

Concussion Practice Patterns among Speech-Language Pathologists

Mary Ann Williams-Butler¹, Robert C. Cantu^{1,2}

¹Emerson Hospital, Concord, MA, USA

²Boston University, Boston, MA, USA

Email: mbutler@emersonhosp.org

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Abstract

OBJECTIVE: To identify current SLP practice patterns in concussion care, clarify definitions of common cognitive retraining terminology, and establish areas of growth in clinical practice and research. **METHOD:** An online 10 question survey to collect data on assessment and practice components. Total 79 respondents from ASHA Special Interest Group 2 Neurogenic Communication Disorders website participated. Data were analyzed using descriptive statistics. **RESULTS:** Patient education and symptom management were regular components of cognitive retraining with concussion. Smaller percentage included cognitive endurance building. Further analysis identified variation in how clinicians defined terms: patient education, symptom management, and cognitive endurance building. Discrepancies noted with diagnostic tools, with one quarter using screening tools as primary assessment. **CONCLUSION:** Strong knowledge base to support differential diagnosis and therapeutic plan is critical to optimize outcomes in concussion care. Consistency with terminology use can reduce the risk of confusion but also support the value of what SLPs contribute to an interdisciplinary concussion team.

Keywords

Concussion, Post-Concussive Syndrome, Cognitive-Communication, Traumatic Brain Injury, Symptoms

1. Introduction

Concussion, defined as a traumatic brain injury (TBI) caused by biomechanical forces, results in a complex pathophysiological process including metabolic, physiological and microstructural injury, often causing diffuse injury with insult to multiple areas of the brain [1] [2] [3] [4]. This can contribute to a constella-

tion of signs and symptoms as the brain attempts to regain homeostasis. The majority of concussions generally resolve within a period of four to six weeks [2] [5]. However, when concussion symptoms persist beyond that general timeframe, typically between one to three months, [2] [4] [6] [7] [8] [9] the diagnosis shifts to post-concussion syndrome (PCS).

These concussion symptoms can be best served by an interdisciplinary team to address the numerous and complex factors that influence the recovery trajectory [3] [4] [9] [10]. Concussion can cause signs and symptoms in any combination of four main categories: somatic, cognitive, affective, and sleep. Cognitive-communication deficits negatively impact daily functioning and social interactions. Cognitive skills that may be disrupted include attention, memory, processing speed, reasoning, problem solving, cognitive fluency, and executive function. Communication skills that may be disrupted include auditory functioning, reading, word-retrieval, written formulation, and pragmatics. These disruptions can also lead to social isolation [11] [12] [13] [14] [15]. As more is understood about the neuropathological changes and resultant cognitive symptoms secondary to a concussion, the role of the Speech-Language Pathologist (SLP) on the interdisciplinary concussion care team becomes essential. The SLP can, within their scope of practice, provide assessment, diagnosis, and treatment of these cognitive-communication deficits for the individual with concussion [16]-[21]. The American Speech and Hearing Association (ASHA) established a Practice Portal for TBI outlining guidelines for evaluating and treating cognitive-communication deficits, however, much of the work that was included focused on moderate-severe TBI rather than mild TBI [22] [23]. With limited research supported evidence related to SLP concussion intervention [9] [20], the clinical methods used may not be appropriate to fully address the needs of this unique population. As the responsibilities of the SLP within the interdisciplinary team grow [24] [25], it is important to ensure that there is consistency with practice patterns, whenever possible, to optimize outcomes.

A review of guidelines for concussion care emphasizes the effectiveness of patient/family education specifically to validate symptoms, outline the expected trajectory of recovery, and help establish realistic goals [1] [26] [27] [28] [29]. Guidelines for concussion care also highlight symptom management and the importance of establishing techniques to stay within a subthreshold level so as not to exacerbate the symptoms [30] [31]. Although there is an acknowledgement that PCS symptoms such as headaches, fatigue, sleep disturbances, irritability, anxiety, and fluctuating attention, are also common in the normal population, these same symptoms in the person with concussion can have a debilitating impact on overall day to day function [32] [33]. A third component to concussion care recognizes the limiting effects of cognitive fatigue on function and the importance of addressing it as part of the therapeutic process [34] [35]. While the literature discusses a graduated return to physical activity [26] [27] [31] [36], the guidelines are less specific as to the best way to build cognitive endurance in the person with concussion other than to reinforce

the need to keep symptoms within a subthreshold level [27]. Without a consistent body of evidence to support specific practice recommendations, practicing clinicians are left to rely on their knowledge of other neurological populations to care for this group with concussion [20]. Identifying the current state of practice for SLPs is critical to enable future development in concussion care.

