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A report produced under the auspice of the National Task Group on Intellectual Disabilities and Dementia Practices and the LuMind IDSC Foundation

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Neuroatypical Conditions Expert Consultative Panel

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Project Principals

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Abstract

Detection of any cognitive impairment as part of the Affordable Care Act's annual wellness visit in primary or other health care settings for adults with pre-existing neuroatypical or neurodivergent conditions (NACs) is challenging. Included here are common adult conditions that affect normative intellectual development and function (such as intellectual disability (ID) and ID with conjoint psychiatric condition), thought, moods, and cognition (such as severe mental illness), communication functions (such as conditions on the autism spectrum and hearing/vision impairments), and brain and motor function (such as cerebral palsy and acquired or traumatic brain injury).

Current federal guidance for the assessment of cognitive impairment for MCI or dementia do not include information as how to assess such adults. A Neuroatypical Conditions Expert Consultative Panel was tasked with identifying barriers and the special needs and adaptations for examination of adults with NACs. The Expert Panel determined that adults with NACs (1) posed various challenges for clinicians when discriminating current behavior and function from that which was pre-existing; (2) presented issues related to inherent comprehension, oral communication difficulties, motor task performance impediments, or recognition of visuals; and (3) complicated testing when standardized dementia assessment measures were used and benefited from specialized instruments.

Adults with NACs present with varying degrees of risk for dementia. To increase the accuracy rate in the assessments, clinicians should be more aware of how older age affects each of the NACs, be familiar with expectations for cognitive decline and risk of dementia (and what type) and be facile with adapting testing situations and measures. Expert Panel recommendations included (1) broadening federal guidance to include adaptations of assessment practices to accommodate NACs; (2) enhancing education for clinicians about NACs and how to detect and diagnose MCI or dementia; and (3) expanding research to produce more evidence-based information on assessing NACs for later life adult cognitive diseases/disorders and for planning subsequent post-diagnostic care.

Executive Summary

Purpose

Detection of any cognitive impairment as part of the Affordable Care Act's annual wellness visit in primary or health care settings is difficult in general but can be particularly challenging when the adults seen have a pre-existing neuroatypical or neurodivergent condition (NAC).

Current federal guidance for the assessment of cognitive impairment related to MCI or dementia do not include protocols on special considerations needed for the assessment of such adults. A consensus outcome effort was undertaken to examine the barriers to inclusion of such adults in existing federal policy and practices as well as in provider and clinical practices.

The effort also examined: (1) the prevalence and risk for dementia in each condition; (2) which had a body of research on ascertaining MCI or dementia; and (3) what adaptations might be undertaken to make the examination process more productive. Implications for post-assessment plans of care were also considered.

Conditions Included

NACs included those that affect normative intellectual development and function (such as intellectual disability - ID) and ID with conjoint psychiatric conditions), thought, moods, and cognition (such as severe mental illness), communication functions (such as conditions on the autism spectrum and hearing/vision impairments), and brain and motor function (such as cerebral palsy and acquired or traumatic brain injury).

Process

A Neuroatypical Conditions Expert Consultative Panel representing clinicians and academic experts from the fields represented by the conditions was tasked with examining what barriers existed and what special adaptations may be needed when examining adults with these NACs. Consultations were held via written material exchanges and virtual conferencing.

Findings

The Panel's findings related to these conditions and the examination situations included:

(1) Adults with NACs faced a variety of barriers to being accurately examined and having determinations made about whether they had a new cognitive impairment.

(2) Most clinicians experience difficulties in discriminating current behavior and function from that which was pre-existing in some of the conditions, particularly those that include pre-existing cognitive deficits.

(3) Many of the conditions included problems with comprehension, oral communication, motor task performance impediments, recognition of assessment related visuals, and comfort in testing situations.

(4) For conditions with pre-existing cognitive issues, the use of standardized dementia assessment measures was not indicated unless the measures were significantly adapted or specially designed.

(5) For conditions with motor or sensory impairments, special adaptations related to

compensating for the impairments were necessary to obtain valid scoring.

(6) Some of the conditions had definable risk for MCI or dementia and were backed by a significant field of study; others were still beginning to be studied and presented with varied expectations for risk of dementia and inherent factors affecting cognitive decline.

(7) To increase the accuracy rate in the assessments, practitioners should be aware of the nature of aging effects in these conditions, know the expectations for cognitive decline and risk of dementia (and of what type), and be familiar with testing adaptations that can facilitate the examination process to generate meaningful data.

(8) Not providing reimbursement for assessments to adults with risk for younger-onset dementia (not yet age 65) is a barrier to the effective and early detection among some adults, including those with cerebral palsy, Down syndrome, some ABIs and other neuroatypical conditions.

Recommendations

The Expert Panel's recommendations addressed decreasing assessment inequities, increasing clinical accuracy, enhancing education and knowledge among examiners, and strategies for underwriting research endeavors by the NIH and the private sector.

Recommendation #1: Broadening federal guidance to include adaptations of assessment practices to accommodate NACs.

- Enhance existing or developing new protocols and guidelines for examining adults with primary and/or secondary or compound NACs.
- Promote the development of specially designed instruments specifically for annual wellness visit initial and subsequent examinations.
- Adapt existing guidelines to accommodate cultural and language diversity – particularly targeted for NACs.
- Create listings and directories of clinicians who are expert in examining adults with collective or individual NACs.
- Expand local diagnostic resources and clinical services familiar with examining and treating adults with NACs.

Recommendation #2: Enhancing education for practitioners to increase knowledge of NACs, how to differentially diagnose MCI or dementia, and how to develop assessment-informed plans for post-diagnostic care.

- Expand trainings by federal agencies to reach primary and health care practitioners who are unfamiliar with many of the NACs.
- Enlist national professional and multidisciplinary organizations and associations to develop guidelines for (1) examining and formally assessing dementia in adults with neuroatypical conditions, and (2) relating assessment findings to condition and dementia specific supportive resources.

Recommendation #3: Expanding research to produce more evidence-based information on assessing NACs as part of cognitive impairment screenings.

- Expand epidemiological and demographic research on adults to determine the prevalence, nature, and characteristics of select NACs in older age.
- Expand clinical proof of practice and applied research on interventions of value following diagnosis and as part of plans of care.
- Expand research on reliability and validity of specialty instruments developed or in use in cognitive impairments assessments with select NACs.
- Obtain, when feasible, normative data for different NAC groups when using existing measures.

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INTRODUCTION

It is generally accepted public and practice policy that early detection of cognitive impairment is useful as it starts the process to validate the presence of brain disease or disorder, can help adults and families plan for a change in functioning, can aid in working through acceptance, and can help with anticipating the need for mitigation strategies.[1,2] Yet, there are barriers to early detection, including issues of personal preferences as 'to know or not to know',[3] resource limitations for large scale screenings, lack of trained clinicians who can discern the nuanced presentations of mild cognitive impairment (MCI) or dementia, and lack of follow-up support services to those adults who are determined to have dementia. In addition, while many organizations promote screening and early detection, the National Academies for Sciences, Engineering, and Medicine has noted that cognitive impairment is significantly underdiagnosed.[4] The Alzheimer's Association has reported that in the United States only roughly half of the population of individuals who have Alzheimer's disease (AD) and other adult cognitive disease (ACD) receive a formal diagnosis.[5] There are significant deficiencies in outreach and processing for determining cognitive impairment among many subpopulations in the United States. While the National Academies recognized the problems inherent in determining cognitive impairment in language, ethnic, and culturally diverse peoples, there are additional subpopulations, such as adults with neuroatypical or neurodivergent conditions (NACs),[6] who as they age experience additional cognitive decline as well as numerous pre-existing cognitive, thought, and sensory impairing conditions.

Determining whether an adult seen in primary care is experiencing some form of cognitive decline is often difficult in general but can be particularly challenging when the adult has some form of pre-existing communication or cognitive impairment or thought disorder. Some communication difficulties may be due to low education level or non-English first language usage. However, innate expressive and receptive language difficulties due to hearing or speech difficulties or life-long limited conceptual development or late-life information processing difficulties may also be associated with communication challenges. Recommendations for assessing for cognitive decline presume that the persons being examined will generally fall within some typical presentations of knowledge, cognitive development, and functioning. Challenges exist when examining outliers – that is, individuals having preexisting NACs that often mask change in cognitive functioning. Inexperienced clinicians examining adults with pre-existing cognitive or sensory impairing conditions may reflexively assume that the behaviors they observe are indicative of dementia.[7,8,9]

Individuals who are outliers are defined specifically as adults with a variety of NACs, including those that affect normative intellectual development and function (such as

intellectual disability (ID)[10] and ID with conjoint psychiatric condition), thought, moods, and cognition (such as severe mental illness), communication functions (such as conditions on the autism spectrum and hearing/vision impairments), and brain and motor function (such as cerebral palsy and acquired or traumatic brain injury). They exist outside of the usual population of middle age and older adults that the National Institute on Aging (NIA) and the Centers for Medicare and Medicaid Services (CMS) consider with respect to guidance or information about screening and assessment of cognitive impairment and possible dementia.[11]

The Centers for Disease Control and Prevention (CDC) estimates that about one in four noninstitutionalized adults (25.7%; 61.4 million persons) has some type of disability or impairment.[12] These adults include those having problems with cognition (10.8%), hearing (5.9%), vision (4.6%), and self-care (3.7%). It has been estimated that about 1.2 million adults have an ID, and some 944,000 adults have another developmental disability, including autism spectrum disorder (ASD) and cerebral palsy (CP). This may be an underestimate as another source noted by the CDC estimated that number of adults age 18+ with ASD in the US to be closer to 5.4 million.[13,14] The National Institutes for Health (NIH) has noted that Down syndrome (DS) is one of the high-risk groups for AD[15] and a recent analysis indicated that in the USA adults with Down age 40 and older may number some 57,600.[16] Additionally, the National Institute of Mental Health (NIMH)[17] has noted that there are an estimated 13.1 million (or 5.2%) adults aged 18 or older with a serious mental illness (SMI). The prevalence varies, with those aged 50 and older representing about 2.9% (or some 380,000) with SMI. The NIMH (2015) estimates the lifetime prevalence among adults 60 and older with mood disorders to be about 12% and with major depressive disorders to be 1%. Brown and Wolf[18] noted that the odds of being given a diagnosis of dementia, and the prevalence of dementia diagnoses, are higher among older adults with a diagnosis of SMI. Each of these conditions has a range of prevalence in the adult population in the US, but in aggregate they represent a considerable number of Americans – probably between 10 and 25% of all older adults and they may initially present with MCI or dementia at their annual wellness visit or other older age screening.

Most guidance for assessment of cognitive impairment neglects to provide protocols to follow for neuroatypical older adults with preexisting neuro-cognitive and neuro-degenerative conditions. Also, if provided, normative data often used for screening does not account for neuroatypical individuals Thus, the aim of the Neuroatypical Conditions Expert Consultative Panel was to examine what special considerations need to be given by *primary care providers* (PCPs)[19] or *health care providers* (HCP)[20] when examining adults with select neuroatypical (e.g., ID, brain injury, severe mental illness) and neurodivergent (e.g., ASD, sensory impairments) conditions and provide guidance and recommendations to professional organizations for developing standards, and to CMS and NIA on adding information to previously issued statements and guidance.

BACKGROUND

BASIS FOR COGNITIVE IMPAIRMENT ASSESSMENTS

Currently, the legislative basis for examining older adults in primary care for cognitive change is the Patient Protection and Affordable Care Act of 2010 (ACA), and which contains a provision for the detection of cognitive impairment that is part of a person's annual wellness visit (AWV). The ACA provision is intended to support the beneficiary to develop and discuss a plan of preventive care for the coming year that includes receiving health advice, routine measurements, screening, advance care planning, and other tasks related to prevention. The components include height, weight, and blood pressure measures; a review of medical and family history; an assessment to detect cognitive impairment; and establishment of a list of current medical providers, and medications, and a schedule for future preventive services.[21] More specifically, the AWV also requires detection of cognitive impairment by "… assessment of an individual's cognitive function by direct observation, with due consideration of information obtained by way of patient report, concerns raised by family members, friends, caretakers, or others".[22] All of these procedures do require involving an adult in conversation, and asking him or her to undertake certain activities to demonstrate function, and generally understand what is being asked by the practitioner. Screening or triage tests are used to help with validating suspicions of change in cognitive functioning, understanding that definitive diagnoses of dementia are not made based on a five-minute pencil and paper test or oral interview.[23] This would be the function of a more extensive cognitive and behavioral (and potentially biomarker based) assessment.

To operationalize and provide guidance for PCPs, HCPs, or clinicians who may be undertaking a more extensive cognitive assessment with the population-at-large, CMS issued a significantly more detailed guidance for cognitive assessment and care plan services.[24] The guidance expands upon what was originally issued in 2016 noting assessments can help detect cognitive impairment as part of a routine visit through direct observation or by considering information from the patient, family, friends, caregivers, and others. CMS suggests that clinicians may also use a brief cognitive test and evaluate health disparities, chronic conditions, and other factors that contribute to increased risk of cognitive impairment. In addition, CMS notes that if the clinician detects cognitive impairment at an AWV or other routine visit, he or she may perform a more detailed cognitive assessment and develop a care plan. Such an additional evaluation is necessary to diagnose a person with dementia, whether caused by AD or something else, and to identify treatable causes or co-occurring conditions, such as depression or anxiety.

CMS also noted that when billing for such more extensive assessments and care planning, the cognitive assessment should include a detailed history and patient examination with provisions for an independent historian for assessments and corresponding care plans (as provided for under CPT [Current Procedural Terminology] code 99483[25,26]). An independent historian can be a parent, spouse, guardian, or other individual who provides patient history when a patient isn't able to provide complete or reliable medical history. CMS estimates that typically, a clinician would spend 50 minutes face-to-face with a patient and independent historian to perform the following elements during the assessment leading to care planning:

- Examine the patient with a focus on observing cognition
- Record and review the patient's history, reports, and records
- Conduct a functional assessment of basic and instrumental activities of daily living, including decision-making capacity
- Use standardized instruments for staging of dementia like the Functional Assessment Staging Test (FAST)[27] and Clinical Dementia Rating (CDR)[28]
- Reconcile and review for high-risk medications, if applicable
- Use standardized screening instruments to evaluate for neuro-psychiatric and behavioral symptoms, including depression and anxiety
- Conduct a safety evaluation for home and motor vehicle operation
- Identify social supports including how much caregivers know and are willing to provide care
- Address advance care planning and any palliative care needs

An Alzheimer's Association (AA) Expert Task Force suggested broadening the original 2016 CMS protocol by recommended several brief measures of cognitive impairment, including the Mini-COG, the general practitioner assessment of cognition (GPCOG)[29, 30], and Short Montreal Cognitive Assessment (MoCA).[31] The AA's Expert Task Force noted that many of the required assessment elements can be completed by appropriately trained members of the clinical team and that assessments that require the direct participation of a knowledgeable care partner or caregiver, such as a structured assessment of the patient's functioning at home or a caregiver stress measure, may be completed prior to the clinical visit and provided to the clinician for inclusion in care planning.[32] The guidance and recommendations of the AA's Expert Task Force offered no indication of what adaptations may be appropriate when examining neuroatypical adults.

BARRIERS

Assessment Tools as a Barrier

In 2013, the U.S. Preventive Services Task Force (USPSTF) reviewed what was extant at the time with respect to assessing for MCI and dementia.[33] The Task Force noted several brief instruments that PCPs used outside of specialty care to screen for cognitive impairment, and

which could be used to adequately detect dementia in neurotypical[34] adults, especially in populations with a higher prevalence of underlying dementia. Some of these tools could detect dementia, regardless of etiology. Included among the prevalent instruments in use were the Mini Mental State Examination[35] (MMSE), Clock Drawing Test[36] (CDT), Mini-Cog[37], Memory Impairment Screen[38] (MIS), and Informant Questionnaire on Cognitive Decline in the Elderly[39] (IQCODE). In a subsequent report in 2020, the USPSTF noted that the MMSE, a brief test taking 7 to 10 minutes to complete, remains the most thoroughly studied instrument and in most use. Across all instruments, test performance was generally better for the detection of dementia when compared to MCI.[40] The USPSTF's updated report concluded that "several brief screening instruments can adequately detect cognitive impairment, especially in populations with a higher prevalence of underlying dementia."[41] A caution was that these cognitive tests absent other measures are not diagnostic of MCI or dementia. The report noted that these instruments represent screens and with a positive outcome, subsequent diagnostic testing is warranted to assess the level and possible etiology of cognitive impairment.[42] Of note, these measures typically have published normative data cut off scores based on neurotypical individuals when assessing for age-related cognitive changes. This poses problems in those adults with a NAC who have pre-existing cognitive deficits and precludes the use of that normative data. This can result in challenges for the clinicians when attempting to disentangling remote cognitive issues versus age-related cognitive problems.

The NIA has noted several such screening tools that can be used as an important first step in assessing cognitive impairment and which may then trigger a more detailed evaluation.[43] However, none of their related materials provide guidance for adaptations to use with adults with NACs. With respect to guidance on assessment of groups with NACs, the NIA only provides information related to DS,[44] embedded in a report of the Global Down Syndrome Foundation Medical Care Guidelines for Adults with Down Syndrome Workgroup.[45] The guidelines cite only one screening tool as applicable, the *NTG-Early Detection Screen for Dementia* (NTG-EDSD).[46,47] This informant completed tool covers six key domains (cognition, memory, and executive function; behavior and personality; communication; adaptive functioning; ambulation and motor skills; and general decline in established skills) and is intended to be completed prior to, not during an assessment visit.

Some additional guidance is warranted to define the tipping point of when direct interaction with the individual cannot be effectively used and sole reliance on informants is necessary, for example, with adults with ID or other conditions who have impaired cognitive functioning. For a person with minimal ID a direct measure may be effective but is not likely to be effective for many adults with more notable lifelong ID. The same may apply in SMI, where psychotic or negative symptoms or lack of awareness of their cognitive and function can be barriers to assessment.[48] Of particular concern is the use of the NIA and CMS recommended functional assessments without recognition that decline or changes in function must be documented as compared to previous limited levels and a lack of guidance or advisories for

examining adults who have NACs and not easily assessed using otherwise recommended methods.

Communication as a Barrier

The presence of dementia may result in difficulties in comprehension, expression, and responding to the queries or instructions of the examiner in all adults. Language performance difficulties include awareness, comprehension, word fluency, word production, syntax, and verbal feedback.[49] For example, adults with NACs may have various types of aphasia that would markedly interfere with verbal functioning. On the one hand, these difficulties may be instrumental in aiding the clinician in detecting MCI or dementia; on the other hand, their presence may be part of a pre-existing condition and therefore make an assessment more difficult. Persons with hearing impairments may not hear instructions or persons with cognitive limitations may not comprehend queries or instructions. More specifically, persons with some neuroatypical conditions may not respond in a manner that the clinician may expect, react adversely to touch or requests for information, or lack the motor skills to complete certain performance requests. In some cases, medications effects may also impair communication functions. Such impediments may cause the clinician to misjudge the person's state of mind and/or ascribe behaviors as symptomatic of MCI or dementia.

NIA's current list of assessment instruments is also largely targeted to English language speakers and adults familiar with common American cultural references and norms. Studies have confirmed that persons in America's various language and ethnic communities are often underdiagnosed for MCI and dementia and that there are substantial disparities in the timeliness and comprehensiveness of their dementia diagnosis.[50] Some of these language and cultural differences reflect access and other inequities but when presenting for assessment, undertaking screening or assessments with persons whose communication is affected by a NAC is even more challenging. This also leads to questions about cultural fairness in dementia assessment given the dearth of culturally informed cognitive assessment tools applicable to, for example, indigenous populations.[51] Research has shown that in the United States there are certain groups that have a higher risk for dementia, but as with concerns about moving too quickly to a diagnosis, underdiagnosis may occur when a NAC presents significant challenges to determining its presence and can lead to direct safety concerns in impaired individuals.[52] Additional cultural barriers to assessment include cultural beliefs regarding aging and lack of proper assessment tools for clinicians for select cultural and language groups.[53]

There are efforts to respond, particularly to language-based barriers.[54] In the United States, clinicians fluent in Spanish and regional dialects often adapt screening tools – particularly in areas with high concentrations of persons from Central and South America and the Caribbean.[55] The same applies to other areas with concentrations of residents whose first language is not English.[56,57] Yet, English language familiarity is assumed in most instances when conducting examinations. Problems may arise when among adults with NACs this has not been

established and when there is little consideration of the ethnicity, race, and culture among these individuals, further complicating assessment.

Relevant to fairness in undertaking cognitive assessments is the US DHHS's 'Guidance to Federal Financial Assistance Recipients Regarding Title VI Prohibition Against National Origin Discrimination Affecting Limited English Proficient Persons', which may affect those settings that undertake cognitive assessments, but do not offer accommodations when examining adults with limited English proficiency (LEP).[58] DHHS[59] regulations [45 CFR 80.3(b)(2)], require all recipients of federal financial assistance (FFA) from DHHS to provide meaningful access for adults with LEP. Settings receiving FFA can include hospitals, nursing homes, home health agencies, and managed care organizations, universities and other entities with health or social service research programs; state, county, and local health agencies; public and private contractors, subcontractors, and vendors; and physicians and other providers. Settings undertaking cognitive assessments should consider whether accommodations are or need to be provided for persons with LEP as well as adults with communication impairments. However, this guidance does not extend a similar level of concern for the barriers posed by cognitive assessments for adults with NACs.

