Mini-Mental State Examination and Large Allen Cognitive Level Screen: Predictive validity for discharge disposition among patients of a skilled nursing facility

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Abstract

The objective of this study was to determine the association between scores on the Large Allen Cognitive Levels Screen (LACLS) and the Mini-Mental Statue Examination (MMSE) among residents of a skilled nursing facility (SNF) and to what extent they have predictive validity for discharge disposition. Data were collected from one SNF in Washington State through a retrospective chart review. Among all cases, no correlations were found between the MMSE and discharge disposition, and the LACLS and discharge disposition. However, the LACLS was a statistically significant predictor of discharge disposition among orthopedic patients, $r\,(22) = .479$, $p = .01$. A statistically significant correlation was found between the LACLS and MMSE, $r\,(122) = .565$, $p = .01$ in all cases, and for 28% of the population, the assessments were not in agreement of cognitive status. The difference between mean scores of patients who discharged to supported versus unsupported living on the MMSE (21.45 vs. 21.83) and LACLS (4.31 vs. 4.21) were insignificant, indicating these assessments may not be valid as sole predictors of discharge disposition. Complex medical and social histories of the elderly population are among many factors that affect where and why a patient is discharged to a particular location. Further research is needed to provide stronger evidence for the MMSE and LACLS in their predictive validity for discharge disposition.

In the United States, the proportion of the population aged 65 and older is expected to increase due to a declining birth rate and an increased average life span. In 2000, 12.4% of the population was aged 65 and older. This number is predicted to increase to 19.6% by 2030 (Centers for Disease Control and Prevention, 2003). In 2002, an estimated 22.2% of the population aged 71 years or older had cognitive impairment without dementia, but progressed to having dementia within one year (Plassman et al., 2008). According to Hendrie (1998), the prevalence of dementia in individuals aged 65 and older is approximately 6% to 10%.

Cognitive impairments among older adults may be a result of aging-associated cognitive decline or disease such as Parkinson disease (Jokinen, et al., 2009), Huntington disease (Troster, Jacobs, Butters, Cullum, & Salmon, 1989), multiple sclerosis (Savettieri et al., 2004), viral disease (Strandberg, Pitkala, Linnavuori, & Tilvis, 2004), hypotension (Maule et al., 2008), diabetes, cerebral vascular accident (Wu et al., 2008) and anything that may cause brain damage such as anoxia or traumatic brain injury. Many people are hospitalized due to these diagnoses, among others, and are subsequently discharged to some form of post acute inpatient rehabilitation facility. (Sandstrom, Lohman, & Bramble, 2009).

The American Health Care Association (2001) reported that in 1999, 5.8% of the population aged 65 and older were living in nursing facilities. This number is expected to increase to 8.4% by 2050. In addition, Sandstrom et al. (2009) reported that three of every four residents in a skilled nursing facility have some cognitive impairment. In skilled nursing facilities the most common skilled services include nursing, physical therapy, occupational therapy, social work, and dietetics. This multidisciplinary team

provides intensive rehabilitation for patients recovering from complex illness or injury (Sandstrom et al., 2009) and eventually makes a recommendation for the most appropriate discharge placement.

If discharge is to an independent living setting, the patient must be able to complete self-care tasks with a high level of independence. This may be an immense challenge for patients recovering from physical, mental, or medical injuries and illnesses (MacNeil & Lichtenberg, 1997). The American Health Care Association (2001) reported that in 1999, the average resident of a nursing facility required assistance with 3.75 activities of daily living (ADL). Although physical rehabilitation is a primary emphasis, cognitive function cannot be ignored in the successful, safe completion of ADL and instrumental activities of daily living (IADL).

Occupational therapists use cognitive assessments to evaluate an individual's cognitive capacities in relation to daily functioning. Patient performance on cognitive assessments could be used to understand cognitive abilities and identify the potential for rehabilitation while establishing realistic and functional goals. Zwecker et al. (2002) suggested that cognitive function and motivation are strong predictors of functional outcome from rehabilitation as measured by ADL. They further suggested that early assessment of cognitive functioning should be a crucial part of any routine rehabilitation evaluation.

Additional studies have indicated that higher cognitive functioning is associated with better rehabilitation outcomes and higher community functioning. Likewise, patients with higher cognitive assessment scores were more likely to be discharged to their own home and live independently (Astell et al., 2008; Barnes et al., 2004;

Hershkovitz et al., 2007; Heruti et al., 2002; MacNeil & Lichtenberg, 1997; Rabadi,

Rabadi, Edelstein & Peterson, 2008).

