS) ___ 31

TOTAL LEVEL 3 (0-6 POINTS) ___ 32

TOTAL NEECHAM (0-30) ___ 33

NAME PAGE 5 PT. ID_____ DATE_____

SELF-PERCEIVED MENTAL CLARITY:

Cue: *"It is quite common for patients to have some temporary problems with their ability to think clearly while in the hospital".*

34 Since this morning (yesterday afternoon), have you had any experiences of confusion? ___ 34

Yes = 1 No = 2

(If yes to 1.) What was that like for you? (Focus on symptoms that were troublesome for the patient)_____

_____

_____

35 How would you rate your clearness of though right now compared to this morning (this afternoon)? ___ 35

Better = 1 About the same = 2 Worse = 3

36 Last night or during the day have you had any disturbing dreams that troubled you? ___ 36

Yes = 1 No = 2 Can you describe what that was like for you?

_____

_____

_____

_____

PART II: (complete with NEECHAM SCALE but do not add to score)

37 Level of Self Report:

A. REPORT OF CONFUSION: (mixed up feelings, etc.)
3=Does not report feelings of confusion
2=Reports some feelings of confusion
1=Reports high level of confusion
0=No response
If other than no confusion, would you describe how you feel? ___ 37

B. REPORTS DISTURBED DREAMS IN WHICH THE DREAM SEEMED REAL OR CAUSED AWAKENING:
1=Yes
0=No
8=Unable to respond ___ 38

38 Presence of DMS-III criteria:
(code if present) 1=Yes, 0=no

I. Clouding of consciousness: ___ 39

(reduced clarity of awareness of the environment)
with reduced capacity to shift, focus and sustain attention to environmental stimuli?

II. Any of the following present?

A. Perceptual disturbance?
(misinterpretations, illusions or hallucinations) ___ 40

B. Speech that is at times incoherent? ___ 41

NAMF PAGE 6 PT. ID_____ DATE_____

C. Disturbance of sleep-wakefulness cycle, with insomnia or daytime drowsiness? ____ 42

D. Increased or decreased psychomotor activity? ____ 43

III. Disorientation and memory impairment ____ 44

IV. Change in behavior or mentation developed over a short period of time (hours to days), symptoms fluctuate over the course of a day? ____ 45

V. Evidence from history, physical exam, or laboratory tests of a specific organic factor judged to be etiologically related to the disturbance. ____ 46

Time Finished (military)_____ 47

Completion: ____ 48

Patient refused = 1
NDT tolerated = 2
Interrupted = 3
Completed-all = 4
Variables completed

Comments:_____

FOLSTEIN MINI-MENTAL STATE EXAMINATION

FOLSTEIN MINI MENTAL STATE WORKSHEET

1. ORIENTATION

Ask "What is today's date?" (Then ask specifically for parts omitted, e.g., "Can you also tell me what season it is?")

Ask "Can you tell me the name of this clinic (hospital)?" "What floor are we on?" "What city (town) are we in?" "What county are we in?" "What state are we in?"

II. REGISTRATION

Ask the subject if you may test his memory. Then say, "ball" "flag" and "tree" clearly and slowly, about one second for each. After you have said all 3 ask him to repeat them. This first repetition determines his score (0-3) but keep saying them until he can repeat all 3. If after 6 trials, he does not learn all 3, recall cannot be meaningfully tested.

III. ATTENTION AND CALCULATION

Ask the subject to begin with 100 and count backwards by 7. Stop after 5 subtractions (93, 86, 79, 72, 65). Score the total number of correct answers.

If the subject cannot or will not perform this task, ask him to spell the word "world" backwards. The score is the number of letters in correct order. For example: dlrow = 5, dlorw = 3. Record how subject spelled "world" backwards.

I. ORIENTATION	SCORE
1. Date	
2. Year	
3. Month	
4. Day	
5. Season	
6. Facility Name	
7. Floor	
8. City (town)	
9. County	
10. State	
II. REGISTRATION	
11. "Ball"	
12. "Flag"	
13. "Tree"	
(14. # of Trials	NOT SCORED)
III. ATTENTION AND CALCULATION (score 15 thru 19 or 20)	
15. "93	
16. "86"	
17. "79"	
18. "72"	
19. "65"	
"WORLD" spelled backwards 20. D L R O W (score 0-5)	

Patient's Name	Physician	Chart No.	Room No.

IV. RECALL

Ask the subject to recall the 3 words you previously asked him to remember. Score 0-3.

V. LANGUAGE

Naming: Show the subject a wrist watch and ask him what it is. Repeat for pencil.

Repetition: Ask the subject to repeat, "No ifs, ands, or buts."

3-Stage Command: Give the subject a piece of plain blank paper and say "Take the paper in your right hand, fold it in half and put in on the floor."

Reading: On a blank piece of paper, print the sentence, "Close your eyes" in letters large enough for the subject to see clearly. Ask him to read it and do what it ways. Score correct only if he actually closes his eyes.

Writing: Give the subject a blank piece of paper and ask him to write a sentence. It is to be written spontaneously. It must contain a subject and verb and be sensible. Correct grammar and punctuation are not necessary.

Copying: On a clean piece of paper, draw intersecting pentagons, each side about 1 inch, and ask the subject to copy it exactly as it is. All 10 angles must be present and two must intersect to score 1 point. Tremor and rotation are ignored.

VI. LEVEL OF CONSCIOUSNESS

Rate the subject as to his level of consciousness.

Poor performance on items 11-14 (Registration), 15-20 (Attention and calculation), indicate a deficit which tends to invalidate the remainder of the exam

IV. RECALL	SCORE
21. "Ball"	
22. "Flag"	
23. "Tree"	
V. LANGUAGE	
24. Watch	
25. Pencil	
26. Repetition	
27. Takes paper in right hand	
28. Folds paper in half	
29. Puts paper on floor	
30. Closes eyes	
31. Writes sentences	
32. Draws pentagons	

TOTAL SCORE

ALL ITEMS EXCEPT NO. 14 AND NO. 20 ARE EACH SCORED 1 IF CORRECT AND 0 IF INCORRECT.

ITEM NO. 20 IS SCORED 0-5.

THE TOTAL SCORE IS THE SUM OF ITEMS 1-32 EXCLUDING NO. 14.

TOTAL SCORE

VI. SUBJECTS LEVEL OF CONSCIOUSNESS
CHECK ONE:

☐ COMA ☐ DROWSEY

☐ STUPOR ☐ ALERT

INTERPRETATION OF TOTAL SCORE
28-30 Normal
20-27 Mild Dementia or Psuedodementia
12-19 Moderate Dementia
0-11 Severe Dementia

Completed by:

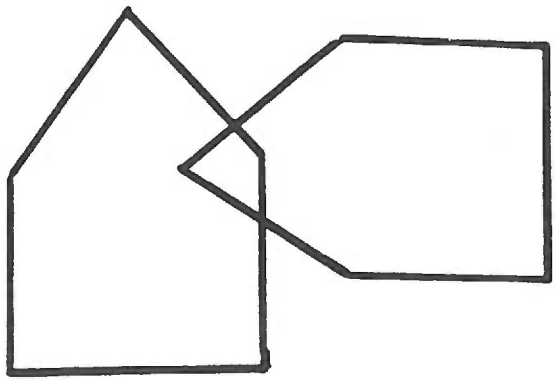
Date:

Examples for Folstein Mini-Mental Exam Item V: Language

Sentance for reading and doing:

Close your eyes.

Pentagons for copying:



POST-DISCHARGE CHART AUDIT

Subject Characteristics

Face Sheet

1. Sex _____ D1____
2. Unit 4C=1 6SW=2 D2____
3. Discharge date___/___/___ 4. Admit Date___/___/___ D3____
5. Age_____ D4____
6. Marital Status M S W D D5____
7. Admitted from Own Home = 1 Other's = 2 D6____
   Foster Care = 3 Retirement Home = 4
   Assisted Living = 5 Nursing Home = 6
   Other Hospital = 7 Other_____

Related Factors

Nursing Admission Data Sheet

8. Reason for admission
   (describe)_____
   _____Symptoms of Substance Abuse
   (describe)_____
   _____
   _____

10. Support Systems: Lives with_____
    Support Services used_____

11.

Vision/Hearing/Speech	Y	H
Eye Glasses	—	—
Contact Lenses	—	—
Artificial Eye	R	L
Blind	R	L
Hard of Hearing	—	—
Deaf	—	—
Hearing Aid	—	—
Speech Clear	—	—
Aphasic	—	—
Non-English Speaking	—	—
H:Left at Home		

12. Functional Level P. T. A.

	I	A	D
Ambulation	—	—	—
Hygiene	—	—	—
Eating	—	—	—
Toileting	—	—	—
Turning	—	—	—
Transfers	—	—	—
Shopping	—	—	—
Cooking	—	—	—
Dressing	—	—	—
Unable to Assess	—	—	—

3. Equipment Used

	Y	H
Cane	—	—
Walker	—	—
Crutches	—	—
Wheelchair	—	—
Prothesis	—	—
Dentures	—	—
FULL	—	—
PARTIAL	—	—

Other_____

Patient Care Record (Nursing)

14. Review for nursing assessment of L.O.C. and mental status changes. Include description of behavior problems, sleep disruption or description of safety measures. (Indicate date of notation.)

_____
_____
_____
_____
_____
_____
_____
_____
_____

15. Discomfort: Briefly note type/location, Interventions and response (Date notations)

_____

_____

_____

Admission Medical Physical Assessment and Prgress Notes

16. Primary Diagnos(es)

_____

_____

17. Secondary Diagnos(es)

_____

_____

18. Assessment of Cognitive Function (date)

_____

_____

Nursing Care Plan: Review for problems addressing cognitive-perceptual pattern: Altered thought processes_____

_____

_____

_____

_____

Appendix D

Training Manual

This section contains the author's contribution to the training manual for research assistants developed for the study. The data collection resource manual submitted by the author was revised, reviewed by a panel of experts (graduates of doctoral programs), revised again, and published in final form as "Research Assistant Resource Manual". Copies of the final product may be obtained from Georgene Siemsen, principal investigator. The table of contents of the "Resource Assistant Research Manual" appears below.

TABLE OF CONTENTS

The author's contribution to the training manual:

DELIRIUM IN ELDERLY PATIENTS AT GOOD SAMARITAN HOSPITAL: DATA COLLECTION RESOURCE MANUAL

Preparation for Data Collection

Objectives

- Provide raters with accurate, consistent information about the assessment instruments and techniques to be employed.
- Apply the assessment instruments in simulated and actual practice situations.
- Ensure at least 90% interrater reliability between and across groups of raters on scores of assessments for the same patient during the same observation time.

Methods

- Lecture/discussion/demonstration
- Videotaped demonstration
- Classroom and field practice
- Comparison of assessment scores between and across groups of raters

Topics

- Following the research protocol. Consent, confidentiality, adhering to scheduled collection times, completing forms, when data is not available or cannot be obtained, chart review only after discharge,

communicating with nursing staff (scheduled care, urinary continence, vital signs), patients who are transferred, research resources, non-research problematic issues

- Assessment forms. NEECHAM , Self Perceived Mental Status, Folstein Worksheet (MMSE), Post-Discharge Chart Audit
- Physiological measurements. Temperature, pulse, respirations, blood pressure, oxygen saturation

Research Protocol

Consent. All patients with medical or orthopedic diagnoses who are 65 years of age or older and who are admitted to either 4C or 6SW are potential subjects for this study. Each of these patients will be visited by a researcher who will briefly describe what we are doing (collecting information from patients that will assist nurses to better meet patients needs), and what participation will involve (being visited twice a day by a research nurse who will check vital signs and talk with him/her about how he/she is doing). The consent form must be signed, indicating that the patient, or his/her family/guardian, has agreed to participation before the patient can become a study subject. The signed consent form will be placed in the patient's chart. Participation in the study is voluntary. Medical and nursing care will not be affected by either participation or non-participation. There are no costs to the patient

associated with the study. The subjects may benefit from the additional time spent with them by a registered nurse and the opportunity to discuss their hospitalization.

Confidentiality. Strict confidentiality of all data gathered for this study must be maintained. The only identification on the assessment forms will be the subject's study number. Raters need to check to be certain the identification number is on the assessment forms. The subject's name, study identification and medical records numbers will be recorded in a special notebook which will be accessible only to the primary researchers; this notebook will be destroyed when the study is completed.

Data collection schedule. It is important for the research that subjects be assessed twice every day during the designated data collection hours of 0700-1100 and 1500-2100. It will be necessary to indicate on the forms the start and finish time for each subject for each assessment period, as well as the rater's code number.

Completing the forms. The research process will be facilitated by completing all the items on the designated forms each assessment period. There may be times when the subject appears to be uncomfortable with the data collection process. If, in your professional judgement this is occurring, attempt to discover the cause of the discomfort and remedy the situation if possible. If the subject continues to be uncomfortable, in spite of your efforts, discontinue the collection of any data for which the

subject's cooperation is required at that time, and record your observations. The subject may be told that you, or another rater, will return during the next data collection period. When data are not available or cannot be obtained, record -99 in their stead.

Communicating with the nursing staff. The nurses on 4C and 6SW are aware of our study and are supportive of its purposes. We will strive not to interfere with patient treatment or care. This may require that we juggle our various subject assessments around the subjects' other scheduled activities. It will be necessary to communicate with subjects' nurses in order to obtain the information regarding urinary continence within the past 24 hours; we will share the vital signs (TPR and BP) results, by noting them on the "Temp Board", so that these assessments are not duplicated by the staff nurses. It will be important for the study results that we do not obtain the nurses' impressions regarding a subject's mental status before all the research data for a specific subject has been recorded.

Subjects transferred. We will continue to do our assessments on subjects who are transferred to other nursing units, with the exception of those who go to the critical care center (CCC). All nursing units have received information regarding the research project. If nurses on the unit to which a subject has been transferred are unfamiliar with the study, please explain the study briefly and

succinctly. Refer any problems or questions you are unable to answer to Georgene Siemsen or Colleen Lucas.

Researcher resources. A copy of this resource manual, which includes the study protocol, instructions for using all assessment instruments, and telephone and pager numbers for Georgene Siemsen and Colleen Lucas, will be available with the data collection materials on 4C and 6SW. Please contact any of the primary researchers for assistance with research-related questions or problems (yours or those of the staff or subjects).

Problematic issues. Occasionally a researcher/data collector becomes aware of patient care or staff issues that seem too important to ignore, but may not be directly related to the research project. If such a situation should occur, please contact either Georgene Siemsen or Colleen Lucas for consultation regarding any action to be taken.

Assessment Forms

NEECHAM assessment. The NEECHAM information is intended to be gathered as part of a patient's regular nursing care. It incorporates several usual assessments, such as level of consciousness, orientation, and vital signs, along with notations regarding memory, appearance, and oxygenation. Assessments of subjects usually will be done in the course of checking their vital signs. The raters' assessment data will be utilized by the nursing staff and the duplication of

assessment time and effort, and possible inconvenience to the patient/subject will be avoided.

Cues or suggestions regarding positive approaches to the several sections of the questionnaire are printed on the form. The data collector completes the form from information obtained through observation, verbal interaction with the subject, measurement devices (TPR, BP, O_2 Sat.), or from the subject's nurse (urinary continence). Data for the NEECHAM Confusion Scale can be collected in any sequence, and the less obtrusive, interruptive, or time consuming the better. It has been suggested that by beginning with the vital signs assessments, most of the other data can be gathered in the course of doing these usual nursing tasks. The data collector should record the assessment ratings directly onto the forms while at the bedside, without delay. It is very important for this study that the NEECHAM ratings be done before proceeding to the second section of the data collection form, Self-Perceived Mental Clarity.

It is also important that each data collector use her/his own judgement regarding the ratings. We will have opportunities to practice using the NEECHAM in the classroom and in field practice before we actually rate study subjects. If you have questions regarding this assessment form at any time during the study please ask one of the primary researchers.