Conditions as a Barrier

Other factors may disproportionately apply to one or more of the neuroatypical or neurodiverse groups within the American population. For example, examining adults with ID as part of the AWV or other assessment opportunities is often difficult for medical personnel who may be unfamiliar with ID or the adult who has an ID.[60] Barriers would include the degree of ID, not knowing the immediate lived history of the individual,[61] remote history of childhood trauma, expressed/unexpressed anxiety at the examination, and understanding of posed questions and/or pre-existing limits in expressive language skills.[62] There may also be confounding symptoms and presentations when an individual may have multiple conditions, for example, such as the co-occurrence of DS and ASD,[63] sensory impairments and psychiatric conditions,[64] schizophrenia and ID,[65] and cerebral palsy and psychiatric disorder.[66] Additionally, the presence of neuropsychiatric symptoms that can be categorized as behavioral and psychological symptoms of dementia (BPSD) and which may be already present, independent of the pre-existing condition, or exacerbated by it can be a factor in confounding assessments.[67] Those with acquired brain injury may have loss of vision or visual field cuts which impact performance on visual components of any assessment.

For clinicians undertaking a cognitive impairment assessment differentiating presenting behavior due to cognitive decline from pre-existing cognitive limitations is often difficult absent the availability of 'personal best' functioning data or of recent history of changes in functioning and behavior.[68] An additional challenge is that already 85% of Medicare beneficiaries seen for cognitive impairment assessments were noted to have MCI or dementia by a "nondementia specialist physician", with little involvement of dementia specialists following this assessment –

only 22% within one year and 36% within five years – leading to the validity of many assessments being questioned.[69] Relatedly, an "unspecified" dementia diagnosis was common when completed by nondementia specialists (half of diagnoses were for AD).[70] Given such ambiguities in ascertainment, misdiagnoses may be more likely and prevalent when clinicians are presented with adults with NACs.

Changes in behavior such as social withdrawal, depression, oppositional behaviors, anxiety, or aggression may also be associated with the onset of dementia and should be considered in clinical exams and in interviews with informants' presentations of chronic behaviors.[71],[72] Such notable symptoms may also reflect pseudodementia and thus may confound determination[73] Dementia symptom presentation may also be masked by a pre-existing NAC meaning that the ability to differentiate reversible dementias from progressive, largely untreatable neurodegenerative conditions may be compromised.[74] For example, survivors of traumatic brain injury may develop behavioral issues associated with their brain injury and differentiating this behavior from dementia with behavioral disturbance is more difficult.

It has been noted for hearing impaired adults, hearing loss is associated with poorer cognitive scores on MMSE and MoCA, and cognitive scoring is likely confounded by poor hearing ability.[75] One study found that this is an often-overlooked aspect during cognitive screening and that provisions should be made when testing impaired persons for cognition to avoid misdiagnoses of cognitive impairment.[76] Hearing impairment in adults with DS may particularly be a factor in assessment as studies show that hearing loss rates increase in adults with this syndrome with advancing age.[77] In severe mental illness, particularly among 'thought disorders', there may be confabulation of symptoms, which may make it difficult to ascertain during assessment that the behavior observed is due to cognitive neurodegeneration, and it has been reported that dementia in schizophrenia may be a real entity with a neuropsychological signature similar to that of frontotemporal dementia.[78] As noted below, cognitive impairments in the range of performance that define MCI, if not AD, are commonly present at the time of the first episode of schizophrenia even after clinical stabilization.[79]

OTHER CONSIDERATIONS

Biomarkers

Another factor gaining prominence in screening and assessment is the use of biomarkers to note risk or the presence of neuro-biological evidence of brain disease or dysfunction.[80, 81, 82, 83] Recent findings have yet to be incorporated into screening and assessment guidelines.[84] The use of biomarkers can apply to the determination of the various causes of dementia besides AD.[85] Further, biomarker evidence may be helpful for adults with NACs. For example, recent studies in DS have shown that the use of imaging and fluid biomarkers (such as plasma and cerebrospinal fluid) is useful in better defining the age of onset

and the course of the disease. Natural history studies such as the ABCDS,[86] LIFE-DSR,[87] and DABNI[88, 89] have shown that the neuropathology of Down Syndrome Associated Alzheimer's Disease (DS-AD) is like Late-Onset Alzheimer's Disease (LOAD) in the neurotypical population. The progression of LOAD begins with the deposition of amyloid β (Aβ) plaques more than 15 years before an individual develops overt cognitive symptoms. The hyperphosphorylation of tau protein (p-tau) follows leading to neurodegeneration and symptom on-set.[90,91] This predominant model for LOAD has been adapted to DS-AD.[92,93] The emergence of plasma AD biomarkers could allow for the early screening of signs of AD as the population with NACs ages with plasma neurofilament light chain (NfL) emerging as a prognostic biomarker.[94,95] Plasma p-tau (p-tau181 and p-tau217) is a rapidly emerging biomarker studied in LOAD populations, and it might also have great utility in DS, frontotemporal lobar degeneration (FTD), and in differential diagnosis for a range of populations.[96,97,98]

Importance of Screening and Assessment

Assumptions lead many clinicians to view cognitive decline and impairment to be a natural process of aging.[99] These assumptions may also be influenced by a misunderstanding of expressions of aging and may lead to misdiagnoses, emotional tolls on those examined and caregivers, and inappropriate prescriptions of medications and other treatments. Nevertheless, various international and national organizations have advocated for greater focus on early detection and screening of cognitive impairments to determine whether such decline or impairments may be a function of a neurodegenerative brain disease process or due to other factors and potentially reversible.[100] While screening for cognitive decline in general has equivocal support, screening of at-risk adults has clinical value.[101] There is potential to determine and treat a condition that may be mitigated via adaptations compensatory behaviors, environmental accommodations, and other means for coping with change. The same value attached to general population screening via the AWV or other medical or health checks among older at-risk adults is attached to persons with NACs. Health equity calls for educating and informing PCPs and other clinicians on how to best undertake screening and assessment with diverse populations, including the conditions covered in this paper.

Importance of Diagnostics

Although the purpose of this report is not to examine diagnostic processes and their precision, it is useful to note their importance. The need for an accurate diagnosis of AD or other cause of brain disease or disorder is not only important for research and clinical trials, but also for prescribing medications, designing interventions within clinical practice, and in constructing post-diagnostic strategies.[102] When undertaking diagnostics beyond early detection, even with populations with NACs, the convergence of approaches is more notable as they rely more on bio-neurological measures (such as cognitive and neurological tests, brain scans, and genetic and blood tests) that have a high degree of validity. Clinical diagnostics may also, in the future, have a bearing on financing and reimbursement formularies, with costing

projections linked to the nature and expected duration of life years associated with type of dementia.

With respect to participation in clinical trials, there is a need to define the population that the therapeutic candidate is designed to treat and utilize well-recognized diagnostic criteria to identify the trial subjects. What this means in accurately ascertaining a diagnosis among adults with NACs may be a challenge. This issue was raised in 2021 by the Food and Drug Administration (FDA) at a Critical Path Innovation Meeting (CPIM) on DS-AD trials organized by the LuMind IDSC Foundation. The FDA pointed out there are no standard criteria for DS-AD diagnosis, and this could represent a challenge for trials. As more diverse biological markers emerge, the need for significant accuracy in defining the nature of the derivation of later-life cognitive impairments takes on more importance. So, while diagnostics are important, there remains a need for agreement on the process of attainment.

Importance of Care Planning.

Initial and follow-up or periodic assessments provide increasingly accurate information about an individual's functioning and a duration prognosis for maintaining abilities**.** It also covers that transitional period when progressive cognitive impairment is paired with physical decline and inabilities. General approaches to care planning have been outlined by several organizations and advocacy groups.[103, 104, 105, 106] Nonetheless, it has been noted that in actuality, navigating care post-assessment is often sketchy. Needed is comprehensive care planning (e.g., functional assessment, review of current medications for high-risk medications, evaluation of home safety, and caregiver needs), linkage to social services, management of comorbidities, and discussions about end-of-life care.[107]

With respect to planning with and for adults with NACs, care planning is even more sketchy, but should follow many of the same steps and formularies as previously noted albeit applying some specialized approaches. For example, when dependent adults with NACs begin to decline, often more emphasis may be placed on enhancing the capacities of family and other caregivers.[108] The emphasis may also be placed on enabling skills for staff-based care in residential settings.[109] For others who have always had more autonomy, care planning may place more emphasis on enabling the individual to continue functioning as independently as possible, but with planning also focusing on long term supports and services and advanced dementia care.[110, 111] Care planning is a natural extension of the process to identify the presence of dementia and crucial in formulating how the adults once diagnosed will best be aided.

COMMENTARY

Given all the above, it is disconcerting that missing from the extensive guidance for the AWV and its follow-ups is a stipulation for augmenting the assessment for persons with pre-existing cognitive impairments, such as SMI, ASD, ID or other NACs. It is also disconcerting that

no guidance is provided for examination situations where there are cultural or ethnic differences or primary language barriers, particularly if the person has a NAC and is culturally or linguistic different from the examiner. Further, findings of an inverse relationship between examiners' determinations of dementia and the presence of risk factors among racial groups is a concern and should also receive attention in guidance documents.[112] Within the context of the COVID-19 pandemic, the absence of guidance requiring consideration of infection history and possible long-term neurological effects could lead to confounded assessments.[113] The Expert Consultative Panel is suggesting that the current CMS guidance be augmented with a notation of what alternative measures and procedure may be applied when conducting cognitive impairment assessments with adults with a variety of NACs. Such procedures should include:

(a) drawing more systematically upon information from persons close to the individual, who understand the individual's history and pre-morbid optimal functional abilities (thereby recognizing that there is a greater propensity for individuals to be unable to report for themselves, but also should nevertheless have that opportunity),

(b) defining ages when early screening might be most effective with select conditions to establish a clinical baseline and the frequency of re-examinations to measure change over time (thereby recognizing that onset of symptoms may be earlier for some populations),

(c) using functional assessment instruments developed for specific use with adults with NACs or use of separate normative data for various NACs as feasible (and particularly for those who may be experiencing decline thereby recognizing that some symptoms may be atypical), and

(d) working with primary caregivers, whether family or staff from support organizations or agencies to design dementia care plans (thereby recognizing the high likelihood that the range of services needed will be different and may be greater).

In addition, the guidance should recognize that many support agencies have long-term medical and health records that can help examining clinicians with discriminating typical functioning from that associated with emerging neuropathologies and encourage PCP/HCPs and establish appropriate mechanisms to access such information. Further, many support agencies may also have records of the use of condition-specific standardized screening instruments that can provide insights into the history or frequency of occurrence of behavioral symptoms.

Mechanisms are also needed to access such data jointly and appropriately within the limits of privacy stipulations, so that PCP/HCPs may access this historical information and the expertise of host agencies in interpreting change that has been documented. However,

historical or contemporary documentation may not be found in support systems for some of the conditions.

SPECIFIC AIMS

This effort emanated from both discussions by the National Task Group on Intellectual Disabilities and Dementia Practices with the NIA about the lack of focused guidance for assessing neuroatypical adults, and with the Alzheimer's Association's NIH-funded 'Leveraging an Interdisciplinary Consortium to Improve Care and Outcomes for Persons Living with Alzheimer's and Dementia Project' (LINC-AD).[114,115] The work builds upon a goal of the LINC-AD effort to focus on measures that are feasible and useful for clinicians and researchers, and which can be useful to undertaking a plan of care. The National Task Group on Intellectual Disabilities and Dementia Practices (NTG) and the LuMind IDSC Foundation were sanctioned to produce and submit a report/journal article manuscript on cognitive impairment assessment process adaptations for adults with NACs related to the identification of MCI or dementia and recommendations for adaptations that would produce individual-level data and findings useful in guiding the initiation and provision of services. The effort examined current guidance and advisories provided by federal agencies, specifically the NIH/NIA and CMS regarding measures and protocols for undertaking assessments and whether the guidance and advisories considered groups of adults with neuroatypical presentations. A systematic scan of the guidance and advisories by the project principals indicated that they did not.

AIM 1: CLINICAL ASSESSMENTS

To address these omissions and to broaden the utility of available guidance and advisories, the first aim of the Expert Consultative Panel was to examine and specify what special considerations need to be given by PCP/HCPs when examining adults with select neuroatypical (e.g., ID, brain injury, severe mental illness) and neurodivergent (e.g., ASD, sensory impairments) conditions and to provide related guidance and recommendations to CMS and NIA on adding information to previously issued statements.

An important question is to what extent there are commonalities when undertaking assessment across NACs. The literature does indicate that language usage, comprehension, information processing, and performance are areas where specialty approaches may be necessary across conditions. When divergencies do appear, then to what extent are they validated by clinical practice (including availability of normative data for NACs rather than reliance on standard population based normative data) and what might be specific

recommendations for practice. Any guidance for a cognitive impairment assessment offered will be functional and fit within the parameters noted by Cordell et al.,[116] which specified that when practical:

(1) There is a completed pre-visit screen by or about the patient either before or during the visit. The Health Risk Assessment (HRA) should be reviewed for any reported signs and symptoms indicative of possible dementia.

(2) As the assessment will likely occur in a primary care setting, tools for initial cognitive assessments should be brief (<5 min), appropriately validated, easily administered by non-physician clinical staff, and available free of charge for use in a clinical setting.

(3) When further evaluation is indicated based on the results of the practitioner's assessment, a more detailed evaluation of cognition should be scheduled for a follow-up visit or via a referral to a specialist familiar with the pre-existing condition.

In addition, to addressing the prescriptions of CMS for more in-depth assessment, the recommendations that result will provide information on specialized instruments and processes outside of the norm and applicable to individuals with NACs and consider applications of biomarkers to reduce reliance on difficulties to administer and interpret instruments.

AIM 2: CARE AND SUPPORT SERVICES

A second aim was to use the findings on the adaptations in the assessment process to develop recommendations for protocols for communication and other interaction methodologies when planning post-diagnostic supports and other services for individuals with NACs that will be like those for other adults diagnosed with MCI or dementia.

A number of NACs have been identified and the questions posed for each of the conditions encompassed in this report, included (a) what is the inclusion definition for the condition – that is, at what point does the condition cross over to need special consideration; (b) what is the noted risk for dementia, if any; (c) what, if any, are notable issues raised in the literature; (d) what are appropriate assessment adaptations that can facilitate and increase the accuracy of the screening process; and (e) what recommendations might facilitate a clinician's assessment of adults with the condition and improve communication and interactions outcomes for the post-diagnostic support process.

Implications

The value of this enquiry is to offer greater attention to the special problems experienced by adults with NACs when being examined for possible age-associated and neuropathological changes in cognitive function as well as increasing their inclusion in efforts to

screen and assess older adults for cognitive impairment and to attain equity status within the production and distribution of protocols and informational materials associated with undertaking cognitive impairment assessments. The conditions chosen by consensus among the principals for inclusion all represent conditions with inherently organic derivation for brain conditions either originating at birth or during the developmental period or emanating from disease or trauma that has affected brain and neurological or sensory processes. A second criterion considered was that there are advocacy and compensatory activities undertaken with or for these distinct groupings as they are or may be perceived as disadvantaged.

An additional value is that the information generated may be utilized by federal and state agencies responsible for issuing protocols and guidance documents, as well as by multi-disciplinary organizations that create useful generic guides for their members (such as The GSA KAER Toolkit for Primary Care Teams, 2020 Edition, developed by the Gerontological Society of America[117]), and specialty population informational materials like those of the American Association on Intellectual and Developmental Disabilities[118] and others, and discipline specific organizations such as the American Geriatrics Society,[119] the American Psychological Association[120], the American Psychiatric Association[121,122] and others.[123,124,125]

METHOD

An Expert Consultative Panel was composed of clinicians familiar with various NACs where pre-existing cognitive limitations may (a) confound differential ascertainment of new versus long-standing cognitive impairment, and (b) proffer significant communication barriers (including expressing and receptive language issues) that make assessment difficult, and potentially confound presentations due to emotional or reality processing difficulties. The Expert Panel members were identifying via queries posed to professional and scientific organizations and included both researchers and practitioners with extensive experience working with each of the conditions included.

The Expert Consultative Panel was asked to consider:

- Components of the AWV and follow-up assessments that may also pose challenges for those adults with NACs
- Issues/challenges in cognitive assessment and care planning
- Recommendations for changes, adaptations, and supplements in communication, information capture, and ascertainment of functioning to improve assessment.

The Expert Consultative Panel was also asked to identify:

- Critical factors in the cognitive impairment assessment interview that rely on communication and ascertainment of function from the individual as an informant and comprehension in undertaking tasks that are part of testing protocols.
- Factors that inhibit or are a barrier to performance of requests and verbal exchanges between the examiner and the adult being examined.
- Exceptional risk factors that have been identified in studies that might raise the risk for dementia in any of the conditions included in this article.
- Any compensating protocols, aids, or other adaptations which were prevalent or have been reported in use to help with the assessment interview.
- Screening instruments specially developed or adapted from those already in use for cognitive assessments that have been successfully applied to examining adults with any of the conditions noted in this examination.
- Preliminary recommendations in the identified NACs that would enhance research inquiries

Members of the Expert Panel associated with each identified condition were asked to review the related literature and reported practice and provide a summary of the issues and related recommendations. The Expert Panel then met virtually on December 3, 2021, to review the core concepts inherent in this report and discuss various facets raised in an early draft of the report. Subsequent discussions were held to review the penultimate version of the report and provide for a consensus on the findings and recommendations. Most work was undertaken off-screen and involved various Expert Panel members providing cross-cutting comments and specialty topic information, as well as contributing to overall editing. A pre-issuance summary presentation of the Panel's work and recommendations was given at the meeting of the federal Advisory Council on Alzheimer's Research, Care, and Services on January 24, 2022.[126]

REVIEW OF COGNITIVE IMPAIRMENT & DEMENTIA ASPECTS OF NEUROATYPICAL AND NEURODIVERGENT CONDITIONS

Eight NACs with evidence of cognitive or sensory impairment histories prior to older age were summarized given the impairments related to the conditions may impede routine assessment for MCI or dementia and potentially under or over diagnoses. The conditions were: (1) acquired brain injury; (2) autism spectrum disorder; (3) cerebral palsy; (4) Down syndrome; (5) intellectual disability; (6) intellectual disability with mental health dual diagnosis; (7) severe mental illness and (8) vision and hearing impairment. We created separate topics for

intellectual disability, Down syndrome, and intellectual disability with mental health diagnosis because ID is a broad condition and has significant science focused on its variants with respect to onset age, symptoms, trajectories, and mix of dementia types. Also, because Down syndrome presents earlier in the lifespan, has different initial symptoms, has a shorter trajectory and duration, and is generally associated with Alzheimer's disease. Similarly, adults with ID and mental health conditions are more complex, as they present with more variations, causes, and outcomes. This parsing allowed for more detailed and specific information.

First, a commentary on the terminology used for some of the conditions included in this report. We have chosen to use terms that are most prevalent in the literature when speaking about the conditions. However, a note on the distinction between ID and developmental disability (or disabilities). In some jurisdictions these two terms are used indistinguishably, with ID being encompassed by developmental disability. However, there is a significant difference. According to the WHO, ID "means a significantly reduced ability to understand new or complex information and to learn and apply new skills (impaired intelligence)… [which] results in a reduced ability to cope independently (impaired social functioning), and begins before adulthood, with a lasting effect on development.[127]

Similarly, the American Association on Intellectual and Developmental Disabilities notes that an ID is "characterized by significant limitations in both intellectual functioning and in adaptive behavior, which covers many everyday social and practical skills. This disability originates before the age of 22."[128] In both definitions, the core factor is impaired intellectual functioning. Sometimes, the term 'intellectual and developmental disabilities' is used to represent a collective of conditions,[129] but it introduces confusion and lacks precision when related to defining specific older age neurodegenerative conditions.[130]

Conversely, developmental disabilities are a "group of conditions due to an impairment in physical, learning, language, or behavior areas *** [which] begin during the developmental period, may impact day-to-day functioning, and usually last throughout a person's lifetime."[131] Further, according to the CDC, developmental disabilities include ADHD, ASD, cerebral palsy, hearing loss, ID, learning disability, vision impairment, and other developmental delays.[132] In many individuals with developmental disability, innate intellectual functioning is not impaired. However, in many cases persons with ID may also have a coincident developmental disability (e.g., ASD, cerebral palsy, etc.). As clinical diagnoses require precision and fit with coding in accord with medical classification and payment systems, we opted for clinical categories rather than political or functional definitions.

Additionally, as most of the lifelong cognitive disability-related research reported in the dementia literature refers to participants with ID, we parsed on the conditions normally included under 'developmental disabilities' and included only those relevant to discussions of older age neuropathologies. Although there is a limited amount of literature present, but growing interest, we also included ASD, and cerebral palsy in this report. Because of the wealth

of research literature on ID, we also parsed ID into three groups of relevance, general ID, ID with coincident mental health issues, and DS.

Similarly, we opted to use the mental health terminological category encompassing schizophrenia, bipolar disorder, and major depression disorder.[133] We also recognize that psychiatric conditions may be characterized as 'Any Mental Illness' (AMI) which is defined as a mental, behavioral, or emotional disorder. AMI can vary in impact, ranging from no impairment to mild, moderate, and even severe impairment (e.g., individuals with serious mental illness); and as 'Serious Mental Illness' (SMI) which is defined as a mental, behavioral, or emotional disorder resulting in serious functional impairment, which substantially interferes with or limits one or more major life activities. The burden of mental illnesses is particularly concentrated among those who experience disability due to SMI [134] and SMI is the primary focus here.

We also considered as to whether to assess cognition in adults with certain NACs prior to age of risk or following an event (such as a stroke) to allow for comparison of assessment over time. Thus, this would rely on individual comparison of functioning over time as being ideal as opposed to a single time point evaluation. We asked our topic contributors to address this issue, when appropriate.