Background

According to Diller (1993), "Cognition involves the acquisition, processing, and

application of information in daily life" (pg. 9). Radomski (2008) further described

cognition as an influence on the selection, performance, analysis, and learning of

everyday activities and occupational functioning. A cognitive deficit is characterized by

an observable limitation in the completion of routine tasks (Allen, 1985). Many cognitive

assessments are available for occupational therapists to administer to patients upon

admission to an inpatient rehabilitation facility for the purpose of screening for cognitive

deficits. Two such assessments are the Mini Mental Status Exam (MMSE) (Astell et al.,

2008; Hershkovitz et al., 2007; Heruti et al., 2002; Zwecker et al., 2002) and the Allen

Cognitive Level Screen (ACLS) (David & Riley, 1990; Henry, 1998; Velligan, Bow-

Thomas et al., 1998; Velligan, True et al., 1995).

Mini-Mental Status Exam. The MMSE is a screening tool, developed in 1975,

used to identify and measure cognitive impairment (Folstein, Folstein, & McHugh,

1975). It has become widely used as a tool for diagnosing dementia and related

disorders. It has 19 individual tests of 11 domains covering a variety of aspects of

cognition including orientation, registration, attention, calculation, recall, naming,

repetition, verbal and written comprehension, writing, and construction (Mitchell, 2009).

An individual can score between 0 and 30 points. Rabadi et al. (2008) divided the

scores into four categories to identify levels of cognitive impairment. Severe cognitive

impairment includes scores ≤ 9 points, moderate cognitive impairment, 10-20 points, mild cognitive impairment, 21-24 points, and intact cognition, ≥ 25 points.

   Research on the MMSE. Folstein et al. (1975) reported the reliability and validity of the MMSE among geriatric patients (*n* = 63) with no psychiatric diagnosis and patients (*n* = 206) with dementia, affective disorder with cognitive impairment, mania, schizophrenia, and personality disorders.   They found that the score of 20 or less was found only in patients diagnosed with dementia, delirium or affective disorder, and those without psychiatric diagnosis did not score below 20 with a mean of 27.6. In contrast, Kim and Caine (2002) found that patients with mild to moderate Alzheimer disease scored between 21 and 25 points on the MMSE. Although there is no consensus on the optimal cut-off score for identifying dementia with the MMSE, a meta-analysis by Mitchell (2009) found that over half of the reviewed studies favored a score of 23.

   According to Tombaugh and McIntyre (1992), lower MMSE scores are associated with increasing age and lower education level. Crum, Anthony, Bassett, and Folstein (1993) however, calculated adjustments for age and education in a sample of 18,056 adults from five communities in the United States in order to compensate for differences in education and age among patients completing this assessment.

   Zwecker et al. (2002) reported the MMSE to be favored over the Loewenstein Occupational Therapy Cognitive Assessment (LOTCA) and the cognitive subsection of the Functional Independence Measures (FIM) because it is easier to administer and requires less time and expertise by the administrator. The researchers further reported the MMSE to be a useful assessment upon admission to a rehabilitation setting and to be effective in predicting functional outcomes. Likewise, Heruti et al. (2002) found that

among a sample of 315 elderly stroke patients at an inpatient clinic, higher scores on

the MMSE upon admission were correlated with a better motor outcome and shorter

length of stay. On the other hand, patients with low scores on the MMSE experienced

limited functional gains and a poorer rehabilitation outcome. Diamond, Felsenthal,

Macciocchi, Butler and Lally-Cassady (1996) administered the MMSE to 52 patients

admitted to a geriatric rehabilitation unit and found that those with a low score had a

greater likelihood of being discharged to a nursing home.

Allen Cognitive Level Screen. The ACLS uses a leather-lacing task, in which the

patient must follow directions and learn to replicate three demonstrated stitches. Allen

(1992) described the ACLS as a quick estimate of the patient's current capacity to learn,

used as a guideline for treatment goals achievable at the time of administration, usually

after the initial interview. Penny, Mueser, and North (1995) speculated that the ACLS

encompasses many elements of cognitive functioning including attention, memory,

processing, organization and problem solving, making it a useful global cognitive

assessment.

The Large Allen Cognitive Level Screen (LACLS) is a larger version of the ACLS

leather-lacing task developed by Kehrberg et al. (1992) for use in geriatrics, specifically

for patients with impaired vision or hand function. It provides more visual contrast with

larger laces and holes as compared to the original ACLS (Allen et al., 2007). Kehrberg

et al. (1992) found a strong, statistically significant correlation between the ACLS and

LACLS, $r (49) = 0.95$, $p < .0001$. Additional research could not be found specifying the

use of the LACLS, though this is the version that was used in the current study and

based on the findings of Kehrberg et al. (1992), we can assume that the LACLS and ACLS would have provided similar outcomes.