Self-Perceived Mental Clarity. It is important to learn what subjects think about their own mental clarity. We are

interested in what types of thinking problems subjects are experiencing and how they feel about any situations that are troublesome. Any disturbing dreams subjects experience are also important to note and describe.

It is helpful to assure subjects that many patients experience some temporary problems with their ability to think clearly while they are hospitalized. Conjecture regarding the cause of any confusion, or disturbing dreams, and prognosis of these symptoms is to be avoided. Reflective statements indicating understanding of their feelings, and expressions of caring may be reassuring.

Folstein worksheet. This worksheet will be completed during the first assessment period after a subject has been admitted. Some subjects will have a second Folstein done at a time that will be indicated on your assignment sheet. Whenever the Folstein is scheduled it must be completed after you have finished with the NEECHAM and Self-Perceived Mental Clarity for that subject.

The Folstein assessments require responses to some items that are different from usual nursing assessments. A statement about all of the items being important, along with understandable explanations for some of the items, such as "drawing helps us check your muscle strength (or, eye and hand coordination)", will usually be useful in gaining the subjects' cooperation.

Post-Discharge chart audit. The information on the Post-Discharge Chart Audit form will be obtained by a

specially-assigned data collector from charts of discharged subjects. Completion of this form will require review of the Face Sheet, Admission Data Sheet, Patient Care Record, the Admission Medical Assessment, and the Medical Progress Notes. Careful reading of the narrative descriptions and accurate notation of the pertinent data, including dates and times, is essential in order to collect all of the available data relevant to the research efforts.

Physiological Measurements

Temperature, pulse, respiration, blood pressure, and oxygen saturation data are to be recorded as part of the NEECHAM assessment. The instruments used to check blood pressure will be the sphygmomanometers used for all patients on the study units. Data collectors will have a portable pulse oximeter available to assess oxygen saturation levels and an electronic thermometer to check temperatures. Wall clocks or the raters' personal watches will be used to count pulse and respiration rates.

It is recognized that vital signs are very common nursing assessments and that nurses may vary somewhat in their techniques for obtaining these measurements. During this study we will adhere to the manufacturer's guidelines for use of the electronic thermometer and pulse oximeter to obtain the temperature and oxygen saturation percentage. Protocols to be used for obtaining blood pressure and pulse and respirations assessments are included in this manual.

Guidelines for consistency between raters in obtaining vital signs measurements are as follows:

1. Temperatures will be taken orally whenever possible; axillary temperatures will be taken if the oral route is not possible;
2. Pulses will be radial and counted for one minute;
3. Respirations will be counted for one minute;
4. Blood pressure will include systolic and diastolic (last audible sound) readings.

Use of the pulse oximeter and electronic thermometer will be demonstrated in the classroom and opportunity will be provided for practice with these instruments. The manufacturers' directions, as well as spare batteries and extra printer paper for the pulse oximeter, will be available with the data collection supplies in the principal investigator's office. Temperature, pulse, respirations, and blood pressure measurements will be demonstrated, using the study protocols; raters will practice all aspects of data collection, including the physiological measurements, and be checked for consistency of results (interrater reliability) in the classroom, using each other as subjects, before data collection for the study is begun.

Protocols for Physiological Assessments

Temperature (Adapted from Lane Community College Nursing Fundamentals, NUR 106A,B, 1989, p.139). Normal temperature for adults is 36.0-37.0 C. All temperatures will be measured

with an electronic thermometer and recorded in degrees Celsius; temperatures will be taken orally whenever possible, with axillary being the next preferable site.

Electronic thermometers employ a sensor protected by a cover that permits accurate measurement of extremely small changes in temperature. The temperature is recorded on a lighted panel approximately 20 seconds after placement.

Technique: ORAL	AXILLARY	RECTAL
1. Insert oral probe firmly into probe cover	Same --use oral probe	Use rectal probe, lubricate tip of probe cover
2. Instruct subject to partially open his/her mouth	Explain to subject	Explain to subject
3. Slowly slide probe under the front of the subject's tongue and along the gum line, to the sublingual pocket at the base of the tongue; lips should be at the step on the probe cover. Accurate temperatures may be obtained with the mouth open.	Expose axilla, pat dry. Place probe in armpit and cross arm tightly over chest.	Turn subject on side and flex knee. Insert probe 0.5 inch to 1.5 inches into rectum.
4. Hold probe in position until the audible signal indicates the maximum temperature has been reached.	Same	Same
5. Remove probe, record reading.	Same	Same
6. Depress the ejection button to dispose of probe cover into trash.	Same	Same
7. Record on assessment form.	Same	

Precautions for oral temperatures: (1) probe must contact tissues covering sublingual artery, (2) probe cover must be installed securely, (3) tip of probe should not contact teeth or dentures during measurement period.

Pulse (Adapted from Kozier & Erb, 1987, pp. 778-781). Radial pulses will be used in this study. Normal range for adults is 60-100.

Technique:

1. Subject should assume a comfortable position.
2. Palpate radial artery, on thumb side of inner aspect of subject's wrist, with the three middle fingers.
3. Count pulsations for one minute.
4. Note whether the pulse rhythm is regular or irregular; do not count pulsation of infrequent premature contractions.
5. Record pulse rate and rhythm notation on assessment form.

Respirations (Adapted from Kozier & Erb, 1987, pp. 788-789). Normal range for adults is 14 to 22 breaths per minute.

Technique:

1. Place a hand against the subject's chest to feel the chest movements or place the subject's arm across his/her chest and/or observe the chest movements.
2. Count the respirations for one minute; an inhalation and an exhalation count as one respiration.

3. Note whether there are apneic periods; if so, note the length of time between breaths.
4. Note the number of respirations and information about apnea on the assessment form.

Blood pressure (Adapted from Kozier & Erb, 1987, pp.790-796). Adult normal blood pressure range is 100-160/50-90. For purposes of this study blood pressures will be measured with inflatable cuffs, wall-mounted mercury manometers, and a stethoscope. The cuff bladder size must be the correct width and length for the subject's arm in order to obtain an accurate reading. The width of the bladder should be 40% of the circumference, or 20% wider than the diameter of the midpoint of the arm. To determine appropriate size: (1) lay the cuff lengthwise at the midpoint of the upper arm; (2) hold the outermost side of the bladder edge laterally on the arm, (3) with the other hand, wrap the width of the cuff around the arm and determine whether the width is 40% of the arm circumference. The length of the bladder should be sufficiently long to almost encircle the arm and cover from 60% to 100% of its circumference, preferably 80%.

Technique:

1. Apply cuff smoothly and firmly to middle portion of upper arm, position arm so that antecubital area is accessible for auscultation with stethoscope.
2. Pump the cuff up to about 30 mm Hg above the point where the last sound is heard.

3. Release the pressure slowly while listening with the stethoscope over the antecubital space to detect sounds of blood flowing through the artery.
4. Note the first faint clear sound and the point where sounds disappear; record these as systolic and diastolic blood pressure on the assessment form.

Oxygen saturation (Adapted from Nellcor Incorporated, 1986, p. 1). The Nellcor N-10 portable pulse oximeter with adult reusable digit sensor will be used to assess oxygen saturation levels. Normal range for this study is 93-100%. Technique:

1. Press ON button to activate printer.
2. Apply sensor to subject's finger, with the Measure button on the nail side of the finger and the fingertip touching the finger stop.
3. Press Measure button; wait 10-30 seconds for reading and printout.
4. Record oxygen saturation reading on assessment form; attach printout to form.

Kozier, B. & Erb, G. (1987). Fundamentals of Nursing. pp.778-796. Menlo Park: Addison-Wesley.

Lane Community College. (1989). Nursing Fundamentals, NUR 106A,B. p 139. Eugene, Oregon.

Nellcor Incorporated (1986). User's Manual Nellcor N-10 Portable Pulse Oximeter. Hayward, California: Author.

Appendix E

Research Conference Participation

The "Collaborative Approach to the Study of Delirium in Elderly Patients" was selected to be presented in a poster session at the "Key Aspects of Elder Care" conference in Chapel Hill, North Carolina, April 11-13, 1991. All four co-researchers attended the conference and participated in the poster session.

Related Conference Activities

Virginia Neelon, of the University of North Carolina at Chapel Hill, principal investigator for an extended research project to study cognitive impairment, invited all those who presented research related to cognitive impairment to meet with her and many of her staff in their research facility. We were able to informally discuss our current projects, clarify understandings regarding use of the NEECHAM tool and the conduct of the research. An added feature was the opportunity to observe one of the Neelon research staff assess a patient using the NEECHAM scale.

A bonus to our conference participation was an invitation to attend an informal gathering of all those who assisted with the organization of the conference or who made research presentations. This provided an exceptional opportunity to meet nationally known nurse researchers and to

share information in an informal setting. This gathering was hosted by Elizabeth Tornquist, co-project director for "Moving New Nursing Knowledge Into Practice: A Continuing Education Program", editor, and lecturer at the University of North Carolina at Chapel Hill.

Summary

The preparation and presentation of the poster, attendance at the research conference, preparation of a portion of the report of our study for publication, and the opportunities to meet with Virginia Neelon and many other nurse researchers were new experiences for me. These opportunities provided practical experience in some of the basic mechanisms used for sharing and promoting nursing research.

The research conference brochure is reproduced on the following pages.

Key Aspects of Elder Care

Managing Falls, Incontinence, and Cognitive Impairment

Keynote Addresses:

A Conversation with Virginia Henderson
Virginia Henderson, AM, RN, FAAN, FRCN, Yale University

Key Aspects of Elder Care
Thelma J. Wells, PhD, RN, FAAN, FRCN, University of Rochester

Topic Speakers:

Falls
Carol C. Hogue, PhD, RN, FAAN
University of North Carolina at Chapel Hill

Incontinence
Jean F. Wyman, PhD, RN, CS
Medical College of Virginia

Cognitive Impairment
Virginia J. Neelon, PhD, RN
University of North Carolina at Chapel Hill

Using Research to Rethink Practice
Linda R. Cronenwett, PhD, RN, FAAN
Dartmouth-Hitchcock Medical Center

April 11-13, 1991
Omni Europa Hotel
Chapel Hill, North Carolina

Nurses provide care to elderly patients in a variety of settings. "Key Aspects of Elder Care," the third in a series of national conferences on research for practice, will bring together researchers, clinicians, and nurse managers to examine current research and practice in key aspects of elder care--the management of falls, incontinence, and cognitive impairment. Research presentations will be followed by discussions of the applicability of the research to practice and its implementation in health care settings.

This is an opportunity to learn, to share, and to establish connections with colleagues. Conference participants will receive practical, usable information and materials to share with others at home. Within a year they will also receive a published volume of carefully edited presentations and discussions of research based on the conference. An information center and newsletter will encourage continued discussions between clinicians and researchers.

As a new addition to the conference series, a workshop will be offered immediately before and after this conference to provide practical and individual guidance to clinicians and nurse managers interested in using the new research-based knowledge in practice (see page 10).

Keynote Speakers:

Virginia Henderson, AM, RN, FAAN, FRCN, is Research Associate Emeritus at Yale University School of Nursing. She began her long and distinguished career in nursing in 1921 as a staff nurse with the New York Visiting Nurse Society; since the early 1930's she has been teaching and writing about nursing. Her textbook *Principles and Practices of Nursing* has been a resource for nurses around the world for over 50 years. In 1956 she compiled and published the first survey of nursing research and over the next few years published the *Nursing Studies Index*, an annotated guide to nursing research from 1900 to 1959. She is perhaps the most influential nurse in the 20th century--her detailed writings on how to be a competent, caring nurse are respected not only in this country, but throughout the world. Virginia Henderson is loved and respected everywhere for her clarity of mind, her warmth and wit, and her enduring conviction that research and practice are inseparable in nursing.

Thelma J. Wells, PhD, RN, FAAN, FRCN, is Professor at the University of Rochester School of Nursing. An educator, researcher, writer, and speaker, Dr. Wells is widely known for her work in gerontological nursing. She has established master's and doctoral programs in the care of the elderly, done major studies of the elderly, and developed the role of the gerontological specialist in clinical settings. She served on the evaluation committee for the Robert Wood Johnson Teaching Nursing Home Project and currently serves as a peer reviewer for other nationally funded research projects. As a speaker, Dr. Wells shares her wealth of knowledge on the key aspects of elder care with humor, illustrations and charismatic energy.

Topic Speakers:

Carol C. Hogue, PhD, RN, FAAN, is Associate Professor at the University of North Carolina at Chapel Hill School of Nursing and Senior Fellow at the Center for the Study of Aging and Human Development at Duke University. She has been a Robert Wood Johnson clinical nurse scholar, is currently on the board of directors of an extended care facility, and serves as chair of the School of Nursing's Program on Aging and Care of the Elderly. Her areas of clinical interest and research include mobility, falls, medication use and functional integrity in elders.

Jean F. Wyman, PhD, RN, CS, is Director of the Graduate Program in Gerontologic Nursing and Associate Professor, School of Nursing, and Department of Obstetrics and Gynecology, School of Medicine, Medical College of Virginia, Virginia Commonwealth University. A gerontological nurse practitioner, Dr. Wyman is a clinical consultant in geriatric nursing at the McGuire Veterans' Administration Medical Center in Richmond, Virginia, and serves on the ANA Board of Certification and Committee of Examiners for Gerontological Nursing Practice and Clinical Specialists in Gerontological Nursing Practice. Her areas of clinical interest and research include behavioral therapy, pelvic muscle exercise and bladder training for treatment of urinary incontinence, and balance assessment and intervention in the elderly.

Virginia J. Neelon, PhD, RN, is Associate Professor and Director of the Biobehavioral Laboratory at the University of North Carolina at Chapel Hill School of Nursing. She serves on the Priority Expert Panel for the National Center for Nursing Research and is Chairperson of the Durham County Nursing Home Advisory Committee. Dr. Neelon's clinical and research interests include acute confusion, sleep apnea and its effects on function, and measurement of biobehavioral clinical markers. She is currently developing interventions to prevent acute confusion in the hospitalized elderly and studying the relationships between sleep apnea, vital function and functional outcomes.

Linda R. Cronenwett, PhD, RN, FAAN, is Director of Nursing Research at Dartmouth-Hitchcock Medical Center and Associate Research Professor at Dartmouth Medical School in Hanover, New Hampshire. She chaired the subcommittee that developed the Sigma Theta Tau International Research Utilization Conferences and currently serves as Chair of the American Nurses' Association Congress on Nursing Practice. In addition to conducting research in maternal and child health, Dr. Cronenwett is involved in numerous activities to facilitate staff nurses' use of nursing research.