ACQUIRED BRAIN INJURY

Contributors: David X. Cifu, MD & Michael Hall, PhD

INCLUSION DEFINITION

Acquired brain injury (ABI) involves damage, injury, and illnesses that have direct impact on central nervous system functioning, including but not limited to trauma, vascular issues (i.e., stroke and ruptured aneurysm/venous malformation), toxic exposures, hypoxia, tumors, epilepsy, autoimmune processes, and infectious processes (i.e., HIV/AIDS or COVID-19). The diverse causes of ABI are matched by equally diverse clinical presentations of residual deficits that impact thinking and functioning that can pose challenges in screening for age-related changes associated with MCI or dementia. Given that stroke and traumatic brain injury are the most common causes of ABI these causes are used for this review, but the principles noted below are largely true for the other mechanisms of ABI.

Traumatic brain injury (TBI) involves disruption in brain functioning secondary to blow to the head or a penetrating injury (e.g., a gunshot wound) and is one of the leading causes of death and neurologic disability. Approximately 3.8 million TBI occur each year in the United States with an estimated 230,000 of those who experience a TBI seeking hospital care, 50,000 expiring from the injury, and up to 90,000 survivors experiencing long term disability.[135] It is

estimated that 5.3 million individuals are currently living with residual symptoms that interfere with functioning in key areas, such as employment.

TBIs are classified by level of severity:

- *Mild* (mTBI or concussion) is if the injury results in alteration on consciousness whether being dazed or confused, and/or experiencing a loss of consciousness for less than 30 minutes. Estimates are that between 70-90% of TBIs will fall into the mild TBI/concussion category.

- *Moderate* TBI is when an individual experience a loss of consciousness for ≥ 30 minutes and up to 24 hours with an estimated 5-10% of TBIs being in the moderate range.

- *Severe* TBI involves a loss of consciousness for ≥ 24 hours and estimates are that severe TBIs account for another 5-10% of TBIs.

Outcomes are associated with the severity of brain injury; the vast majority of those who experience a mild TBI fully recover within several months. However, individuals who experience moderate and severe TBIs often experience persistent deficits that interfere with functioning in major functional domains.[136] There is also concern for lasting deficits in individuals who are exposed to repetitive TBIs of any severity.[137]

Cerebrovascular accidents (CVA or strokes) account for the highest proportion of ABI admissions and those with significant persistent neurologic difficulties, with estimates of more than 795,000 people in the United States experiencing a CVA per year and post-stroke deficits being a leading cause of long-term disability.[138]

RISK FOR DEMENTIA

Dementia risk assessment is important following ABI, including stroke and TBI. Survivors have been noted to be at increased risk for MCI, vascular dementia, and other neurodegenerative diseases.[139] Prior history of stroke has been found to result in dementia in up to 25-30% of survivors.[140] Likelihood of developing MCI or dementia (vascular in particular) is often associated with the severity and locations of a stroke. TBI and cardiovascular disease ICVD) also poses an elevated risk, as CVD is an additive effect increasing dementia risk by ~2.5-fold.[141] Risk of developing dementia in those adults with histories of moderate to severe TBIs or multiple mTBIs is two to four times that of those adults without histories of TBI. Severity of the TBI tends to correlate with increased risk (i.e., higher risk in those adults diagnosed with a severe TBI compared to those diagnosed with moderate TBI).

While there has been some recent progress on potential biomarkers for acute TBI, there is no generally accepted biomarker for long term damage in TBI. Studies have shown that people who experience TBI in early to midlife are two to four times more at risk of developing

dementia in late life.[142] A recent study also suggests that combat exposed adults with TBI may show younger-onset (<65) dementia.[143]

A low incidence, but high severity ABI condition is chronic traumatic encephalopathy (CTE) which is a progressive and fatal brain disease associated with repeated TBI, potentially including concussions.[144] Individuals with CTE show brain changes that are unique from that of other neurodegenerative diseases, including AD.[145] CTE is associated with behavioral changes, executive dysfunction, memory deficits, and cognitive impairments that begin insidiously and most often progress slowly over decades and eventually lead to dementia.[146,147]

ISSUES

Deficits from stroke, moderate or severe TBI, and other ABIs are diverse in nature and outcomes are often dependent on the location of the injury or insult, co-morbid conditions, etiology of the ABI (e.g., ischemic versus hemorrhagic stroke, penetrating vs. non-penetrating TBI), timing of acute interventions, and long-term rehabilitation management.

- TBIs and CVAs not only impact some or all domains of thinking but can also involve language, motoric problems, and other sequela that can impact performance on cognitive screening measures.

- Lasting deficits associated with ABI are often dependent on where the insult/injury occurred and the services received; however, even with the best care survivors can have persistent cognitive problems in up to 50% of ABI[148,149] affecting memory, attention, executive functioning, expressive and receptive language, visuospatial functioning, and thinking speed, depending on the type, severity, management, secondary conditions, and time post injury.

- ABI survivors may also experience changes in mental health and behavioral function (e.g., depression, agitation, anxiety), motor and sensory problems, language difficulties, and/or difficulty with special senses (e.g., vision, hearing, balance). These additional "non-cognitive" effects of an ABI may be misinterpreted as ABI-related cognitive dysfunction.

- Age-related changes seen in cognition, behavior, motor and/or sensory systems may be unrelated to the specific ABI but attributed to it.

The ability of the evaluator to ascertain or apportion the etiology of the deficits seen on cognitive screening measures is often limited and thus complicated in individuals with ABI. The use of standard normative data to assess for MCI or dementia in stroke, TBI survivors, or any ABI is often inappropriate due to these "non-cognitive" post-ABI deficits.

ASSESSMENT ADAPTATIONS

When screening ABI survivors for MCI or dementia, it is important to obtain background information regarding prodromal function, including age-related difficulties, and post-injury or insult deficits to help delineate the source of potential cognitive limitations. Use of collateral sources (i.e., informants, such as family or medical personnel) is helpful to obtaining information on pre- and post-ABI problems. In general, these sources can also be useful in gaining information regarding changes in cognition and functioning in the first two years post-ABI, as deficits associated with ABI tend to improve over time for at least the first 18-24 months post-injury/insult. At this time, biomarkers such as neuroimaging can be of help in identifying areas of abnormality, but too often, there is a lack of correlation between neuroimaging findings and cognitive deficits highlighting the need for use measures with higher levels of sensitive and specificity.

During this period of recovery, attention should also be paid towards ABI- or co-morbidity-related complications (e.g., repeat CVA, hydrocephalus, post-TBI depression, seizures, etc.) that are more common in the first 2 years and can impact cognitive, neurologic, and functional skills testing. Assuming medical stability, worsening cognition and/or functional deficits during and after this recovery period are most likely related to a non-ABI cause, including MCI or a degenerative disorder.

Obtaining information regarding pre-, co-, and post-morbid conditions that could impact test performance allows clinicians to get a better sense of possible causes for cognitive problems.

- Adaptations to the administration of common cognitive screening measures may be necessary as ABI-related deficits may preclude the individual being able to complete certain items. For example, a person presenting with a history of a stroke or TBI affecting the occipital lobes, vision issues may necessitate use of verbal items only.

- If possible, however, before making these types of adjustments, it is best to complete the entire screening measure and then work to account for what might be ABI-related problems versus other causes (e.g., MCI or dementia).

- For those who obtain impaired results on a cognitive screening measure, consideration of a consult for more in-depth cognitive assessment is encouraged.

RECOMMENDATIONS

When screening ABI survivors for MCI or dementia, it is important

- To obtain background information regarding pre-ABI function, co-morbid conditions and related difficulties, age-related difficulties, and deficits resulting from the ABI as

a means of working to delineate the etiology of any cognitive difficulties. This can include prior cognitive assessment which can serve as a comparison point in addressing subsequent effects of aging.

- To be aware of mood since individuals who are diagnosed with ABI are an increased risk for mood problems, especially depression, and as with other neurotypical processes, mood problems can exacerbate cognitive problems which necessitate assessment of mood in the context of cognitive screenings.

- To consider using longitudinal screenings which can provide important information regarding progression of problems.

- To consider using a qualitative approach to interpreting screening results as available normative data do not account for ABI-related dysfunction, and developing such norms is impractical given the marked diversity of ABI-related deficits.

- When feasible, to account for the motor, sensory, special senses, and behavioral dysfunctions that can accompany many ABIs for the first 24 months (or longer) post-ABI, adjust the screening and/or completion of more comprehensive testing to account for these "non-cognitive' causes of abnormalities.

AUTISM SPECTRUM DISORDER

Contributors: Jessica Sanders, MD, Wilfreda Lindsey, MD, Giacomo Vivanti, PhD, & Gregory Wallace, PhD

INCLUSION DEFINITION

The DSM-5 currently defines autism spectrum disorder (ASD) as a neurodevelopmental disorder characterized by significant impairment in social communication and atypical repetitive and/or restrictive behaviors and/or interests beginning early in the development phase and causing clinically significant impairment across multiple contexts.[150] The diagnosis of ASD can be further classified by specifying if it is accompanied by intellectual or language impairment, if it is with catatonia, or if it is associated with another neurodevelopmental, mental, or behavior disorder, or a known medical or genetic condition. The DSM-5 also specifies that the observed behaviors cannot be better explained by ID or global developmental delay.[151]

While DSM-IV included 4 subtypes of 'Pervasive Developmental Disorders' (i.e., autistic disorder, Asperger's disorder, childhood disintegrative disorder, and pervasive developmental disorder not otherwise specified),[152] ASD in DSM-5 encompasses all these previously defined subtypes.[153] The inclusiveness often can lead to confusion in characterizing adults with ASD, as

most studies use the terms 'autism' or 'ASD' without differentiation. The International Classification of Diseases, 11th (ICD-11) revised diagnostic criteria for autism is the same as the DSM-5 but treats ASD with and without ID as two separate entities.[154]

It is estimated that 2.2% (or 5.4M) of adults aged 18-84 in the United States have ASD.[155] Also, estimates are that some 10% of adults with ID[156] (and some 19% with DS[157]) have ASD; the percentage of adults with ASD who may be also diagnosed with an ID is thought to be high (among children it is estimated to be about 35%).[158,159] Nevertheless, many adults with ASD remain undiagnosed due to various factors, including changes in diagnostic criteria (DSM-III to DSM-IV to DSM-5) over time, an ethno-racial diagnostic disparity gap, and integration (invisibility) within the general society.[160]

Also, the underlying etiology for ASD is so heterogeneous that many adults with syndromes (such as tuberous sclerosis complex,[161] fragile X,[162,163] Rett syndrome,[164] and other genetic anomalies) have signs and symptoms that meet the criteria for ASD, but they do not carry a diagnosis of ASD. Additionally, an initial diagnosis of ASD in adults can be challenging for several reasons: lack of informants who can provide a developmental history, developmental processes (e.g., the acquisition of learnt or camouflaging strategies), and a high frequency of co-occurring disorders.[165]

RISK FOR DEMENTIA

Little is known about the specific risk for dementia among older adults with ASD as most research surrounding ASD has been pediatric-focused.[166, 167, 168] Additionally, as ASD co-occurs with other disorders such as anxiety, attention deficit hyperactivity disorder (ADHD), depression, and obsessive-compulsive disorder – each of which alone present cognitive, emotional, and behavioral challenges. Many of these conditions are associated with cognitive difficulties and neurocognitive disorders among aging neurotypical individuals, thus dementia symptoms may be masked in adults with ASD. A small portion of adults with ASD are also diagnosed with DS; knowing this might lead to assumptions about elevated risk for AD in this subgroup.[169, 170] Studies have also presented mixed results with some questioning whether adults with ASD (absent the presence of DS) do present with an elevated risk for dementia.[171,172]

The literature on ASD and dementia has been limited. Studies have pointed to earlier onset of dementia among adults with ASD.[173] One study found that early-onset dementia (diagnosis at <65 years of age) occurred 2.6 times more frequently in individuals with ASD with and without co-occurring ID than in the general population of Medicaid beneficiaries.[174] Another study reported a higher prevalence of dementia in adults with ASD (2.3% vs. 0.5% in the general population control group).[175] One review noted that compared to the general population, adults with ASD might develop earlier cognitive decline and dementia with cognitive functions such as memory and executive functions most affected.[176] Another report noted that adults with ASD have high rates of severe psychiatric disorders and medical conditions (such as diabetes, hypertension, and seizures), which in neurotypical adults are

linked to increased risk of dementia and can also impact their quality of life, their health, and prognosis.[177]

Moderate or greater impairments due to ID, "as well as reductions in white matter, seems to be precursors for the development of cognitive impairment and dementia in adults with ASD."[178] However, it should be noted that an elevated risk for dementia was found adults with ASD both with and without co-occurring ID in the recent study.[179] Several studies have noted signal behaviors associated with suspicions of the presence of dementia which include degeneration of frontotemporal functioning,[180] severity of expressed BPSD,[181] and increased stereotypical behaviors and increased compulsivity.[182]

Other studies have noted that adults with ASD are perhaps protected from age-related cognitive impairment.[183] One theory proposed that lifelong subclinical autistic symptoms might emerge once neurologic function is compromised in older age.[184] Although some studies indicate possible associations between dementia and symptoms of ASD, there is a need for further research investigating the interplay between the entities.

ISSUES

Adults with ASD process information and express themselves in ways that differ from the neurotypical population. However, screening measures for dementia and cognitive impairment that have been standardized only to the general population, do not incorporate the unique differences in the neuropsychological profiles of people with ASD. Even a basic neurologic assessment can be challenging for some individuals because of the interactive nature of the examination process.

Characteristics of ASD

- Communications skills, such as expressive language and conversational abilities, vary greatly among adults with ASD. Approximately one quarter of children with ASD are minimally verbal, which means they have "a very small repertoire of spoken words or fixed phrases that are used communicatively."[185] These language and social communication impairments often continue into adulthood among persons with ASD.[186] For example, a core feature of ASD is deficits in nonverbal communicative behaviors ranging from poorly integrated verbal and nonverbal communication to deficits in understanding and use of gestures and facial expressions. These deficits or limitations may impair interactions, as many of the standardized assessments for cognitive impairment rely on (usually verbal) communication between the examiner and the adult.

- Adults with ASD may
    - Have difficulty with interpreting non-literal language (e.g., sarcasm) and nuance.
    - Have difficulties with joint attention, which impacts their ability to share interest in an object or task with someone else.

  - Have a difficult time participating in standardized testing due to a core symptom of ASD that involves cognitive or behavioral inflexibility or strict adherence to routines and rituals**.** Standardized measures often require performance in a specified order or manner. Adults with ASD may have strong preferences on how they perform tasks, and these preferences may not fit with what is expected on the standardized evaluation.
  - May be uncomfortable in an unfamiliar situation or with unfamiliar people.

- Difficulties with compliance, motivation, and ability to engage in unfamiliar tasks and with unfamiliar assessors can negatively impact test-taking skills. For example, unpredictability of the situation alone could impair an adult with ASD's ability to process verbal instructions.

- Motor difficulties and imitation difficulties which are frequent in ASD may disrupt assessments that involve copying a model (e.g., reproducing a pattern with blocks).

- Sensory processing abnormalities are common in ASD, which may include both hypersensitivity and hyposensitivity to various stimuli, as well as strong preferences for or against stimuli that are typically regarded as neutral.[187]

- Unusual sensory processing in ASD extends across the lifespan and has implications regarding both assessment for cognitive decline and implementation of dementia-related post-diagnostic supports.[188]

- Some adults with ASD may have co-existing conditions (anxiety, attention deficit hyperactivity disorder [ADHD], depression, and obsessive-compulsive disorder), any of which may interfere with assessment, and require unique person-centered strategies related to post-diagnostic supports.

Adult regression

Individuals with Phelan-McDermid (PMD) syndrome, a genetic condition seen in a small percentage of individuals with ASD,[189] can develop as rare adult regression in adults with ASD. The significant changes in cognitive and physical function, may have the appearance of advanced dementia, but it occurs as a regression syndrome in younger age adults.[190] Most adults affected also have an ID and a communication disorder; also present are tremors in extremities, and at times, seizures. Symptoms may include unusual energy levels, with alternating periods of excitement and apathy, and physical problems, such as type 2 diabetes, scoliosis, and renal disease. One report described six adults with PMD, aged 28 to 43, who showed a decline in physical and cognitive function after age 30.[191]

Disparities

Most adults with ASD do not access the health care system in the same way or with the same frequency as other adults their age.[192,193,194] Reports are conflicted as to whether adults

with autistic traits may have higher or lower rates of physical conditions, but generally have agreed on higher rates of mental health conditions, thus suggesting that older adults with elevated autistic traits may be at greater risk of poorer mental, but not physical, health in later life.[195] Additionally, individuals with ASD are also more likely to identify as gender diverse, and/or in a sexual minority group, both of which have poorer health outcomes when compared to the general population.[196] These disparities must be taken into consideration when evaluating for cognitive changes.

ASSESSMENT ADAPTATIONS

When administering an assessment, receptive and expressive language abilities should be taken into consideration. Directions should include non-verbal strategies, such as visual representations and demonstrations of the task requested. Maximize the potential use of alternative and augmentative forms of communication, in addition to or instead of verbal or written options to communicate. Social communication accommodations will need to be highly heterogeneous and unique to each adult with ASD. Be very concrete with instructions and in conversation during the assessment. Minimize abstract language. Establish rapport to maximize engagement to obtain the most valid assessment possible.

Obtaining ancillary information from family members or others who area familiar with the daily routines and lifestyle of the adult is helpful. Ask caregivers who know the person well, "How much of what I just saw here during this assessment represents the routine functioning of the individual with ASD?" Combine information from multiple contexts to evaluate decline in abilities so that the screening contextualizes each adult's cognitive expectations and helps in understanding a timeline/storyline of the changes in the individual's cognition.

Baseline expectations vary based on baseline cognitive abilities. Because ASD is so heterogeneous, a 'one-off' screening recommendation is not always possible. Some individuals with ASD with baseline typical intelligence could participate in typical screenings, but those with concomitant ID or other co-occurring features may require multiple visits. A 'one size fits all' approach to interaction with adults with ASD is unlikely to be the best approach – efforts are needed to individualize the assessment process.[197]

RECOMMENDATIONS

Clinical practice

- Allow time for building rapport with the individual with ASD. Learn about how he or she communicates and what are their interests. Provide predictability about the testing situation, e.g., when the testing is going to happen, how many items are left, and what is going to be happening afterwards. Visual supports can be used to increase predictability.

- Given the challenges that the core symptoms of ASD pose in obtaining reliable standardized assessment scores, work to obtain multiple sources of information on the individual's past functioning and changes in functioning and when possible, conduct assessments in settings that the person is familiar with, and with familiar assessors (or a familiar person involved in the assessment).

- Pre-morbid assessment is essential. For example, assessing levels of independence skills must be compared to prior abilities. Individuals with ASD may have challenges with activities of daily living (ADLs) that are long-standing and do not mean cognitive decline.

- Assess opportunities the adult with ASD has had to continue practicing skills that are lacking, rather than assuming that declining skills are due to cognitive decline. For example, changes in language use may be secondary to limited opportunities to practice use of language rather than true personal decline. Do not just look at past performance over time, but also assess the continuing opportunities provided to the individual.

- Changes in environment and routine can contribute, but also can coincide with cognitive decline.

- Consider the impact of anxiety and other co-occurring symptoms that can impact performance on standardized tests.

- Consider other factors which can contribute to changes suggestive of dementia, such as physical factors (gastrointestinal issues –constipation and diarrhea due to food sensitivities and allergies and impaired carbohydrate metabolism changes[198]) and medications (due to the frequent use of psychotropic medications[199]).

- Assess for pain as contributory to changes particularly with co-existing conditions which may present with discomfort (such as arthritis or gastrointestinal distress).

Research

There is a need to create more clinical information about the nature of ASD, aging, and the risk for later age neuropathologies, including dementia. Research is warranted in the following:

- Studies investigating the interplay and possible associations between dementia and symptoms of ASD, including neurobiological research as to the etiologies of neuropathologies and their trajectories.

- Studies examining the nature and degree of cognitive decline among aging adults with ASD and degree of transition to dementia.

- Studies examining the nature or types of dementias that may be present, or perhaps over-represented, in older adults with ASD and their etiologies.
- Studies identifying subgroups of individuals on the autism spectrum who might be at higher risk for dementia, as well as lifestyle factors related to reduced access to appropriate services in ASD (e.g., barriers to accessing intellectual, educational, and social opportunities).
- Studies examining potential testing strategies to assess neuropathology in ASD that do not require verbal instruction and capitalize on visual strengths (e.g., passive viewing tasks to examine visual memory).[200]

CEREBRAL PALSY

Contributors: Patricia Heyn, PhD, James J. Carollo, PhD, & Alex Tagawa, MPH

INCLUSION DEFINITION

Cerebral palsy, a non-progressive motor encephalopathy,[201] is a group of disorders that affects a person's ability to move and maintain balance and posture. CP is caused by damages or malformations of the brain sustained before, during, or shortly after birth. People with CP have problems controlling gross and fine movement that are often accompanied by other neurological conditions such as problems with sensation, vision, hearing, speech, cognition, communication, and behavior.[202] They may also present with intellectual disability, epilepsy, and seizures.[203] CP affects 2 - 2.5 individuals out of 1000 live births and is the most common physical disability in children.[204] Although CP originates prenatally or neonatally and is considered a pediatric condition, it is a chronic disability that presents challenges throughout a person's lifetime.[205]

While non-progressive, the disorders of movement and posture are permanent and often lead to greater limitations in activities in older age.[206] The motor disorders of CP are often accompanied by disturbances of sensation, perception, cognition, and communication, and behavior, by epilepsy, and by secondary musculoskeletal disorders.[207] From a third to half of persons with CP also have mild ID[208]; about 1 of 5 have moderate to severe ID.[209] There are various systems in use that functionally define impairment in CP.[210] One basic classification system[211] defines the range of impairments and their functional implications as:

- Mild CP – usually means an adult can move without assistance; his or her daily activities are not limited.