The ACLS measures the levels of functional cognition identified in the cognitive disabilities model. They are identified by Allen (1985) as follows: (Level 1) automatic actions, indicates severe cognitive dysfunction resulting in the need for custodial care; (Level 2) postural actions, where the patient responds to proprioceptive cues and is mobile, but still in need of total assistance with ADL; (level 3) manual actions, the patient shifts attention to the environment and object manipulation is seen, but constant supervision and moderate assistance are required; (level 4) goal directed actions, where the patient has awareness of an intended goal, may benefit from routines, and need help with IADL tasks requiring sequencing and planning; (level 5) exploratory actions, when the patient is able to adjust to changes in a task, but still has some limitations with planning; independent living is possible with periodic support and supervision; (level 6) planned actions, the patient is able to recognize symbolic cues, and planning and problem solving are observed. This stage indicates the absence of disability. Occupational therapists often use the cognitive disabilities model as a framework to assess, record, and recommend compensatory techniques for managing cognitive disabilities identified by the ACLS (McAnanama, Rogosin-Rose, Scott, Joffe & Kelner, 1999).

Although there are six levels identified in the cognitive disabilities model, the ACLS is designed to test the middle range between levels 3.0 to 5.8. McAnanama et al. (1999) reported that the ACLS should not be used alone as the sole predictor of the client's ability to complete ADL because it only requires a brief surge of concentration.

It does not address skill proficiency, previous learning, motivation, or stamina of the

patient, which are essential features of performing ADL independently. The ACLS has

been used extensively with a variety of psychiatric and geriatric populations in assisting

with treatment plans and community placement (Velligan, Bow-Thomas et al., 1998).

Many studies have examined the relationship between discharge disposition and the

ACLS in psychiatric populations, but few studies are available to support its validity

when administered to individuals without a psychiatric diagnosis.

Research on the ACLS. McAnanama et al. (1999) compared two groups, one of

patients diagnosed with psychotic disorders, the other of patients with non-psychotic

diagnoses including mood and anxiety disorders. The ACLS was found to be a better

predictor of ADL performance and community living in patients with a psychiatric

diagnosis compared to those without a psychiatric diagnosis, although it was not a

statistically significant difference. The small sample size ($n = 16$) in the group of

patients with psychiatric diagnoses and in the group without psychiatric diagnoses ($n =$

24) may have contributed to the lack of statistical significance (McAnama et al., 1999).

Velligan, Bow-Thomas et al. (1998) studied the validity of the ACLS in a sample of 110

patients diagnosed with schizophrenia. One to three years after discharge, a small

sample ($n = 30$) of the original participants participated in a follow-up study comparing

discharge ACLS scores to community functioning. The ACLS was found to be related

to overall community function, $r(30) = 0.60$, $p < .001$, level of productive activity, $r(30) =$

0.46, $p < .01$, employment, $r(30) = 0.37$, $p < .05$, and social effectiveness, $r(30) = 0.40$,

$p < .05$, but did not predict independence in the performance of ADL. Velligan, Bow-

Thomas et al. (1998) also reported a trend, but no significant correlation, between the

ACLS and the level of structure or assistance in the discharge living situation, r (30) = 0.35, p = .06. The absence of a correlation here may have been due to the resources available to the patients in the community being a confounding factor. Unfortunately, all levels of assistance or structure are not equally available to patients to aid in successful community dwelling. Ultimately, Velligan, Bow-Thomas et al. (1998) reported the ACLS to have some utility for the purposes of treatment and discharge planning.

In a sample of 100 individuals with psychiatric disorders in an acute mental health unit, Henry et al. (1998) found ACLS scores to be second only to prior living situations in predicting discharge disposition. The ACLS scores were more strongly related to discharge location than diagnosis, admission history, suicidal tendency, substance abuse history and physical health history. Higher ACLS scores were associated with being younger, living independently before admission, being suicidal before admission, and having a nonpsychotic diagnosis. The mean ACLS score was 4.92 for patients who were discharged to an independent living placement, whereas those who were discharged to a supported living environment had a mean ACLS score of 4.50, t (89.1) = 3.653, p = .0004.

The above research provides evidence suggesting the ACLS to have some utility in predicting ADL performance and discharge disposition in psychiatric patients. However, the lack of research in elderly populations without psychiatric diagnoses leaves clinicians with an uncertainty about its validity in measuring cognitive functioning and predicting discharge disposition among geriatric patients without psychiatric diagnoses.

Research examining the relationship between MMSE and ACLS. Kehrberg,

Kuskowski, Mortimer, and Shoberg (1992) compared the ACLS and MMSE in a group

of people who had a probable diagnosis of Alzheimer disease ($n = 49$) and a control

group ($n = 34$). A statistically significant correlation was established between these two

assessments, r (43) = 0.80, $p < .001$. Thirteen of the participants were unable to

complete the MMSE due to language and verbal comprehension deficits, but were able

to perform on the ACLS. This study did not correlate the scores on the MMSE and

ACLS to the participant's discharge location.