CONFERENCE AGENDA

THURSDAY 4/11

1:00-3:00 Registration

3:00-4:30 Welcome and Introduction of Kemble Lecturer
Cynthia M. Freund, PhD, RN, FAAN, Associate Professor and Acting Dean, School of Nursing
University of North Carolina at Chapel Hill

"A Conversation with Virginia Henderson"
The 1991 Kemble Lecture
Virginia Henderson, AM, RN, FAAN, FRCN, Yale University

4:30-6:00 Cash Bar Reception

6:00-9:00 Dinner

6:00 Introduction of Distinguished Guests
Carolyn A. Williams, PhD, RN, FAAN, University of Kentucky

Overview of the Research Utilization Project
Mary T. Champagne, PhD, RN, Duke University

7:30 Intoduction of the Alpha Alpha Chapter of Sigma Theta Tau International Lecturer
Terry Lucas, MSN, RN, President, Alpha Alpha Chapter

"Key Aspects of Elder Care"
Alpha Alpha Chapter of Sigma Theta Tau International Lecture
Thelma J. Wells, PhD, RN, FAAN, FRCN, University of Rochester

FRIDAY 4/12

7:00-8:00 Coffee

8:00-10:00 **CURRENT BASES FOR PRACTICE**
Moderator: Linda R. Cronenwett, PhD, RN, FAAN
Dartmouth-Hitchcock Medical Center

FALLS
Carol C. Hogue, PhD, RN, FAAN, University of North Carolina at Chapel Hill
Sponsored by the Dana Dysmobility Program, Center for the Study of Aging and Human Development
Duke University Medical Center

INCONTINENCE
Jean F. Wyman, PhD, RN, CS, Medical College of Virginia

COGNITIVE IMPAIRMENT
Virginia J. Neelon, PhD, RN, University of North Carolina at Chapel Hill

USING RESEARCH TO RETHINK PRACTICE
Linda R. Cronenwett, PhD, RN, FAAN, Dartmouth-Hitchcock Medical Center

10:00-10:30 Break

10:30-12:00 Concurrent Sessions A and B

A. **Falls**
Moderator: Carol Hogue, PhD, RN, FAAN
University of North Carolina at Chapel Hill

Patient Slips and Falls: Assessment and Prevention
Bettie Jackson, EdD, MBA, RN, FAAN
Lawrence Krasnoff, PhD
Brian Regan, PhD
Nadine Johnson, MS, RN
Laura Ostrowsky, MUP, RN
Pamela Mentley, BSN, RN
Kathleen Whelan, MSN, RN
Montefiore Medical Center, Bronx, NY

A Risk Model for Preventing Patient Falls
Mary Soja, MSN, MA, RN
Tom Kippenbrock, EdD, RN
Ann Hendrich, MSN, RN, CEN
Allen Nyhuis, MS
Indiana University

The Postural Control Scale
Nancy E. Dayhoff, EdD, RN
Indiana University

Discussion Leaders:
Janice Janken, PhD, RN
University of North Carolina at Charlotte
Dana Hull-Hickman, MSN, RN, FNP-C
Veterans' Administration Medical Center
Durham, NC
Carol Hogue, PhD, RN, FAAN

B. **Cognitive Impairment**
Moderator: Mary Champagne, PhD, RN
Duke University

Acute Confusional States in the Hospitalized Elderly
Marquis Foreman, PhD, RN
University of Illinois at Chicago

Use of the NEECHAM Confusion Scale to Assess Acute Confusional States of Hospitalized Older Patients
Virginia Neelon, PhD, RN
Mary Champagne, PhD, RN
Eleanor McConnell, MSN, RN
John Carlson, MS
Sandra Funk, PhD
University of North Carolina at Chapel Hill

Clinical Assessment of Confusion
Patricia Vermeersch, PhD, RN
Rutgers University

Discussion Leaders:
Margot Stock, DPhil, RN
East Carolina University
Laura Pole-Trafidlo, MSN, RN
Virginia Baptist Hospital, Lynchburg, VA
Mary Champagne, PhD, RN

12:00-1:30 Lunch

1:30-3:00 Concurrent Sessions C and D

C. **Falls**
Moderator: Carol Hogue, PhD, RN, FAAN
University of North Carolina at Chapel Hill

Nursing Interventions to Reduce Falls and Fall Injuries
Merideen Maas, PhD, RN
JoEllen Ross, MA, RN
Teresa Gyldenvard, MA, RN
Jeffrey Huston, PhD
University of Iowa

A Program to Reduce Frailty in the Elderly
Elizabeth McNeely, PhD, RN
Sandra Clements, MSN, RN
Steve Wolf, PhD
Emory University

D. **Cognitive Impairment**
Moderator: Virginia Neelon, PhD, RN
University of North Carolina at Chapel Hill

Clinical Outcomes of a Nursing Intervention for Delirious Hospitalized Elderly
Eileen Sullivan, MS, RN
Christine Wanich, MSN, RN
Jerry Johnson, MD
Gary Gottlieb, MD
University of Pennsylvania

The Relationship Between Psychiatric Symptoms and Nursing Home Placement of Patients with Alzheimer's Disease
Cynthia Steele, MPH, RN
Barry Rovner, MD
Gary Chase, PhD
Marshal Folstein, MD
Johns Hopkins University

A Falls Prevention Program for the Acute Care Setting
Patricia Patterson, MS, RN, CCRN
Linda Hollinger, PhD, RN
Rush-Presbyterian-St. Luke's Medical Center

Discussion Leaders:
Katherine Moore, MSN, RN
University of North Carolina at Chapel Hill
Nancy Smith, MSN, RN
Dartmouth-Hitchcock Medical Center
Carol Hogue, PhD, RN, FAAN

Use of Special Units for Patients with Dementia
Laura Mathew, MPH, RN
University of North Carolina Hospitals
Philip D. Sloane, MD, MPH
Jaikishan R. Desai, MS
Margaret Scarborough, MPH
University of North Carolina at Chapel Hill

Discussion Leaders:
Nancy Langston, PhD, RN
University of North Carolina at Charlotte
Sharon Sells, RN
The Pines, Davidson, NC
Virginia Neelon, PhD, RN

3:00-3:30 Break

3:30-5:00 Concurrent Sessions E and F

E. Incontinence
Moderator: Jean Wyman, PhD, RN, CS
Medical College of Virginia

Selecting Patients for Toileting Programs: A Computerized Assessment and Management System
John Schnelle, PhD
Joseph Ouslander, MD
University of California, Los Angeles
M. Stan Newman, MS
Marilyn White, BSN, RN
Barbara Bates-Jenson, MSN, RN

Urodynamic Assessment of Bladder Instability in Women
Mikel Gray, PhD, CURN
Private Practice, Atlanta, GA

Skin Alterations in Elderly Women Using Disposable Adult Incontinence Briefs
Leigh A. Bertholf, BSN, RN
Kearney State College, Kearney, NE
Sue Popkess-Vawter, PhD, RN
University of Kansas Medical Center

Discussion Leaders:
Carolyn Graham, MSN, RN
Duke University Medical Center
Carol Sacket, MPH, RN
University of North Carolina Hospitals
Jean Wyman, PhD, RN, CS

F. Cognitive Impairment
Moderator: Virginia Neelon, PhD, RN
University of North Carolina at Chapel Hill

Assessing Eating Problems in Alzheimer's Patients
Joanne Muir, BSN, RNC
Kate Musallam, BSN, RNC
Mary Tulley, BA, RN
Sally Young, RNC
National Institutes of Health, Bethesda, MD

Decreasing Demented Older Adults' Need for Assistance with Dressing
Cornelia Beck, PhD, RN
Patricia Heacock, PhD, RN
Susan Mercer, DSW
Chris Walton, MNSc, RN
University of Arkansas for Medical Sciences

Work Therapy: A New Approach to the Care of Alzheimer's Patients Living in the Community
Brenda Ebbitt, MS, RN
Theressa Burns, OTR
Renee Christensen, MS, RN
Jean Buell, OTR
Alzheimer's Disease Clinical Research Center, Minneapolis, MN

Discussion Leaders:
Eleanor McConnell, MSN, RN
Veterans' Administraton Medical Center
Durham, NC
Ruth Ouimette, MSN, RN
Carol Woods Retirement Community
Chapel Hill, NC
Virginia Neelon, PhD, RN

5:00-7:00 Cash Bar Reception
Displays and Demonstrations

Dinner on own

SATURDAY 4/13

7:00-8:00 Coffee

8:00-9:30 Concurrent Sessions G and H

G. Incontinence
Moderator: **Jean Wyman**, PhD, RN, CS
Medical College of Virginia

Patterned Urge-Response Toileting for Urinary Incontinence
Joyce Colling, PhD, RN, FAAN
Oregon Health Sciences University
Joseph Ouslander, MD
University of California, Los Angeles
Betty Jo Hadley, PhD, RN
University of Cincinnati
Emily B. Campbell, MS, RN
University of Wisconsin-Madison
Joan Eisch, MSN, RN, FNP
State University of New York/Binghamton

Urine Control by Elders: Noninvasive Strategies
Betty D. Pearson, PhD, RN, CA
University of Wisconsin-Milwaukee
Jan Larson, MS, RN, ANP
Consultant, Appleton, WI

Reduction of Incontinence Among Elderly in Long Term Care Settings
Diane A. Smith, MSN, CRNP
Diane Newman, MSN, CRNP
Golden Horizons, Newtown Square, PA
Joann McDowell PhD, RN
Benedum Geriatric Center, University of Pittsburgh
Louis Burgio, PhD
University of Pittsburgh

Discussion Leaders:
Catherine Propst, BSN, RN
Moses Cone Memorial Hospital
Greensboro, NC
Jack Schnelle, PhD
University of California, Los Angeles
Jean Wyman, PhD, RN, CS

H. Cognitive Impairment
Moderator: **Virginia Neelon**, PhD, RN
University of North Carolina at Chapel Hill

Cognitive Impairment Among Elderly Newly Admitted as Patients of a Visiting Nurse Association
Cheryl Dellasega, PhD, CRNP
Pennsylvania State University
Deborah Moore, MSN, RN
Visiting Nurses Association, Cleveland, OH

Stressors and Strategies Associated with Giving Care to Alzheimer's Patients
Brenda L. Cleary, PhD, RN, C
Texas Technical University Health Sciences Center

Clinical Assessment of Mutuality and Preparedness of Family Caregivers for Frail Older People
Patricia Archbold, DNSc, RN, FAAN
Barbara Stewart, PhD
Oregon Health Sciences University
Merwyn Greenlick, PhD
Center for Health Research, Kaiser Permanente Portland, OR
Thersa Harvath, MS, RN
Oregon Health Sciences University

Discussion Leaders:
Virginia Stone, PhD, RN, FAAN
Duke University
Jodi Clipp, PhD, RN
Center for the Study of Aging and Human Development, Duke University
Virginia Neelon, PhD, RN

9:30-10:00 Break

10:00-11:30 Concurrent sessions I and J

I. Incontinence
Moderator: Jean Wyman, PhD, RN, CS
Medical College of Virginia

The Effect of Graded Exercise on Pressures Developed by the Pelvic Muscles
Molly Dougherty, PhD, ARNP
Kevin Bishop, BSN, ARNP
Ruth Mooney, PhD, ARNP
Phyllis Gimotty, PhD
Bradford Williams, MD
University of Florida

Pelvic Muscle Exercise Treatment for Elderly Incontinent Women
Carol A. Brink, MPH, RN
Thelma J. Wells, PhD, RN, FAAN, FRCN
University of Rochester
Ananias C. Diokno, MD
William Beaumont Hospital, Royal Oak, MI

Treatment of Stress Incontinence with Pelvic Floor Exercises and Biofeedback
Patricia A. Burns, PhD, FAAN
Kevin Pranikoff, MD
State University of New York/Buffalo
Thomas Nochajski, PhD
Research Institute on Alcoholism, Buffalo, NY
Patricia Desotelle, BSN
M. Kay Harwood, BA
State University of New York/Buffalo

Discussion Leaders:
Christine Heine, MS, RN, C
Old Dominion University
Deborah Lekan-Rutledge, MSN, RN
University of North Carolina at Chapel Hill
Jean Wyman, PhD, RN, CS

J. Falls
Moderator: Carol Hogue, PhD, RN, FAAN
University of North Carolina at Chapel Hill

Managing Falls: Identifying Population-Specific Risk Factors and Prevention Strategies
Kathleen Hesline, MScN
Mario Jacques, RN
Colleen Leckie, RN
Joyce Mullin, BScN
Karen Perkin, BScN
Heather Thornton, RN
Lynn Wick, RN
St. Joseph's Hospital, London, Ontario

Elderly Exercise: Relationship to Ambulatory Function, Fall Behavior, and Well-Being
Betty J. Reynolds, EdD, RN, GNP, ANP
University of North Carolina at Wilmington
Corre J. Garrett, EdD, RN, CCRN
East Carolina University

Reducing Restraints: One Nursing Home's Story
Lois Evans, DNSc, RN
Neville Strumpf, PhD, RN, FAAN
University of Pennsylvania

Discussion Leaders:
Virginia Newburn, PhD, RN, C
University of North Carolina at Greensboro
Teepa Snow, MS, OTR-L, FAOTA
Veterans' Administration Medical Center
Durham, NC
Carol Hogue, PhD, RN, FAAN

11:30-12:30 **NEW APPROACHES TO MANAGING ELDER CARE: A DISCUSSION OF THE RESEARCH**
Moderator: Carolyn Williams, PhD, RN, FAAN, University of Kentucky

Lois Evans, DNSc, RN, University of Pennsylvania
Thelma Wells, PhD, RN, FAAN, FRCN, University of Rochester
Mary Champagne, PhD, RN, Duke University

CONCLUDING REMARKS
Laurel Archer Copp, PhD, RN, FAAN
University of North Carolina at Chapel Hill

12:30-1:30 Lunch

POSTERS

Falls

Identifying Patient Fall-Risk Factors
Cynthia Mersmann, MSN, RNC; Marian T. Mignano, MPS, BSN, RN; Jacqueline M. Schnur, MA, RN; Janet B. Kelly, MA, RN; Ellen Graham, MA, RN; Diane Janovas, BA, RN, New York University Medical Center

The Predictive Value of a Falls Assessment Tool
Hollis Sensenig, RN, CRRN; Diane Donaher, MSG, RN; Hillel Rubinsky, PhD, Magee Rehabilitation Hospital, Philadelphia, PA

A Research Utilization Project to Decrease Patient Falls
Nancy Smith, MSN, RN; Virginia Kilpack, PhD, RN; Judy Boehm, MSN, RN; Bridget Mudge, MS, RN, Dartmouth-Hitchcock Medical Center

Incontinence

The Effectiveness of Pelvic Muscle Exercises in the Treatment of Urinary Incontinence: A Meta-analysis
Kathleen S. Cannella, PhD, RN; Atlanta Veterans' Administration Medical Center, Decatur, GA, and North Georgia College

Nursing Personnel's Knowledge of and Attitudes Toward Urinary Incontinence in the Elderly
Margaret Freundl, MSN, RN, CS, VA Medical Center, Allen Park, MI; Janet Dugan, MS, RN, Good Samaritan Hospital, Dayton, OH

An Epidemiological Study of Urinary Incontinence Among Hospitalized Patients
Edward J. Halloran, PhD, RN, FAAN, University of North Carolina at Chapel Hill; Margaret England, PhD, RN; Susan Whitman, MS, RN; Marylou Kiley, PhD, RN, Case Western Reserve University

Forced Expiration as a Provocative Maneuver for the Quantification of Urine Loss
Ruth Mooney, PhD, C, ARNP; Molly Dougherty, PhD, ARNP, University of Florida

Urinary Continence Status of Newly Admitted Nursing Home Residents
Mary Palmer, PhD, RNC, National Institute on Aging, Baltimore, MD; Pearl German, ScD, Johns Hopkins University; Larry Brant, PhD, National Institute on Aging; Joseph Ouslander, MD, University of California, Los Angeles, and the Jewish Homes for the Aging of Greater Los Angeles

Cognitive Impairment

Care of Institutionalized Geriatric Patients
Linda Edgar, MSc(A), RN; Sir Mortimer B. Davis-Jewish General Hospital, Montreal, Quebec

The Effects of Spouse Death on Elders' Activities of Daily Living, Self-Care and Need for Caregiver
Marge Hegge, EdD, RN, South Dakota State University

Acute Confusion in Elderly Postoperative Patients
Brenda L. Jordan, BSN, RN; Maureen Giuffre, PhD, RN, Charlotte Wilkinson, BA, RN, Dartmouth-Hitchcock Medical Center

Assessment of Subtle Changes in Cognition in Hospitalized Elders
Don Kautz, MSN, RN, CS, CRRN; Robyn Cheung, MSN, RN, CCRN; Mary K. Walker, PhD, RN, University of Kentucky

Predictors of Burden Among Caregivers of the Elderly
Linda Lepage, MScN; Jocelyne Bureau, MSS; Gaby Carrier, MSS; Veilleux Marie-France, MSS, Universite Laval, Quebec

The Relationship Between the Components of Cognitive Function and Functional Status in a Group of Non-Institutionalized Elderly
Marilyn Loen, MS, RN, Metropolitan State University, St. Paul, MN

Time, Work, and Frustration: Nurses' Perceptions of Caregiving to Confused Patients
Ruth Ludwick, MSN, RN; Mary Scott, MSN, RN, Kent State University

In the Trenches: Nursing Home Employment from the Perspective of Nurses' Aides
Rita Short Monahan, EdD, MSN, RN; Sue McCarthy, MS, RN, Oregon Health Sciences University

Primary Nurse Ratings of Nursing Care Needs of Elderly Patients
Katherine Moore, MSN, RN; Mary Champagne, PhD, RN; Virginia Neelon, PhD, RN; Lynne Bresler, MPH, University of North Carolina at Chapel Hill

Acute Confusion in Two Types of Elderly Hip Surgery Patients
Beverly Raway, MSN, OSB, RN, Catholic University of America

Delirium in Elderly Hospitalized Patients
Georgene C. Siemsen, MS, RNC; Colleen Lucas, MN, RN, CS, Good Samaritan Hospital and Medical Center, Portland, OR; Judy Miller, PhD, RN, C; Annette Newman, MS, RN, Oregon Health Sciences University

Use of Cognitive Assessment to Predict Rehabilitation Potential of Stroke Patients
Rebecca A. Sisson, PhD, RN, University of South Florida

Methods of Measuring Height in the Elderly
Barbara Trapp-Moen, MSN, RN, Carol Woods Retirement Community, Chapel Hill, NC; Betty Hanrahan, MSN, RN, Shoreline Community College, Seattle, WA; Virginia Neelon, PhD, RN, University of North Carolina at Chapel Hill

ADVISORY COMMITTEE AND CONFERENCE TEAM

Presentations and posters for this conference were reviewed and selected by the advisory committee, the panel of content experts, and the conference staff at the University of North Carolina at Chapel Hill School of Nursing. This conference is part of a project "Moving New Nursing Knowledge Into Practice: A Continuing Education Program" funded by the Division of Nursing, DHHS, Grant # 1 D10 NU24318-01, and is recipient of the 1990-91 Sigma Theta Tau International Region Seven Research Utilization Award.