As an initial step in contributing to this goal of answering questions regarding practice patterns, we conducted a survey study of SLPs responsible for providing concussion evaluation and treatment in an effort to determine practice variations.

The study goals were to:

- 1) Identify current SLP practice patterns related to assessment and treatment with adults and pediatrics diagnosed with concussion.
- 2) Clarify definitions of common terms used in cognitive retraining, and
- 3) Establish areas of growth in clinical practice and research.

2. Method

An online survey of 10 questions was compiled to collect data on current assessment and practice components utilized by SLPs in outpatient concussion clinics across the United States (See **Table 1**). The questions were established based on existing literature regarding cognitive-communication, SLP scope of TBI practice endorsed by ASHA, as well as prevailing practices for treatment of concussion [20] [22] [23] [34] [35] [37] [38]. The questions were shared with a three-member expert panel, consisting of one neurologist and two SLPs, as a way to review for clarity and relevance prior to posting the survey. Questions consisted of both closed-set response and open-ended format in an effort to obtain the most accurate representation of practice patterns. A qualitative analysis of the open-ended responses was used to identify themes. Confirmatory coding was completed by two SLPs and any discrepancies were discussed and reconciled. The protocol was reviewed by an institutional review board and determined to have exempt status.

The first survey question identified who was responsible for providing cognitive retraining within their clinic. If the SLP was not responsible for providing that service, they were instructed to discontinue the survey.

The second component explored what diagnostic batteries were utilized by the SLP to assess the concussed person's cognitive-communication skills. This section also sought to determine if patients were receiving full diagnostic batteries versus screening tools to aid in determining plan of care.

The third component focused on the individual elements of the cognitive retraining program based on the current literature, specifically patient education, symptom management, and cognitive endurance building.

3. Participants

Participants for the survey were recruited online from the ASHA Special Interest

Table 1. Cognitive retraining with concussion survey.

	Who at your concussion clinic is responsible for providing cognitive retraining to patients diagnosed with concussion?
Q1	<ul style="list-style-type: none"> • SLP • Neuropsychologist • Psychologist • Other
Q2	If you are NOT responsible for providing cognitive retraining to patients diagnosed with concussion, please do not complete the rest of the survey.
	If YOU are responsible for providing cognitive retraining to patients diagnosed with concussion, which diagnostic tests do you administer as part of your initial evaluation? Please check all that apply.
Q3	<ul style="list-style-type: none"> • Woodcock Johnson III, IV • FAVRES • BDAE • TOMAL • TEA • BADS • WMS-R • CLQT • RBANS • Other
Q4	As part of your cognitive retraining program for concussion, do you incorporate patient/family education? <ul style="list-style-type: none"> • Yes • No
Q5	If yes, what education do you typically share with the patient/family?
Q6	As part of your cognitive retraining program for concussion, do you typically incorporate symptom management techniques? <ul style="list-style-type: none"> • Yes • No
Q7	If yes, what techniques do you utilize to manage concussion symptoms?
Q8	As part of your cognitive retraining program for concussion, do you typically incorporate cognitive endurance building into your sessions? <ul style="list-style-type: none"> • Yes • No
Q9	If yes, what techniques do you utilize to help build cognitive endurance with the concussed patient?
Q10	As part of your cognitive retraining program for concussion, please check all that are typically included in your therapy. <ul style="list-style-type: none"> • Attention building • Meta-cognitive expansion • Executive function building • Word retrieval strategies • Desensitization to background noise • Return to work accommodations • Return to learn accommodations • Return to social activity accommodations • Other

Group (SIG) 02 Neurogenic Communication Disorders website. The posted request was seeking participants who were ASHA certified SLPs that provided care in an outpatient concussion clinic to adults and/or pediatrics with a diagnosis of concussion. At the point of recruitment, potential participants were assured anonymity; no demographic or personal information was collected and there was no interaction with the respondents. The survey remained posted via Survey Monkey for 13 days during the month of January 2018 with a total 79 respondents completing the survey out of the total SIG 02 membership of 4532. While this is a very small percentage (0.01%) of the total SIG 02 membership, the request sought SLPs that specifically provided concussion care in an outpatient clinic.