Heying (1985) examined the relationship between cognitive disability and the

performance in ADL in persons with senile dementia. The primary purpose of the study

was to compare scores on the ACLS with those on the Physical Self-Maintenance Scale

(PSMS) and the IADL scale. Thirty-three subjects over the age of 60 with a clinical

diagnosis of senile dementia were included in this study. The MMSE was used as a

criterion for inclusion of participants in the study. The mean score on the ACLS was 2.6

and the mean score on the MMSE was 8.7, this being lower than the mean score of 9.6

for persons with dementia in Folstein, et al. (1975). This study suggested that the

MMSE had a moderate association with the ACL, r (33) = 0.656, $p < .001$. It was also

suggested that the MMSE might be a good predictor of current abilities to perform

activities of daily living as evidenced by a significant positive correlation with the PSMS-

IADL, r (33) = .749, $p < .001$.

Due to the lack of research in the geriatric population with the MMSE and

LACLS, the purpose of the current study is to determine the association between scores

on the LACLS and the MMSE among residents of a skilled nursing facility and to what extent they have predictive validity for discharge disposition.

Method

Research Design

The current investigation was a retrospective correlational study aiming to identify relationships between scores on the LACLS, MMSE, and discharge location, collected via chart review. Secondary analysis examined demographic information including age, sex, length of stay, and primary diagnosis. This design was determined to be the best way to discover relationships providing clinical evidence of the comparative predictive validity and clinical usefulness of these two cognitive assessments.

Setting

The current study was completed at a Washington State skilled nursing facility (SNF) with 125 beds. The occupational therapists in this facility administer both the MMSE and LACLS to the majority of their patients within one week of admission, unless the patient is unable to complete the assessments due to severe cognitive or functional limitations.

Participants

A convenience sample of 122 residents (41 men, 81 women) of a SNF, discharged between July 1, 2009 and March 12, 2010 were included in this study. This start date was selected because it was when documentation of the scores on the LACLS began to be included in the patient's chart. The inclusion criteria were (1) age 65 or older, (2) chart records of both MMSE and LACLS administered within one week

of the patient's admission, and (3) both assessments administered by an occupational

therapist (OT), certified occupational therapy assistant (COTA), or level II Fieldwork

occupational therapy student (OTS). Patients were excluded if either MMSE or LACLS

scores were not in the chart.

Instrumentation

In the initial study to validate the LACLS by Kehrberg et al. (1992), a research

group ($n = 49$) with a probable diagnosis of Alzheimer disease and a control group ($n =$

34) of elderly patients without dementia were administered both the LACLS and ACLS

in a split format. Scores on the ACLS and LACLS were significantly correlated for the

research group, r (49) = 0.95, $p < .0001$ and for the control group, r (34) = 0.58, $p <$

.0001. The results provide a rationale for occupational therapists to use the LACLS

when a patient cannot perform on the original ACLS due to cognitive, visual, or physical

deficits. Other studies have established the high interrater reliability of the ACLS, r (49)

= 0.85-.091, $p < .05$ (Velligan, Bow-Thomas et al., 1998; Velligan, True et al., 1995).

Folstein et al. (1975) found the MMSE to have high test-retest reliability, r (22) =

0.887, $p < .0001$ when administered 24 hours apart, and high interrater reliability, r (19)

= 0.827, $p < .0001$. When the MMSE was administered twice, 28 days apart, no

significant difference was found between scores, r (23) = 0.98, $p < .0001$.

Procedure

Prior to beginning data collection, this study was approved by the SNF and the

University Institutional Review board. The author then reviewed the medical records of

patients who left the SNF in the indicated time frame. Collection was done

alphabetically by last name following the organization of the charts in the records room.

To ensure confidentiality, each resident was assigned a case number for research and all collected data were de-identified. The data extracted from the charts included: the exact MMSE and LACLS scores, age, sex, primary diagnosis, secondary diagnoses, LOS, and discharge location. Demographic information was collected from the admittance record and primary and secondary diagnoses were reported according to ICD-9 codes. The extracted data were collected in an Excel document and transferred to SPSS for further statistical analysis. Charts were excluded if the patient was discharged prior to July 1, 2009, if the patient was younger than 65 years of age, or if the scores on the MMSE and LACLS were not available.

Data Analysis

The primary variables for this study include MMSE scores, LACLS scores, and discharge location. Both the LACLS and MMSE use a scoring progression in which a lower score indicates a more severe cognitive impairment. Discharge location was separated into ordinal categories with death being coded as 1, and the highest level of independence coded as 7. Categories, in ascending order, included: expired, hospital, SNF, assisted living facility (ALF), home with professional assistance, home with family or spousal support only, and home with support not specified.

Secondary variables included age, sex, length of stay (LOS), and primary diagnoses. Primary diagnoses were divided into homogenous categories including neurological, cardiac, orthopedic, respiratory/pulmonary, UTI, surgery aftercare, internal medical problems, blood disorders, and other. These categories were developed after data collection and based on the frequency of reported primary diagnoses. The category labeled "other" contains miscellaneous diagnoses that did not fit into an

already existing category and that did not occur frequently enough to justify an additional category.