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University of Kentucky

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Director of Nursing Research
Dartmouth-Hitchcock Medical Center
Hanover, NH

Cynthia M. Freund, PhD, RN, FAAN
Associate Professor and Acting Dean, School of Nursing
University of North Carolina at Chapel Hill

CONTENT EXPERTS

Falls
Carol C. Hogue, PhD, RN, FAAN
Associate Professor
University of North Carolina at Chapel Hill

Incontinence
Jean F. Wyman, PhD, RN, CS
Associate Professor
Medical College of Virginia

Cognitive Impairment
Virginia J. Neelon, PhD, RN
Associate Professor
University of North Carolina at Chapel Hill

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Southern Nursing Research Society

IN COOPERATION WITH:

American Nurses' Association
- Council of Clinical Nurse Specialists
- Council of Gerontological Nursing
- Council of Nurse Administrators
- Council of Nurse Researchers

Research Poster

The poster was displayed, along with several others, from 0700 hours until 1330 hours on the second day of the conference, coinciding with presentations by Marquis Foreman, Virginia Neelon, and Patricia Vermeersch (read by Eleanor McConnell) on the topic of cognitive impairment. All poster-presentors for this topic were introduced to the conference participants and were included in the discussion that followed the formal presentations.

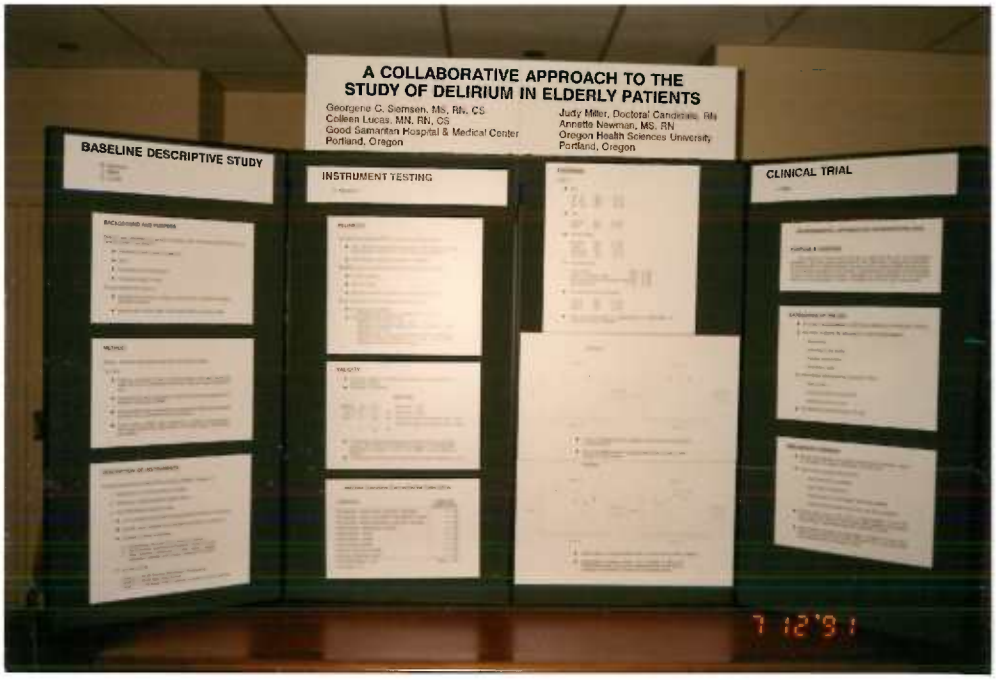
Informal viewing of the poster generated considerable interest with many conference participants pausing to discuss the study. A printed handout summarizing the study was provided to supplement the abstract contained in the conference manual. Among those particularly interested in our poster were Mary Champagne, co-developer with Virginia Neelon, of the NEECHAM Confusion scale, and Eleanor McConnell and Katherine Moore who both have been involved in the study of cognitive impairment led by Virginia Neelon at the University of North Carolina at Chapel Hill.

Each of the four panels of the poster displayed data pertaining to a major aspect of the study, as prepared by the researcher(s) responsible for that particular area of the project. On the following pages please find:

- A photograph of the poster
- The conference schedule noting the poster display

- A summary of the results of the reliability and validity testing of the NEECHAM Confusion scale, from which the poster "Instrument Testing" content was derived
- The text of the entire poster
- The handout summarizing the study

Research Poster



FRIDAY 4/12

10:30-12:00 Concurrent Sessions A and B

A. Falls - *Europa C*
Moderator: Carol Hogue, PhD, RN, FAAN
University of North Carolina at Chapel Hill

Patient Slips and Falls: Assessment and Prevention *(p. 31)*
Bettie Jackson, EdD, MBA, RN, FAAN
Lawrence Krasnoff, PhD
Brian Regan, PhD
Nadine Johnson, MS, RN
Laura Ostrowsky, MUP, RN
Pamela Meadey, BSN, RN
Kathleen Whelan, MSN, RN
Montefiore Medical Center, Bronx, NY

A Risk Model for Preventing Patient Falls *(p. 57)*
Mary Soja, MSN, MA, RN
Tom Kippenbrock, EdD, RN
Ann Hendrich, MSN, RN, CEN
Allen Nyhuis, MS
Indiana University

The Postural Control Scale *(p. 21)*
Nancy E. Dayhoff, EdD, RN
Indiana University

Posters (displayed in Lobby 7:00 AM - 1:30 PM):
Identifying Patient Fall-Risk Factors *(p. 39)*
Marian T. Mignano, MPS, BSN, RN; Cynthia Mersmann, MSN, RNC; Jacqueline M. Schnur, MA, RN; Janet B. Kelly, MA, RN; Ellen Graham, MA, RN; Diane Janovus, BA, RN; Therese E. Meehan, PhD, RN, New York University Medical Center

The Predictive Value of a Falls Assessment Tool *(p. 52)*
Hollis Sensenig, RN, CRRN; Diane Donaher, MSG, RN; Hillel Rubinsky, PhD, Magee Rehabilitation Hospital, Philadelphia, PA

Discussion Leaders:
Janice Janken, PhD, RN
University of North Carolina at Charlotte
Dana Hull-Hickman, MSN, RN, FNP-C
Veterans' Administration Medical Center
Durham, NC
Carol Hogue, PhD, RN, FAAN

12:00-1:30 Lunch - Country Fare
Music by Dulcimer Dan
Accompanied by Tony Weatherman

B. Cognitive Impairment - *Europa A*
Moderator: Mary Champagne, PhD, RN
Duke University

Acute Confusional States in the Hospitalized Elderly *(p. 26)*
Marquis D. Foreman, PhD, RN
University of Illinois at Chicago

Use of the NEECHAM Confusion Scale to Assess Acute Confusional States of Hospitalized Older Patients *(p. 44)*
Virginia Neelon, PhD, RN
University of North Carolina at Chapel Hill
Mary Champagne, PhD, RN
Duke University, Durham, NC
Eleanor McConnell, MSN, RN
Veterans' Administration Medical Center,
Durham, NC
John Carlson, MS
Sandra Funk, PhD
University of North Carolina at Chapel Hill

Clinical Assessment of Confusion *(p. 61)*
Patricia Vermeersch, PhD, RN
Rutgers University

Posters (displayed in Lobby 7:00 AM - 1:30 PM):
Acute Confusion in Elderly Postoperative Patients *(p. 32)*
Brenda Jordan, BSN, RN; Charlotte Wilkinson, BA, RN; Maureen Giuffre, PhD, RN, Dartmouth-Hitchcock Medical Center

Practical Assessment of Cognition in Hospitalized Elders *(p. 33)*
Don Kautz, MSN, RN, CS, CRRN; Robyn Cheung, MSN, RN, CCRN; Mary Walker, PhD, RN, FAAN, University of Kentucky

Acute Confusion in Two Types of Elderly Hip Surgery Patients *(p. 48)*
Beverly Raway, OSB,MSN, RN, The Catholic University of America

A Collaborative Approach to the Study of Delirium in Elderly Patients *(p. 53)*
Georgene C. Siemsen, MS, RN, CS; Colleen Lucas, MN, RN, CS, Good Samaritan Hospital and Medical Center, Portland, OR; Judy Miller, MS, RN; Annette Newman, MS, RN, Oregon Health Sciences University

Discussion Leaders:
Margot Stock, DPhil, RN
East Carolina University
Laura Pole-Trafidlo, MSN, RN
Virginia Baptist Hospital, Lynchburg, VA
Mary Champagne, PhD, RN

A Summary of the Results of the Reliability and Validity Testing of the NEECHAM Confusion Scale

Instrument Testing

Reliability

Following a seven-hour multiphasic training program, six raters agreed on 75% of the total NEECHAM Confusion Scale items; raters differed by one point on three items. A reliability check of five raters mid-way through the data collection period found an average interrater correlation of .99 for total scores of four subjects.

Thirty paired observations made by two raters over three weeks were correlated using Pearson's product moment correlation, with r = .99 for the NEECHAM total scores. For all but one item, interitem correlations ranged from r = .78 to r = 1.00. One item, "Performance - appearance, hygiene", was identified as most problematic for scoring consistency (r = .62). Rater training requires more consideration.

NEECHAM CONFUSION SCALE

Subscale	Interitem Correlation
Processing - neurosensory (attention, alertness)	r = .87
Processing - motor (recognition, interpretation, action)	r = .89
Processing - verbal (orientation, short-term memory)	r = .92
Performance - appearance, hygiene	r = .62
Performance - motor	r = .78
Performance - verbal	r = .80
Vital function stability	r = .91
Oxygen saturation stability	r = 1.00
Urinary continence control	r = 1.00

# of observations = 30
# of raters = 2

total r = .97

Interrater agreement for the MMSE prior to beginning data collection was 94% for six raters. Six paired ratings during the study had a correlation of r = .97, comparing favorably with the reported reliability of this instrument.

Validity

The predictive validity of the NEECHAM scale was examined using Folstein's MMSE as the reference criterion (56 ratings on 21 subjects).

	NEECHAM		
MMSE	≤24	25+	
≤23	9	21	30
24+	2	24	26
	11	45	56

Sensitivity = 30%
Selectivity = 92%
Predictive value of a positive test = 81%
Predictive value of a negative test = 53%

The findings of this study suggest further testing is needed to support and improve the predictive validity of the NEECHAM, particularly in regard to use of the MMSE as the reference criterion. Of particular concern are the large number of false negatives.

Clinical Utility

The NEECHAM was found to be a clinically useful tool and was administered to every subject in this study, even those who were unresponsive or blind. The MMSE was not administered to eight subjects, 29.63%of the sample population, who were too ill, or otherwise unable, to cooperate with the response requirements.

[Note: the interrater percent agreement reported here and on pages 112 and 115, was calculated in error and not discovered until after the presentation. The accurate interrater percent of agreement following the seven-hour multiphasic program was 67%. This correction was made in the report of the study that was submitted for publication.]

Text of the Research Poster

A COLLABORATIVE APPROACH TO THE STUDY OF DELIRIUM IN ELDERLY PATIENTS

Judy Miller, Doctoral Candidate, RN
Annette Newman, MS, RN
Oregon Health Sciences University
Portland, Oregon

Georgene C. Siemsen, MS, RN, CS
Colleen Lucas, MN, RN, CS
Good Samaritan Hospital & Medical Center
Portland, Oregon

BASELINE DESCRIPTIVE STUDY

G. Siemsen
J. Miller
C. Lucas

BACKGROUND AND PURPOSE

Delirium was identified by general medicine and orthopedic staff nurses as a clinical problem resulting in:

- Interference with medical treatment
- Injury
- Increased use of resources
- Increased length of stay

Nurses initiated the study to:

- Describe the incidence, pattern and outcome of delirium in elderly medicine patients
- Examine the clinical utility of the NEECHAM confusion scale

METHOD

Design: Baseline descriptive study with instrument testing.

Overview

- Patients ≥ 65 years of age on target medical units were assessed within 48 hours of admission and twice daily throughout length of stay
- Assessments were completed using the Nursing Assessment of Mental Functioning (NAMF)
- Assessments were completed by experienced RNs who attended a seven hour multiphasic training program
- Charts were audited post discharge to obtain demographics, discharge placement, descriptions of mental status and clinical information

DESCRIPTION OF INSTRUMENTS

Nursing Assessment of Mental Functioning (NAMF) consists of:

1. Identification of impediments to mobility
2. Evaluation of self perceived mental clarity
3. The NEECHAM Confusion Scale
   - a non-invasive observational assessment of level of confusion
   - permits rapid bedside documentation of level of confusion
   - consists of three subscales:
     a. Processing neurosensory, motor, & verbal
     b. Performance appearance/hygiene, motor & verbal
     c. Vital function measures of vital signs, oxygen saturation stability and urinary continence control
   - scores of 0-30

     Level 3 = 30-25 Normal Information Processing
     Level 2 = 24-20 Mild Disturbance
     Level 1 = ≤ 19 Acute mild to severe confusion and/or delirium

INSTRUMENT TESTING

A. Newman

RELIABILITY

Six raters completed seven hour multiphasic training program:

- 75% interrater agreement achieved on NEECHAM Confusion Scale items; on three items, raters differed by one point
- 94% interrater agreement achieved on MMSE

Reliability check on NEECHAM midway through data collection:

- On four subjects
- With five raters
- Average interrater correlation of .88 for total scores

Paired observations by two raters over three weeks:

- Six ratings using MMSE
  - Revealed high interrater correlation of r = .97
- Thirty ratings using NEECHAM
  - Pearson's r for total scores = .89
  - Interitem correlations ranged from r = .78 to r = 1.00 except for one item
  - "Performance - appearance, hygiene" most problematic item for scoring consistency (r = .62). This finding resulted in training program revision.