4. Data Analysis

The collected data was analyzed using descriptive statistics. Participants had the opportunity to provide open responses which were tabulated. The open responses allowed for additional insight into how participants defined and used terminology in common practice, specifically patient education, symptom management, and cognitive endurance building. Some survey questions allowed the participants to select more than one option.

5. Results

Table 2 summarizes participant responses to the query that asked, *Who at your concussion clinic is responsible for providing cognitive retraining to patients diagnosed with concussion?* The majority of respondents (75.49%) identified the SLP as the person responsible, although other professionals were also identified including neuropsychologists (11.77%), psychologists (5.88%), and “other” (6.86%) which included occupational therapists and cognitive therapists. If the SLP was not responsible for providing the cognitive retraining, they were instructed to discontinue the survey since the remaining questions sought to understand practice patterns of the SLP working with patients with concussion. There were two SLPs that discontinued the survey at that point.

Table 3(a) and **Table 3(b)** summarize the specific diagnostic tests the participants reported administering as part of the cognitive-communication assessment. The diagnostic batteries in **Table 3** were selected based on current

Table 2. Who at your concussion clinic is responsible for providing cognitive retraining to patients diagnosed with concussion? (N = 79).

Discipline	Percent	Number of Responses
SLP	75.49%	77
Neuropsychologist	11.77%	12
Psychologist	5.88%	6
Other (OT, Cognitive Tx)	6.86%	7
Total	100%	102

Table 3. (a) Which diagnostic tests do you administer as part of your initial evaluation? (N = 72); (b) Other.

(a)		
Diagnostic Test	Percent	Number of Responses
Woodcock-Johnson Test of Cognitive Abilities III, IV	10.99%	20
Functional Assessment of Verbal Reasoning and Executive Strategies (FAVRES)	20.33%	37
Boston Diagnostic Aphasia Examination (BDAE)	5.49%	10
Test of Memory and Language (TOMAL)	3.30%	6
Test of Everyday Attention (TEA)	9.34%	17
Behavioural Assessment of the Dysexecutive Syndrome (BADS)	10.44%	19
Wechsler Memory Scale-R (WMS-R)	1.65%	3
Cognitive Linguistic Quick Test (CLQT)	23.08%	42
Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)*	15.38%	28
Total	100%	182
(b)		
Other	Percent	Number of Responses
Boston Naming Test (BNT)	18.92%	7
Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT)*	2.70%	1
Montreal Cognitive Assessment (MOCA)*	2.70%	1
Pediatric Test of Brain Injury (PTBI)	10.81%	4
Rivermead Behavioural Memory Test (RBMT-3)	37.84%	14
Scales of Cognitive Ability for Traumatic Brain Injury (SCATBI)	21.62%	8
Standardized Touchscreen Assessment of Cognition (STAC)*	5.41%	2
Total	100%	37

*Indicates a screening tool.

neuropsychological and SLP literature that reports to assessing cognitive-communication abilities [11] [19] [21] [39] [40]. Of note 26.19% reported using screening tools as their diagnostic battery such as Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) (2.70%), Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) (15.38%), Montreal Cognitive Assessment (MOCA) (2.70%), and Standardized Touchscreen Assessment of Cognition (STAC) (5.41%). One quarter of the respondents (24.41%) reported using language based tests such as Boston Diagnostic Aphasia Examination-3rd Edition (BDAE-3) and Boston Naming Test (BNT) to assess cognitive skills.

Question 4 stated, *As part of your cognitive retraining program for concussion do you incorporate patient/family education?* All of the respondents 100% reported that this was a key component to their therapeutic program. When analyzed further (See **Table 4**), there was great variation in the specific education information that was shared. It could include cognitive hygiene (9.13%) such as energy conservation and pacing, concussion prevention (2.40%), definitions (attention types, memory types, executive function) (11.54%), neuropathological changes (17.90%), expected recovery trajectory (7.69%) and symptom

Table 4. What information do you typically share with the patient/family? (N = 73).