- Moderate CP – usually means an adult needs braces, medications, and adaptive technology to accomplish daily activities.
- Severe CP – usually means an adult may not be ambulatory, uses a wheelchair, and will have significant challenges in accomplishing daily activities.

For most individuals with CP, life expectancy is nearly the same as for the general population, but it is affected by degree of severity of physical or cognitive impairment.[212] Adults with moderate to severe CP often face issues and challenges reflecting greater overall impairment. Some adults may experience premature aging with early signs of advanced age beginning in their forties. A 'post-impairment syndrome' occurs about this age, when a lifetime strain and demand on use of muscles and bones begins to compromise muscle strength.[213, 214] Cervical spinal cord compression, relatively common cause for progressive loss of motor function as adults age, is also a factor.[215] Overuse of joints in knees, ankles, hips, and arms can lead to osteoarthritis and may result in the use of mobility aids, such as a wheelchair or walking aids.

Other signs of premature aging include increased pain, stiff muscles, and problems with the heart or lungs. Adults with CP frequently experience serious co-morbidities that impact their daily functioning or can increase their risk for premature death. Common conditions that occur with CP include seizure disorders, GERD, chronic constipation, nutritional deficiencies, pressure ulcers, joint contractures, and dislocations due to spasticity, scoliosis, osteopenia, and urologic disorders.[216]

RISK FOR DEMENTIA

The Birth Injury Justice Center in the UK has noted that there is no definitive link between having CP and eventually developing Alzheimer's disease and other adult cognitive diseases, leading to dementia, except when there were "additional health problems, such as epilepsy or intellectual disorders."[217] While there are no clear links to aging-associated neurodegenerative diseases, some adults with CP tend to experience memory loss,[218] and are at increased risk of additional neurologic conditions, such as stroke and myelopathy[219] which could result in vascular dementia. Generally, there is a dearth of epidemiological studies examining later-life neuropathological conditions among adults with CP.[220]

One English study examined the outcomes of a sample of 1703 adults with CP noted that 72 (4.2%) were diagnosed with dementia. The authors noted that there was no difference in the proportion of people with CP and matched controls who were diagnosed with dementia during the follow-up and while they did note that there was evidence for an increased hazard of dementia among people with CP, this "association was attenuated after controlling for comorbidities indicates that this association may be explained by comorbidities rather than

being a direct result of CP."[221] In another report, the same study team noted that only those people with CP and ID, or CP and epilepsy, are more likely to develop dementia. This suggests that the previously speculated link between CP and dementia may be due to other neurologic or intellectual co-morbidities rather than as a direct effect of CP.[222]

In a United States study using administrative insurance claims data, it was noted that of among some 5176 adults age 45 and older, the unadjusted incidence of dementia was 9 and 2.4 times higher among cohorts of adults 45 to 64 years and 65 years and older with CP than adults without CP,[223] and that the risk of 'ADRD' was higher among adults with CP.[224] Another study evaluating similar pathology and phenotypes between adults with CP and older adults with MCI, noted a shared biological underpinning and similar neurodegenerative risk factors between the two, inferring a 'double-hit premature aging model' in CP.[225]

ISSUES

Adults with cerebral may experience difficulties with communication, fine motor skills, and mobility. The latter may affect measures of their gait (as a marker for a neurodegenerative condition), as well as the former in demonstrating skills in handling objects, and in speech – thus affecting their expressive language skills.[226]

- Higher older age mortality rates have been noted in CP. The strongest factor associated with increased mortality was intellectual disability; nonetheless, adults with CP who had no intellectual impairment were still at somewhat greater risk of death than the general population. The causes of death differ, as many have respiratory diseases, and they are less likely to die of injuries and accidents than the general population.[227]

- Adults with more severe degrees of CP where ambulation was challenging and causing lifetime strain on muscles, joints, and bones, may experience post-impairment syndrome which may affect their mental health. This life stressor, associated with increased discomfort, pain, fatigue, weakness, and premature aging, may result in depression, memory losses, and behaviors that may appear to be BPSD.[228]

- Most individuals with CP have issues with balance and mobility and as they get older, their walking ability declines which could lead to prematurely developing health conditions that are associated with aging (such as metabolic syndrome, diabetes, and cardiovascular disease).[229]

- CP is a musculoskeletal disorder impacting the person's ability to control movement and maintain gait. Therefore, individuals with CP are at greater risk of falling. They are also at greater risk for developing osteopenia (bone loss) and sarcopenia (muscle loss) leading to a premature frailty syndrome state (a marker for a neurodegenerative condition).[230]

- Poor gait, impaired sensory and cognitive ability, cardiovascular disease, and frailty syndrome are risk factors for dementia.[231,232] Adults with CP should undergo continuous cognitive and physical health assessments to detect early health decline and memory problems possibly indicating MCI or dementia and for providing appropriate and timely intervention and treatment.

- Generally, for adults with CP, PCP/HCPs tend to focus on the motor issues associated with CP and not on brain health. Adults with CP also report not being evaluated for cognitive functioning during medical examinations.[233,234] Examining for memory function should be part of the standard of care for adults with CP.

Given all the above, early detection can help track the course of the any neuropathological brain disorder or disease and test the effectiveness of potential interventions to slow its progression. Behavioral lifestyle approaches could be part of the treatment and it also could help adults with CP and caregivers plan for eventualities.

ASSESSMENT ADAPTATIONS

Memory/cognitive function assessments

- ***History of memory complaints***. When evaluating cognitive function and cognitive changes in adults with CP, start by obtaining a history of cognitive complaints which should include an informant interview and a conversation with the adult with CP. The informant should be quite familiar with the person's abilities (such as a caregiver, friend, or family member) and who can relate concerns about the person's cognitive abilities, including changes in function. Through an informal interview format, the informant can express any concerns with the person's memory and whether there have been any memory changes. Potentially, the informant interview could include the following questions:

    - "*Are you worried about [person's name] memory*?"
    - "*Have you noticed any changes in [person's name] memory that concern you*?"
    - "*During the past few months, have you had increasing problems with [person's name] memory*?"

  The questions related to memory are important. The first question can confirm any concerns that the informant may have, whereas the second and third questions can capture any notable changes in memory. Focusing on memory complaints with an informant is designed to pick up on any potential changes in the person's thinking and

memory, and as other related cognitive functions (such as attention, executive function, language, and spatial orientation) may also decline, these too will be picked up on.

- ***Recent problems with movement and behavior***. Often increases in gait and balance difficulties, and decreases in mobility ease, and focusing on general ADL skills may indicate a change in brain health. Additional signs may include the occurrence of seizures when none were noticed before. The informant interview could also include the following:

    - "*Have you noticed more falling than usual*?"
    - "*What has changed in the [person's name] mood and interests*?"
    - "*Has [person's name] expressed any concerns that worry you*?"

  The questions on movement and behavior are important as well. The family member or informant may express concerns that the person is changing and seems to have more problems than before. Using a short behavior checklist can help the caregiver focus on those aspects about which you want to know more.

Members of the care team should also be included in the memory history assessment, and they can help differentiate between subjective cognitive complaints and cognitive impairment due to MCI or early dementia, which can be challenging to diagnose with an adult with CP. History taking and the informant interview provide critical information for further screening consideration and diagnostic procedures.

Cognitive screening adaptations

CP is a condition that affects the brain, nerves, muscles, motor, and sensory controls and impacts the extent to which an individual can perform during standardized neuropsychological tests and batteries. The following warrant consideration:

- Impairment in the upper extremities can impact fine motor control and dexterity and will limit testing presentations and procedures format due to the person's impairment in key manual functions that most neuropsychological assessments require such as picking up objects, grasping, pointing, writing, copying, and drawing.

- If the purpose of testing is to determine the extent to which the *physical disability* impacts the performance of tasks, or when the physical disability is itself being evaluated, then test adaptation and modification is not appropriate.

- If the purpose of testing is to determine the extent to which *cognitive abilities* are impaired or showing progressive impairment and any standard test administration requires intact motor or sensory skills such as hearing, vision, and speech, then alternate means of assessing cognitive functions are necessary and should be provided.

- As preparation, a comprehensive medical history and health status assessment should be performed before any cognitive screening or neuropsychological evaluation is performed.

- The pre-cognitive test medical history should include hearing, vision, speech, dental status, hand dexterity, seating ability, assistive devices, presence of pain, and overall health status (i.e., sleeping issues, depression, anxiety, drug addiction, and medications used). Psychosocial (social network) and ecological conditions (level of support, living environment) should also be considered.

- Environmental modifications should include the testing room, so that no barriers exist for the person to enter or demonstrate gross motor skills.[235] Evaluating the physical space for safety and proper light, furniture, noise, and physical space accessibility should be part of the cognitive evaluation accommodations and modifications protocol for individuals with CP.

RECOMMENDATIONS

Clinical practice

- If there are concerns about the person's memory, as reported by the person with CP or a care partner, it is critical to perform a comprehensive evaluation for early and accurate diagnosis. It will allow the patient and the family to plan effectively for the future, in addition to helping the clinician anticipate necessary changes in the management of non-dementia health issues.

- Start by obtaining a clinical interview with the patient and at least one additional informant. It is important to gather information about the person' s medical history, social engagements, functional abilities, behavioral or psychological concerns, including comorbid medical conditions, alcohol and other substance use, vision and hearing problems, and depression.

- Recent illnesses, falls events, head injury, prescription and over-the-counter medications, unexpected body weight changes, and family history of dementia should be included in the clinical interview.

- A brief structure assessment that includes alternate tools to confirm cognitive impairment such as the Mini-Cog, Mini Mental Status Exam (MMSE)*; Montreal Cognitive Assessment (MoCA)*; or the St. Louis University Mental Status Exam (SLUMS)

  * These tests should be used before referral or initiation of a full neuropsychological evaluation is performed.

- During the evaluation rule out potential confounders such as low education status, secondary neurological health conditions (e.g., autism, mild stroke or brain injury, epilepsy, seizures), as well as communication challenges (e.g., English as a second language).

- If there is a conformation of cognitive impairment by the brief cognitive assessment corroborated by the informant (care partner) a specialist referral should be made to initiate a full dementia evaluation.

  Note: Brief cognitive screening should not be used to determine a diagnosis of dementia. A full medical history, neuropsychological evaluation, neuroimaging, functional, and laboratory tests will be needed to evaluate the severity of the condition as well as to rule out treatable causes for cognitive impairment. Some providers repeat brief cognitive assessment with an alternate tool (e.g., SLUMS, or MoCA) to confirm initial findings before referral or further evaluation is performed

Research

- Longitudinal studies are warranted that would examine accelerated biological aging phenomena in adults with CP and what might be life factors that affect greater mobility impairment in older age.

- Studies are needed to examine the phenomenon noted in large scale administrative data analyses that show inverse divergence in incidence of dementia between late-middle age and older age.

- Epidemiological studies are needed that examine later-life neuropathological conditions among adults with cerebral palsy.

- Studies to determine which cognitive impairments measures are most adaptable for examining adults with communication and motor impairments.

DOWN SYNDROME

Contributors: Brian Chicoine, MD & Seth M. Keller, MD

INCLUSION DEFINITION

Down syndrome or Trisomy 21 is a genetic disorder caused by a partial or complete trisomy of chromosome 21 and is the most common genetic cause of ID.[236] The phenotype of DS commonly includes ID, characteristic facial features and other anatomic characteristics, and common behavioral characteristics. Down syndrome is marked by growth, developmental, and learning delays that vary from mild to severe. There are many commonly co-occurring conditions in people with DS, including major congenital malformations, obstructive sleep apnea, auto-immune conditions (such as celiac disease, alopecia, and others), endocrine conditions (such as thyroid disorders, low bone mass, short stature, and the tendency to be overweight/obese).[237] Life expectancy for adults with DS absent significant medical conditions has improved considerable, but is still below the expectancy rates for adults with most other ID.[238] With changes in childhood survival impacting the age distribution of people with DS, there are now more adults with DS in their fourth to sixth decades of life, and the number of individuals with DS aged over 50 years is predicted to increase significantly in the coming years.[239, 240] Adults with DS demonstrate precious aging often beginning in their 50s and with advancing age present with a high risk for dementia of the Alzheimer's type (DAT).[241]

RISK FOR DEMENTIA

Estimates suggest that 50% or more of people with DS will develop dementia due to AD as they age,[242] and that by age 65 dementia will be evident in more than 80%.[243] Younger-onset DAT is the most prevalent in people who have DS.[244] The concerns for early cognitive decline may begin to show signs in many with DS in their 40s with the average age of onset at 52[245] and the average age at diagnosis at 55.[246] Median survival after diagnosis is about 3.8 years.[247] Sex is a factor with females usually have an earlier age of onset.[248]

Compared to neurotypical adults for which short-term (episodic) memory loss is the most common indicator associated with the onset of AD, adults with DS show executive dysfunction, BPSD during early stages and which may precede memory loss.[249] There is also evidence that emergence of BPSD is underpinned by impairments in executive functioning changes that may implicate impairments in frontal lobe integrity and in related brain networks.[250] Given accelerated biological or precocious aging among adults with DS and earlier onset of dementia, it is recommended to be begin collecting 'baseline' performance information at age 30 and introducing screenings by age 40.[251]

ISSUES

It is often difficulty to determine the presence of MCI or dementia in adults with DS.[252] Among adults with DS there are some commonly occurring confounding factors that make it unclear whether a change in functioning or decline as adults with DS age is the beginning of the presentation of symptoms of dementia.

- ***Younger age onset of dementia***. The most prominent feature of dementia and Down syndrome is the emergence of symptoms much earlier in the lifespan. Persons with DS experience accelerated biological or precocious aging, which may explain that the average age of onset of symptoms is in the early 50s.[253] Such younger onset of dementia symptoms is prevalent, but some adults show can symptoms earlier (late 40s) and some later (late 50s or early 60s).

- ***Rapidly progressing dementia.*** There is a low incidence, but significant aggressive form of function loss linked to accelerated aging and a rapid decline that that occurs in some adults with DS.[254] Behavioral changes characteristic of such a rapidly progressing dementia may show markedly, and function may rapidly decline over a period of one to 2 years after the first presentation.[255] In such cases, affected adults should be followed in successive shorter-term intervals to document decline. While recognized within the general population, rapidly progressive neurodegenerative dementias are relatively unstudied with respect to DS.[256,257] Studies in general population have noted that rapidity was associated with primary frontotemporal lobar degeneration and a frontotemporal dementia clinical subtype.[258]

- ***Regression syndrome***. There is also a low incidence condition associated with a dramatic loss of function in younger age adults that is often mistaken for a form of dementia.[259,260] The key variable is age – it generally occurs in the late teens and twenties (some occurrences have been noted later in age). This 'DS regression syndrome' (or DS disintegrative disorder) has been noted in a small number of cases; the etiology for the presentation is currently unknown.[261,262] Symptoms typically associated with this condition may include:
    - Decline in cognitive function
    - Social withdrawal
    - Loss of acquired skills
    - Loss of functional use of language
    - Changes in behavior
    - Expressions of psychiatric conditions
    - Failure to acquire new skills
    - Changes in sleep patterns

- ***Co-incident health conditions***. Some medical complications are common in people with DS that can confound and affect function and produce cognitive decline.[263] These may include thyroid dysfunction, sleep apnea, and hearing and vision changes.[264] The behaviors produced may appear as symptoms of dementia. For example, difficulties with vision or hearing may result in the person not fully able to react or respond to their environment and therefore maybe misinterpreted as having dementia. Also, metabolic factors (e.g., diabetes, obesity) factor in with later age. Overweight and obesity are common in aging adults with DS[265,266] (women, more than men, tend to be obese[267]), with higher serum leptin levels a potential endogenous factor.[268] Exogenous risk factors associated with obesity include psychiatric diagnosis, mobility limitations, and sedentary lifestyle.[269] Despite high rates of overweight and obesity, few adults with DS are reported to have chronic health conditions associated with excess weight.[270] Nor has excess weight been linked to cognitive decline.

- ***Misdiagnoses.*** Among some adults, behavioral and functional changes that occur may be signs of normal aging, underlying health issues, or maladaptive adjustments to personal issues or social/environmental changes and be mistaken for early onset (or younger onset) of dementia. Often depression, thyroid irregularities, adverse reactions to medication, and nutritional imbalances may show as symptoms of dementia, as might psychological symptoms stemming from life course stressors

- ***Epilepsy.*** One feature common to adults with DS once the onset of dementia is evident is the presence of late onset seizures.[271] Studies have found that such late onset seizures are strong indicators of the presence of dementia and such late onset seizures may be used as a prognostic indicator.[272,273] One study found that such seizures may signal a life expectancy of less than 2 years and death almost invariably within 5 years of onset.[274] Late-onset myoclonic epilepsy (LOMEDS) has been particularly prevalent in adults with DS who may have AD and is associated with significant deterioration of cognition and function.[275] Late-onset seizures can also be present in some adults with DS with no overt symptoms of dementia.[276]

- ***Nervous system effects*.** The presence of de-conditioning and gait dyspraxia are markers for neurological signs of brain change,[277] as are late-onset seizures.[278] The presence of AD related brain pathology creates the alterations in the nervous system that lead to the increased risk of developing seizures as well progressive loss in the ability to walk normally and eventually will lead to total immobilization in the disease's later stages.[279]

- ***Autistic features*.** Associated autistic behaviors may be evident throughout the lives of some adults with DS.[280] These may affect behavior, communication abilities, and functionality and impair an initial assessment for cognitive decline. Current research

suggests between 8 and 18 percent of individuals with DS may also have ASD.[281] ASD symptomatology/risk is often negatively associated with IQ and adaptive behaviors and positively associated with certain types of maladaptive behaviors.[282] Behavioral challenges, psychological symptoms, communication limitations and cognitive impairment may all be chronic manifestations of ASD in these individuals and therefore may limit the ability to detect further decline associated with AD.

- ***Diagnostic overshadowing***. Given the high risk for AD in adults with DS, there is a propensity to assume that observed functional and behavioral changes are due to the presence of AD without assessing for another underlying cause.[283] This diagnostic overshadowing can impede further workups and accurate diagnosis of the actual cause. Other physiological factors, unrelated to AD, may change behavior and should be identified and treated.

- ***Collecting pre-diagnostic information*.** Dysarthria and various communication challenges are common in many adults with DS, particularly as expressive language abilities become more compromised with increasing age. Thus, assessing maintenance of baseline characteristics may normally become somewhat more difficult with progressive aging and may be misinterpreted as pathologic aging. Much of the history then must come from someone other than the individual with DS. From whomever the history is obtained, serial history taking and recording of the person's level of function in a variety of domains (see for example, the NTG-EDSD) is important to diagnosing dementia.

- ***Environmental influences***. Information should be obtained about recent changes in the individual's personal and social life. Difficulties that an aging parent or sibling may experience as well as any similar problems that friends, work, play or within a living setting may all have a possible dramatic impact upon how the person with DS may react to and contribute to the onset of behaviors which could be misinterpreted as associated with dementia (for example, depression or maladaptive behaviors).

ASSESSMENT ADAPTATIONS

Adults with DS will have their AWV and as they age, they will be evaluated by their PCP/HCP for commonly related issues and concerns like other neurotypical patients. Because decline in function may appear earlier in these individuals it is extremely important that the PCP/HCP have not only the skill and knowledge to be able flesh out the potential reasons for change in function, but also use appropriate cognitive screening assessment tools that can aide them in their evaluation.

The most used cognitive assessment tools include the Mini Mental Status Exam (MMSE), Saint Louis University Mental Status (SLUMS) examination,[284] and the Montreal Cognitive Assessment (MoCA), however, these tools require a higher level of baseline cognitive abilities, comprehension, language, and education than may be manifested by most adults with DS. Therefore, these tools, if used, would provide misleading information as to the individual's cognitive state and whether he or she was developing decline in cognitive abilities or showing signs of dementia.

A simple, objective measure, that is validated, and which can be tracked over time should be added to the AWV, particularly when examining adults with DS 40 years of age and older. As noted above, the common screening tools (e.g., Mini Mental Status Exam, etc.) usually do not provide beneficial information in people with DS or those with other ID.

An appropriate tool should include:

- Information of the person's past 'personal best' performance in communication and ADLs prior to the onset of any signs of decline. Photographs and digital videos can be helpful.
- Any recent personal, social, health changes or issues.
- The person's place of residence and its social environment (and length of residence).
- How long the person providing the information at the time of the AWV has known the individual and in what capacity.
- Any changes in gait or seizure history, including presence of myoclonic events.
- When changes began and to what degree they have progressed.
- Serial objective evidence of dementia symptoms and signs as the disease progresses.
- Any changes in their personal life and social challenges, including changes in the health and wellness of their caregiver, friends/housemates, and changes in living situation, work, and social environment.

Behavioral challenges are also common for many people with DS; these would include anxiety, depression, and autistic behaviors. Knowledge about these various behaviors and the medications taken for them would need to be compiled as part of the AWV. Family members and caregivers would be the best informants as to when changes in behavior and function occurred. Having the PCP/HCP have this information prior to or during an AWV is vital to initiating a discussion about the possible presence of MCI or dementia.

The use of a data gathering form can help informants with collecting relevant information. One such instrument designed to capture such relevant information is the NTG-Early Detection Screen of Dementia (NTG-EDSD).[285] The data provided on NTG-EDSD can be used in starting that critical conversation with (and among) clinical personnel as to whether their observations of possible decline in function merit more explicit assessment for MCI or dementia[286] or – alternatively – signal behaviors that may be amenable to intervention and remediation. The NTG-EDSD, while not a diagnostic tool, is useful for collective discussions and dementia care planning involving families and care providers.[287] For diagnostics, most of the same specialized dementia diagnostic tools as noted in the section on ID would apply also to adults with DS.