VALIDITY

- Predictive validity of NEECHAM examined using MMSE as a reference criterion
- 86 ratings, 21 subjects

NEECHAM

MMSE	≤ 24	25+	
≤ 23	8	21	30
24+	2	24	26
	11	45	56

Sensitivity = 30%
Selectivity = 92%
Predictive value of a positive test = 81%
Predictive value of a negative test = 53%

- The findings of this study suggest that further testing is needed to support and improve the predictive validity of the NEECHAM, particularly in regard to use of the MMSE as the reference criterion.
- Of particular concern are the large number of false negatives (n=21)

NEECHAM CONFUSION SCALE INTERITEM CORRELATION

SUBSCALES	INTERITEM CORRELATION
Processing - neurosensory (attention, alertness)	r = .87
Processing - motor (recognition, interpretation, action)	r = .89
Processing - verbal (orientation, short-term memory)	r = .92
Performance - appearance, hygiene	r = .82
Performance - motor	r = .78
Performance - verbal	r = .80
Vital function stability	r = .91
Oxygen saturation stability	r = 1.00
Urinary continence control	r = 1.00

# of observations = 30
# of raters = 2

Total r = .97

CLINICAL TRIAL

J. Miller

ENVIRONMENTAL OPTIMIZATION INTERVENTIONS (EOI)

PURPOSE & OVERVIEW

The purpose of this clinical trial was to pilot test the EOI and innovation strategies. Six staff nurses participated in the refinement, testing and evaluation of the EOI with 13 elderly patients, as part of their regular patient assignments. The EOI were evaluated in terms of their effectiveness in reducing and preventing confusion with the elderly patients; feasibility for implementation in the hospital setting; and acceptability to patients, families and friends, and nursing staff.

CATEGORIES OF THE EOI

- FOCUSED ASSESSMENT & MEETING IMMEDIATE PERSONAL NEEDS
- HELPING CLIENTS TO ORGANIZE THEIR ENVIRONMENT
  - Welcoming
  - Orienting to the facility
  - Familiar environment
  - Orientation aids
- PROVIDING MEANINGFUL SENSORY INPUT
  - Staff contact
  - Family and friend involvement
  - Managing sensory input
- MAXIMIZING INDEPENDENCE IN ADL

PRELIMINARY FINDINGS

- Nurses had difficulty accurately screening for confusion, relying on indicators of patient orientation and alertness.
- Staff Nurses reported that the EOI:
  - were beneficial to patients
  - were easy to implement
  - helped them to "bond again" with their patients
  - made them feel better about the care they provided
- Overall, there was a low rate of implementation of the EOI associated with limited nurse contact with patients and frequent interruptions, especially during the admission period.
- Interventions requiring documentation of patient records were given low priority by the nurses, although they recognized that this detracted from continuity of care.

FINDINGS

SAMPLE

- Age

65 - 74	32%	(n=9)
75 - 84	45%	(n=11)
85 - 100	23%	(n=6)

- Sex

Female	55%	(n=15)
Male	45%	(n=11)

- Marital Status

Married	55%	(n=15)
Single	12%	(n=3)
Widowed	26%	(n=7)
Divorced	6%	(n=1)

- Admitted From

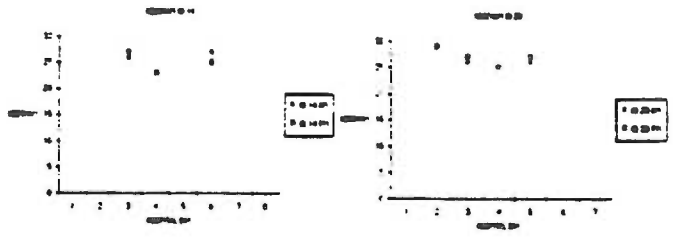
Own Home	58%	(n=15)
Other's or Foster Care	21%	(n=6)
Retirement Home or Assisted Living	8%	(n=2)
Nursing Home	11%	(n=3)

- Admission Level of Confusion

Level 3	73%	(n=19)
Level 2	12%	(n=2)
Level 1	15%	(n=4)

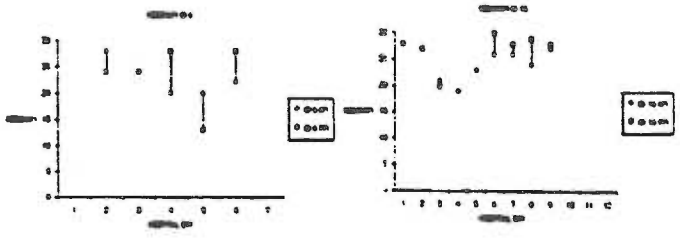
- 73% (n=19) improved or experienced no deterioration in cognitive function

Example



- 19% (n=5) deterioration in cognitive function from normal (Level 1) to mild (Level 2)
- 8% (n=2) deterioration in cognitive status from normal or mild (Level 1 or 2) to severe

Example



- Deterioration in cognitive status lasted >24 hours for 6 of the 7 patients
- Relationships between acuity, cost or length of stay and NEECHAM scores could not be determined due to the lack of variability in the levels of confusion in this small sample

Abstract of Study Distributed at Poster Session

A Collaborative Approach to the Study of Delirium in Elderly Patients

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This study involved the following components: a baseline descriptive study with instrument testing, and a pilot intervention study (Environmental Optimization Interventions). Staff nurses on a general medical unit of a large metropolitan hospital had identified the clinical problem of delirium, and nurses were interested in developing interventions for managing delirium. The descriptive baseline study examined the extent of delirium in a convenience sample of 26 patients over the age of 65 admitted to the target medical unit over a two month period. Study measures included the NAMF (Nursing Assessment of Mental Functioning) tool, consisting of the NEECHAM scale (Neelon, Champagne, McConnell, 1989), a measure of cognitive function; self-perceived mental clarity; and impediments to mobility. Subjects were examined twice daily over length of stay due to staff nurse and researchers concern about diurnal fluctuations in cognitive functioning. Other variables examined included patient acuity, length and cost of stay, environmental factors, and patient outcome. After patient discharge, patient charts were audited to obtain demographic data, identify descriptions of mental status and clinical response to hospitalization and discharge placement. The study measures were compared to current nursing practice via review of the nursing care plan and progress notes.

A seven hour multiphasic program was developed with the eventual goal of training the staff nurse in the use of the NAMF. Research assistants for this study were experienced registered nurses. At the beginning of the study, raters differed by one point on three items of the NEECHAM Confusion Scale, resulting in interrater agreement of 75%. Again during the course of the study, interrater agreement on four subjects with five raters achieved an interrater correlation of .99 for total scores. Thirty paired observations made by two raters over three weeks were correlated using Pearson's product moment correlation, with $r = .99$ for the NEECHAM total scores. One item, "Performance-appearance, hygiene", was identified as most problematic for scoring consistency ($r = .62$). This finding resulted in revision of the training program.

Validity as sensitivity and specificity was calculated using the Folstein Mini Mental Status Exam (MMSE) as the reference standard. At cutoff scores of 25 for the NEECHAM and 24 for the MMSE, sensitivity was 30% and selectivity 92%, with the predictive value of a positive test 81% and of a negative test 53%. These findings suggest that further testing is needed to support and improve the predictive validity of the NEECHAM, particularly in regard to use of the MMSE as the reference criterion.

The sample (n=26) included nine (32%) patients age 65-74 years, 11 (45%) age 74-84, and six (23%) over age 85. The average length of stay was 6.7 days (range = 1-19). Fifty-five percent of the sample was female (n=15). A majority of the sample was admitted from their own home; the balance from foster care, retirement home, assisted living or nursing home.

The admission level of confusion was 73% (n=19) admitted with normal cognitive function, 45% (n=11) with a mild disturbance and 15% (n=4) with an acute, or, moderate to severe confusion. A majority of this sample (73%, n=19) improved or experienced no deterioration in cognitive function over length of stay. A deterioration from normal to mild deficit was experienced by 19% (n=5) of the sample. A deterioration from normal or mild confusion to severe was experienced by 8% (n=2) of this sample. Deterioration in cognitive status lasted greater than 24 hours for six of the seven patients experiencing confusion.

Relationships between acuity, cost or length of stay and NEECHAM scores could not be determined due to the lack of variability in the levels of confusion in this small sample. Care must be taken to consider that this sample represents a relatively high percentage of non-impaired persons due to the inability to obtain consent from patients admitted with confusion. Therefore, the actual incidence of confusion and deterioration in mental status may well have been greater than found in the study.

The NEECHAM was found to be a clinically useful tool since it was administered to every subject in this study, even those who were unresponsive or blind. The MMSE was not administered to eight subjects (30%) who were too ill, or otherwise unable to cooperate with the response requirements. The baseline descriptive study was followed by the pilot intervention (Environment Optimization Interventions).

The intervention protocol includes the Environmental Optimization Interventions (EOI). There are four categories of EOI which were implemented by six staff nurses as part of their regular patient assignment. These categories are: focused assessment and meeting immediate personal needs, helping clients to organize their environment, providing meaningful sensory input and maximizing independence in activities of daily living. The baseline comparative information about delirium, the hospital environment, and usual nursing practice was used for comparison in the intervention component.

Appendix G

Research Article for Publication

All presentors at the research conference were encouraged to submit manuscripts for potential publication in Key Aspects of Elder Care, to be published by Springer Publishing Company in the spring of 1992. My contribution to the research article is found in the Results section. The manuscript submitted by the study group is found on the following pages, followed by the abstract of the study as it appeared in the conference manual.

A Collaborative Study of Delirium in Elderly Patients

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1991

Nursing staff on medical and orthopedic units identified problems with the management of delirious elderly patients. Increased confusion resulted in impaired safety of these older patients, including falls, interference with treatment such as pulling out IVs or urinary catheters, and inability to comply with physical mobility restrictors. The purpose of this study was to examine the incidence and severity of delirium on a medical unit and to evaluate the clinical utility of the assessment instrument.

The NEECHAM instrument was examined for its usefulness as a tool that staff nurses could use to assess delirium in hospitalized elderly patients. Of particular interest were: 1) the reliability of the NEECHAM when used by several raters, that is, could several nurses use the scale and obtain similar scores when independently observing the same patient at approximately the same time; and 2) the accuracy (predictive validity) of the NEECHAM as a screening tool for confusion when compared with the more widely used Mini-Mental State Exam (MMSE), or, said another way, what percentage of patients who were confused, according to the MMSE, had NEECHAM scores that indicated they were confused; and what percentage of patients who were not confused,

according to the MMSE, had NEECHAM scores in the non-confused range?

Definitions

In this study, confusion was viewed as maladaptive behavior which occurs as a consequence of alterations in the individual's internal and/or external environment, and this creates difficulty for the person (Foreman, 1989). There have been problems with the definition of the term confusion in the literature (Chisholm et al., 1982; Nagley & Dever, 1988), and contradictory findings as to the consistency with which nurses use and define confusion in clinical practice (Brady, 1987; Chisholm et al.; Palmateer & McCartney, 1985). Use of the medical term, delirium, alleviates some of the problem with terminology and will be used as a proxy term for confusion. Since subsequent work at the study hospital will involve interdisciplinary involvement in the development of appropriate standards of care, the term delirium was deemed more familiar to a variety of health providers. Delirium is a medical problem which has been defined and studied far more extensively than confusion in the hospitalized elderly population.

For the purposes of this study, delirium was defined as an organic brain syndrome characterized by transient, global cognitive impairment of abrupt onset and relatively brief duration accompanied by diurnal fluctuation of simultaneous disturbances of sleep-wake cycle, psychomotor behavior, attention and affect (Foreman, 1986). This definition was chosen due to its congruence with the Diagnostic and Statistical Manual of Mental Disorders, 3rd edition (DMS111-R) (American Psychiatric Association, 1987).

METHODS

The study was conducted with a convenience sample of patients over age 65 admitted to a general medicine unit over a four month period of time. The target unit was selected for the following reasons: 1) there were a relatively large percentage of elderly patients on the unit 2) staff nurses had identified delirium as a clinical problem 3) the presence of documented case types at high risk for delirium and 4) nurses were interested and had been involved in the development of interventions.

Measures

The study measure was the Nursing Assessment of Mental Functioning (NAMF) tool (see Appendix A), which

consisted of three measures: 1) the NEECHAM Confusion Scale (Neelon, Champagne, McConnell, 1989) 2) self-perceived mental clarity and 3) two items which measured impediments to mobility.

Neecham Confusion Scale

The primary measure of cognitive functioning was the NEECHAM scale. The NEECHAM scale was developed to measure disturbances in information processing, acute confusional states and delirium in hospitalized elderly patients. The NEECHAM tool has a strong, positive correlation with the Folstein Mini Mental Status Exam (MMSE) (.78) (Folstein, Folstein & McHugh; 1975), a tool widely used to detect alteration in mental function with older adults, including those with dementia. The NEECHAM scale has been tested with over one thousand observations of elderly subjects in hospital and nursing home settings (Neelon, Personal Communication, 1990). Although not initially developed for use with patients who have an underlying dementia, it has subsequently been used with such individuals. The NEECHAM tool involves both observation, and the physiological measurement of vital sign stability, oxygen saturation stability, and urinary continence control. Oxygen saturation is measured using non-invasive

pulse oximetry. The interrater reliability was high (r=.96), as well as test-retest reliability (r=.98) in stable, elderly subjects (Neelon, Champagne & McConnell, 1989).

The instrument was used to measure delirium in elderly subjects from admission throughout their hospitalization. In order to detect the diurnal fluctuations in cognitive function that may occur among elderly hospitalized persons, the instrument was administered once during the morning and again in the afternoon or early evening by members of the research team. The NEECHAM scale took less than twenty minutes to administer and placed a limited response burden on patients. Therefore, frequent administration was not viewed as problematic for the patients or for nursing assessment.

Folstein Mini Mental State Exam

Mental status was measured intermittently using the MMSE to address concurrent validity of the NEECHAM tool. The MMSE was selected as the reference standard because it is well known by multiple disciplines and is widely used by mental heath specialists as a structured screening tool for cognitive impairment. The MMSE took approximately 5-10 minutes to administer and focuses on the cognitive aspects of mental function (Folstein, Folstein & McHugh, 1975). The MMSE

measures thinking functions of orientation, registration, attention and calculation, recall, and language ability; completion of all items requires that the subject be able to see and communicate verbally and in writing. The MMSE was not administered to eight subjects (30%) who were too ill or otherwise unable to cooperate with the response requirements. Although both tools measure mental status by assessing some common factors, they also measure different factors and may compliment rather than substitute for each other.

Self-Perceived Mental Clarity

Self-perceived mental clarity was also examined. Three questions were asked of the patient about his self-perceived mental clarity and presence of disturbing dreams. These questions were included because of the importance with Lawton's model of perception on behavior (Lawton, 1982). It was recognized that older patients might be quite protective of revealing problems with mental functioning. There was the need to phrase the questions in a manner which did not cause the older person more distress. The self-perceived questions were deleted from the interview for only one subject. That patient had expressed much concern about her mental status and feared involuntary commitment to an institution. Williams

et al. (1979) found that elderly patients did respond to the question, "Do you feel mentally clear today?" The question used in this study is similar to Williams' and uses some of the descriptive phrases from her subjects for clarification (Miller, 1991).

The presence of mobility restrictors was determined because they could have had a direct effect on outcomes on the NEECHAM scale scores. These were measured using the tally of treatment devices and restraints that restricted the patient's mobility during the observation periods.

Patient acuity was determined because it was seen as a potentially important factor in the care of the delirious patient. Patient costs were calculated using available data indicating total charges after discharge.

PROCEDURES

Patient Selection

The initial criteria for the patient sample included: adults over the age of 65 who did not have a primary or secondary diagnosis of a psychiatric disorder (excluding dementia), were admitted to the study unit and from whom consent could be obtained. Twenty-nine elderly patients were admitted to the study. Over one third of potential subjects did not enter the

study due to their inability to give consent because of cognitive impairment. The short length of hospitalization and limited availability of family members severely limited the ability of the investigators to obtain consent for those patients who were markedly impaired.

Fifty-five percent of the sample were female, with an average age of 79 years (range 65-100). A majority of the sample was admitted from their own home, the balance from foster care, retirement facilities, assisted living or nursing homes.

