**Transitioning from hospital to home: Validation and application of a unique Cognitive-Functional Evaluation of older people (COFEE – HD)**

**Key words: need 5 key words**

**Abstract if Australian Journal of Occupational Therapy – 300 word abstract**

**Background**

With the continued presence of the COVID-19 pandemic placing the older population at higher physical and social risk, ‘aging in place’ has become even more crucial to implement. Effective discharge planning may increase the patient’s independence upon return home and reduce risk of rehospitalization. Despite the documented importance of hospital discharge planning for older adults, there are no standardized guidelines for discharge protocol for occupational therapists (OTs).

**Methods**

We compared a modified evaluation, COFEE-HD, to standard hospital assessments, in a rehabilitation ward. Patients were evaluated upon discharge and four months later, to assess the effectiveness of the tool to predict future functioning at home.

**Results**

A total of 77 patients were recruited in the hospital, and home assessments were conducted on 64 participants.TheCOFEE-HD evaluation was significantly related with the standard measures used in the hospital: COFEE-HD physical functioning and personal and environmental safety with hospital FIM (p = 0.049 - p < 0.001), and COFEE-HD cognitive functioning with hospital MMSE and KPT (p = 0.048 - p = 0.031).

TheCOFEE-HD was significantly related with functioning at home four months later: COFEE-HD physical functioning and personal and environmental safety with home mobility, BADL, IADL, and home safety (p = 0.031 to p < 0.001), and COFEE-HD cognitive functioning with home BADL and IADL (p = 0.045 - p = 0.016). Home BADL and IADL were significantly predicted with COFEE-HD BADLs and IADLs, home safety, and the participant’s mobility score (p = 0.043 - p < 0.001).

**Conclusion**

A comprehensive functional-cognitive assessment prior to discharge enables occupational therapists to provide accurate recommendations and can include function, safety, and meta-cognitive function information to promote continued independence at home. These unique elements are essential to incorporate within the discharge protocol.

**Title: Transitioning from hospital to home: Validation and application of a unique Cognitive-Functional Evaluation of older people (COFEE – HD)**

**Introduction**

Due to a global increase in the population of older adults, the importance of being able to ‘age in place’ safely and independently has been emphasized by current social and health policies (Zur et al., 2013). With the continued presence of the COVID-19 pandemic placing this population at higher physical and social risk (Yanez et al., 2020; Hargrove et al., 2021), it is even more important to ensure the possibility of living safely at home.

In general, aging increases risk of hospitalization (Hsu et al., 2020) and subsequent risk of cognitive impairment (James et al., 2019), future disability (Davydow et al., 2014), and may be compounded by an increased risk for injuries caused by falls, stroke or functional deterioration (Naseri et al., 2020). Effective discharge planning has been found to increase the patient’s independence upon the return home and reduce risk of rehospitalization (Provencher et al., 2020; Wales et al., 2012).

The purpose of an occupational therapy discharge plan is to identify potential problems which may appear when patients resume their activities of daily living (ADLs), and suggest modifications or adaptations needed to maximize independence and safety (Clemson et al., 2016). Despite the documented importance of hospital discharge planning for older adults (Mabire et al., 2015; Provencher et al., 2020), there are no standardized guidelines for discharge protocol for occupational therapists (OTs). Even with a proven necessity to implement a routine discharge process (Roberts et al., 2020; Rogers et al., 2017), each hospital decides individually how to conduct the assessment and provide discharge recommendations. As the overarching goal of an OT is to enable the client to return/participate in an active life as possible, an extensive evaluation is essential in order to assess the patient’s needs and create future recommendations (AOTA, 2017). Function is often assessed via questionnaires, based on self-report and functional diagnoses. Yet responses may be affected by patient bias, cognitive state, culture, language and education. In contrast, occupational performance-based assessments can better measure the patient’s ability to perform various function-based tasks, such as basic daily activities (BADL) and instrumental daily activities (IADL) (Rogers et al., 2017). The Cognitive OT Functional Evaluation of the Elderly (COFEE) was initially developed using a Functional Cognitive Evaluation (FCE) model (Zilbershlag & Josman, 2019) for home assessment of patients with an element of cognitive decline, and was modified (COFEE-HD) to provide older adults and their families essential information and recommendations regarding function, cognition, and safety in the home prior to hospital discharge.