The orthopedic ($n = 22$) and respiratory/pulmonary ($n = 20$) subgroups were the only groups to have a frequency of twenty or more, so relationships for only these primary diagnoses, between scores on the MMSE and LACLS and discharge disposition were examined separately. All other subgroups were not large enough to support a justifiable correlation with the primary variables. All data were analyzed using Pearson correlation coefficients, which were identified as the appropriate statistical measure to examine possible relationships between cognitive scores, discharge location and relevant secondary variables.

It was hypothesized that higher scores on both assessments would be associated with discharge destinations involving lower levels of care, and that a longer length of stay would be associated with lower scores on both cognitive assessments. It was also hypothesized that the correlation between the LACLS and MMSE scores would be positive, in that they would predict the same level of cognitive functioning: either intact or indicating deficits. This would have provided evidence that it was unnecessary for occupational therapists at this SNF to perform both assessments on patients upon admission.

<div align="center">Results</div>

The study population included 41 men and 81 women ($N = 122$) with a mean age of 80.9 years. The average LOS in the SNF was 34.0 days. See Table 1 for a summary of demographics including the distribution of primary diagnoses.

The mean score on the MMSE in this sample was 21.6 (see Figure 1 for the

distribution of MMSE scores). The mean score on the LACLS was 4.27 (see Figure 2

for the distribution of LACLS scores). Mitchell (2009) found that over half of the

reviewed studies in a meta-analysis favored a cut-off score of 23 on the MMSE for

identifying dementia. Allen (2007) stated that on the LACLS, a score of 5.0 or higher

indicates that a person is able to live alone. In the current study, 43.4% of the

population scored 23 or greater on the MMSE, while just 11.5% scored 5.0 or above on

the LACLS.

Table 2 shows the Pearson product-moment correlations among all primary and

secondary variables.

Relationship between MMSE and LACLS. A statistically significant correlation

was found between the MMSE and LACLS among all 122 cases, r (122) = .565, p = .01.

A higher correlation was found in the orthopedic subgroup, r (22) = .620, p = .01, and a

lower correlation in the respiratory/pulmonary subgroup, r (20) = .482, p = .05. Some

disagreement was identified between the MMSE and LACLS in identifying cognitive

status (see Table 3).

Mini Mental Status Exam. No significant correlation was found between the

MMSE and discharge disposition. When scores of the MMSE were compared with

other secondary variables, a statistically significant correlation was found only between

the MMSE and age, r (122) = -.200, p = .05, indicating younger individuals were more

likely to score higher than older adults.

Large Allen Cognitive Levels Screen. A statistically significant correlation existed

between LOS and the LACLS, r (122) = -.197, p = .01, indicating a lower score may be

associated with a longer LOS. A statistically significant correlation was also found

between the LACLS and age, r (122) = -.308, p = .01, indicating older patients were

more likely to score lower. Within the orthopedic subgroup, a statistically significant

correlation was found between the LACLS and discharge disposition, r (22) = .479, p =

.01, indicating these patients were more likely to be discharged to a location of higher

independence with a higher score on the LACLS.

    Discharge Disposition. No significant correlations were found between discharge

location and the MMSE or LACLS among all cases in this sample. A statistically

significant correlation was found between discharge location and LOS, r (122) = .243, p

= .01, indicating patients with a longer LOS were more likely to discharge to a location

of higher independence. However, when omitting the subjects who expired and were

discharged to the hospital, a statistically significant correlation was found, r (100) = -

.217, p < .05, indicating patients with a greater LOS are discharged to a location with

less independence. Within the orthopedic subgroup, a statistically significant correlation

was seen between discharge location and age, r (22) = -.568, p = .01, indicating that

older orthopedic patients are more likely to be discharged to a location with a higher

level of assistance compared to younger orthopedic patients. See Figure 3 for the

distribution of patients to the seven levels of discharge location.

<div align="center">Discussion</div>

    The profile of the participants in this study are assumed to be typical of a SNF in

Washington State, according to therapists familiar with this general setting. More

orthopedic patients are increasingly being seen in SNFs, while fewer stroke patients are

being admitted. Also, it is typical to see a greater proportion of women than men due to

a longer life expectancy. The mean LOS (34.0 days) was higher than expected for a SNF, but the range was large, contributing to this higher average LOS.

The results of this study indicate a moderate association (r = .565) between the MMSE and LACLS, suggesting they may measure some of the same aspects of cognitive functioning among patients at a SNF. Kehrberg et al. (1992) found a strong significant correlation (r = .80) between the MMSE and ACLS, but that study only had 43 participants. Similarly, Heying (1985) found a moderate association (r = .656) between the ACLS and MMSE, again with a small sample size (N = 33).