Research Assistant Training

Research Assistants for this study were five clinically experienced registered nurses. A seven hour multiphasic program provided instruction in the research protocol and practice in using the NEECHAM, MMSE, and other assessment tools in videotaped and live patient settings. Prior to data collection the percent agreement for all raters scoring one practice subject using the NEECHAM was 67%. The total score assigned by raters differed by no more than one point. All raters agreed on scoring for six of the nine NEECHAM items and disagreed by one point on three items.

The initial training was accomplished in two half-day sessions. Ongoing communication among research assistants was maintained through a log to determine problems and questions pertaining to the use of the research instrument. A meeting of the research assistants midway through the data collection period provided a forum to discuss the use of the instrument and clarify coding (scoring) decisions.

RESULTS

Relationships between acuity, cost or length of stay and NEECHAM scores could not be determined due to the lack of variability in the levels of confusion in this small sample. Care must be taken to recognize that this sample represented a relatively high percentage of non-impaired persons due to the difficulty in obtaining consent from patients admitted with confusion. Therefore it can be assumed that the actual incidence of confusion and deterioration in mental status was greater than found in this study.

Incidence of Confusion

Twenty-seven percent of the elderly patients were found to have cognitive impairment with the initial NEECHAM assessment. Table 1 presents the fluctuations in levels of confusion, which occurred within a calendar day, across the

days of hospitalization. A comparison of days one through five shows the marked increase in changes which occurred on day 2, with a reduction and stabilization (across the sample) through day five. There are two points which need to be emphasized when reviewing these data. First, a change in the level of confusion can be an improvement or deterioration. The small number of patients for whom NEECHAM assessments were done on day one could bias the results for that day. It was found that a number of patients admitted on day one of hospitalization experienced a change in level of confusion on day two. Patients were not admitted on day 1 if family consent was required or the admission process was particularly hectic. It can be assumed that those subjects would have been more likely to experience delirium associated with physiological instability on day 1. This could partially account for the difference in the amount of fluctuations in mental status between days 1 and 2.

Insert Table 1 about here

Because of the investigator's interest in the confusion trajectory, an analysis of stability was done (Miller,1991).

Table 1

Fluctuations in Levels of Confusion Within a Day

Sample	Days of Hospitalization							
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Number of patients who have change in level	0 1*	11	7	6	3	2	2	2
Total number of patients in study with a.m. and p.m. assessment	8 9*	24	20	17	10	9	3	5
Percent of patients with change in level	0 11.1*	45.8	35.0	35.3	30.0	22.2	66.6	40.0

If include the 1 subject judged by investigator in experimental study to be at different level.

Stability was defined as the maintenance of the same level of confusion during a day for which there were two assessments completed. The number and percentage of patients with stability was examined in relation to the admitting level of confusion (Table 2). Patients admitted with early/mild confusion (level 2) were far less stable than those admitted with no confusion. Figure 1 presents examples of the confusion trajectories for elderly persons admitted with early/mild confusion.

Insert Table 2 about here

Insert Figure 1 about here

Four patients showed episodes of a marked drop in mental status as shown in Figure 2. Two of these patients were admitted with no confusion, and two were admitted with early/mild confusion. Anecdotal information was available from the research assistants about the increased confusion that occurred with these subjects. One subject had received a large dose of a tranquilizer in preparation for a diagnostic test

Table 2

Stability by Admitting Levels of Confusion Over Hospitalization

Admitting Level of Confusion (NEECHAM)	Number of patients whose level changed	Number of patients in level
Level I (severe)	2	3
Level II (mild/early)	9	10
Level III (none)	6	16

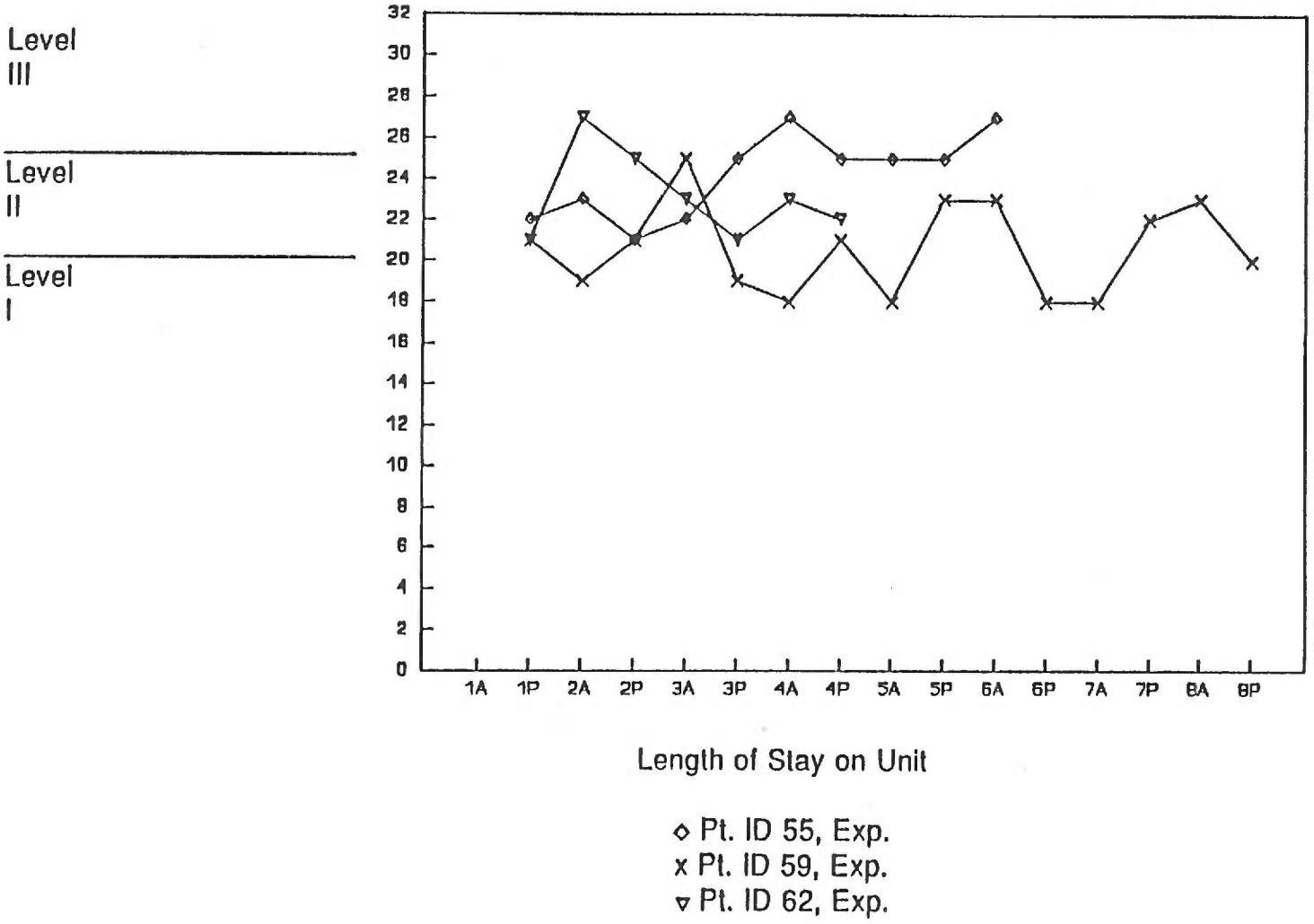

Figure 1 Subjects admitted at Level II confusion.

because she had been combative in x-ray the previous day. Another subject had episodic febrile episodes and is a good example of confusion associated with physiologic instability (Neelon, 1991). Another example of this confusion etiology is found with two subjects who experienced severe respiratory distress, first detected by research assistants.

Insert Figure 2 about here

Frequencies were used to compare the percentage of subjects who were discharged at a lower, higher, or same level of mental function from admission, and those who had no changes in their levels throughout their hospitalization. Changes in level of confusion over hospitalization must be considered with caution given the recognized limitations in sample size and composition. By discharge, approximately 75% of the patients were at the same level of confusion as when they were admitted to the study, similar to results found by Williams (1979). Thirteen percent of the sample left the hospital more confused than they were at admission. Three patients improved in their level of mental clarity from admission.

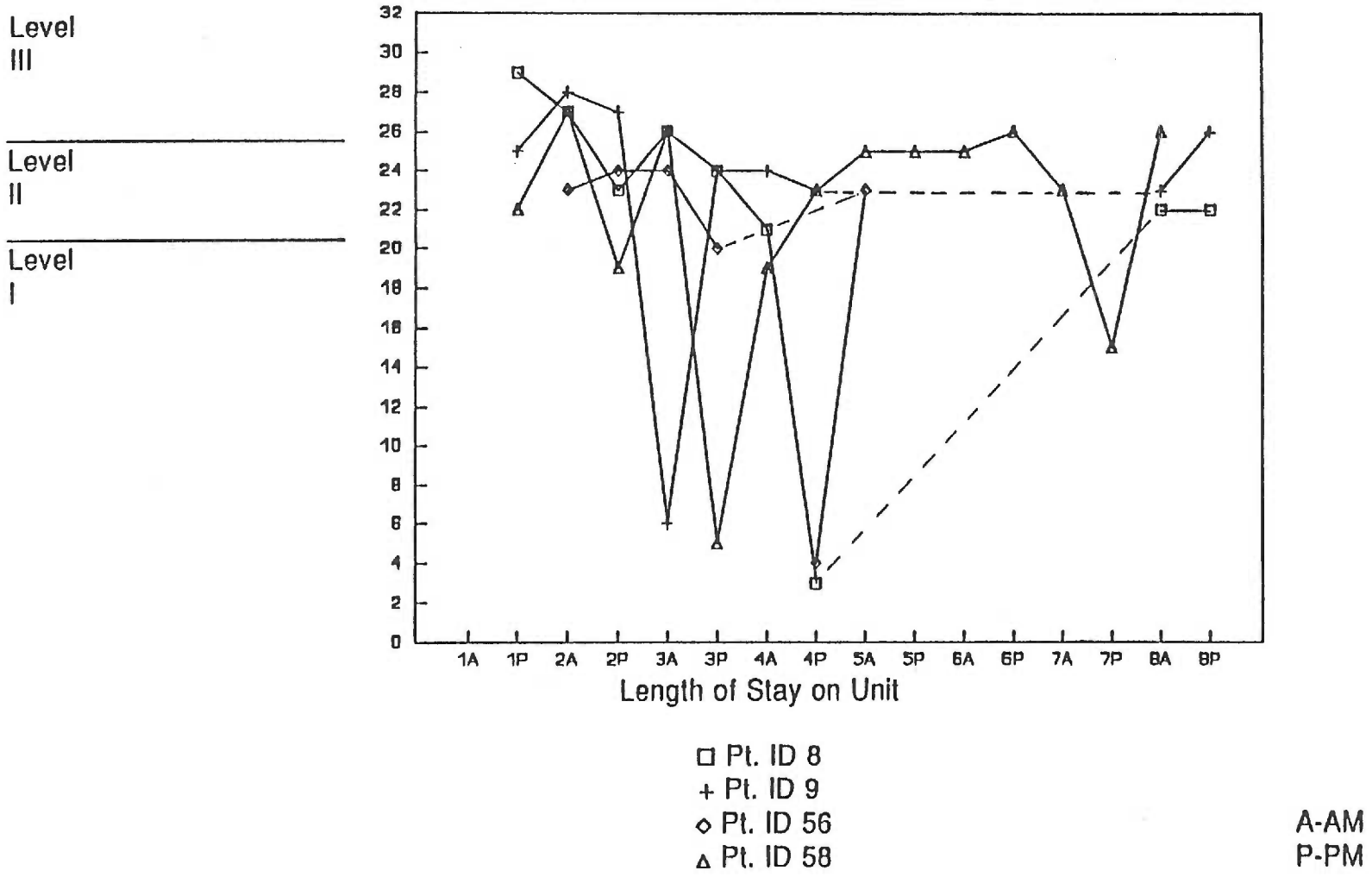

Figure 2. Patients with marked drop in mental status.

Two of the three self-perceived mental clarity items, the reports of confusion and disturbing dreams were analyzed for their sensitivity, specificity, predictive value, and clinical usefulness in comparison with the NEECHAM. The third item which asked the elderly subject to rate his mental clarity compared to the previous assessment period was not included. This decision was made because of the tendency for patients to respond that they were either better or the same. The NEECHAM levels 1 or 2 were used as the reference criteria for the presence of confusion. The sensitivity of the self-report of confusion question in discriminating between confused and non-confused patients was 58.8%, and that of the report of troubling dreams, 70%. There were seven occasions when subjects were unable to answer the self report of confusion question. If it is assumed that the individuals who were not able to answer were limited because of altered mental status, then the sensitivity was increased to 70.8%. This assumption was used by Neelon (1991) with her questions of self-perceived mental clarity. The same assumption with the dream question resulted in a sensitivity of 80% (five occasions when subjects were unable to respond). The specificity, or ability of the questions to identify the absence of confusion,

were a low 42% and 39.3% respectively. The predictive value of a positive test, when the self-perceived questions correctly identified confusion when it was present, was 25% for the confusion question, and 15.9% for disturbing dreams (not including those who were unable to respond).

Neecham Instrument Testing

A mid-study reliability check of five raters using the NEECHAM to assess four subjects found excellent interrater correlation (.99). The percent agreement on total scores, a more conservative measure of reliability, was 70%. Raters varied by as many as four points on total scores for one subject.

Thirty paired observations made by two raters over a three-week period were highly correlated for the NEECHAM total scores (Pearson's product moment correlation, $r = .97$, $p < 0.001$), and consistent with reported interrater reliability (Champagne, Neelon, McConnell, & Funk, 1987). The percent agreement for total scores was 100% in relationship to the cut-off score of 24 or less indicating confusion. For all but one item, scoring agreement was good, ranging from $r = .78$ to $r = 1.00$. The correlations tended to be at the lower end of the range for those items which involved the observation of patient

behaviors. The most problematic item was "Performance/appearance, hygiene" with an interitem correlation of r =.62. The lower correlation on this item and the other two performance items may have been due to a greater degree of subjective judgement required to score performance and the tendency of less-experienced raters to score high by awarding points for the best observed behavior rather than for the most impaired (V. J. Neelon, Personal communication, 12/10/90). Information regarding the need to score performance items at the lowest observed level was subsequently provided to all raters two-thirds of the way through the data collection period.

Insert Table 3 about here

Among all raters, the interrater agreement for the MMSE prior to beginning data collection was good (94%). Six paired assessments during the study had a high correlation (Pearson's product moment, r =.97, $p<0.001$), comparing favorably with the reported reliability of this instrument (Folstein, Folstein, & McHugh, 1975).

Table 3

Reliability Assessment of Items within the NEECHAM CONFUSION SCALE

Items	Interitem Correlation
Processing - neurosensory (attention, alertness)	r = .87
Processing - motor (recognition, interpretation, action)	r = .89
Processing - verbal (orientation, short-term memory)	r = .92
Performance - appearance, hygiene	r = .62
Performance - motor	r = .78
Performance - verbal	r = .80
Vital function stability	r = .91
Oxygen saturation stability	r = 1.00
Urinary continence control	r = 1.00
# of observations = 30	total r = .97
# of raters = 2	for all items
	p<0.001

NEECHAM as a Screening Tool

The concurrent and predictive validity of the NEECHAM, a form of criterion-related validity, was examined using the Folstein's MMSE as the reference criterion. The purpose was to determine to what extent the NEECHAM total scores when compared with the MMSE total scores, obtained at approximately the same time, identified subjects as being either confused or not confused. It is recognized that there was potential for bias (criterion contamination) since the same raters administered both the NEECHAM and the MMSE. This was compensated for by always using the NEECHAM first; scores were not totaled until all data for the study were collected.

The selection of a cut-off score to designate the presence or absence of confusion represents a considered decision to balance the effects of false negative and false positive results. NEECHAM scores of 24 or less indicate confusion, while MMSE scores of 23 or less indicate cognitive impairment. Neelon (V. J. Neelon, personal communication, 4//13/91) reported that subjects with NEECHAM scores of 27 or higher on admission did not develop confusion unless there was some catastrophic occurrence.