The purpose of this study was to:

(a) Examine the validity of the COFEE-HD when compared to accepted current assessments for older adults hospitalized in geriatric wards

 (b) Assess the ability of the COFEE-HD to predict the capability of hospitalized older adults to continue safe and independent living at home

**Methods**

Inclusion criteria for this longitudinal study from March, 2018 to December, 2019 were adults 65 and older, who were hospitalized in a geriatric rehabilitation ward and could communicate in Hebrew. Exclusion criteria were Mini Mental State Examination (MMSE) (Folstein et al., 1975) score >10, aphasia, restrained to the bed, and/or those already receiving 24-hour assistance from a live-in caregiver prior to this hospitalization.

Study Instruments

**Cognitive OT Functional Evaluation of the Elderly in the Hospital (COFEE – HD):** COFEE is a composite tool created to holistically, and effectively, evaluate an older person’s ability to live independently and safely at home, and act as a foundation on which to base future recommendations. The evaluation consists of three sections: 1) function BADL and IADL 2) personal and environmental safety and 3) current meta cognitive function (awareness/Executive Function-(EF). Validity was established (Zilbershlag & Josman, 2019) for home evaluation. The COFEE –HD is a modified version of the COFEE to reflect the patient’s current status of hospitalization. This tool can then be implemented prior to discharge to create a detailed recommendation plan for the patient and family, so that, when possible, the older adult can remain living safely and independently at home.

***Standard assessments currently used with older adults in geriatric wards***

To assess elements of basic and instrumental function, the standard is the Functional Independence Measure (FIM) (Chang et al., 1997), an observational tool for evaluating the degree of cognitive and physical assistance needed for daily function. The FIM consists of 18 items related to functional tasks, grouped into two themes: motor and cognitive. Scores for each item range from 1 (total dependence) to 7 (total independence), and the total score ranges from 18 to 126, where higher scores indicate greater levels of independence. (Fioravanti et al., 2012). In our study center, a partial FIM assessment is used, which includes transfers, and upper and lower body dressing.

As currently there is no standardized survey utilized in a hospital setting to assess future personal and environmental safety in the home, we also used aspects of the FIM to compare with the safety component of the COFEE-HD evaluation.

To compare elements of meta cognitive function, we utilized the following two assessments:

1. Mini Mental State Examination (MMSE) (Folstein et al.1975): a standardized screening tool for detecting cognitive impairment; includes eleven items to evaluate temporal orientation, attention, memory, language and visual-spatial skills. Scores range from 0 to 30; higher scores indicate normal cognitive abilities.
2. The Kitchen Picture Test (KPT) (Mansbach et al., 2014): an assessment of judgment in which the participant is presented with a picture showing a room with hazards and asked to identify and solve the identified problem. Scores range from 0 to 8; 7-8 represents normal judgment.

***Follow up Home Assessment***

To assess the predictive value of the COFEE-HD for future home-based functioning, the following standard instruments were used when a home assessment was conducted:

 **Basic and Instrumental Functioning:**

* 1. The Barthel Index of Activities of Daily Living (Barthel ADL) (Mahoney & Barthel, 1965)
	2. The Lawton Instrumental Activities of Daily Living Scale (Lawton ADL) (Lawton & Brody, 1969)

**Personal and environmental safety:**

1. The Home Occupational Environment Assessment (HOEA), (Baum & Edwards, 1998): assesses the environment of a person with cognitive impairment in order to determine ability to safely dwell at home. Higher scores mean increased risk.
2. Home safety self -report as developed by the researchers: Participants were asked about 13 different unsafe events at home (e.g. leaving the oven on, falling, letting a stranger in, taking wrong doses of medication). The total score was composed of the sum of the items; a higher score represents greater safety.

**Procedure**

The study was approved by the Ethics Committee of the medical center. A process of reliability was conducted between judges and the research team that included seven occupational therapists working at the hospital who also recruited participants according to the inclusion criteria. Possible participants were approached by the professional team and received an explanation about the study. Those who recognized the benefit of receiving this in-depth evaluation and were interested in participating, were further explained the goals and procedures and signed an informed consent form. The current hospital discharge evaluation was then performed by the hospital occupational therapist, to be followed by the COFEE -HD, executed by the research team. On average, four months after discharge, another evaluation was performed during a home visit by a different OT than the one in the hospital.