During subsequent visits, supplemental Information can address caregiver concerns about how they are or will be personally impacted by the disease and its future decline, and prognostics about quality of life over the course of the disease. Such dementia care planning should also address the need for increased caregiver assistance.

RECOMMENDATIONS

- Training PCP/HCPs about identifying symptoms of younger-onset AD in people with Down syndrome and resources for non-medical supports useful for families.
- Educating PCP/HCPs on the differential diagnosis for changes in cognition and behavior and for the development of psychological symptoms in older individuals with DS.
- Training PCP/HCPs about informant-based instruments (e.g., the NTG-EDSD).
- Developing and adding a brief ID/DS-ADL focused cognitive assessment tool to the AWV.
- Building the tool into the electronic medical record in a way that it can be easily recorded and tracked over time.

Currently adults with DS do not have any equitable cognitive screening tool as part of the AWV. The high prevalence of early-onset AD and several common age-related comorbidities as they age do create challenges for the PCP/HCP in being able to assess them and to be able to provide an accurate diagnosis. This uncertainly may create inaccurate and possibly inappropriate conclusions about the cause of the changes and may miss out on possible reversable causes of decline and/or labeling them as having a dementia diagnosis. It is essential that a tool be developed for the PCP/HCP to use with this population and training and education be provided on how to effectively examine adults with DS.

Intellectual Disability

Contributor: Stephen Ruedrich, MD

INCLUSION DEFINITION

An intellectual disability is a condition that includes the presence of deficits in intellectual and adaptive functioning, both of which have their onset from birth or during the developmental period of life.[288] The formal definition requires:

a. Deficits in intellectual functioning (reasoning, problem solving, planning, abstract thinking, judgment, academic learning, and learning from experience).
b. Deficits in adaptive functioning, which result in failure to meet developmental and sociocultural standards for independence and social responsibility.
c. Onset of both intellectual and adaptive deficits that occur during the developmental period.[289]

The intellectual deficits present should be confirmed by both a clinical exam and individualized, standardized testing. The adaptive deficits should limit functioning in one or more ADLs and occur across multiple environments (home, school, and community). The developmental period is usually defined as lasting from pre-natal through the late teens. Legal definitions of ID in the United States provide for definitional eligibility for services from birth through to the end of age 22.[290]

The term 'intellectual disability' is equivalent to the ICD-11 diagnosis of Intellectual Developmental Disorder.[291] In lay, public, and advocacy settings, the terms 'intellectual disability' (ID) and 'intellectual and developmental disabilities' (IDD) are often used interchangeably[292] but a difference is that 'developmental disabilities' usually also encompasses primary conditions lacking intellectual deficits and little research exists on the extent of dementia in developmental disabilities other than ID.

The changes that have taken place in the definition of ID between the publication of DSM-IV (APA, 1994)[293] and DSM-5 in 2013 have been:

a. Updating the antiquated and pejorative term 'mental retardation' to ID.
b. Less reliance on intellectual deficits alone in making the diagnosis.
c. More emphasis and requirement on characterizing the deficits in adaptive functioning which are present, and that the adaptive deficits are related to the intellectual deficits.
d. Extension of the developmental period from age 18 until age 22.

RISK FOR DEMENTIA

The risk for dementia for most persons with ID *without DS* generally tends to be like that of the general population and age of onset generally approximating that of the general population when absent confounding medical/health/social factors.[294,295,296] However, risk can be higher among some groups of adults with ID; for example, adults with some genetic syndromes (e.g., Down, Prader-Willi, and Williams syndromes),[297, 298,299] those with epilepsy or other neuropathological coincident conditions,[300,301] and those who are elderly.[302] Some reports from outside of the United States note that adults with ID may also develop MCI at an earlier age and at a higher rate than the general population.[303,304]

The evolving extended life span of persons with ID makes them vulnerable to developing older-age related disorders, including MCI and dementia.[305] Originally, interest in neurodegenerative conditions stemmed from clinical studies showing that adults with DS begin to present with DAT beginning in the fourth or fifth decade of life. Studies now also often show the pathological brain changes of DAT decades earlier.[306,307] Given these findings on older age neuropathologies, adults with ID and particularly those with DS are among the most studied of the NACs. That said, studies show that although Alzheimer's disease is the most prevalent cause of dementia in DS, adults with non-DS derived ID are diagnosed with a range of dementias, much like adults in the general population.[308,309]

ISSUES

Screening of adults with ID for cognitive impairment evolving into MCI or dementia usually involves a basic screening tool which notes changes in function and behavior over time. Such screening can help with opening the discussion about whether to proceed with a more extensive assessment to validate the presence of MCI or dementia. The *Global Down Syndrome Foundation Medical Care Guidelines for Adults with Down Syndrome Workgroup* (2020)[310] noted that a screening instrument that can help with the AWV or an initial referral for a workup based on family or staff suspicions is the NTG-EDSD [Early Detection and Screen for Dementia].[311,312]

Suspicions of the presence of pathological change, potentially validated over subsequent administrations and clinical assessment, should lead to a fuller assessment using tools developed to aid in the diagnosis of dementia in persons with ID. Albeit, the accurate identification of dementia in adults with ID is challenging, and identification of MCI even more so.[313,314] The assessment of neurocognitive decline in persons with ID has followed two primary pathways: the development of neurocognitive batteries to assess cognition directly, and the search for biomarkers, which might indicate the presence of a disease associated with MCI or dementia without (or in addition to) the direct assessment of cognition.[315] The former has included neurocognitive batteries for direct assessment of persons with ID and use of

informant-rated scales measuring decline in cognitive functioning (such as language and memory), combined with functional decline in other areas (such as ADLs). Most scales utilizing direct assessment of cognition in neurotypical individuals are not applicable to persons with ID due to floor effects.[316,317] As a result, several cognitive exams have either been created or adapted for use with persons with ID.[318,319]

Paiva et al.[320] identified 39 separate scales and 13 batteries, which have been developed and used to assess cognitive change in persons with ID. Most of the research in this area has focused on individuals with DS, but persons with ID *without DS* have also been extensively studied.[321] Of the 52 scales and batteries reviewed, 23 were informant-based measures, and 29 involved direct assessment of the individual, through either self-reporting or direct examination.[322] Zeilinger et al.[323] also examined informant-based measures. Examples of informant- based measures include:

- Behavioral and Psychological Symptoms in Dementia-Down Syndrome (BPSD-DS)[324]
- Cambridge Examination for Mental Disorders of Older People with Down Syndrome and other Intellectual Disabilities (CAMDEX-DS)[325]
- Cognitive Scale for Down Syndrome (CS-DS). [326]
- Dementia Questionnaire for People with Learning Disabilities (DLD)[327]
- Dementia Screen for Down Syndrome (DSDS)[328]
- Dementia Screening Questionnaire for Individuals with Intellectual Disability (DSQIID)[329]
- National Task Group-Early Detection and Screen for Dementia (NTG-EDSD)[330]

Direct assessment methodologies include:

- Cambridge Cognitive Examination for Older Adults with Down syndrome (CAMCOG-DS)[331]
- Modified-Cued Recall Test (M-CRT)[332]
- Rapid Assessment for Developmental Disabilities (RADD)[333]
- Severe Impairment Battery (SIB)[334]
- Test for Severe Impairment (TSI)[335]
- Wolfenbütteler Dementia Test for Individuals with Intellectual Disabilities (WDTIM)[336]

Assessing MCI

There is limited literature that addresses the assessment of MCI in persons with ID.[337] The valid identification of MCI in this population may be particularly challenging in persons with severe and profound ID[338], whose cognitive impairment is already significant, such that additional cognitive difficulty from a new source (such as MCI) may not be appreciated.[339]

- Strydom et al.[340] studied 222 older adults with ID at two points in time approximately 3 years apart, using dementia diagnostic criteria from DSM-IV, ICD-10 and DC-LD, and found satisfactory validity of dementia diagnoses, with good inter-rater reliability. However, they noted that MCI diagnosis was less valid, and dementia diagnosis even less valid in those adults with severe ID or sensory disabilities.

- Silverman et al.[341] studied 185 adults with DS and found the NTD-EDSD sensitive to the identification of MCI in their sample, with concerns in the "Memory, or Language and Communication" domains most useful. They concluded the NTG-EDSD is a useful tool for screening for MCI but needed to be combined with other information for accurate diagnosis.

Using biomarkers

There is also much interest in determining which biomarkers might identify dementia, and/or MCI, particularly in persons with ID who are otherwise more challenging to examine for cognitive decline, compared to neurotypical peers.[342] Considerations for the use of biomarkers with brain diseases includes:

- Neuropathological changes consistent with DAT can be seen in the brains of persons with DS before age 40, even though the clinical signs of dementia do not occur for another 10-15 years.[343]

- Amyloid biomarkers, tau biomarkers, and neurodegeneration markers available in serum samples are three current candidates for possible assessment, and abnormalities of one or more of these may someday constitute a methodology for early identification of dementia in persons with ID (and particularly in DS), perhaps before the individual has any clinical signs of neurocognitive decline.

- Whether similar neuropathological changes may also occur in persons with ID *without DS* (primarily as Alzheimer's disease is not as prevalent in ID as it is with DS), with similar or other possible biomarkers, is not yet clear. In the future, it may be possible to combine neurocognitive assessments with specific biomarkers for greater diagnostic accuracy.

ASSESSMENT ADAPTATIONS

The assessment for dementia or MCI in persons with ID typically begins with a concern expressed by a family member or caregiver, and almost never by the individual him/herself. This happens when:

- Someone in the person's circle of caregivers will have noticed some change from baseline functioning, with either an obvious cognitive change, or a change in behavior or daily functioning.

- During a visit to a PCP/HCP, the clinician notices a behavioral and/or cognitive change since the individual's last appointment, or with an assessment based on the adult's age.[344]

There are signals or times when suspicion arises for when to assess persons with ID for MCI or dementia. These are often associated with:

- Empirical bases for raising suspicions. Based on findings of studies, clinicians of all disciplines must maintain a high index of suspicion for cognitive decline based on the adult's chronological age.

- Changes in function. Direct caregivers and/or family may note deterioration from the adult's previous level of functioning (memory problems, decreased vocabulary or amount of speech), struggle with previously mastered tasks (grooming, self-care, feeding), orientation (getting lost, wandering, confusion in familiar places), and difficulties with previously facile social connections.

- Sustained change. Deterioration of function must have some apparent permanence (i.e., has been present for at least several weeks).

Initial and subsequent stages of the assessment process

Begin with screening for the symptoms and signs of a possible neurocognitive disorder with a standardized screening tool, such as the NTG-EDSD or DLD.

- Although most screening instruments do not offer strict cut-off points for determining the likely presence of a neurocognitive disorder, scoring which reveals apparent cognitive deterioration across more than a single domain (or many domains) should prompt the examiner or treatment team to pursue additional formal evaluation by the individual's primary care clinician, psychiatrist, neurologist, or neuropsychologist.

There are many potential reasons (other than the onset of a dementing process) that may explain apparent cognitive change or deterioration in a person with an ID. These can include:

- Any environmental perturbation (change in residence or day programming, caregiver departure, etc.).

- Any psychosocial change (change in frequency of family or meaningful relations' contact, illness or loss of a family member or primary caregiver or housemates/peers).

- The onset or exacerbation of a medical illness (epilepsy, delirium, infection, others) or condition (constipation, appetite or weight change, and diet changes).

- The onset or exacerbation of a psychiatric illness (depression, bipolar disorder, psychosis, substance use disorder).

- A recent change in psychotropic medication.

- A recent change in non-psychotropic medication with side effects (sedation, restlessness, confusion, constipation, gait changes, etc.).

The medical assessment for a potential reversible etiology for the suspected cognitive change should not be delayed for long, and should include:

- A detailed history, from as many caregivers with knowledge of the individual as possible, of environmental or psychosocial changes or incidents and accidents not resulting in medical attention.

- A detailed history of any past or current substance use disorder which may produce cognitive dysfunction.

- A review of recent consults, such as ophthalmology, dental, cardiac (or other specialists for chronic conditions and recent hospitalizations).

- A careful physical examination, looking for evidence of medical illness, sensory impairment, and/or pain from any source.

- A careful psychiatric examination, looking for onset of or exacerbation of a psychiatric disorder (including substance use disorder).

- A careful review of current medications, looking for any recent changes in dosing or timing of dosing of psychotropic and non-psychotropic medications.

- A comprehensive laboratory evaluation, (completed anew, or within the preceding three months); to include complete blood count, comprehensive metabolic panel (includes renal and hepatic panels), thyroid stimulating hormone (TSH), Vitamin B12 and

folate levels, urinalysis; and for individuals with DS, Celiac screening with total IgA and tTG. In individuals who have been sexually active with others, screening for tertiary syphilis with [Venereal Disease Research Laboratory] VDRL test is also recommended.

- Additional exams as warranted by history and physical examination, which might include screening for obstructive sleep apnea, vision/hearing/audiology examination, and Computerized Tomography scan (CT) of the brain.

The presence of any abnormality outlined above causing cognitive and/or behavioral dysfunction does not preclude that the individual may also be experiencing the onset of a primary mild or major neurocognitive (dementing) disorder (AD, or vascular disease-related neurocognitive disorder). If so, the evaluation process for both may proceed simultaneously. Combining two screening examinations (perhaps including one informant-based exam such as NTG-EDSD, and one direct examination such as the SIB or CAMCOG-DS) may improve the sensitivity of the dementia-screening process. [345] *(Note: In routine clinical screening practice, this combining of multiple screening examinations seems to be rarely undertaken in a systematic manner).*

Once a diagnosis of a mild (MCI) or major (dementia) neurocognitive disorder is formally made, this information, as well as the justification for the diagnosis itself, should be shared with the individual and his/her family, and other caregivers as appropriate. This stage should include significant psychoeducational time and effort with the individual, family, and treatment team, and the opportunity to ask questions and address concerns regarding the diagnosis and likely course of the disorder. To initiate dementia care planning, following careful discussion with all concerned, this stage may also result in referral to a medical specialist (usually a psychiatrist or neurologist) for discussion of available treatment options (including social, habilitative, behavioral, and psychopharmacological treatments).

RECOMMENDATIONS

There is a need for consensus regarding the accurate and reliable identification of dementia and MCI in persons with ID.[346] Reviews of these various methodologies have identified multiple screening instruments, both direct and informant-based, but at this time no single instrument or methodology has seemed able to become the accepted standard in the field.

- Most dementia and MCI screening methodologies for use in persons with ID involve either specialized laboratory examinations not widely available in clinical settings (in the

case of emerging biomarkers); or lengthy and time-consuming direct or informant-based assessments.

- Direct assessment often requires highly skilled professional staff not available in many settings outside of academic centers, and informant-based evaluations are directly dependent on the presence of direct caregiving staff with long-term (multiple-year) knowledge of the individual. In settings without either, assessment is often delayed or does not happen at all.

- For these reasons, the field should endeavor to arrive at a consensus on one or two instruments/methodologies, applicable across multiple geographic settings and with diverse cultural and language groups, and with a focus on making the process accessible to all, and relatively time sensitive.

Currently there is no universally accepted brief or bedside assessment methodology for initiating screening for MCI or dementia in persons with ID. The NTG-EDSD may be the best current informant-rated instrument available, and benefits from its ease of administration, relative brevity, and application to persons with ID.[347] The Modified-Cued Recall Test (M-CRT) is a brief direct assessment methodology whose usefulness as a screening test for early memory deficits is also a possibility, but should be further evaluated.[348,349]

Over the last decade, the NIH has launched a major initiative to produce a valid and reliable cognitive test battery, which could be used to assess both children and adults, and note changes over time.[350] Recently, the National Institute of Health Toolbox-Cognitive Battery (NIHTB-CB) has been thought to be valid in assessing cognition in children and young adults with ID with a mental age of 5 or older.[351] It is anticipated that ultimately the NIHTB-CB could be useful in tracking cognitive responses to interventions,[352] or perhaps be useful in noting cognitive decline from baseline in adults with ID.

Intellectual Disability and Dual Diagnosis with a Mental Health Condition

Contributor: Lucille Esralew, PhD

INCLUSION DEFINITION

Adults with a combination of ID and some forms of excessive behavioral anomaly are often known by the term ‘dual diagnosed’.[353] Dual diagnosis is the co-occurrence of a major

mental health disorder or SMI (consistent with the taxonomy of the DSM-5[354], DM-ID-2[355], or ICD-10[356]) with a neurodevelopmental disorder, primarily ID. A WHO report[357,358] noted the distinction between *SMI-focused conditions* which can be classified into diagnostic systems such as the ICD-10 and DSM-5 and often attributed to biological, psychological, and social factors which may contribute to their expression, and *behavioral disorders* which are patterns of maladaptive behaviors (usually as perceived by an informant) that interfere with typical life functioning.

- With respect to the occurrence of various major mental (or SMI) conditions, studies have noted significant variability, but are in general agreement that there are elevated rates of SMI conditions in adults with ID when compared to the general population.[359,360,361] For example, one study noted that 48.2% of adult had psychiatric disorders such as schizophrenia and disorders of adult personality, which were noted significantly more frequent in adults with mild ID.[362] An Australian study found that some 1.3% of adults with ID had a psychotic disorder, 8% had a depressive disorder, and 14% had an anxiety disorder.[363] An English study found diagnosable disorders at 11.4%, mostly for major depression and generalized anxiety.[364] Another found that the rates of schizophrenic and phobic disorders were significantly higher when compared with the general population.[365] A Norwegian study noted that 'problem behaviors' were the most prevalent single diagnosis next to anxiety and affective disorders.[366] A Polish study reported that mental disorders were present in up to 40% of older adults with ID (the most prevalent were challenging behaviors, depression, anxiety, and dementia).[367]

- Degree of ID is factor, with prevalence of psychiatric conditions generally higher in mild, moderate, and severe ID compared to profound ID. Type of ID is also a factor; adults with DS are generally less prevalent among individuals with a dual diagnosis despite being one of the most common causes of ID.[368] While these studies point to elevated rates, they also illustrate the absence of definitive epidemiological research on the population of adults with ID with who may have a neuropsychiatric condition. The variations in these figures are affected by the study samples (clinical vs. population), type of documentation, definitions employed, level of ID, informant reliability, diagnostic categories included, and confounding behavioral presentations.

- With respect to the occurrence of behavioral disorders, studies generally show higher rates in adults. Behavioral disorders are defined as behaviors that are difficult or disruptive, including stereotypes, difficult or disruptive behavior, aggressive behavior toward other people, behaviors that lead to injury to self or others, and destruction of property.[369] Data are sparse on the rate of behavioral disorders among older adults with

ID, but one study of adults with ID noted that some 10–15% of adults presenting to specialized educational, health or social care services showed some form of behavioral disorder.[370] These may a factor as masking a more serious neuropsychiatric condition, but generally their etiology is not organic, but reactive or bound to environmental factors. Such disorders may be linked to social, cultural, environmental, and developmental factors and to stressors which have significant impact on the expression of both psychiatric and behavioral disorders in older people with ID. Such stressors may be multiple and at times reactive (e.g., separation from or death of a parent, loneliness, and sudden relocation) which may lead to referrals for assessment.[371] Alternatively, behavioral disorders may fall under the category of BPSDs when evident in adults with neuropathological cognitive impairment.

- Broad-based studies which also generally encompass a range of psychiatric and behavioral conditions lead to figures that may be misleading. Often there is a large discrepancy between the overall rate of neuropsychiatric disorders and the rate of behavioral disorders/challenging behaviors. Also, studies on clinical populations and focusing on psychiatric conditions such as severe mental illness, tend to range broadly, often due to the difficulty to diagnose ID and psychiatric disorders at the same time.[372] Studies also note that the total prevalence of psychiatric disorders is affected by the degree of ID, evidenced by progressive decreases with severity of ID.[373]

RISK FOR DEMENTIA

The risk for dementia among adults with ID and multiple conditions has been reported. One study noted that those adults with ID along with a comorbid diagnosis of mental illness or neurological disease had a higher risk of dementia than their counterparts absent such dual diagnosis.[374] Studies show that the risk is associated with poor mental health[375] and diagnosable severe mental illness.[376] While specific studies examining the rate of dementia among adults with a dual diagnosis of ID and mental illness are sparse, studies of adults absent an ID but with SMI indicate that the risk is significant. One large study noted that Individuals with schizophrenia, especially those younger than 65 years, had a markedly increased relative risk of dementia that could not be explained by established dementia risk factors.[377] In another study involving military veterans, diagnoses of bipolar disorder and schizophrenia were each associated with increased risk of receiving a new diagnosis of dementia.[378] Other SMI, such as longitudinal depression, bipolar, and anxiety disorder have also been noted as a risk factor.[379,380] Given these (and other) findings, the expectation that adults with ID with diagnosed severe mental illness would be at greater risk for dementia.

When behavioral disorders are considered, little data are available that show a trajectory to dementia when 'challenging behaviors' are present. Further, no risk has been noted for behavioral disorders in adults with ID leading to dementia.

ISSUES

There are complexities in undertaking differential diagnosis when individuals with ID present for assessment when mental health conditions and cognitive or functional decline are present or suspected. The challenge to differential diagnosis within this group is greater as multiple morbidities that may manifest as cognitive and functional impairments, and which can seem like or mask dementia because the impairments reflect significant decline from a previous higher baseline performance in multiple domains of adult functioning.