Sensitivity is the ability of the NEECHAM to correctly identify the individuals who were confused and specificity is the ability to correctly identify the individuals who were not confused. Using the MMSE as the reference criterion, this study found the sensitivity of the NEECHAM to be 30% and specificity to be 92% (see Table 4). This is in contrast to the reported sensitivity of 95% and specificity of 78% of the NEECHAM (Neelon, Funk, Carlson, & Champagne, 1989). The predictive value of a positive test is the probability that when a test is positive, confusion is truly present.

Insert Table 4 about here

These differences may be due to use by Neelon, et al. of additional reference criteria other than the MMSE, a different subject population, the small sample size in this study, or different raters. Because the greater personal risk to the patient lies in not identifying confusion and properly treating its etiology, it is preferable that the screening tool identify a higher percentage of those who have confusion, or some degree of cognitive impairment (risk having more false positives) than to set the cut-off to obtain a higher percentage of specificity

Table 4

Sensitivity and Specificity of the NEECHAM

	NEECHAM			
	<24	25+		
<23 MMSE	9	21	30	Sensitivity = 30% Selectivity = 92%
24+	2	24	26	Predictive value of a positive test = 81%
	11	45	56	Predictive value of a negative test = 53%

(fewer false positives). A change in the NEECHAM cut-off score of 26 or less for confusion, and the MMSE as the only reference criterion, would yield a sensitivity of 53% and a specificity of 88%, with the predictive validity of a positive test being 84% and the predictive validity of a negative test being 62% (see Table 5). This suggested change in cut-off score would have resulted in more individuals who scored in the confused range on the MMSE to have scores in the confused range on the NEECHAM and would have resulted in fewer false negative NEECHAM scores in this study.

Insert Table 5 about here

DISCUSSION

The measures of confusion have important implications for clinical practice. The nurses on the study unit assessed patients' mental status via level of orientation and alertness. On numerous occasions, nurses were not aware a patient was experiencing a significant delirium until informed by the research assistant. The fluctuations in mental status that

Table 5

Test of Validity in Percentage of the NEECHAM Confusion Scale

NEECHAM Score	Sensitivity	Specificity	Predictive value of positive test	Predictive value of negative test
<29	80	31	61	80
<28	90	62	73	84
<27	77	73	73	77
<26	53	88	84	62
<25	40	92	86	48
<24	30	92	81	53
<23	20	100	100	52

occurred with elderly patients, and its development in patients without confusion upon admission makes the adoption of a nursing assessment measure by the unit of major importance.

The NEECHAM is an instrument which does not impose a response burden on the patient, and is not time consuming to administer, as it can be incorporated into usual nursing activities. The temptation is to recommend its adoption for use in practice. However, questions remain about its reliability for the items involving behavioral observation, and sensitivity. The overall reliability of the instrument for determining a level of confusion is very good. If these levels have clinical relevance to nurses, then the achieved interrater reliability would be satisfactory to proceed with the next step. It is recommended that clinical trials then be implemented to determine what type and degree of training is necessary for nurses in the clinical setting to use the NEECHAM. Certainly the length of the training program developed for the research assistants would be inappropriate for nurses, and much of it might be unnecessary. That the research assistants scored patients differently as they became experienced with the instrument and when they knew the patient is most relevant to use of the NEECHAM by staff nurses.

It is recommended that the two questions related to the patient's self-perception of confusion and disturbing dreams be implemented in nursing practice. They were not distressing to patients when asked with the associated prompts, nor time-consuming, and had high interrater agreement. Although they are limited in their sensitivity, the self-perception questions provide more information about confusion than the current assessment practices of the nurses on the study unit. In addition, these questions would at least sensitize staff to the potential problem of confusion with elderly patients.

Use of the NEECHAM requires nursing judgement and discrimination of observed behaviors. It should be administered by experienced clinical nurses who have had sufficient training and practice in using the tool to ensure consistent scores (intra- and interrater). This is especially important if medical and nursing treatment decisions are to be based on NEECHAM results. This study found that the performance items, particularly "appearance,hygiene", required additional clarification to obtain scoring consistency. Procedures to elicit patient performance in this area need to be addressed in training. This situation was improved in a later study by doing training assessments of subjects who had

marked variations in mental status. Raters were able to clarify scoring for a wide range of behaviors prior to beginning data collection. It is important to determine the patient's ability to maintain "appearance,hygiene" when scoring this item and not score someone based on how recently the nurse had provided care.

The low sensitivity of the NEECHAM when compared with the MMSE may have been the result of limited preparation of the raters and subsequent high scores. Retraining during the data collection period seemed to have corrected this problem; however, no further interrater checks were done. It would be desirable to compare NEECHAM scores with chart notations regarding mental status since clinical judgements have been found to correlate most highly with this tool. However, the absence of even minimal chart documentation of mental status found during this study identifies another area where nurses can improve the quality for patients by consistently documenting their assessments.

Further study of the NEECHAM to address the unresolved issue of rater training would be desirable. Support for the NEECHAM's sensitivity may be obtained by using a reference criterion other than the MMSE, for example, professional

clinical assessment records of mental status. It is probable that structured assessments of confusion, such as the NEECHAM, may provide the most accurate information for planning care when combined with other data such as the patients' and caregivers' perceptions of mental status.

The study hospital is currently in the process of revising their admission nursing assessment form. Based on the findings of this work, the following changes have been recommended in the admission assessment: delete statements of "alert" and "oriented", administer the MMSE, and include the self-perception of confusion and disturbing dream questions. If incorporated, these changes would improve the admission assessment of confusion until the recommended clinical testing of the NEECHAM can occur, and perhaps increase the sensitivity of nurses to confusion among elderly patients. Periodic staff development activities would be necessary to maintain the innovation of screening for confusion throughout the patient's hospitalization, and to refine it when predictive factors are further identified.

In summary, this study validates that the problem of delirium is significant in elderly hospitalized patients. Further work needs to be done in the development of nursing tools for

the efficient, reliable and valid assessment of mental status in this at-risk population.

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Appendix A

1. Patient I.D. ____
2. Date __/__/__ (mo day yr)
3. Start time ____ (military)
4. RA # __
5. (Code #) ____

NURSING ASSESSMENT OF MENTAL FUNCTIONING (NAMF)

AS YOU ENTER THE ROOM, TAKE THE FIRST 30 SECONDS TO OBSERVE THE PATIENT.

Cue: "Hello, I am (name), and I've come to check how you are doing." (Avoid the use of orienting cues, such as "Good Morning".)

6. **Mobility Restrictors:** devices in use that are required for treatment of the underlying medical disorder but so restrict the patient's mobility (circle all that apply. Enter the number circled.) **IV lines if tubing connected; 02 mask, or cannula; Foley or condom catheter; N/G tube; chest tubes; inhalation treatments; gastrostomy tube; drainage tubes (if connected to bedside drainage); pillow or heating pad under leg; other (describe)** ____ 6

_____
_____
_____

7. **Restraints:** devices that restrict a patient's mobility not directly related to a medical disorder. (Circle all that apply. Enter the number circled). ____ 7
Wrist; mitten; chest or vest; waist; wheelchair (W/C) locked or geri-chair braced against a wall; commode or W/C or geri-chair with an overbed table in front; four bedrails up; other (describe)

_____
_____

NEECHAM CONFUSION SCALE

ENGAGE PATIENT IN CONVERSATION. IF PATIENT DOES NOT RESPOND READILY, KEEP CONVERSATION GOING TO ELICIT RESPONSE. RECORD THE LOWEST LEVEL OF PATIENT FUNCTION.

Points (Circle point level)

Processing--neurosensory: (Attention-Alertness-Recognition) ____ 8

4 **Full attentiveness/alertness:** responds immediately and appropriately to calling of name or touch--eyes, head turn; fully aware of surroundings, attends to environmental events appropriately.

3 **Short or hyper attention/alertness:** either shortened attention to calling, touch or environmental events, or hyper alert, over-attentive to cues/objects in environment.

2 **Attention/alertness inconsistent or inappropriate:** slow in responding, repeated calling or touch required to elicit/maintain eye contact/attention; able to recognize objects/stimuli, though may drop into sleep between stimuli.

1 **Attention/alertness disturbed:** eyes open to sound or touch; may appear fearful, unable to attend/recognize contact, or may show withdrawal/combative behavior.

0 **Arousal/responsiveness depressed:** eyes may/may not open; only minimal arousal possible with repeated stimuli; unable to recognize contact.

NAME Page 2 PT. ID_____ Date _____

Processing–motor (Recognition-Interpretation-Action) ___/9

5 **Able to follow a complex command:** "Turn on nurse's call light". (Must search for object, recognize object, perform command.)

4 **Slowed complex command responds:** requires prompting or repeated directions to follow/complete a complex command. Performs complex command in "slow"/over attending manner.

3 **Able to follow a simple command:** "Lift your hand or foot Mr....." (Only use 1 object.)

2 **Unable to follow direct command:** follows command prompt by touch or visual cue–drinks from glass placed near mouth. Responds with calming affect to nursing contact and reassurance or hand holding.

1 **Unable to follow visually guided command:** responds with dazed or frightened facial features, and/or withdrawal-resistive response to stimuli, hyper/hypoactive behavior; does not respond to nurse gripping hand lightly.

0 **Hypoactive, lethargic:** minimal motor/responses to environmental stimuli.

PROCESSING–VERBAL: (Orientation, short-term memory, though/speech content). ___/10

DETERMINE PATIENT'S GENERAL SENSE OF TIME THROUGH CONVERSATION, DO NOT ASK TIME, PLACE, PERSON QUESTIONS SPECIFICALLY.

5 **Oriented to time, place, and person:** thought processes, content of conversation or questions appropriate. Short-term memory intact.

4 **Oriented to person and place:** mild memory/recall disturbance, content and response to questions generally appropriate; may be repetitive, requires prompting to continue contact. Generally cooperates with requests.

3 **Orientation inconsistent:** oriented to self, recognizes family but time and place orientation fluctuates. Uses visual cues to orient. Thought/memory disturbance common, may have hallucinations or illusions. Passive cooperation with requests (cooperative cognitive protecting behaviors).

2 **Disoriented and memory/recall disturbed:** oriented to self, recognizes family. May question actions of nurse or refuse requests, procedures (resistive cognitive protection behaviors). Conversation content/thought disturbed. Illusions and/or hallucinations common.

1 **Disoriented, disturbed recognition:** inconsistently recognizes familiar people, family, objects. Inappropriate speech/sounds.

0 **Processing of stimuli depressed:** minimal response to verbal stimuli.

NAMF Page 3 PT. ID_____ Date _____

PERFORMANCE--APPEARANCE/HYGIENE: ___/11

2 **Controls posture, maintains appearance, hygiene:** appropriately gowned or dressed, personally tidy, clean. Posture in bed/chair normal. (Head in neutral position, positioned in alignment up in bed.)

1 **Either posture or appearance disturbed:** some disarray of clothing/bed or personal appearance, or some loss of control of posture, position. (Unshaven, hair uncombed, food particles around mouth.)

0 **Both posture and appearance abnormal:** disarrayed, poor hygiene, unable to maintain posture in bed. (when pillow removed limb falls; hand or foot hanging off bed; shoulders or neck flexed; patient has slid down in bed.)

PERFORMANCE–MOTOR: ___/12

4 **Normal motor behavior:** appropriate movement, coordination and activity, able to rest quietly in bed. Normal hand movement.

3 **Motor behavior slowed or hyperactive:** overly quiet or little spontaneous movement (hands/arms across chest or at sides) or hyperactive (up/down, "jumpy"). May show hand tremor.

2 **Motor movement disturbed:** restless or quick movements. Hand movements appear abnormal--picking at bed objects or bed covers, etc. May require assistance with purposeful movements.

1 **Inappropriate, disruptive movements:** pulling at tubes, trying to climb over rails, frequent purposeless actions.

0 **Motor movement depressed:** limited movement unless stimulated; resistive movements.

PERFORMANCE–VERBAL: ___/13

4 **Initiates speech appropriately:** able to converse, can initiate and maintain conversation. Normal speech for diagnostic condition, normal tone.

3 **Limited speech initiation:** responses to verbal stimuli are brief and uncomplex. Speech clear for diagnostic condition, tone may be abnormal, rate may be slow.

2 **Inappropriate speech:** may talk to self or not make sense. Speech not clear for diagnostic condition.

1 **Speech/Sound disturbed:** altered sound/tone. Mumbles, yells, swears or is inappropriately silent.

0 **Abnormal sounds:** groaning or other disturbed sounds. No clear speech.

38

NAMF Page 4 PT. ID_____ Date _____

LEVEL OF INTEGRATIVE PHYSIOLOGICAL CONTROL:

Recorded Values:	Normals:	
Temperature (Add 1 degree if taken axillary)	(36-37°)	14
Systolic BP	(100-160)	15
Diastolic BP	(50-90)	16
Pulse	(60-100)	17
Irreg Pulse (don't count infrequent PC's) 1=yes 2=no		18
Respirations (count for one minute)	(14-22)	19
Periods of apnea/hypopnea present: 1=yes 2=no (Resp < 10)		20
Longest # of seconds present between breaths: (code 88 if not applicable)		21
O2 Sat range during apnea/hypopnea cycle: FROM: (code 88 if not applicable)		From: __.__ 22
		To: __.__ 23
O2 Sat (≥93) (Code 11.1 if oximeter alarms low perfusion) Patient position_____.		__.__ 24
Receiving O2: 1=yes 2=no		25
Oxygen on now: 1=yes 2=no		26

VITAL FUNCTION STABILITY: 27

2 BP, P, TEMP, RESPIRATION within normal range with regular pulse

1 Any of above in abnormal range (count SBP, and/or DBP as one; count apnea/hypopnea and increase/decrease in resp. as one)

0 Two or more in abnormal range

OXYGEN SATURATION STABILITY: 28

2 O2 sat in normal range

1 O2 sat 90 to 92 or is receiving oxygen

0 O2 sat below 90

NAMF Page 5 PT. ID_____ Date _____

URINARY CONTINENCE CONTROL:
(If can't obtain data from observation, review nurses notes up to previous observation period) ___/29

2 Maintains bladder control

1 Incontinent of urine in last 24 hours or has condom cath

0 Incontinent now or has indwelling or intermittent catheter or is anuric.

NOTES:

DO NOT WRITE IN THIS BOX

TOTAL LEVEL 1 (0-14 POINTS)	___/30
TOTAL LEVEL 2 (0-10 POINTS)	___/31
TOTAL LEVEL 3 (0-6 POINTS)	___/32
TOTAL NEECHAM (0-30)	___/33

SELF-PERCEIVED MENTAL CLARITY:

Cue: "It is quite common for patients to have some temporary problems with their ability to think clearly while in the hospital". The medications, treatments and disturbances with sleep often make patients feel a little fuzzy or unclear.

34 Since this morning (yesterday afternoon), have you had any experiences of confusion? ___/34

Yes = 0 No = 1 Unable to Respond = 8

(If yes to 34) What was that like for you? (Focus on symptoms that were troublesome for the patient)_____

35 How would you rate your clearness of thought right now compared to this morning (this afternoon)? ___/35

Better=3 About the same=2 Worse=1 Unable to Respond=8

36 Last night or during the day have you had any disturbing dreams that troubled you? ___/36

Yes=0 No=1 Unable to Respond=8

Please describe what that was like for you.

_____

NAME Page 6 PT. ID_____ Date _____

PART II: (complete with NEECHAM SCALE but do not add to score)

37 Level of Self Report:
A. REPORT OF CONFUSION: (mixed up feelings, etc.) ___/37

3=Does not report feelings of confusion
2=Reports some feelings of confusion
1=Reports high level of confusion
0=No response
8=Unable to respond
If other than no confusion, would you describe how you feel?