However, when considering the cut-off levels identified in both assessments, the LACLS and MMSE agreed on the cognitive status of the individual 72% of the time. The MMSE more often identified cognition as intact, whereas the LACLS more often identified lower cognitive functioning (see Table 3). This suggests the LACLS to be a more strict assessment in determining cognitive status, which may lead a patient to a discharge location with greater support than necessary.

It was hypothesized that higher scores on the cognitive assessments would be associated with a discharge location of greater independence. There were no significant correlations between discharge disposition and the LACLS or MMSE among all cases, but in the orthopedic subgroup there was a moderate association between the LACLS and discharge disposition. This finding may indicate that cognition, as measured by the LACLS, plays a greater role in affecting discharge disposition when the diagnosis is orthopedic, compared to a chronic or progressive neurological condition.

Numerous studies have indicated that in general, higher cognitive functioning may be associated with higher independence in the community, not just with orthopedic patients (Astell et al., 2008; Barnes et al., 2004; Diamond et al. 1996; Hershkovitz et al., 2007; Heruti et al., 2002; MacNeil & Lichtenberg, 1997; Rabadi, et al., 2008). The findings of the current study may be due to the patient population of the SNF, as younger patients were more often admitted for orthopedic issues. It can be assumed that this younger population had higher scores on the cognitive assessments, and thus were discharged to a location of higher independence. It was beyond the scope of the current study to control for numerous variables that may have impacted the reason for a particular discharge location among all patients, which may contribute to the lack of statistical evidence to agree with previous studies.

It was also hypothesized that a longer LOS would be associated with lower cognitive assessment scores. The results of this study showed this to hold for the LACLS, where a weak association was found, that is, a patient who scored low on the LACLS had an increased LOS. No correlation between the MMSE and LOS was indicated in the current study, although Heruti et al. (2002) suggested that higher scores on the MMSE at admission in an inpatient rehabilitation ward were associated with a shorter LOS.

In addition, a significant correlation between LOS and discharge disposition among all cases suggests a patient with a longer LOS in a SNF will more likely be discharged to a location of higher independence. These data may not be accurate since patients who expired and those discharged to the hospital ($n = 22$) were included in this sample. In this small subgroup it can be assumed that a medical crisis emerged

that caused them to be prematurely discharged from the SNF and subsequent therapy. Because of this, we cannot assume that a longer LOS and more rehabilitation may lead to greater likelihood of discharge to a location of higher independence. The negative correlation found when these 22 patients were omitted indicate that patients with a longer LOS in the SNF were more likely to be discharged to a location of lower independence, possibly due to more complex medical problems, which resulted in a longer LOS, which would be assumed for a normal population in a SNF.

In addition, relationships between age and the MMSE and age and the LACLS indicate that younger individuals were more likely to score higher on either of these two assessments compared to older individuals. These data are consistent with the findings of Tombaugh and McIntyre (1992), who found that older individuals scored lower on the MMSE.

In the current study, the mean score on the MMSE for patients being discharged to an unsupported environment was 21.83 ($n = 48$), whereas those discharged to a supported living environment, including those who expired, had a mean score of 21.45 ($n = 74$). These data suggest that there is not a significant difference in scores on the MMSE across discharge locations. This indicates that the MMSE may not be a valid predictor of discharge disposition when used as a sole predictor of cognitive functioning.

Among 100 patients admitted to an acute mental health unit, Henry et al. (1998) reported that the mean ACLS score for patients discharged to independent living was 4.92. The mean score for the current study of patients discharged to an unsupported living situation was 4.213. For those discharged to supported living, Henry et al. (1998) reported a mean score of 4.50, whereas the current study had a mean of 4.305,

including patients who had expired. The data from the current study compared to that

of Henry et al. demonstrated the variation among scores of cognitive assessment in

samples of approximately the same size. This indicates that there are many factors that

affect where and why a person is discharged, especially among older adults who have

complex medical and social histories.

Limitations

The information concerning the discharge disposition of participants in this study

was limited. More information on the specifics of the environment could have been

helpful, such as the level of care, how much and how often support was available, and

how close family or friends are that were available to help as needed. This would have

provided more accurate information concerning the discharge environment in relation to

cognitive scores, and would ideally eliminate the "home unspecified" category.

The primary diagnoses recorded in this study were likely not representative of all

elderly patient populations. These diagnoses were collected from the ICD-9 codes on

the admittance record to keep all data collection consistent. It was found that the

reason for rehabilitation was not always the primary diagnosis recorded upon

admittance to the SNF and secondary diagnoses may have an impact on cognitive

status, though this was not supported by the identified diagnoses. The secondary

diagnoses' ICD-9 codes did not consistently support the primary diagnosis in identifying

any cognitive impairment, so these were not recorded for statistical analysis. The

variability and uncertainty of these reports resulted in a complexity that was beyond the

scope of this study. This inaccuracy may have attenuated relationships in the diagnosis

subgroups.