Difficulties in conducting diagnostic interviews

Despite the widespread movement in United States and abroad to focus on the mental health needs of individuals with ID, there is still no consensus on best practice in differential diagnosis. Sovner, who promoted psychiatric specialization in the area of dual diagnosis (i.e., MI and ID), was among the first to identify and publish factors for consideration during a psychiatric diagnostic interview of individuals with ID.[381] Those factors that may complicate differential diagnosis of dementia in adults with ID and mental health issues include limited expressive and receptive language skills (which limit self-report and lead to reliance on collateral informants), degree of ID, differentiating maladaptive behaviors from organic psychiatric conditions, and psychosocial masking, baseline, intellectual distortion, and cognitive disintegration.[382] These latter factors are explained further:

- ***Baseline Exaggeration*** Consideration of the increases in maladaptive or challenging behaviors in terms of frequency, duration, or intensity during an acute episode of mental illness. These increases in behavior may be what occasions a request for assessment.

- ***Intellectual Distortion*** Consideration of the limitations in cognitive abilities which affect how an adult with ID may understand or adequately respond to the question. For example, when asked if hearing voices, the person may not understand this is a question about hallucinations and respond that they can hear the clinician's voice or can hear themselves when talking to themselves. The clinician should be wary of taking answers at face value.

- ***Psychosocial Masking*** Consideration of the individual's symptom picture in the context of developmental challenges. An individual might overestimate their capability, underestimate their limitations, and therefore present an unrealistic picture of themselves which is due more to their cognitive issues than to mental health problems.

An example would be stating that he is going to get married to someone in his workshop with whom he is not in relationship nor would have the ability to marry. Is this wishful thinking or grandiosity?

- ***Cognitive Disintegration*** Consideration that individuals may appear more impaired than would seem warranted by their mental health disorder because of the individual's limited coping capacity and limited cognitive reserve. A person is much more likely to appear psychotic even when presenting with affective spectrum disorder

Conditions confounded with MCI or dementia

Arguably, a case can be made for adults with ID meeting criteria for MCI based on non-AD brain changes associated with SMI (i.e., major depressive disorder, bipolar disorder, schizophrenia). There is a need for longitudinal research of adults with dual diagnosis, particularly with histories of ID and schizophrenia, major depression, and bipolar disorder. Although there is a known connection between schizophrenia and cognitive impairment, recent information is emerging about the progressive neurological changes associated with chronic mental illnesses (such as major depression and bipolar disorder). Hallucinations related to brain changes in AD and other neurocognitive disorders may also be confused with hallucinations that are among signs and symptoms of psychosis. This may further confuse differential diagnosis.

- ***Pseudodementia*** Among the source of complication in differential diagnosis, is that psychopathology may lead to cognitive changes and functional decline and dementia may be preceded or accompanied by signs and symptoms of mood or affective spectrum disorder. People with ID have a predisposition to co-morbidity, which is often severe or frequent enough to influence the evaluation and interpretation of their cognitive impairment. Pseudodementia[383] in known for its association with the general geriatric population;[384] however, it has not been extensively studied within the population of individuals with ID who are dually diagnosed.[385] Pseudodementia has been most consistently linked to depression. It has been noted that individual's pseudodementia is considered reversible when there is improvement in depression and that many individuals without DS who develop AD have symptoms of depression early in the disease.[386] That depression can be a source of cognitive impairment independent of AD-related changes. The cognitive impairment accompanying depression can be significant enough to cause confusion in differential diagnosis of dementia and depression.

  The symptoms of pseudodementia can be easily mistaken for neurocognitive disorders because they may include memory problems, attention, decline in executive functioning

manifest as problems with organization and planning and difficulty regulating emotions all of which contribute to functional decline. However, since the basis of this decline is linked to depression and not neurocognitive disorder, additional signs and symptoms may include those much more consistent with affective disorder including the loss of interest in activities, depressed mood lasting for several weeks at a time, social withdrawal, sleep disturbance (insomnia or hypersomnia), suicidal thoughts or behaviors, fatigue, and disturbance in appetite or eating.

- ***Bipolar Dementia*** *C*ognitive impairment has a close relationship with bipolar disorder (BD) which presents the highest risk for the development of dementia syndromes when compared to other clinical diseases.[387,388] One meta-analysis undertaken provided evidence that bipolar disorder can be viewed as a progressive condition that leads to cognitive impairment and dementia, at least in a subgroup of individuals.[389] Cognitive impairments associated with BD affect mainly memory, attention, language, and executive functions, even during the euthymia stage. Although some studies reviewed by the authors revealed stability of cognitive impairment, others show cognitive impairment and neuroprogression to dementia.[390]

- ***Behavior and Psychological Symptoms of Dementia*** Behavioral and psychiatric symptoms are common in adults with ID and dementia. A working group associated with the International Association for the Scientific Study of Intellectual and Developmental Disabilities recommended greater emphasis be placed on behavioral and personality changes (together with evidence of functional decline) in the diagnostic evaluation.[391] Behavioral changes present in a variety of ways, ranging from patterns of behavior excess as in aggression to behavior deficits as reflected by, slowing and apathy. Behavioral changes may be subtle at first and then progress in tandem with progression of the underlying dementia. Restlessness, impulsivity, and agitation are common, as are wandering and inappropriate motor behaviors (e.g., elopement). Individuals may appear agitated, hostile, and aggressive including being combative with caregivers during routine care provision.

  These behaviors may overwhelm caregivers and result in presentation for hospitalization, institutionalization, and result in loss of community placement. It may also lead individuals to be treated for psychiatric illness. A decrease in motor or social spontaneity is also common and can occur at any stage of the dementing process. Adults may display psychomotor retardation or diminished spontaneous movement.

ASSESSMENT ADAPTATIONS

The Diagnostic Manual-Intellectual Disability: A Textbook of Diagnosis of Mental Disorders in Persons with Intellectual Disability (DM-ID-2)[392] is a useful consensus guideline as it offers considerations for examining adults with mental or behavioral disorders. The DM-ID-2 also offers guidance when adapting assessment in situations where a mental disorder overlays an ID. For practical applications:

- Follow recommendations in Chapter 2 on Assessment Procedures within the DM-ID-2.
- Consider reliance on collateral information, observation, and first instance sources within the professional literature.
- Consider positioning self at eye level with the persons being examined in a quiet, well-lighted, distraction-free setting.
- Follow psychiatric interview protocols and gather and consider information from collaterals.

The DM-ID-2 also provides separate guidelines for applying DSM criteria to psychodiagnosis of individuals with ID. In this case, see adaptations of the psychiatric interview (*Chapter 2, Assessment and Diagnostic Procedures pp. 13-34, DM-ID-2*). Such adaptations may include:

- Use of language and checking in with individual about comprehension.
- Use of vocabulary and short sentences.
- Ask one question at a time and wait for a response before proceeding to the next question.
- Use visuals to get around oral communication limitations (see Books Beyond Words[393]).
- Watch for acquiesce, as there a tendency among some adults with ID towards response bias (saying “yes” to questions in an apparent desire to please the interviewer). Avoid asking ‘yes-no’ questions.[394]

Assessments

When undertaking a preliminary interview during a brief assessment, the following should be considered:

- Collateral information of family and staff who can report departures from characteristic baseline in daily functioning.
- Results from rating tools such as the NTG-EDSD,[395] Adaptive Behavior Assessment System 3 (ABAS-3),[396] and the Vineland Adaptive Behavior Scales-3[397].

- History and or treatment depression.
- Recent medical status changes that might signal delirium.
- Recent trials of benzodiazepine or psychoactive medications.
- Substance use/abuse.
- Life events information.

When undertaking a more in-depth assessment, there are several broad-spectrum screens or assessments for diagnosis of mental health disorders in adults with ID that are utilized by clinicians familiar with examining adults with dual diagnosis. These include:

- Diagnostic Assessment for the Severely Handicapped-II (DASH-II)[398] which is based on DSM-IV-TR criteria for mental illness
- Reiss Screen for Maladaptive Behavior (RSMB)[399]
- Developmental Behaviour Checklist (DBC)[400]
- Psychiatric Assessment Schedules for Adults with Developmental Disabilities (PAS-ADD)[401]
- Mini PAS-ADD[402]
- Psychiatric Interview and Mental Status Examination[403] *(may be most useful in psychodiagnostics)*
- Aberrant Behavior Checklist (ABC)[404]

RECOMMENDATIONS

Clinical recommendations

Given the complexities of differential diagnosis for this population of individuals with co-occurring mental health conditions and ID:

- Ask for status update from treating PCP/HCP, psychiatrist, or psychologist for individuals with a known history of mental health disorder.

- Consider that the presenting problem which is the reason for referral is likely to be part of changes in functioning across multiple domains and setting and ask for history of observed functional decline from the individual, family, and staff. Refer to behavior specialist (if available) to track.

- When considering mental health disorders for adults with ID look for depression in adults with DS, epilepsy, and/or cerebral palsy.

- Consider the high co-prevalence of mood disorders, anxiety, and the presence of ASD.

- If a mental health disorder in an adult with ID is known or suspected (especially depression, bipolar disorder, or schizophrenia) raise level of suspicion that long-term SMI may separately contribute to observed or measured cognitive, behavioral, or functional decline.

- Individuals may show cognitive and behavioral changes which overlap with younger-onset dementia, in particular manifestation of pseudodementia usually associated with depression but possible with other psychiatric disorders.

- Consider use of the Cornell Scale for Depression in Dementia[405] (CSDD) to identify depression co-occurring with dementia.

- Assessments that can be useful in baselining functional status: Neuropsychological profile of individuals with chronic mental illness.[406]

Educational recommendations

There is a need that clinicians become aware of the complexities of arriving at an assessment outcome when examining adults with ID and a mental health condition. Given this it is suggested undertaking efforts to:

- Raise awareness that affective disorders are prevalent among adults with DS.[407]

- Promote the widespread use of the DM-ID-2[408] as the basis for consensus guidelines for differential diagnosis of mental health disorders among individuals with ID.

- Promote the standardization of mental health screens, assessment protocols and batteries for individuals with ID.

- Raise awareness that differential diagnosis cannot be made solely based on evidence of increased behavioral problems. Behavioral concerns may be elevated among individuals with dementia, they may be even more elevated in individuals with comorbid psychopathology.

- Closely examine the underlying cause of increased behavioral concerns.

Research recommendations

Considering that long term mental illness, which has been associated with behavioral, cognitive, and functional decline may contribute to non-AD dementia, more longitudinal research is needed on:

- Following the trajectory of mental illness for individuals with DS and non-DS ID.
- AD in population of individuals with dual diagnosis.
- Pseudodementia and dual diagnosis and bipolar dementia and dual diagnosis.
- Problems in differentiating bipolar disorder from frontotemporal dementia.

Serious Mental Illness

Contributor: Philip D. Harvey, PhD

INCLUSION DEFINITION

Serious mental illness (SMI) is defined as a mental, behavioral, or emotional disorder resulting in serious functional impairment, which substantially interferes with or limits one or more major life activities.[409] These illnesses include disorders that produce psychotic symptoms, such as schizophrenia and schizoaffective disorder, and severe forms of other disorders, such as major depression and bipolar disorder.[410, 411] The burden of mental illnesses is particularly concentrated among those who experience disability due to SMI.[412] Disability is present in approximately 80% of people with schizophrenia and people with bipolar illness, despite their higher levels of pre-illness functioning, fail to achieve lifetime functional milestones at rates approaching 60%.[413, 414]

RISK FOR DEMENTIA

Severe depression, bipolar disorder, and schizophrenia are associated with lifelong cognitive impairments, even in periods of symptomatic remission.[415, 416] Older adults with schizophrenia and bipolar illness have an increased risk of receiving a diagnosis of dementia across a wide age range, possibly because of cognitive and functional deterioration related to the illness, comorbidities, and treatments that induce states that resemble dementia.[417,418,419] Given the nature of the various SMI conditions, the bases for the evolution of dementias in adults with SMI have yet to be determined.

ISSUES

There are several critical issues in terms of differentiating the life-long, but non degenerative, cognitive, and functional impairments seen in serious mental illness from new-onset dementia.

- Lifelong cognitive impairment is extremely common and thus a single assessment by a clinician who does not have information about previous functioning can lead to a new diagnosis based on a lifelong state.[420]

- Cross sectional differences between older patients with severe mental illness and AD are quite limited. Some studies have found cross section differences between SMI and AD in the domains of rapid forgetting[421], even when the groups were matched for severity of global impairment defined by the MMSE.[422] However, post mortem studies have found that the vast majority of people with schizophrenia who meet behavioral criteria for dementia do not have plaques and tangles present at postmortem.[423, 424] Similar findings using blood biomarkers have been reported in bipolar illness.[425] The cross sectional differences found in rapid forgetting are not sensitive enough on a cross-sectional basis for a differential diagnosis; many older patients with schizophrenia have delayed recall scores of 0 on traditional memory tests but do not show subsequent cognitive and functional decline.[426]

- Participants with severe mental illness have substantial challenges estimating their current cognitive and functional abilities. Often the correlation between self-reported cognitive performance and impressions of high contact clinicians is close to zero[427], but clinician and high contact caregiver impressions have repeatedly been found to correlate with cognitive performance.[428, 429]

- Many informants also do not provide valid reports of functioning for people with SMI, with friend or non-caregiver relative informants providing information often that is uncorrelated with patient performance, in contrast to the reports of high contact clinicians.[430]

ASSESSMENT ADAPTATIONS

Considerable data have suggested minimal intermediate term changes in cognitive performance in older people with schizophrenia (e.g., Harvey et al. noted 2 years and Heaton et al. noted 3 years).[431, 432] In a direct comparative study of AD, SMI, and healthy older people,[433] 6-year follow up data suggested changes in MMSE scores of 1.5 to 3 points per year in the AD participants. For schizophrenia patients under the age of 65, there were no 6-year changes in MMSE scores, and older patients (aged 65-75) manifested a change in MMSE scores of 1 point per year which would be undetectable to clinical observation. Baseline MMSE scores for SMI patients over the age of 50 were all in the impaired range on average (Mean =18.3 for age 50-64). Thus, notable profound impairments may be found to be largely non-progressive.

Thus, evidence of rapid decline on an individual basis, particularly in the domains of delayed recall memory, is very uncommon in people with SMI. Similarly, functional declines have been reported to correlate with cognitive decline changes in the limited number of cases

who do manifest these changes in cognitive performance.[434] Any worsening in cognitive performance at a level congruent with that seen in AD, such as a 20% reduction in formal recall memory testing, or a new onset inability to engage in previously master functional tasks, even simple ones, is atypical because of SMI alone.

RECOMMENDATIONS

People with SMI can develop AD and other forms of dementia after life-long mental illness. However, most people with SMI who have significant impairments do not manifest decline in the way that people with cortical dementia do. Thus, large scale studies reporting high point prevalence of dementia in people with lifelong SMI do not identify new onset cases without longitudinal data.[435] As noted by Stroup et al., the most important implication is the high level of impairment seen in this population in late life, with a dementia diagnosis offered in lifelong schizophrenia patients at a prevalence of 70% by age 80.[436] As noted above, it has been reported that the mean MMSE score of participants in their 80s was 12, which is in the range of moderate to severe dementia.[437]

There are several recommendations to increase the validity of diagnosis of new-onset dementia in people with SMI.

- Focus on longitudinal information that suggests either stability or significant decline in a short term (e.g., annual) basis.

- Neuropsychological assessment if delivered should focus on delayed recall, particularly development of impairment in delayed recognition memory which was very impaired in AD patients but unimpaired in schizophrenia patients as reported by Davidson et al.[438]

- Informants who know the patients well are required. Although cognitive and functional performance manifests considerable day to say stability in older schizophrenia patients, people with SMI can have a bad day as well.[439] A time limited alteration in behavior may be due to psychosis.

- View older people with schizophrenia and bipolar disorder similarly, in that cognitive impairments differ in their severity but have very similar profiles across the conditions. Further, long-term follow studies of bipolar illness find not remitting and non-exacerbating deficits over time.[440]

- Ensure that exacerbating cognitive deficits are not due to anticholinergic burden, to which people with SMI become more sensitive as they age.[441]

- Include review of all medications and nutritional and fluid status as medication metabolism is impaired with increasing age due to changes in kidneys and liver, even

protein status. Thus, the addition or modification of medication or even change in diet or fluid intake can cause a cascade that ends with cognitive changes.

- Post-diagnostic care planning consisting of individualized monitoring, links to local services, dementia-related education, and caregiver skills building, can lead to more successful retention at home and higher quality-of-life.[442]

Significant Vision/Hearing Impairments

Contributor: Natalie F. Douglas, PhD, CCC-SLP

INCLUSION DEFINITION

Sensory impairment can include an impairment in hearing, vision, or olfaction.[443] For the purposes of cognitive impairment testing, sensory impairment includes adults who have a self-reported hearing or visual impairment that interferes with activities of daily living.[444,445]

RISK FOR DEMENTIA

Several researchers have identified at least some association among aging, cognitive decline, and hearing and/or vision loss.[446,447,448,449,450,451] While these associations are not necessarily causative, emerging evidence highlights the need to attend to the aging population. It has been estimated that over 90% of adults with cognitive impairment also have hearing loss and that almost 1/3 of people with dementia also have vision loss.[452] Sensory impairments were also associated with a greater risk of dementia in a large study of adults in China aged 65 years and older.[453] In a study of older women, it was found that there was an association between visual impairment and risk of dementia.[454] Another study found that both hearing and visual impairment were associated with risk of AD and mixed dementias.[455] Hearing loss was independently associated with cognitive decline in older adults as well,[456] and impairments in vision, hearing and cognition were associated with greater functional communication impairment when compared to only having cognitive impairments alone.[457]

ISSUES

Often, it can be difficult to decipher whether a person's functional impairments are a result of cognitive decline, sensory impairment, or both.[458] Standard vision and hearing assessments require cognitive-communication skills that are often difficult for people with dementia.[459] For instance, it can be difficult for people with dementia to follow instructions and respond verbally. It can be impossible for someone with visual impairment to label a picture or for someone with hearing impairment to respond to a working memory question, as is the case

of the items embedded within many cognitive impairment screens. Sensory and cognitive impairments can both cause disorientation, social isolation, loss of independence, and a decrease in life participation that affects mood, response styles and reliability of information offered.

- Clinical assessments for sensory and cognitive functioning in older adults often do not adequately meet the needs of adults with dementia with concurrent hearing and/or vision impairments for several reasons. These include a lack of appropriate information offered by professionals, inadequate communication about the adults' complex needs, limited consultation time, and a lack of knowledge and skills in any one or combination of cognition, hearing, or vision.[460]

- A problematic issue is which provider may be conducting the screen. Raymond et al.[461] found that otolaryngologists and audiologists were more likely to refer patients for cognitive assessment as opposed to completing a cognitive screen themselves. If they did use a cognitive screen, the MMSE or MoCA were used, both of which require adequate hearing and vision. As a cautionary note, one study found that cognitive abilities of people with sensory impairment were underestimated when using the MoCA.[462]

- The assessment of sensory or cognitive function may be difficult if the adults have concurrent dual or triple impairments.[463] Most standard cognitive assessment tests are heavily dependent on having intact hearing and vision, and impairments in these domains may render the assessments unreliable or even invalid. From the cognitive testing perspective, for all the three domains (i.e., cognition, hearing, and vision), distinguishing cognitive impairment from vision or hearing impairments and vice versa may be hampered by the lack of appropriately adapted cognitive screening tools for older people with dual or triple impairments.

ASSESSMENT ADAPTATIONS

Cognitive screening tests frequently rely on items being correctly heard or seen.[464] To determine which cognitive screening and assessment tools for dementia have been developed or adapted for adults with acquired hearing and/or vision impairment, Pye et al. found that a small number of tests had been adapted for hearing impairment, but many tests had been adapted for vision impairment. They also reported that adaptations for hearing impairment involved deleting or creating written versions for hearing-dependent items. No studies have reported validity of the tests in relation to detection of dementia in people with hearing/vision impairment. Adaptations for vision impairment involved deleting vision-dependent items or spoken/tactile versions of visual tasks. Frequently adapted tests were the MMSE and the MoCA [See Table 1].

Table 1: ***Validated Measures to Support Cognitive Screening in Adults Who Are Visually And/or Hearing Impaired***

Measure	Adaptations	Validating Study
COGEVIS	Vision	Meyniel et al., 2018[465]
MOCA-HA	For hearing aid users	Utoomprurkporn et al., 2021[466]
MOCA-HI	For hearing impaired	Lin et al., 2017[467]; Lerch & Benz, 2017[468]
AD8 Dementia Screening Interview	Hearing not involved in test administration [informant reliant]	Galvin et al., 2005[469]
Short Form of the Informant Questionnaire on Cognitive Decline in the Elderly (Short IQCODE)	Hearing not involved in test administration [informant reliant]	Jorm, 1994[470]
QuickSort	Hearing involved in initial instructions only; minimal expressive language demands	Foran et al., 2021[471]
Simple questions	Minimal visual demands	Daté et al., 2020[472]

Generally, for individuals who are not blind but rather less severely visually impaired, certain measures can be undertaken.

- If the person is wearing glasses, ensure that the glasses are clean. Ensure that the room is well lit and that any lights or incoming sun are not causing glare. It is suggested that all visual stimuli used during a cognitive assessment be of high visual contrast.

- If reading print is part of the cognitive screen, consider enlarging font size or making a magnifying glass available.[473]

Generally, for individuals who are not deaf or profoundly hard of hearing but rather less severely hearing impaired, these adaptations can be undertaken.

- If the person is wearing hearing aids, ensure that the hearing aids are working properly and that the batteries are in full operation.

- If the person does not have a hearing aid, consider amplifying the clinician's voice through either a personalized amplifying device or an assisted listening device such as a *Pockettalker*.

- Ensure that screening is completed in a quiet room without background noise.