38 B. REPORTS DISTURBED DREAMS IN WHICH THE DREAM SEEMED REAL OR CAUSED AWAKENING: ___/38

1=no
0=yes
8=Unable to respond

39 Presence of DMS-III criteria:
(code if present) 1=Yes, 0=no 8=Unable to evaluate

I. Clouding of consciousness: ___/39
(reduced clarity of awareness of the environment)
with reduced capacity to shift, focus and sustain attention to
environmental stimuli?

II. Any of the following present?

A. Perceptual disturbance? ___/40
(misinterpretations, illusions or hallucinations)

B. Speech that is at times incoherent? ___/41

C. Disturbance of sleep-wakefulness cycle, with insomnia or daytime drowsiness? ___/42
(Not frequent awakenings 2 deg hospital noise.)

D. Increased or decreased psychomotor activity? ___/43

III. Disorientation and memory impairment ___/44

RETROSPECTIVE AUDIT - DO NOT COMPLETE

IV. Change in behavior or mentation developed over a short period of time (hours to days), symptoms fluctuate over the course of a day? ___/45

V. Evidence from history, physical exam, or laboratory tests of a specific organic factor judged to be etiologically related to the disturbance. ___/46

48 Completion:
Patient refused = 1
NOT tolerated = 2
Interrupted = 3
Completed-all = 4

Time Fin.
Military ___/47

___/48

Comments_____

Abstract of the Study as it Appeared in the Conference Manual

A Collaborative Approach to the Study of Delirium in Elderly Patients

Georgene C. Siemsen, MS, RN, CS
Colleen Lucas, MN, RN, CS
Good Samaritan Hospital and Medical Center
Portland, OR
Judy Miller, MS, RN
Annette Newman, MS, RN
Oregon Health Sciences University

This work included a baseline descriptive study of delirium in elderly patients with instrument testing, and a pilot intervention study (Environmental Optimization interventions). Staff nurses on a general medical unit of a large metropolitan hospital had identified the clinical problem of delirium and were interested in developing interventions for managing delirium. The baseline study examined the extent of delirium in a convenience sample of 26 patients over the age of 65 admitted to the target medical unit over a 2-month period. Study measures included the NAMF (Nursing Assessment of Mental Functioning) tool, consisting of the NEECHAM scale (Neelon, Champagne, & McConnell, 1989), a measure of cognitive function; self-perceived mental clarity; and impediments to mobility. A 7-hour program was developed to train staff nurses in the use of the NAMF. Interrater reliability was determined among five observers in the beginning and again during the course of the baseline study. In addition, interrater reliability was examined among 30 paired observations between two raters.

Subjects were examined twice daily over their stay because of staff nurses' and researchers' concern about diurnal fluctuations in cognitive functioning. Other variables examined included patient acuity, length and cost of stay, environmental factors, and patient outcome. After patient discharge, patient charts were audited to obtain demographic data, descriptions of mental status and clinical response to hospitalization, and discharge placement. The study measures were compared to current nursing practice through review of nursing care plans and progress notes. The concurrent validity of the NEECHAM in detecting delirium was determined with the Folstein Mini Mental Status Exam one to two times during length of stay.

The baseline descriptive study was followed by the pilot intervention using a protocol of the Environmental Optimization Interventions (EOI). Four categories of EOI were implemented by six staff nurses as part of their regular patient assignment: focused assessment and meeting immediate personal needs, helping clients to organize their environment, providing meaningful sensory input and maximizing independence in activities of daily living. Baseline information on delirium, the hospital environment, and usual nursing practice was used for comparison in the intervention component.

Appendix H

Communications With Virginia J. Neelon, RN, PhD
Associate Professor
School of Nursing
University of North Carolina at Chapel Hill

My communications with Virginia J. Neelon, consisted of several letters and telephone conversations, and in-person meetings at the research conference in Chapel Hill in April, 1991. The appended documents are as follows: (1) Dr. Neelon's letter to me authorizing use of the NEECHAM instrument and her enclosures of instructions for administration and scoring; (2) my letter to Dr. Neelon reporting the conclusion of our study; (3) a sample of the data validation report form which was completed for each administration of the NEECHAM during the study; and (4) a guide to the interpretation of the data report forms. Data validation reports for all administrations of the NEECHAM (n=157) have been sent to Dr. Neelon, per her request, to permit comparison of the scale's use in this study with its use in tested groups.

THE UNIVERSITY OF NORTH CAROLINA
AT
CHAPEL HILL

School of Nursing

The University of North Carolina at Chapel Hill
CB# 7460, Carrington Hall
Chapel Hill, NC 27599-7460

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Dr. Joan Uhl, Associate Dean for Academic Affairs/Director Graduate Studies 919/966-3733
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Dr. Neal Cheek, Director of Student Services 919/966-4260
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Dr. JoAnn E. Glittenberg, Chairman of Primary Care Dept. 919/966-4352
Dr. Sandra G. Funk, Director of Research Support Center 919/966-5420

April 23, 1990

Ms. Annette H. Newman, RN, MS
185 East 39th Avenue
Eugene, Oregon 97405

Dear Ms. Newman:

In response to your recent letter, I enclose the revised NEECHAM Confusion Scale. Most of the changes in the revision were made to insure that descriptive and behavioral statements more accurately reflect our observations of key characteristics of early changes in information processing. Because the findings of the pilot study indicated the importance of oxygen stability as a potential identifier of physiological risk, this item has been added to subscale III. Replication of the psychometric analyses of the NEECHAM with the first 75 subjects of the present study produced correlations of similar magnitude as shown in the pilot study. A summary of these are enclosed in the instruction guide. In addition the Neecham has been further validated against other clinical markers including the DSMIII criteria for delirium, medical documentation of mental states problems and Folstein's MMSE. The GSA abstract describing this validation study is also included in this packet. Along with the scale, I enclose instructions for administration, a scoring guide, and a data validation form. If you ultimately use this scale, would you consider returning the validation forms on subjects/patients you test to allow us to compare the scale's use with other tested groups?

Several manuscripts describing the scale and our thinking on confusion are in process. I enclose copies of abstracts about the scale and our work that I think will assist you in your endeavors until full papers are published. We are unable at this point to share additional information regarding specific risk factors that we think comprise the predictive patterns of confusion as data analysis is still underway. In addition, I am unable to provide you with information on interventions at this time. We plan an intervention study that will begin in the fall which is designed to

validate the pattern specific interventions we have developed and that we think will prevent or reduce the adverse effects of confusion.

You noted in your letter several other researchers whose work is in the area of confusion. If you have not yet read the book Confusion: Prevention and Care written by MO Wolanin & LR Phillips, I would strongly encourage you to do so.

I appreciate your interest in confusion and in the NEECHAM Confusion Scale. If I can be of further help, please contact me.

Sincerely yours,

Virginia J. Neelon, RN, Ph.D.
Associate Professor

Neelon/Champagne/McConnell
(c'85,87)

INSTRUCTIONS FOR ADMINISTRATION OF
NEECHAM CONFUSION SCALE

The NEECHAM scale was developed as an instrument for rapid and nonintrusive assessment of normal information processing, early changes in disturbed information processing (DIP), and for documentation of acute confusional behavior, including delirium. It can be scored by the nurse at the "bedside" in a manner similar to other vital function measurements during routine or required nursing assessments. It makes maximum use of already collected data. Because the NEECHAM places a minimal response burden on the patient, NEECHAM ratings can be repeated at frequent intervals to monitor changes in the patient's status.

The validity and reliability of the NEECHAM Scale has been established in the hospitalized and nursing home elderly (Champagne MT, Neelon VJ, McConnell ES, and Funk S: "The NEECHAM Scale: Assessment of Acute Confusion in the Hospitalized Elderly." 1988).

Summary of Psychometric Data:
Inter-rater (.96); test-retest in stable elderly subjects (.98); internal consistency for the total score (Cronbach's alpha=.86); correlation with MMSE (.78). All items except vital function and oxygen stability showed a good corrected item-total correlation, loading on one factor explaining 49.7% of the variance.

The NEECHAM total score range is from 0 (minimal responsiveness) to 30 (normal function). The NEECHAM has nine scaled items divided into three subscales of assessment: Responsiveness, Performance, Physiological Control.
See attached abstract for additional data.

V. Neelon, PhD, RN
CB# 7460, Carrington Hall
University of North Carolina at Chapel Hill
Chapel Hill, NC 27599-7460
(1/90)

Neelon/Champagne/McConnell
(c'85,87)

SCORING THE NEECHAM SCALE

Points are assigned for the item level description which represents the subjects behavior/performance during the rater's interaction. The subject need not exhibit every behavior in the item description level to score at that point level.

Subscale I	Response/Attention	= 0-4 pts.
	Processing/Command	= 0-5 pts.
	Orientation/Memory	= 0-5 pts.
		0-14
Subscale II	Performance/Appearance	= 0-2 pts.
	Performance/Motor	= 0-4 pts.
	Performance/Verbal	= 0-4 pts.
		0-10
Subscale III	Vital Function	= 0-2 pts.
	Oxygen Stability	= 0-2 pts.
	Continence	= 0-2 pts.
		0-6
Total		0-30

Scores of:

30-25 ------ normal information process.
24-20 ------ mild disturbance in information processing --early cues, fatigue, quiet confused.
19-0 ------ acute confusion -- moderate to severe confusion and/or delirium -- to non-responsiveness.

Scores for subjects with severe chronic cognitive impairment may differ from the above ranges. Oxygen stability is scored by a non-invasive measure of oxygen saturation (pulse oximeter). In place of oximeter measurements, scoring can be done by scoring one point loss for required oxygen therapy and one point loss for the presence of apnea (greater than 15 sec period during a one minute observation and more than one observation).

V. Neelon, PhD, RN
CB# 7460, Carrington Hall
University of North Carolina at Chapel Hill
Chapel Hill, NC 27599-7460
(5/89)

185 E.39th Avenue
Eugene, OR 97405
August 9, 1991

Virginia J. Neelon, RN PhD
CB# 7450, Carrington Hall
University of North Carolina at Chapel Hill
Chapel Hill, NC 27599

Dear Dr. Neelon:

We are completing the final details of our study of confusion/delirium in hospitalized elderly at Good Samaritan Hospital in Portland, Oregon. One of my personal responsibilities is to provide to you any data from our project that will be helpful to your large study. Enclosed are completed copies of your data forms for each time we administered the NEECHAM scale. Also enclosed is the draft of the research article we have submitted for potential publication in Key Aspects of Elder Care, to be published by Springer Publishing Company in the spring of 1992. If there are other data we might have that would be helpful to you, please let me know and I will endeavor to obtain them for you.

As you know, this study was part of my Master's Research Project, a requirement for a Master of Science degree in Nursing from Oregon Health Sciences University. I feel very fortunate to have had the opportunity to work with Georgene Siemsen, Colleen Lucas, and Judy Miller on this study. Attending the Elder Care Conference and meeting you and other well-known nurse researchers was definitely a highlight of my professional experience. I am particularly privileged to have met you, visited your school, shared information directly with you, and had an observational visit in your clinical research area. Again, I thank you for your interest and hospitality.

Sincerely,

Annette H. Newman, RN, MS

telephone: (503) 687-8755

Interpretation of Data Report Forms

The NEECHAM Confusion scale was incorporated into a larger tool, Nursing Assessment of Mental Function (NAMF), for the Collaborative Study of Delirium in Elderly Patients at Good Samaritan Hospital and Medical Center in Portland, Oregon. On the data report forms submitted to Virginia Neelon, item 10a, "mental status exam score", reports total scores for the Folstein Mini-Mental State Exam; item 10c, "other", reports three items related to self-perceived mental clarity. Scores for the latter item are recorded vertically with the top number being the score for NAMF item 34, experiences with confusion; the middle recorded score is for NAMF item 35; and the bottom score is for NAMF item 36.

NAMF **PAGE 5** **PT. ID**_____ **DATE**_____

SELF-PERCEIVED MENTAL CLARITY:

Cue: ***"It is quite common for patients to have some temporary problems with their ability to think clearly while in the hospital".***

____ 34

34 **Since this morning (yesterday afternoon), have you had any experiences of confusion?**

Yes = 1 **No = 2**

(If yes to 1.) What was that like for you? (Focus on symptoms that were troublesome for the patient)_____

_____

_____

35 **How would you rate your clearness of though right now compared to this morning (this afternoon)?**

____ 35

Better = 1 **About the same = 2** **Worse = 3**

36 **Last night or during the day have you had any disturbing dreams that troubled you?**

____ 36

Yes = 1 **No = 2** **Can you describe what that was like for you?**

_____

_____

_____

Data for DMS-III criteria are not included because insufficient information was obtained from the retrospective chart audits.

Recording codes: 88 = unable to obtain data; -9 = missing data.

RETURN TO:
Virginia J. Neelon, RN, PhD
CB# 7460, Carrington Hall
University of North Carolina at Chapel Hill
Chapel Hill, NC 27599

CODE # 13643/

NEECHAM VALIDATION: SUBJECT ITEMS

1. SUBJECT ID: 1 DATE: 11/6/90 pm
2. AGE: 78
3. SEX: F
4. RACE: W
5. EDUCATION LEVEL: _____ (grades completed)
6. PRIMARY DIAGNOSIS: UTI
7. OTHER MAJOR PROBLEMS: multi-infarct dementia, cortical atrophy, Primary biliary cirrhosis, pancytopenia, organic heart disease
8. TESTING SITE:
   Hospital ✓
   Clinic _____
   Home _____
   Extended Care Facility _____
   Other _____
9. NEECHAM SCORE:
   LEVEL 1 (0-14) 14
   LEVEL 2 (0-10) 8
   LEVEL 3 (0-6) 4

   TOTAL NEECHAM: (0-30) 26
10. DOCUMENTATION OF COGNITIVE STATUS BY OTHER MEASURES:
    a. mental status exam score: (name of test and score)

       MMSE 28

    b. clinical record documentation: (briefly describe)

    c. other 2
       1
       2

Abstract

Title: The NEECHAM Confusion Scale: A Replication Study Testing Interrater Reliability and Predictive Validity

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The primary purpose of this study was to examine the NEECHAM Confusion Scale as a structured tool that staff nurses could use to assess for confusion in hospitalized elderly patients. This replication study, as part of the larger study, "A Collaborative Approach to the Study of Delirium in Elderly Patients", tested the interrater reliability and the predictive validity of the NEECHAM when administered by five registered nurses to 26 hospitalized medical patients 65 or more years of age. The Mini-Mental State Exam (MMSE) was used as the reference criterion.

The study was conducted with a convenience sample over a two-month period of time. The NEECHAM was administered to each subject twice a day, between 7-11 a.m. and 3:30-9 p.m., for the first eight days of hospitalization. The MMSE was administered twice during the first four days of hospitalization.

Interrater reliability for the NEECHAM, determined during the first half of the study by 30 paired observations made by two raters, was $r = .97$ (Pearson product moment correlation) for total NEECHAM scores. For all but one item the scoring agreement ranged from $r = .78$ to $r = 1.00$. The

most problematic item was "Performance-appearance, hygiene" with an interitem correlation of $\underline{r}$ = .62. The percent agreement for total scores was 100% in relation to the cut-off score of 24 or less indicating confusion.

Using cut-off scores of 24 for the NEECHAM and 23 for the MMSE as indicators of cognitive impairment, sensitivity of the NEECHAM was found to be 30% and specificity to be 92%. This is in contrast to the validity testing reported by Neelon, Funk, Carlson, & Champagne, (1989) in which the NEECHAM was found to have sensitivity of 95% and specificity of 78%, using an undesignated reference criterion.

Further study of the NEECHAM is needed to determine its predictive validity. The low sensitivity of the NEECHAM, when compared to the MMSE, suggests that a different reference criterion should be considered. It appears that the NEECHAM and MMSE measure mental status by assessing both similar and dissimilar factors. It is possible that the tools complement rather than substitute for each other. Structured assessments of confusion, such as the NEECHAM, may provide the most accurate information for planning care for elderly patients when combined with other data such as the patients' and caregivers' perceptions of mental status.