Education Components	Percent	Number of Responses
Cognitive Hygiene/Energy Conservation	9.13%	19
Concussion Prevention	2.40%	5
Coping Techniques	0.96%	2
Defining Attention Types	4.33%	9
Defining Memory Types	4.33%	9
Defining Executive Function	2.88%	6
Referral to Other Disciplines	2.88%	6
Neurophysiological Education	17.90%	37
Recovery Trajectory	7.69%	16
Return to Learn	4.33%	9
Return to Work	4.81%	10
Sleep Hygiene	1.44%	3
Strategies Training	14.42%	30
Support Groups	1.44%	3
Symptom Awareness	11.54%	24
Symptom Management	9.62%	20
Total	100%	208

awareness (11.54%). By definition, any of these would be considered education material as the clinician is imparting information to the patient and family members. However, also reported as education were techniques that could be classified as addressing symptom management/strategies training (24.04%). These included the implementation of memory strategies, attention strategies, executive function techniques, and symptom management techniques.

When asked how many respondents incorporated a symptom management component into their cognitive retraining program, the overwhelming majority of respondents (96.05%) reported including some type of symptom management, whereas 3.95% reported they did not. When analyzed further (See **Table 5**), there were variations in the specific symptom management techniques that were provided. These included anxiety control/meditation/relaxation (12.22%), implementing breaks (13.33%), teaching cognitive pacing/energy conservation (8.33%), sleep hygiene techniques (6.67%), symptom awareness (7.78%), symptom tracking/journaling (11.67%), environmental modifications to limit sensory overload (18.89%), and time based planning/structure (5.00%). Some respondents used a combination of these techniques, compared to others who only reported using one or two techniques. Of the total respondents, 7.22% reported referring the patient to other disciplines (PT, OT, Audiologist, psychologist, MD) to address the reported symptoms. It was unclear if this was in addition to the SLP's intervention or as a replacement for any SLP intervention.

When asked how many respondents incorporated cognitive endurance building into their cognitive retraining program, 80.50% of the total participants

Table 5. What techniques do you utilize to manage concussion symptoms? (N = 70).

Symptom Management	Percent	Number of Responses
Anxiety Control	5.00%	9
Breaks	13.33%	24
Cognitive Energy Conservation	8.33%	15
Compensatory Strategies	8.89%	16
Daily Structure	5.00%	9
Environmental Modifications	18.89%	34
Meditation/Relaxation	7.22%	13
Referral to Others	7.22%	13
Sleep Hygiene	6.67%	12
Symptom Awareness	7.78%	14
Symptom Tracking	11.67%	21
Total	100%	180

reported including cognitive endurance as part of their therapy, whereas 19.50% stated they did not. Upon further analysis of those that reported the inclusion of cognitive endurance training, 9.67% described using techniques that could be classified as symptom management techniques, for example symptom tracking/analysis and pacing/breaks were reported as ways of building cognitive endurance. For the remaining entries, (See **Table 6**) specific techniques to build cognitive endurance included building activity tolerance on a hierarchy including length of time, complexity of the task, and level of environmental distractions consistent with the framework outlined by Sohlberg & Mateer [37] for building cognitive endurance on a hierarchy. Some utilized functional activities, while others relied on structured programs such as Auditory Process Training (APT), Interactive Metronome, Workbook of Activities for Language and Cognition (WALC), and computerized programs such as Brain HQ and Dual N-Back.

Table 7 summarizes the final question that sought to identify the use of specific cognitive retraining programs. While the use of the various techniques appeared consistent across all of them, a higher frequency of SLPs reported incorporating attention building (89.47%), executive function building (90.79%), and return to work accommodations (94.74%) into their therapeutic program. When asked the open-ended question, *What techniques do you utilize to help build cognitive endurance with the concussion patient?*, only two SLPs included a Return to Work plan and one included a Return to Learn plan. However, when specifically asked if they include Return to Work and Return to Learn plans, 26% of SLPs endorsed these two modalities (Return to Work (14%); Return to Learn (12.7%). The least number of respondents reported incorporating desensitization to background noise (73.68%) and return to social activity accommodations (76.32%) as part of their cognitive retraining program.

Table 6. What techniques do you utilize to help build cognitive endurance with the concussion patient? (N = 62).