Future Research

This study could be expanded on or improved in a number of ways. First, a better collection method for primary diagnosis should be tried, possibly using the primary problem identified by the therapist. This would provide the primary reason the patient is in therapy, versus the general admittance ICD-9 code. Second, it would be interesting to expand the sample to multiple SNFs, which would increase the generalizability and may increase the stability of findings. Third, a survey could be developed to assess what cognitive assessments are used by therapists in the community at different settings (hospital, SNF, inpatient rehabilitation), what they use them for, and their opinions on the usefulness for predicting discharge disposition.

Implications for occupational therapy

Determining the clinical usefulness of cognitive assessments has become a hot topic in occupational therapy. By providing practitioners with evidence to support or refute the accuracy of certain assessments in measuring cognitive abilities and predicting discharge disposition, occupational therapists can better support and prepare their patients for discharge from therapy. The occupational therapists that work in the SNF sponsoring this study administer both the MMSE and LACLS, as appropriate, to their patients. This study suggests the LACLS may be a better predictor of discharge disposition, potentially due to its rigor and highly structured administration. Cognitive assessments are used for more than predicting discharge disposition, of course. They are also helpful in guiding treatment planning and determining how to grade activities. Further research is needed to establish greater evidence supporting the constructs of these assessments and how they can be useful in a clinical setting.

Conclusion

The data from this study provide evidence that these cognitive assessments are not definitive measures of discharge disposition, although some relationships were found that suggest their usefulness. The MMSE and LACLS may measure cognitive functioning differently, but they show moderate agreement (55%) in identifying cognitive deficits among patients of a SNF. In addition, the LACLS may be a better predictor of cognitive deficits and the ability to live alone, especially among orthopedic patients in a SNF. However, insignificant differences in scores of patients discharged to supported versus unsupported living indicate many variables exist with elderly patients who have complex medical and social histories. The MMSE and LACLS are tools to be used as one component in planning an intervention, but further research is needed to provide definitive evidence of their ability to predict discharge location.

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Table 1

Demographics of study sample (N = 122)

Variable	n	%
Gender		
Male	41	33.6
Female	81	66.4
Age (years)		
Mean (SD)	80.9 (8.0)	
Range	65-100	
LOS (days)		
Mean (SD)	34.0 (27.5)	
Range	4-197	
MMSE		
Mean (SD)	21.6 (6.2)	
Range	3-30	
LACLS		
Mean (SD)	4.27 (4.3)	
Range	3.2-5.8	
Distribution of Diagnosis groups by ICD-9 codes		
Orthopedic	22	18
Respiratory/pulmonary	20	16.4
Other (Rhabdomyolysis, Male genital disorder, History of falls, dizziness/giddiness, cellulitis, pain, Nausea & vomiting, epistaxis)	18	14.8
Surgery aftercare	17	13.9
Cardiac	13	10.7
Internal medicine	12	9.8
Neurological	8	6.6
UTI	6	4.9
Blood disorders	6	4.9

Table 2

Pearson product-moment correlations between all variables (*N* = 122)

Variable	1	2	3	4	5	6
1. MMSE	__	.565**	.121	-.116	-.200*	.013
2. LACLS		__	.039	-.197*	-.308**	-.132
3. DC			__	.243**	-.090	.127
4. LOS				__	.092	.135
5. Age					__	.047
6. Sex						__

*p = .05, two-tailed. ** p = .01, two-tailed.

Table 3

Agreement of intact cognition between MMSE and LACLS (N = 122)

		LACLS	
		Yes	No
	Yes	21 (17%)	32 (26%)
MMSE			
	No	2 (2%)	67 (55%)