**Data Analysis**

Data were analyzed with SPSS v.27 (IBM, Chicago IL). All variables were described with frequencies and percentages for categorical variables, and means and standard deviations for continuous variables. Spearman correlations were calculated between the variables of the standard evaluation conducted in the hospital and the variables of the COFEE evaluation, as well between the variables of the COFEE evaluation and the variables of the evaluation conducted at home after discharge. Some patients were unavailable for some assessments, and thus the various measures include different amounts of participating older adults. Stepwise regression models were calculated to assess the contribution of the COFEE-HD evaluation at discharge from the geriatric ward, to the functional evaluation in the home visit (BADL and IADL). All COFEE-HD variables that had significant relationships with the home assessment of BADL and IADL were defined as possible predictors. Age and gender were used as well. Variables that were positively or negatively skewed were mathematically transformed. Stepwise regressions were used due to the number of possible predictors versus sample size. Significance level was set at p = 0.05.

**Results**

A total of 77 patients were recruited in the hospital ward, ages 65 to 92 (M =76.38, SD=7.91), 41 women (53.2%) and 36 men (46.8%). Almost half the group had completed high school (48.1%) and 22% had an academic degree (Table 1). Home assessments were conducted on 64 of the 77 participants (83%). Participants were hospitalized for five weeks on average with various diagnoses (Table 1). Mean MMSE score at admission was 24.26, and mean FIM was 4.54. Mobility during hospitalization was mainly with a walking aid or a wheelchair, while at home it was expected to be mainly with a walking aid. Mobility outside the home was expected to be mainly with a wheelchair or companion (Table 1).

***Elements of the COFEE-HD found to be significantly related with standard measurements at discharge***

Within the physical functioning realm, both the mobility score and BADL measurements were positively correlated with the FIM score. The domain of environmental and physical safety within the COFEE-HD was significantly correlated with the FIM evaluation as well. As for the metacognitive functioning in COFEE-HD, the adequacy in cognitive IADL, aEFPT (medication), and awareness (after IADL shopping task), were all significantly correlated with the MMSE and the KPT. The EFPT cooking task, awareness, predictive and evaluative (before and after EFPT cooking task), were also correlated with the KPT. The awareness predictive measure (IADL shopping task) was ~~also~~ significantly correlated with the MMSE as well (Table 2). That is, higher physical functioning at discharge, as measured with the standard hospital tool (FIM), was related with higher COFEE-HD physical functioning and personal and environmental safety at the time. Likewise, higher cognitive functioning at discharge, as measured with the standard hospital tools (MMSE, KPT), was related with higher COFEE-HD cognitive functioning.

**Home assessment after discharge**

By the time of the home visit, four participants had passed away, two participants required complicated nursing care and seven participants terminated consent. Therefore, home assessment was conducted with 64 patients (83%), four to six months after discharge, (M = 108 days, SD = 48.66)

Almost half were married (46.8%) and 46.8% lived alone; 91% had received some type of rehabilitative treatment. Only 6.3% of the participants had not applied any of the recommendations offered during the discharge evaluation, and more than half (53.1%) had partially implemented the recommendations (Table 3).

Tables 4 and 5 present the correlations between the COFEE-HD evaluation for everyday functioning and cognitive functioning at discharge, and the functional evaluation in the post discharge home visit. During the home assessment, basic and instrumental functioning, and personal and environmental safety were assessed (as commonly conducted during home visits by occupational therapists), and compared with the COFEE-HD evaluation at discharge. In all areas, the COFEE-HD was found to be significantly correlated with the home assessment. That is, the mobility and BADL elements of the COFEE-HD were correlated with mobility, BADL (Barthel), and IADLs (Lawton) assessments at home. The safety element within the COFEE-HD was correlated with most of the measurements at home: mobility, BADL (Barthel) and IADLs (Lawton) assessment, and personal and environmental safety (Table 4). All cognitive elements of the COFFEE-HD (IADL tasks, EF cooking tasks and awareness) correlated with the BADL and IADL assessments (Table 5).

Next, the predictive ability of the COFEE-HD to evaluate future performance at home was examined with two stepwise regressions. Functioning indices that were found to predict performance at home after discharge were the overall mobility score, BADLs and IADLs assessments, and the participant’s report of home safety (Table 6). BADL (p<0.001), home safety self-report (p=0.037) and Awareness (evaluative) after IADL shopping task tasks (p=0.043), all elements of the COFFEE-HD, were able to predict BADL (Barthel) functioning at home. BADLs (p=0.006), home safety (p=0.038), and mobility (p=0.006) predicted IADL at home.