Techniques	Percent	Number of Responses
Activity Tolerance Building	36.54%	38
Attention Process Training	7.69%	8
Attention - Selective	13.46%	14
Attention - Sustained	8.65%	9
Attention - Alternating/Divided	9.62%	10
Interactive Metronome	2.88%	3
Progressive Memory	9.62%	10
Reading Comprehension	4.81%	5
Return to Learn	0.96%	1
Return to Work	1.92%	2
Total	100%	104

Table 7. As part of your cognitive retraining program for concussion, please check all that are typically included in your therapy (N = 76).

Cognitive Retraining Techniques	Percent	Number of Responses
Attention Building	13.28%	68
Meta-Cognitive Expansion	11.72%	60
Executive Function Building	13.47%	69
Word-Retrieval Strategies	12.50%	64
Desensitization to Background Noise	10.94%	56
Return to Work Accommodations	14.06%	72
Return to Learn Accommodations	12.70%	65
Return to Social Activity Accommodations	11.33%	58
Total	100%	512

6. Discussion

This study sought to identify current SLP practice patterns related to assessment and treatment with adults and pediatrics diagnosed with concussion. With scarce research that outlines appropriate assessment and therapeutic techniques specifically for concussion, there may be gaps in the knowledge base of SLPs who treat this unique population.

Analysis of our data identified variation in the way SLPs defined the three terms: patient education, symptom management, and cognitive endurance building. For example, some symptom management techniques (eg compensatory strategies for information processing, memory, and attention) were found to be incorporated into patient education. This could be a reflection of possible gaps in knowledge base of cognitive retraining with the concussion population but also the need to better define our therapeutic components to reduce ambiguity. Just as cognitive skills overlap in a synergistic fashion, [38] therapeutic ap-

proaches to cognitive retraining may be equally resistant to separation into three distinct categories.

Results of this study showed that implementation of patient education was a regular component of therapeutic programming administered by SLPs with this population. Every SLP that participated in the survey reported the inclusion of patient education. This is a positive finding as the existent research highlights the importance of patient and family education to support a favorable recovery trajectory [1] [20] [26] [27] [28] [29] [30] [41]. The more understanding patients have regarding their symptoms, the less likely they are to overreact to them or attribute them to significant brain damage [6] [42] [43]. Of all the patient education content, SLPs most commonly shared information about neuropathological changes to the brain that occur following concussion. Nearly all SLPs also reported the inclusion of symptom management techniques into their concussion treatment plan. This is also a positive finding consistent with the research that recommends optimizing function while remaining within a subthreshold level during recovery [27] [31]. Further analysis revealed some respondents utilized a combination of techniques while others limited their treatment to one or two techniques. Knowing which specific techniques and in what combination could potentially impact the recovery trajectory. This is fertile ground for further research. Among the three cognitive retraining techniques, cognitive endurance building was the technique least used by SLPs. That said, it was encouraging to see that one third of SLPs do make an effort to build cognitive endurance. The current research emphasizing the use of cognitive endurance building techniques [20] as part of concussion care is scarce; however, the debilitating effects of cognitive fatigue cannot be underestimated [34] [35]. Sohlberg and Mateer [37] provide the foundation for building cognitive endurance on a hierarchy as a therapeutic approach in TBI care but not specific to concussion. Dams-O'Connor and Gordon [38] acknowledge that "... productive, targeted thinking requires substantial cognitive energy. Cognitive energy is a finite resource ..." (p. 53) following a TBI. Dams-O'Connor and Gordon [38] were describing it in the context of poor emotional regulation depleting one's cognitive energy and preventing adequate problem solving skills. Wylie and Flashman [34] discuss the added mental effort needed to access cognitive skills following a TBI such as attention and processing that further depletes cognitive endurance. As the primary discipline to focus on cognitive-communication deficits, SLPs are in a unique position to address cognitive endurance during the concussion recovery.