Note. LACLS cut-off score = 5.0, MMSE cut-off score = 23

Figure 1

MMSE Scores achieved by patients in SNF (*N* = 122)
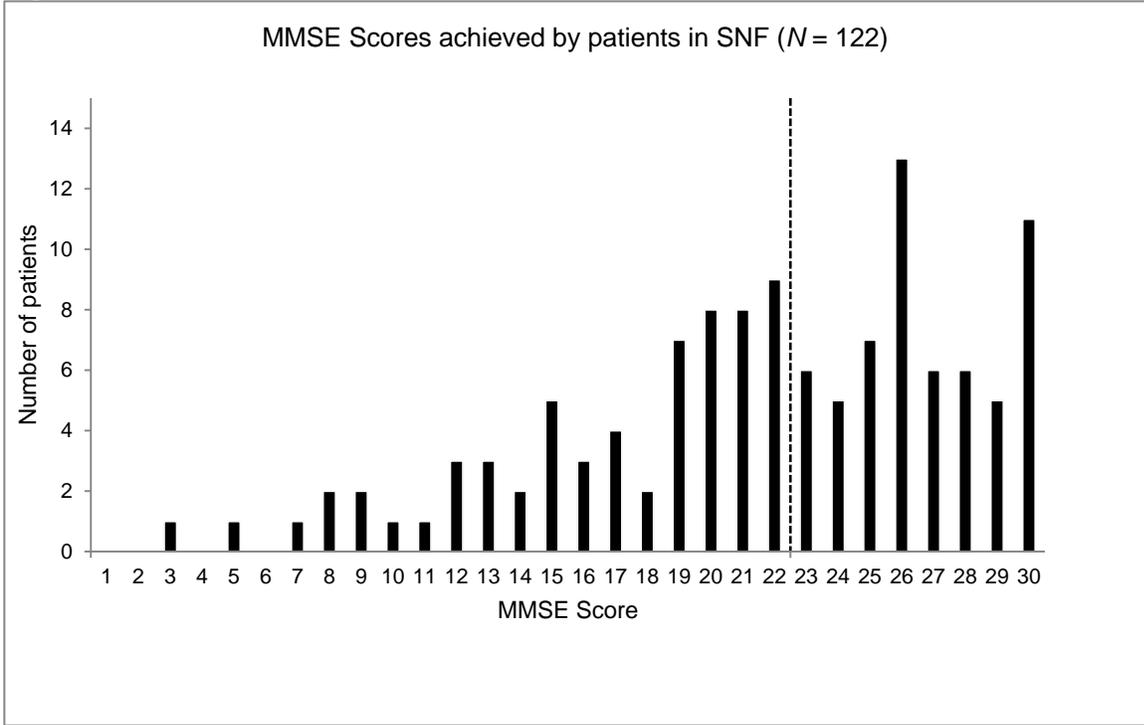
Note. The dashed line indicates the cut-off score for dementia (Mitchell, 2009).

Figure 2.

LACLS Scores Achieved by Patients in a SNF (*N* = 122)
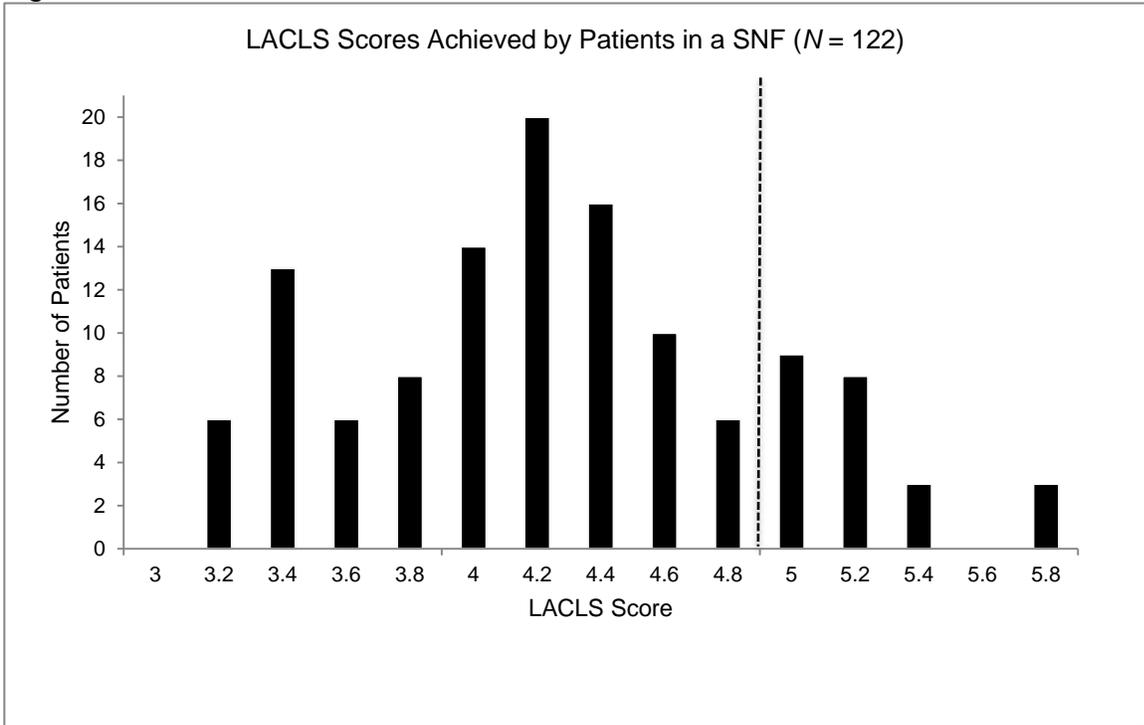
Note. The dashed line represents those scoring above the line are able to live independently (Allen, 2007).

Figure 3.

LACLS and MMSE Scores by Discharge Destination of Patients in a SNF (*N* = 122)