- Use a whiteboard or note pad to jot down key words of the instructions or conversation.
- Provide written instructions if possible, and speak in a slow, natural rhythm. Provide directions one-step at a time and pause frequently to check for understanding.[474]

RECOMMENDATIONS

Minimal definitive data exist that note specific valid and reliable adaptations of existing measures which can help with the assessment of cognitive impairment of adults with hearing/vision impairment. It is recommended to:

- Undertake studies of adaptations of existing instruments to evaluate their capacity to pick up on MCI or dementia during the assessment.
- Conduct investigations directly in the settings where the screens may be administered with practitioners who administer them.
- Engage providers at the research level to speed translation of research findings into typical practice settings.[475]

It is recommended that in addition to reliability and validity data of any adaptation to any screening instrument, implementation outcomes should also be studied. For instance, data on feasibility, acceptability, and appropriateness of any adaptation should be collected directly from providers.[476] A hybrid approach that collects both validation and implementation data may be of use.[477] Finally, it is recommended that research be conducted to directly tie cognitive screening to concrete next steps for individuals and their families with an emphasis on compensatory approaches to support independence, safety, quality of life, social networks, and purposeful, meaningful activity.

COMMENTARY

GENERAL FINDINGS/CONCLUSIONS

Cognitive impairment in older adults has a variety of possible causes, including medication side effects, metabolic and/or endocrine derangements, delirium due to illness (such as a urinary tract or COVID-19 infection), depression, and dementia.[478] One function of the cognitive impairment assessment is to determine the cause of any changes in cognitive

functioning as some causes (such as medication side effects, covert pain, and depression) can be reversed or improved with treatment.[479] Although the rationale for such as cognitive impairment assessment is the same for adults with NACs as it is for other older adults, it may be doubly important as such changes may not be obvious and masked by the adult's disability condition. Yet, as it was found by the Expert Panel, undertaking such assessments for adults with NACs may be difficult and present with barriers.

The main aim was for the Expert Panel to examine the barriers to the effective cognitive assessment of adults with NACs when presenting for their annual wellness visit. The Expert Panel also delved into the mechanisms of undertaking both the initial assessment and a later more in-depth assessment potentially leading to a diagnosis. A secondary aim was for the Expert Panel to consider person-centered formulations of a plan of care in select NACs.

The primary findings were:

- Available protocols and procedural documents to guide assessments as part of the AWV and subsequent visits lacked guidance about conducting cognitive impairment evaluations of adults with NACs who may present symptoms differently and/or have difficulties in assessment situations.

- A dearth of guidance may lead to problematic assessment outcomes, where cognitive impairment may be un- or underdiagnosed, or misdiagnosed and/or other factors underlying behavior and function are missed.

- Commonalities among adults with NACs included communications issues (both in receptive and expressive language), comprehension challenges posed by examination queries, anxiety in the testing situation, and for some, difficulties in fine and gross motor functions, and/or hearing and/or vision impediments.

- For some of the NACs confounding presentations of pre-existing behavior and function may impede assessments of current changes and decline.

- Post-assessment or post-diagnostic care planning would be helped if more accurate assessments of cognitive impairment were carried out.

- There is a need for materials and education that would aid examiners when conducting assessments of adults with NACs.

- Materials available or developed need to respond to diverse populations, including adults unfamiliar with American cultural norms, non-English speakers, and/or sub-populations with various backgrounds.

The NACs considered in the report were the most prevalent and recognized conditions with pre-existing cognitive, motor, or sensory factors which may impede or confound the cognitive impairment assessment. While there are other NACs posing similar barriers and these were considered by the Expert Panel (e.g., substance abuse, various physical disabilities) it was decided to restrict the effort to those NACs with chronic brain or sensory conditions that posed diagnostic barriers to cognitive functions. Challenges for clinicians occur when trying to discern and discriminate current presentation of behavior and function from that which is pre-existing. Most challenging was determining whether the current presentation was due to neurodegenerative decline versus atypical behavior and function due to other chronic or lifelong impairment, and discerning if compound chronic conditions had communication, motor, or sensory impairments that affected the testing situation.

Each NAC was subjected to an analytic review of definitional inclusion, risk for dementia, commonality of issues with respect to presentation for assessment or diagnosis, specialty approaches for assessment, and recommendations for practice or research – ***see Table 2***.

Definitional inclusiveness

For the most part, all the NACs were able to be operationally defined and were recognized in prevalent nosological classifications and taxonomies (i.e., DSM-5 and ICD-11). Most offered diagnostic precision; for some, the inclusiveness was less precise, but was generally seen as having categorical cohesion by and for practitioners. A question was raised as to whether it was appropriate to use categorical diagnostic conditions over using a functional framework which encompassed common behaviors and functioning (e.g., as is done with the definition of developmental disabilities in the Developmental Disabilities Assistance and Bill of Rights Act[480]). The Expert Panel noted that clinical processes are framed around diagnostic features with common neurological presentations and histories and that diagnostic specificity would be more beneficial to clinicians when researching NACs, composing notes for the medical record, and diagnosing and classifying their patients for insurance purposes and other reporting requirements. It was recognized that care plans may also need to be developed with a categorical NAC in mind (e.g., when considering medications, planning environmental modifications in housing or program spaces, treating dual NACs, addressing program eligibility considerations, etc.)

Risk for dementia

There was notable variability among NACs in the precision of defined risk for dementia in general or for specific types of dementias, and whether the risk was elevated, under par, or equivalent to that of the neurotypical population. Some NACs had noted marked elevated risk due to genetic factors (such as DS). In almost all NACs there was elevated risk due to life stresses experienced, socioenvironmental factors, long-term medication usage, and contributions of underlying physiological and neurological conditions. For some of the

Table 2: ***Summary of Factors Related to Dementia in Select Neuroatypical Conditions***

Factor	ABI/TBI	ASD	CP	DS	ID	ID/MH	SMI	Sensory
Risk for dementia	Potentially higher	Potentially slightly higher	Not confirmed	Definitive and high	Potentially higher	Potentially higher	Potentially higher	Not confirmed
Dementia type	Vascular, CTE	Frontotemporal in some	Unknown	Usually AD	Mixed	Mixed	Frontotemporal in some, AD in others	Mixed
Risk feature	CTE high Stroke higher	ASD & DS – higher risk	Younger onset higher	Younger onset prevalent	Coincident conditions	Coincident conditions	Unknown	Unknown
Causal feature	Stroke, extensive head injury	Unknown	Coincidence with seizures and ID	Genetic predisposition and co-incident with seizures	Unknown	Coincidence of ID and SMI	Unknown	Unknown
Associative feature	Behavioral functions Senses Language Loss of prior function without other explanation	Variability in communication abilities Loss of prior function without other explanation	Post-impairment syndrome Loss of prior function without other explanation	Seizures increase risk Precious aging Loss of prior function without other explanation	Loss of prior function without other explanation	Loss of prior function without other explanation	Declines in memory and executive function Declines in memory and executive function	Reported coincidence Declines in memory and executive function
Temporal*	Point measures	Longitudinal measurements	Point measures	Longitudinal measurements	Longitudinal measurements	Longitudinal measurements	Longitudinal measurements	Point measures
Measures	General CIA instruments	General CIA instruments Specialized ID instruments if appropriate	General CIA instruments Specialized ID instruments if appropriate	Specialized ID instruments	Specialized ID instruments	Specialized ID instruments	General CIA instruments	General CIA but adapted for items affected by hearing/vision
Adaptations	Verbal measures when vision affected; Due to ABI effects use of non-normed measures	Visual testing Concrete instructions Serial assessments Individualize exam	Accessible exam room Use measures not requiring task reproduction if fine motor skill impaired	General CIA instruments with mild ID Special instruments with other ID Serial assessments	General CIA instruments with mild ID Special instruments with other ID Serial assessments	General CIA instruments with mild ID Special instruments with other ID Serial assessments	Tracking short-term decline	Visuals for hearing impaired Aural for vision impaired

Barriers to examination	Variability of part of brain affected	Unfamiliar staff and clinic spaces	Speech clarity Impaired fine motor fluency	Speech clarity Comprehension Unfamiliar staff and clinic spaces	Comprehension Unfamiliar staff and clinic spaces	Unfamiliar staff and clinic spaces	Communication impairments	Lack of intact hearing or vision, or both
Use of informants	Useful	Useful	Useful	Required	Required	Required	Required	Useful
Biomarker utility	Not documented	Not documented	As with general population	Research supported	Research supported	Research supported	Not documented	As with general population

Abbreviations/Interpretations

ABI/TBI	Acquired/traumatic brain injury
AD	Alzheimer's disease
ASD	Autism spectrum disorder
CIA	Cognitive impairment assessment
CP	Cerebral palsy
DS	Down syndrome
ID/MH	Intellectual disability with dual diagnosis of a mental health condition
ID	Intellectual disability (including Down syndrome)
Sensory	Significant vision and/or hearing impairment
SMI	Severe mental illness
*Temporal	How often to take measures (Point: generally, at exam; Longitudinal: several measures of time)

conditions the research on risk for dementia was equivocal as reports were from small sample clinical populations or based on reports of association, not causal features.

Research reviewed and Expert Panel member deliberations supported the fact that adults with DS are at high risk for younger-onset AD and present most often with symptoms of DAT (generally in their early 50s). Similarly, it was noted that adults with certain TBIs, particularly athletes who experienced significant and repeated concussions, show high risk for CTE with onset of younger-age symptoms of dementia.

Risk was also notable in some genotypes or phenotypes associated with ID and some forms of serious mental illness (e.g., schizophrenia). Risk was variable in some of the other conditions included, with prevalence generally higher in focal clinic populations over that of those community populations with the same diagnoses. Risk was also seen in some conditions independent of a disease process but associated with some impairments – for example, adults with hearing and vision impairments where higher rates of dementia were noted, but there was not necessarily a causal relationship. Risk was also uncertain in some NACs as empirical data were unavailable. For example, ASD, there are equivocal findings with some speculation that the condition proffered protective features against brain diseases leading to dementia and other literature showing that adults with coincident ASD and ID had a slightly higher risk.

Risk with respect to conversion from MCI to dementia for adults with a NAC is generally unknown. A general population study found that almost half of the individuals with incident MCI diagnoses were classified as cognitively normal at follow-up.[481] Studies also show variable rates when comparing clinic and community samples.[482, 483] There is a dearth of studies related to NACs; however, one study of adults with DS indicated a MCI to dementia conversion rate of about 33% over a 18 month period.[484] Knowing that not all indicators of MCI will mean that dementia will eventually be determined is important.

Focus and issues

We debated as to whether the report should focus on screening people at the AWV, focus on a comprehensive visit to recommend appropriate care and treatment, or a combination. Given our main aim was to detect barriers to effective assessment for later-age neurodegenerative cognitive impairment, it was decided to include information on both as it was likely clinicians would often be unable to detect a cognitive impairment in one visit. This would mean that the AWV would be insufficient for exploring the complexities of many NACs therefore encouraging a subsequent visit where the combined assessments would then inform care planning.

With respect to our first aim, we recognized that guidance was needed for PCPs and other practitioners who are not necessarily trained, experienced, or experts in treating adults

with NACs. Often the times allocated to screening obviate a 'deep dive' into the condition of the patient with consequences for assessing evolving cognitive impairment. Also, most screening instruments used in the neurotypical population were determined inappropriate for use in adults with NACs. Many conditions require the use of screening instruments that are adapted or specially developed for the NAC.

Thus, guidance is needed on how to conduct screening and which tools to use. Guidance is also needed on when to make referrals to specialists who may be more able to undertake the assessments and to decide when and which adults the PCP/HCPs should treat themselves. Having local or regional resource directories of specialists knowledgeable about select NACs would be highly beneficial. Some networks exist within condition specialties that might be enlisted to contribute to such directories. The national network of Alzheimer's Disease Research Centers funded by the NIA,[485] the local Aging and Disability Resource Centers funded by the Administration on Community Living,[486] and national organizations such as the Alzheimer's Association might be called upon to create and manage such directories.

The Expert Panel agreed that:

- PCP/HCPs need to understand the context of a low score on a cognitive assessment and that this may not be due to AD or another cause for dementia, but potentially reflect some inherent aspect of the lifelong or chronic condition.

- One visit may be insufficient to accurately capture the nature of the behavior and accurately distinguish behaviors that are due to the underlying condition from those that are new and possibly due to the onset of MCI or dementia.

- Given emerging changes or signs of decline, for some high-risk individuals annual screening may be too infrequent. If suspicions arise, it would be important to follow some adults longitudinally and track change over time to look for signs that may signal or better establish decline or greater impairment.

- The initial visit should include obtaining accurate family, living situation, and history information to help in understanding the history and behavioral factors in play. Thus, a family member, caregiver, or staff at the adult's residence, should be asked to prepare information about the adult's history, functioning, key recent events, and what suspicions have arisen about the adult's behavior and functioning. Obtaining information from an informant (familiar with the adult) can help place behaviors evident to the examination in context.

- Useful guidance on how to prepare for the assessment by both the family and the PCP/HCP would be helpful. Such guidance has been produced for the ID community;[487,488] guidance addressing other conditions warrants development.

Another consideration for the AWV is that current standards of care for many people with some of the NACs we included (e.g., ID, DS) do not include cognitive assessments and are not required as part of the ACA. Given this, the Expert Panel recommended that standards of care be revised to include screening for cognitive decline and the use of cognitive assessments as part of any annual screen. The concern was acknowledged that many of the questions recommended by CMS for an assessment would not apply to most adults with some of the conditions included (such as queries about loss of driving skills). It was agreed that the evaluation needs to be of aspects of the person's actual life and look at change over time not just a report or measurement of the current level of functioning. Formative to any standards would be an expectation to obtain an accurate baseline picture of function.

The Expert Panel recognized that obtaining a baseline can be challenging if the person does not have a knowledgeable caregiver or informant. Remediations proposed include expanding the existing CMS guidance on examinations and care planning to include atypical elements, as well as professional organizations developing protocols reflecting the special considerations to be observed with examining adults with NACs.

Assessment Adaptations

Common adaptations

There were several recommendations applicable to most conditions that should become standard and expected practice.

Irrespective of the underlying NAC, any individual may also have a sensory impairment, whether poor or impaired vision or poor or impaired hearing or both. Sensory impairments can impact the accuracy of the scoring. It is important to consider this factor when undertaking any cognitive impairment assessment. In some adults, they may be their own informant as to a sensory impairment, in others with low self-awareness or communication deficits, a quick impression of any barriers to seeing or hearing should precede the assessment.

Unspoken also is that an assessment that includes visual items cannot be given to visually impaired individuals, even when absent the presence of a NAC. For adults who are hearing impaired, an informant may be necessary and will play an important role in the assessment. Amplification systems can be used if the person does not have or use hearing aids. With COVID-19, some of assessments are now being used within telemedicine visits and this distancing between the adult and clinician may also impact the accuracy of assessments and scoring.

In terms of general communications best practices there will be value in expecting PCP/HCPs to become adept in the following:

- If the person is wearing glasses, ensure the glasses are clean, the room is well lit, and that any lights or incoming sun are not causing glare. All visual stimuli used during a cognitive assessment should be of high visual contrast.

- If reading print is part of the cognitive screen, the font size should be enlarged, or a magnifying glass should be available. On print images avoid stylized fonts and all capitals; use bold and enlarged fonts (14pt, 16pt or greater).[489]

For individuals who are not deaf or profoundly hard of hearing but rather less severely hearing impaired or who have attention difficulties:

- Ensure that the hearing aids are working properly and that the batteries are in full operation if the person is wearing a hearing aid. If the person does not have a hearing aid, consider amplifying the clinician's voice through either a personalized amplifying device or an assisted listening device.

- Complete screenings in a quiet room without background noise or commotion.

- Use a whiteboard or note pad to write down key words of instructions.

- Provide written as well as verbal instructions if possible, and speak in a slow, natural rhythm and provide directions one-step at a time and pause frequently to check for understanding.

For everyone:

- Given the known impact on cognition of visual decline, all adults should be screened for cataracts and other factors affecting vision prior to cognitive screenings.[490]

- Avoid jargon and use short sentences.

- Ask one question at a time and wait for a response before proceeding to the next question.

- Use visual cues to get around oral communication limitations.

- Watch for acquiescing, as there a tendency among some adults (for example, those with ID) towards response bias (saying "yes" to questions in an apparent desire to please the interviewer).

- Avoid asking 'yes-no' questions.

Specific adaptations

Although the Expert Panel recognized that for the most part there were many cross-cutting aspects of examining adults with some of the NACs that mirrored those of other adults in the general population, there were also some divergences. One is that assessing cognition and function in adults on the autism spectrum may require different approaches. A substantial proportion of individuals on the spectrum will not give reliable test results for anything involving verbal instructions or imitation. Some issues in ASD assessments are like those experienced by persons with ID. These may include being uncomfortable in a new situation and being assessed by a stranger. New settings and timed assessments can create anxiety that may impact the accuracy of the test.

Another concern relates to assessing adults with serious mental illness, especially when ascertaining dementia in schizophrenia. People with schizophrenia meet the behavioral criteria for dementia at the time of their first psychotic episode because the criteria in the DSM-5 includes declining from a higher level of functioning. Most adults with schizophrenia have cognitive impairments on multiple domains that fall below normative standards. So, it may be difficult to detect cognitive decline associated with AD or other causes as adults with schizophrenia age. Similar challenges may be encountered with adults who are clinically depressed and whose communication and emotional expressions are blunted and may reflect a 'cognitive fog' not uncommon in adults with progressive dementia. Prescribed medications may also influence performance. Similar challenges may present when examining adults whose primary diagnosis is one of the NACs, but also have secondary diagnosis of a psychological/ psychiatric disorder. Like with other conditions, longitudinal assessments will be key in detecting DAT when the rate of decline may accelerate as compared with a more constant rate of decline observed, for example, with schizophrenia alone.

Adapting the examination environment to adults with motor impairments and sensory deficiencies is also a factor to consider. Adults using wheelchairs or other mobility devices may have difficulties if the examination room is not barrier free or adapted for use by persons with physical disabilities. Assessing gait and fine motor performance can be challenging when the adult has moderate or severe cerebral palsy. Similar issues may arise when examining a person with low or no vision. Adults with impaired hearing may not be able to communicate responses to typical examination questions, so adaptations using non-aural measures need to be implemented. Being familiar with communication boards and other adaptive equipment will enable the PCP/HCP to better pose questions and elicit responses. Pain may also affect performance; however, assessing pain or discomfort in some people with NACs may be difficult, particularly in adults with impaired communication abilities. Informant information, in combination with the review of medical conditions which commonly cause pain, may help in the assessment.

Systemic aspects

Systemic issues and barriers affect the nature of the assessment visit and may decrease the opportunity to undertake early detection. These can include problems inherent in existing reimbursement and payment policies, workforce issues, as lack of culturally appropriate materials, as well as constructive issues such as initiatives on brain health, and the expanding work on biomarkers.

Reimbursement/payment. One example is when insurance restrictions may prevent PCP/HCPs from conducting primary assessments. Payment for assessments to private or institutional practitioners is important. Many adults with NACs may be without resources to maintain health insurance and if they do have coverage, the policies may be limited. Governmentally provided insurance, such as Medicare Part B coverage, does reimburse for a cognitive assessment under provisions of the Affordable Care Act, but Medicaid and private insurance currently will not. Medicare is linked to age and the base age for including an AWV assessment for cognitive impairment is 65; consideration is not given to adults with symptoms of younger-onset dementia who may be under age 65.

The LEAD Coalition has noted that Medicare does not cover the estimated 275,000 adults with younger-onset dementia, many of whom are adults with ASD, CP, DS, and other neuroatypical conditions.[491] While some adults with NAC may be considered 'dual eligible' – that is, enrolled in both Medicare and Medicaid, and get coverage, those under age 65 are not covered for the assessment benefits provided under Medicare. This applies to adults with DS and others who are genetically at high risk of younger-onset dementia, to adults with CP and others with lifelong and severe neurologically-based neuromuscular limitations, and adults with SMI some of whom develop younger-onset dementia. Reimbursements for assessment for younger-onset dementia are problematic.[492] Parsing payment for assessment from post-diagnostic care and supports is another challenge, where it is up to states to determine what types of community supports may be underwritten via Medicaid for persons diagnosed with dementia.[493]

This coverage issue is a significant barrier as once dementia progresses, the costs incurred will be a heavy burden upon families and the adults. Not considered eligible for long-term care services and supports (LTSS) such pre-Medicaid individuals may not receive needed diagnostic and post-diagnostic supports, and thus with progressive decline incur significant care costs not covered by the state. To address this, states might explore building into a state plan amendment or HCBS waiver application a tailored expansion of Medicaid targeting better detection, diagnosis, and then HCBS supports for people with younger-onset dementia and those with NACs who are suspected or diagnosed with noted cognitive decline.[494] Without reimbursements, many PCP/HCPs will be reluctant to undertake such examinations. Early

detection of dementia is important and artificial barriers caused by legislative or policy impediments can delay recognition of the causes of change, be they related to a neurodegenerative disease or process or a treatable condition.

Workforce factors. Another systemic barrier stems from the lack of stable and longitudinal contact with individuals with NACs by support program personnel and/or PCP/HCPs because of staff turn-over. This may result in a lack of sufficiently prolonged contact with an adult with a NAC and thus an inability to report observable changes, and when serving as an aide in the interview with a PCP/HCP, not being a reliable informant as to pre-existing behaviors. This problem has been particularly acute during the COVID-19 pandemic as providers are scrambling to retain staff who have become ill or have sought out alternative employment.[495] This may apply to some adults with NACs whose living arrangement includes autonomous housing with staff supports or residing in a group home or apartment with supervised care. In such situations when having their housing and care underwritten, COVID-19 and other factors may have affected continuity of knowledge due to challenging workforce issues (such as staff absences due to illness, turn-over with new hires, and suspension of training of personnel).[496]

Additionally, documentation may be lacking as it may not be integral in certain models of care. Generally, host agencies overseeing housing also link persons with NACs to medical services. When high staff absences and turnover occurs, the reliability of information provided by informants who accompany them to medical visit diminishes.