The survey also revealed a discrepancy for what SLPs were identifying as a diagnostic tool. One quarter of the respondents relied on a screening tool as their primary source of assessment. As noted in the ASHA Practice Portal for TBI, "screening tools do not provide a detailed description of the severity and characteristics of deficits resulting from TBI" [22]. Screening tools are not designed as a full diagnostic battery and can therefore underestimate the complex cogni-

tive weaknesses that can result secondary to a concussion [39] [44]. While screens are quick to administer, they are not sensitive enough to identify the subtle, more complex cognitive deficits typically seen with concussion [22] [23]. This practice of using a screening tool for assessment may be related to limited available resources rather than a clinical decision by the SLP. The majority of assessments for cognitive-communication skills come from the field of neuropsychology. Having adequate and appropriate resources allows for comprehensive assessment and the ability to establish an appropriate plan of care for this population [21] [44] [45]. In addition to using screening tools, some respondents reported using language assessments such as BDAE-3 and BNT as their assessment tool. These tests are not designed or normed to assess cognitive-communication deficits typical of the concussed patient but rather are designed to diagnose aphasic syndromes [45]. This unconventional use of testing instruments may prevent adequate diagnosis and therefore should be explored further.

This study did not distinguish between concussion practice patterns of SLPs with pediatrics versus adults. Further research focused specifically on the differences in therapeutic approaches between these two groups would be valuable for practicing SLPs. The recovery trajectory is different in the pediatric population due to the added complications that can occur if the injury is sustained while the brain is still developing [1] [46] [47]. Transitioning back into the academic setting may be more challenging as the student is continuing to build the foundation of cognition and language concomitant with concussion recovery. The responsibility of the SLP to support the transition back to work versus academic setting is also very different. For the student attempting to return to learn following a concussion, they benefit from accommodations and strategies that support new learning, attention, organization, and pacing while recovering [5] [7] [8] [29] [41]. The SLP can facilitate that plan and disseminate information to the educator concomitant with providing cognitive-communication therapy. While assisting with a return to work plan, the SLP can determine strategies to optimize cognitive-communication performance by modifying the environment to optimize function, limiting distractions, approaching one task at a time, manipulating pacing, and using techniques to support processing and memory [34] [41]. Further research in best practices to facilitate successful return to either work or learn would be beneficial to optimize outcomes and clarify the SLP's critical role, regardless of the setting they work (school, health care). Another limitation of the study was the general recruitment of SLPs involved in concussion care rather than gathering specific information identifying years of experience with this population, geographical setting of respondents, and total percentage of respondent's caseload that is diagnosed with concussion. Our study identified approximately one quarter of SLPs were underutilized in providing concussion care. Having more specific demographics of the respondents could potentially help identify contributing factors. It could also assist SLPs in advo-

cating as the professional on the concussion team qualified to provide cognitive-communication intervention.

Further research is recommended to standardize our terms, identify appropriate diagnostic batteries that best represent skills and deficits with this population, and clarify therapeutic elements that would ensure comprehensive cognitive-communication concussion care. Standardizing our taxonomy could improve the consistency and quality of care provided to those diagnosed with concussion, provide a better understanding of what SLPs can contribute to the interdisciplinary concussion team, and allow for common metrics to advance research in concussion care.

7. Conclusion

As the research continues to identify the uniqueness of those diagnosed with concussion and their vulnerability to co-morbidities such as PTSD, anxiety, depression, ADHD, which can impact the recovery trajectory, it is vital that those involved in providing concussion care have a strong knowledge base to support the differential diagnosis and therapeutic plan. Consistency with the terminology communicated to patients and colleagues can reduce the risk of confusion but also support the value of what the SLP can contribute to an interdisciplinary concussion team. The role of the SLP in providing cognitive retraining for those with concussion is growing as more is learned about the neuro-pathological and functional impacts of this type of brain injury [40] [48] [49] [50] [51] and the specific contributions the SLP can provide the person with cognitive-communication deficits. The SLP has the benefit of working in a variety of settings (acute care, skilled nursing facility, outpatient clinic, private practice, schools), which allows accessibility to a person with concussion across the lifespan. This then intensifies the responsibility of SLPs to ensure that the provided intervention is evidence-based and comprehensive, including all necessary components such as patient/family education, symptom management, and cognitive endurance building, to support a positive outcome. Within their scope of practice, SLPs can provide cognitive-communication assessment and treatment to an overarching neurological population. As continued research in the area of concussion emerges, it will allow for more evidence-driven clinical decisions, specifically for cognitive-communication care with this unique population.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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