**Discussion**

There has been continued emphasis on aging in place over the past two decades, and it is important to encourage aging patients to continue to live independently and safely (Skelton et al., 2010). In the face of physiological changes and the increase in chronic illness that develop with age and may affect the ability of older adults to lead an independent life in the community (Bonder & Dal Bello-Haas, 2018), there is a need for a comprehensive functional-cognitive evaluation (Moore et al., 2008) to foresee possible negative events. Hence, it is important to construct a treatment plan and recommendations that are observation based and incorporate tailored strategies to both maintain and improve functioning and quality of life at home.

For these reasons, the COFEE-HD was developed to include functioning, safety, and cognition, and include a written summary of the evaluation that provide specific recommendations. Maintaining these three areas is essential to assist an older person continue to live a safe and satisfying life at home (Stark et al., 2017; Provencher et al., 2020). A recent study in Australia found that when OTs evaluated patients in hospital and planned a post discharge intervention for older adults that incorporated goal-setting, equipment prescription, home visits and telephone follow-up, those patients with mild cognitive impairment had significantly fewer rehospitalizations after three months, then the rest of the study group (Provencher et al., 2020).

In order to validate this evaluation in the hospital, we examined the correlation between the COFEE-HD and the standard hospital assessments (Zilbershag & Josman, 2019). There was a significant relationship between the mobility, BADL function, and safety elements of the COFEE-HD to the FIM, which means that, overall, there is a connection between general function and the element of safety in the COFEE-HD as it is related to the FIM.

It is important to note that the advantage of COFEE-HD is that it examines the issue of safety more in depth, which is known to affect a person’s functioning. This result highlights the important role of examining safety, since it is integral to the ability of older adults to continue to function in the community and participate in their needed and desired occupations (Chiu & Oliver, 2006). We also found correlation between the cognitive assessments (MMSE and KPT) with most of the cognitive aspects of the COFFEE-HD. It is also important to note that this studied evaluation emphasizes meta cognition (EF and awareness) (Skelton et al., 2010). In addition, the COFEE-HD not only includes these elements but also emphasizes the assessment of meta cognitive abilities through the performance of function, like, for example, what occurs during the cooking, medication usage, and IADL shopping tasks.

Furthermore, our evaluation was based on observing the patient in hospital, a vital element of assessing a patient’s true level of functioning (Chisholm et al., 2014) and often missing from two dimensional questionnaires or patient self-report (Zilbershlag & Josman, 2019). Although evaluations based on observation can be influenced by patient motivation, behavior, and cognition at the moment of observation, they do have advantages, since they are objective, measurable, standardized, and can reconstruct and address functional contexts (Wesson et al., 2016). In addition, if occupational therapists are going to be able to effectively evaluate whether a person is able to live independently and safely at home, there needs to be an emphasis on evaluating functional cognition, which responds to the dynamic interaction between motoric abilities, activity requirements of the task environment; this all rests on the foundation of cognitive ability (Wesson et al., 2016).

*Limitations*

Since this was a field-based study, it is difficult to control for variables that would interfere with patients' lives after discharge. The assumption is that the treatments they received represent the distribution in the population and received according to individual need. Under these assumptions, the relationship between COFEE-HD assessment and home functioning was examined. Of course, more research needs to be conducted on subpopulations. Even with our small sample and single center focus, the COFEE-HD were predictive of several aspects of future functioning and safety at home, however, larger studies may be able to provide more robust calculations for prediction.

**Conclusion and recommendations**

The findings of this study could assist occupational therapists in their evaluations of older adults at time of discharge to function safely upon returning home. OT recommendations provided to the patient and family at discharge that includes on function, safety, and meta-cognitive functions for continued independence at home, is a unique, but crucial element to incorporate within the discharge protocol. Predicting if an older person will be able to live safely and successfully in their home environment after hospital discharge, is an important tool for an occupational therapist. (Inoue et al., 2017; Schaefer et al., 2021). This demonstrates the need for us to conduct a larger, multicenter study to ascertain whether our observation-based evaluation would be effective among different populations. We also recommend integrating the COFFEE-HD evaluation among OTs working in the hospital, to enable future successful aging in place, and maximize functioning for the older person returning to live at home. The COFEE-HD is a comprehensive performance-based evaluation that examines function, safety and meta-cognition, and was found valid and feasible, to be performed prior to discharge from hospital.

Key points

* It is essential for clinical application for OTs to for a comprehensive functional cognitive discharge evaluation
* To make possible for older people to live safely at home, our model includes evaluating IADL and BADL function and meta cognition
* OTs have unique position to evaluate patient at discharge in order to offer tailor made recommendations

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