***Cultural/language*.** An additional systemic issue is the barrier posed by the lack of culturally tailored and language specific materials and clinical services. Imagine the frustration on both sides, if the clinician and adult with a NAC cannot communicate effectively simply because they do not understand each other's culturally based perspectives, or if the adult is fluent in a language other than English or using his or her native language as best as he or she can but isn't understood. What misdiagnostic outcomes may result and what may these mean for medication applications, treatment or intervention protocols, care, program eligibility, and the person's quality of life?

Brain health. Healthy brain initiatives and programs for brain wellness generally target children and adults in early life but can also be effective with aging adults with prodromal cognitive impairment. Changing later life health practices, such as managing diet and improving nutrition,[497] surveilling for adverse effects of polypharmacy,[498] mitigating vascular disease risk factors,[499] minimizing tobacco and beverage alcohol use,[500] increasing movement and exercise,[501, 502] monitoring for frailty,[503] and introducing cognitive challenges[504] can help slow decline and sustain maintenance.[505] Access to cognitive impairment assessments and post-visit planning can lead to effective applications of mitigation-based interventions that promote brain

health even after recognition of the presence of a brain disease.

Biomarkers. The Expert Panel explored the broader application of biomarkers as an integral part of the assessment process. The Expert Panel deliberated to what extent can anatomical and functional imaging biomarkers be used to augment clinical assessments to better understand the etiology of disease and possibly to rule out certain causes of dementia. It was recognized that there are FDA approved imaging tools, such as amyloid and tau positron emission tomography (PET). Cerebral spinal fluid (CSF) markers have also been used in clinical settings, although they are more commonly used in Europe. Also, plasma biomarkers are emerging and are being employed in clinical research settings. New data are also emerging where neurodegenerative biomarkers related to COVID-19 are showing evidence of significant encephalopathy which if evident in adults with NACs may confound assessments.[506]

There are appropriate use criteria (AUC) published for PET and CSF markers that may be useful in establishing recommendations for their use in populations with NACs.[507,508] For example, the CSF AUC deemed the following as appropriate for the use of CSF: (a) MCI that is persistent, progressing, and unexplained; (b) Patients with symptoms that suggest possible AD; (c) MCI or dementia with an onset at an early age (<65); and (d) Patients whose dominant symptom is a change in behavior (e.g., Capgras Syndrome, paranoid delusions, unexplained delirium, combative symptoms, and depression) and where AD diagnosis is being considered. All these appropriate uses could well apply to the populations with NACs with biomarkers providing useful additional information to the clinician to aid in the diagnostic process.

Unfortunately, PET imaging is not currently covered by CMS although this may change with the approval of new AD drugs. The emergence and greater use of biomarkers will add considerably to the commonalities of diagnosing the presence of brain disease leading to dementia but may be of lesser value in conditions where brain changes were incident at birth or due to injury and not to disease. This area bears further discussion, and the Expert Panel recommends the NIA to undertake a focused effort to explore this topic.

Training and education needs

The Expert Panel noted the need to educate and provide technical materials that can be used by PCP/HCPs and other examiners. However, the Expert Panel noted that is often a lack of training opportunities and mismatches within disciplines. For example, pediatricians are trained in autism but not PCPs who have adults as patients. Due to a lack of training and experience many PCPs and specialists do not fully understand the population with NACs and how to arrive at the diagnosis of dementia in diverse populations. Training inadequacies also lead to concerns raised over the non-compliance with provisions of the Americans with Disabilities Act (ADA) as evidenced by the lack of understanding about accommodation requirements by many PCP/HCPs.[509] Further, DHHS enforcement of Title II of the ADA relating to access to programs,

services, and activities receiving DHHS federal financial assistance should lead to training about accommodations that have to be provided in testing situations, for example, to adults with hearing, vision, cognitive, or physical impairments.[510]

Another area where training may be of assistance would be with obtaining reliable information from informants, be they family or staff providing community supports or working within residential settings. It was recognized by the Expert Panel that there may be variability in the reporting of observed behavior or changes in function even among members of the same family or staff from situations where the person may reside. Guides might be developed as aids for informants in preparing history and function information for PCP/HCPs. Such pre-examination materials could be completed by informants prior to the appointment and thus aid in increasing the reliability of the information derived.

Care planning

Both the ACA and its annual cognitive impairment assessment and CMS guidelines for payment-related assessments include a component for care planning. CMS has noted that detecting cognitive impairment is a required element of Medicare's AWV and that such detection can also occur as part of a routine visit through direct observation or by considering information from the patient, family, friends, caregivers, and others. If cognitive impairment is detected at an AWV or other routine visit, a more detailed cognitive assessment can be undertaken and be used to develop a care plan during a separate visit.[511] The care plan ideally should include initial plans to address (a) neuropsychiatric symptoms, (b) neurocognitive symptoms, (c) functional limitations, and (d) referral to community resources as needed (for example, rehabilitation services, adult day programs, and support groups) involving the adults and caregivers. Such care planning should result in the provision of initial supports and services as a prelude to further assessments leading to a more definitive diagnosis.

The Expert Panel noted that once there is certainty of the cause of the changes in behavior and function, planning is needed for post-diagnostic support services for dementia (PDS). The role of PDS is to provide supports to people newly diagnosed with dementia with the aim of empowering them and those who care for them, with the tools, connections, resources and plans they need to live as well as possible and prepare for the future.[512] Early diagnosis provides a chance for both practitioners and people with dementia and their caregivers to work together and set goals and make important decisions about PDS needs and care and potentially delay admission to long-term care residential care.[513]

Most resources available were designed for the general population and provide useful guidance on what would best aid family and other caregivers, as well as provide a benefit to adults with dementia. Examples are *The Next Steps: Dementia Post-Diagnostic Support Guidance* (Ireland),[514] the *5 Pillar Model of Post Diagnostic Support* (Scotland),[515] and *Life After*

Diagnosis (US).[516] There are limited resources specifically examining PDS applications for special populations. Two examples are the work of Dodd et al. which examined the factors contributing to PDS with respect to ID,[517] and Jokinen et al. which proposed PDS care guidelines.[518] Another is the work of Stamou et al. related to PDS for adults with younger-onset dementia.[519]

Various governmental and national organizations have outlined care planning,[520, 521, 522] and these processes generally would also apply to adults with a NAC. While there are some differences, most situations are common to those seen in the general population. Strategies for intervention often need to be modified accordingly. One option is the benefits that may result from a care consultation referral to a local chapter of the Alzheimer's Association or similar dementia-focused help group and/or accessing the regional Aging and Disability Resource Center (ADRC). The ADRCs serve as single points of entry into the LTSS system for older adults, people with disabilities, caregivers, veterans, and families, and are generally part of or linked directly to a locality's area agency on aging.

Care planning needs to consider both the adult with dementia as well as his or her immediate caregivers by meeting information and knowledge needs, and providing support needed for managing care recipients' ADLs, instrumental ADLs, and BPSDs. They also involve managing the caregiver's own personal needs (e.g., managing caregivers' physical and psychological health, and managing caregivers' own lives) and aiding them during stressful times.[523] Although care planning generally considers stages of progression of dementia, a 'right size' planning model should consider how caregivers perceive and act with respect to knowing that their family member may have an emerging neurodegenerative condition in addition to a pre-existing cognitive or sensory condition.

One such model, emanated from the Glasgow Summit on Intellectual Disability and Dementia[524] for work in ID care planning, has application for other NACs. This support-staging model for caregivers assumes that if care planning workers know generally the 'mind set' of new or long-term caregivers, related to new information on a relative being diagnosed with dementia, or wrestling with new ascribed or assumed caregiving responsibilities, then aid and advice can be tailored more effectively – a 'right sized' approach.

The Glasgow Staging Model covers four stages[525] and attempts to quantify from a social-psychological perspective where the caregivers are and then provide a framework for organizing resources and providing supports. It assumes that the emergence and progression of dementia places new demands on caregiving and care and that to address new challenges caregivers may need to increase time demands and assume a range of new responsibilities. The first assumptive aspect of the Model is the recognition of the role and nature of the involvement in caregiving, which can be either primary (direct – day-to-day) or secondary

(advocacy or oversight – periodic). The second assumptive aspect is the influence of dementia progression and its effects.

The staging may be broken down as: (a) the "diagnostic phase," seeking validation as to the cause of change in function early on with an assessment for dementia as well as later with the onset of other causes that change behavior; (b) the "explorative phase," accepting the diagnosis and exploring support options as they apply to the dementia diagnosis as well as additional conditions that arise; (c) the "adaptive phase," managing the symptoms of dementia; and (d) the "closure phase," resolving caregiving issues and relief from responsibilities following end-of-life (where "decompression" occurs) or adapting to the loss and rebuilding lives and focus (where "reconstruction" occurs) – depending on the degree or nature of interpersonal investment of the caregivers.[526] Giving consideration to the mindset of caregivers, a 'right sized' care model can go beyond a 'one-size fits all' approach to providing supports.[527]

For many NACs there is a similar dependency element inherent in the adult and/or there is an assumption that a family member will continue to provide supports or be drawn into a new caregiving role. We would propose that when considering dementia care planning, applications of a caregiver staging model will facilitate more functional assistance if it is known how the current (or potential) caregivers perceive the state of their 'loved one' or client and how prepared they may be in accepting new information or their willingness to provide extended care and supports.

RECOMMENDATIONS

The position of the Expert Panel is that there are deficiencies in the manner and processes undertaken to assess adults with certain neuroatypical and neurodivergent conditions when it comes to both the AWV detection of cognitive impairment and most follow-up visits – except perhaps when an adult is seen in a specialty service. Therefore, the Expert Panel offers the following considerations for public policy actions and research initiatives.

PUBLIC POLICY

With respect to public policy or federal or state agency practices, the Expert Panel proposes:

- That the DHHS organize and convene a consultative group for the purpose of examining barriers to diagnostic services and post-diagnostic support planning in legislation and federal agency policies and procedures for adults with NACs and their caregivers.

- That the National Plan to Address Alzheimer's Disease, developed by the Federal Advisory Council on Alzheimer's Research, Care, and Services, include recommendations for actions at the federal and state level to further the effective inclusion of adults with NACs in diagnostic, support, and caregiver assistance services, as well as affirming accessibility and accommodation compliance by clinicians in accord with provisions of the Americans with Disabilities Act (ADA)

- That the CMS expand its guidance and protocol documents to include specific information on populations with NACs regarding cognitive impairment evaluations during the AWV and any subsequent follow-up assessments, both for diagnostic evaluations and for dementia care planning.

- That federal and state regulatory authorities be encouraged to adapt their reimbursement rates for diagnostic services to accommodate the time and specialty clinical services needed to examine adults with NACs.

- That states consider building into waiver applications a tailored expansion of Medicaid targeting better detection, diagnosis, and HCBS supports for people with NACs who have younger-onset cognitive decline.

- That public policy or legislative relief provide for the reimbursement of costs associated with assessing adults with younger-onset dementia.

- That the NIA convene an expert panel to:
    - Develop consensus guidelines for assessments in the population with NACs with the currently available screening tools for MCI and dementia.
    - Expand its guidance and protocol documents to include specific information on populations with NACs regarding cognitive impairment assessments during the AWV.
    - Add specialized information related to MCI and dementia for several diverse NACs.

- That discipline specific professional organizations be encouraged to produce and disseminate guidance and protocols that consider the specific dementia assessment adaptation needs of persons with NACs.

RESEARCH

With respect to research that should be undertaken to broaden the state of knowledge about dementia and adults with NACs, the Expert Panel proposes:

- Research on instruments and processes that:
    - Examines how to best use dementia screening tools matched to specific conditions.
    - Supports the development of new scales to help identify MCI and dementia in adults with various NACs.
    - Examines effectiveness of a short, adapted function/ADL tool that may be repeated across visits and that may highlight concerns for undertaking a more in-depth follow-up.
    - Supports digital adapted versions of common cognitive impairment assessment instruments that minimize bias and increase accuracy when examining adults with NACs.
    - Reviews the reliability of informant-based medical history information as an aid to determining the presence of MCI or dementia.
    - Examines adaptations of existing instruments to evaluate their capacity to pick up on MCI or dementia during the assessment of persons with sensory impairments.
    - Reviews whether settings in which screening instruments are administered influence assessment outcomes.
- Research (e.g., by AHRQ) on the negative health consequences of low quality (and/or low frequency) cognitive assessment among groups of adults with NACs.
- Research on the extent of dementia in adults with ID (excluding DS) and other conditions deemed to be a developmental disability.
- Research focusing on ASD which
    - Examines possible associations between dementia and symptoms of ASD and the interplay between the entities.
    - Compares persons with ASD with and without ID to better understand potential risk and protective factors.

- Epidemiological research which
    - Examines differences in behavioral profiles among adults with psychopathology in comparison to adults in various stages of cognitive decline.
    - Examines rates of adults with ID who have coincident neuropsychiatric conditions.
    - Examines rates of pseudodementia and bipolar dementia in adults with NAC.
    - Examines the conversion rates of MCI to dementia among adults with NAC.

- Longitudinal research to examine:
    - The trajectory of serious mental illness for individuals with ID (with and without DS).
    - The prevalence of AD and other adult cognitive diseases in individuals with dual diagnoses and NACs.
    - Effects of 'long or severe COVID' upon cognitive decline and its differentiation from normative brain neuropathologies leading to dementia

- Research focusing on peri- and post-assessment which
    - Examines the sequelae from assessment to provision of post-diagnostic supports for adults with NACs (with an emphasis on compensatory approaches to support independence, safety, quality of life, social networks, and purposeful meaningful activity).
    - Provides proof of concept of caregiver staging and assistance models with families of adults with a NAC and dementia.

- Research with a bio-medical focus which
    - Examines the applicability of biomarkers in defining the presence of adult cognitive disease in various NACs.
    - Examines the evolution of neurodegenerative brain conditions across NACs to aid in the development and application of pharmaceuticals.

FINAL THOUGHTS

The work of the Expert Panel has provided much for us to consider. We have been enlightened by the perspectives of the experts and what we know and what we do not know about undertaking screenings and assessments for cognitive impairments in a variety of NACs. Where can this information take us?

First, we now know that much of existing guidance and protocols issued or recommended by federal agencies do not consider the needs of adults who fall outside the typical presentations at clinicians' offices.

- What do we need? Amendments or adaptations for guidance issued by the NIA and CMS to include advice and requirements useful for assessing adults with NACs.

Second, we also know that there are deficiencies and lapses in knowledge by clinicians seeing adults at the AWV and other examinations about how to best assess an adult presenting with a NAC.

- What do we need? A package or packages of instructional materials covering examination practices when assessing adults with a NAC. We also need listings or directories of clinics and clinicians who are expert in select NACs that can help with in-depth assessments for MCI and dementia. Additionally needed is an expansion of clinical resources adept at assessing adults with NACs.

Third, we question whether national organizations representing some of the diverse NACs are sufficiently looking after their clientele from a lifelong perspective. While the focus may be on pediatric issues or adult issues, little focus is on older age issues. Much can be done by these national organizations to produce helpful materials, stimulate research to address many unanswered questions, and work toward legislative actions to produce a more inclusive national dementia diagnostics and care system.

- What do we need? More intra- and inter-organization efforts and collaborations that focus on those adults in older age who have NACs. This can begin with expanding website information to include aging issues and recommendations, enabling the development of educational and technical materials advising on aiding older adults, and ensuring that national dementia efforts and programs are inclusive.

Fourth, we recognize that a significant barrier for qualified assessment for adults with younger-onset MCI or dementia is the lack of funding or authorizations for reimbursement for clinical services for adults aged less than 65.

- What do we need? Federal policy adaptations, insurance regulatory relief, and/or legislative enablement that would permit funds to flow to clinicians who examine adults with NACs who may have younger-onset symptoms of MCI or dementia.

Fifth, there is an absence of guidelines and efforts to understand the post-diagnostic support needs of individuals with NACs and diagnosed with dementia.

- What do we need? A package or packages of common and condition specific needed services for both the person with dementia and their caregivers, easily accessed through condition specific organizations and ADRCs, and with identified funding sources.

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APPENDICES

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B. Acronyms in Report

AA	Alzheimer's Association
ABAS	Adaptive Behavior Assessment System
ABC	Aberrant Behavior Checklist
ABCDS	Alzheimer's Biomarkers Consortium-Down Syndrome
ABI	Acquired brain injury
ACA	Patient Protection and Affordable Care Act of 2010
ACD	Adult cognitive disease
ADA	Americans with Disabilities Act
AD8	AD8 Dementia Screening Interview
ADHD	Attention deficit hyperactivity disorder
ADLs	Activities of daily living
ADRC	Aging and Disability Resource Center
ADRD	Alzheimer's disease and related dementias / Alzheimer's disease and related disorders
AHRQ	Agency for Healthcare Research and Quality
AMI	Any mental illness
APP	Amyloid precursor protein
ASD	Autism spectrum disorder
AUC	Appropriate use criteria
AWV	Annual wellness visit
BD	Bipolar disorder
BPSD	behavioral and psychological symptoms of dementia
BPSD-DS	Behavioral and Psychological Symptoms in Dementia-Down Syndrome
CAMDEX-DS	Cambridge Examination for Mental Disorders of Older People with Down Syndrome and other Intellectual Disabilities
CDC	Centers for Disease Control and Prevention
CDR	Clinical Dementia Rating
CDT	Clock Drawing Test
CMS	Centers for Medicaid and Medicare Services
CFR	Code of Federal Regulations
COGEVIS	COGnitive Evaluation in VISual impairment
COVID-19	Coronavirus Disease-19
CP	Cerebral palsy
CPIM	Critical path innovation meeting
CPT	Current procedural terminology
CSF	Cerebral spinal fluid
CSDD	Cornell Scale for Depression in Dementia
CS-DS	Cognitive Scale for Down Syndrome
CPT	Current Procedural Terminology
CT	Computerized tomography scan
CTE	Chronic traumatic encephalopathy
CVA	Cerebrovascular accident
CVD	Cardiovascular disease

DABNI	Down Alzheimer Barcelona Neuroimaging Initiative
DASH	Diagnostic Assessment for the Severely Handicapped
DAT	Dementia of the Alzheimer's type
DBC	Developmental Behaviour Checklist
DHHS	Department of Health and Human Services
DLD	Dementia Questionnaire for People with Learning Disabilities
DM-ID	Diagnostic Manual-Intellectual Disability
DS	Down syndrome
DS-AD	Down syndrome associated Alzheimer's disease
DSDS	Dementia Screen for Down syndrome
DSM	Diagnostic and Statistical Manual of Mental Disorders
DSQIID	Dementia Screening Questionnaire for Individuals with Intellectual Disability
FAST	Functional Assessment Staging Test
FDA	Food and Drug Administration
FFA	Federal financial assistance
FTD	Frontotemporal lobar degeneration
GSA	Gerontological Society of America
GERD	Gastroesophageal reflux disease
GPCOG	General Practitioner Assessment of Cognition
HCP	Health care provider
HIV/AIDS	Human immunodeficiency virus/Acquired immune deficiency syndrome
IADL	Instrumental activities of daily living
ICD	International Classification of Diseases
ID	Intellectual disability
IDD	Intellectual and developmental disabilities
IQCODE	Informant Questionnaire on Cognitive Decline in the Elderly
LEP	Limited English proficiency
LIFE-DSR	Longitudinal Investigation for Enhancing Down Syndrome Research
LINC-AD	Leveraging an Interdisciplinary Consortium to Improve Care and Outcomes for Persons Living with Alzheimer's and Dementia Project
LOAD	Late-Onset Alzheimer's Disease
LOMEDS	Late-onset myoclonic epilepsy
LTSS	Long-term services and supports
MBI	Mild behavioral impairment
MCI	Mild cognitive impairment
M-CRT	Modified-Cued Recall Test
MIS	Memory Impairment Screen
MMSE	Mini Mental State Examination
MoCA	Montreal Cognitive Assessment
mTBI	Mild traumatic brain injury
NIA	National Institute on Aging
NIMH	National Institute of Mental Health
NIH	National Institutes of Health
NIHTH-CB	National Institute of Health Toolbox-Cognitive Battery

NTG	National Task Group on Intellectual Disabilities and Dementia Practices
NTG-EDSD	National Task Group-Early Detection Screen for Dementia
OCD	Obsessive-compulsive disorder
PAS-ADD	Psychiatric Assessment Schedules for Adults with Developmental Disabilities
PCP	Primary care provider
PET	Positron emission tomography
PMD	Phelan-McDermid syndrome
QDRS	Quick Dementia Rating System
QoL	Quality of life
RADD	Rapid Assessment for Developmental Disabilities
RSMB	Reiss Screen for Maladaptive Behavior
SIB	Severe Impairment Battery
SIQCODE	Short Informant Questionnaire on Cognitive Decline in the Elderly
SLUMS	Saint Louis University Mental Status examination
SMI	Serious mental illness
TBI	Traumatic brain injury
TSH	Thyroid stimulating hormone
TSI	Test for Severe Impairment
USPSTF	U.S. Preventive Services Task Force
WDTIM	Wolfenbütteler Dementia Test for Individuals with Intellectual Disabilities
WHO	World Health Organization

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[20] 'Health care provider' can include a physician, other health professionals, a hospital, skilled nursing facility, nursing facility, home health entity or other long term care facility, health care clinic, community mental health center, and any other category of health care facility, entity, practitioner, or clinician determined appropriate by the Secretary of DHHS. https://www.healthit.gov/cures/sites/default/files/cures/2020-08/Health_Care_Provider_Definitions_v3.pdf

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