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**Speech-language pathologists' perspectives on cognitive communication assessment
during post-traumatic amnesia**

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Abstract

Primary objective: There have been few reports of the approaches taken by speech-language pathologists (SLPs) when assessing cognitive communication (CC) during post-traumatic amnesia (PTA) after TBI. This study sought to understand SLPs' rationales for CC assessment during PTA, and to examine their perspectives on assessment methods during the early recovery period.

Methods and procedures: In this qualitative study, ten SLPs participated in semi-structured face-to-face or telephone interviews about their rationales and methods for CC assessment during PTA and early recovery. Content analysis was conducted using NVivo software to identify key categories.

Main outcome and results: SLPs reported their reasons for CC assessment as including:

(1) Documenting changes and monitoring progress, (2) Feedback to team, family, and patient, (3) Diagnosis of communication disorder, (4) Planning, and (5) Prognosis.

They described conducting ongoing, informal assessment and monitoring of CC, using a combination standardised and non-standardised measures during PTA, and commenced formal testing after PTA resolution to formulate a baseline level of communication function.

Conclusions: The current study highlighted the importance that SLPs placed on an individualised approach in CC assessment. Findings provided insight into the process of assessment of CC during PTA and the early stage of recovery after TBI.

Introduction

After injury, patients with traumatic brain injury (TBI) experience post-traumatic amnesia (PTA), a transient stage of disordered consciousness, lasting from a few minutes duration after mild TBI to weeks or months after severe injury [1]. This period of confusion may occur immediately following injury, or after the patient emerges from coma or minimally conscious state. Patients with very severe injury may have a prolonged PTA, and be confused, cognitively and behaviourally impaired, and yet may be ambulant and interactive on the ward.

Speech-language pathologists (SLPs) have a key role as part of the multidisciplinary team caring for the hospitalised patient after TBI [1-3]. In the acute hospital setting, the patient may have a fluctuating medical status, which for those patients in PTA may impact on performance with PTA testing and with cognitive communication (CC) ability. For patients with severe injury, PTA may extend across acute and inpatient rehabilitation admission [4], when there is most access to allied health rehabilitation. In Australia, patients are not routinely discharged from hospital until they have emerged from PTA, and cognitive assessment and rehabilitation is commonly delayed until after PTA resolution [1]. Studies of SLP practice with CC assessment [5, 6] and with communication assessment in the acute setting after stroke [7] have reported on the widespread use of informal methods. From our related research it appears that SLPs typically conduct informal CC assessment throughout PTA, and formal, standardised assessment at the point of PTA emergence [8]. However there has been little previous examination of how SLPs conduct informal assessment of CC, or on their rationales for practice during PTA and early recovery.

1.1 Assessment of cognitive communication

There has been recognition from professional bodies and in SLP literature that CC assessment after TBI is a challenging area of practice [6, 9, 10]. It has been recommended

that the skill level of SLPs working with people after TBI should be 'at a specialist level or under specialist supervision' [2, p.12]. The Academy of Neurological Communication Disorders and Sciences (ANCDS) review of CC assessment (2005) has informed practice on methods and materials appropriate for use after TBI [11-13]. The review recommended that standardised tests (i.e. published tests with defined administration process) should be used cautiously and supplemented with non-standardised measures (e.g. use of discourse analysis, observational methods and behavioural checklists). The authors proposed an approach incorporating dynamic, contextualised, hypothesis-testing methods. This entails using suitable assessment tools to test out specific hypotheses of impairments, based on the clinician's judgements of which aspects of communicative function are impacting on performance. Supporting this approach, a guide produced by INCOG (an international team of researchers and clinicians) on management of CC after TBI highlighted the need to consider a range of factors in the CC assessment process, including sociolinguistic, contextual, environmental, and interactional factors that may impact on the person's communicative performance [14].

1.2 Post-traumatic amnesia

Post-traumatic amnesia is generally measured serially using standardised assessment tools, such as the Westmead PTA Scale (WPTAS) [15] or the Galveston Orientation and Amnesia Test (GOAT) [16]. These scales consist of memory and orientation questions, and are administered daily until the person reaches criteria for PTA emergence. The importance of PTA as a construct is increasingly recognised, as PTA duration has been closely associated with cognitive recovery level [17], functional outcome [18-21] and productive return to work or study [22]. PTA duration is used to rate injury severity, in conjunction with Glasgow Coma Scale [23] scores [24]. Clinically, the endpoint of PTA is used to signal the patient's readiness for engagement in rehabilitation [25, 26]. There are a range of symptoms reported

as characterising PTA, including cognitive and behavioural disturbance and confusion [27]. More recently, the literature has emphasised the multifactorial nature of PTA, in addition to anterograde amnesia and disorientation. Research has identified involvement of retrograde amnesia, impaired attention and behavioural issues [28]; confusion and agitation [29, 30] and impaired attention and executive function [31]. Sherer et al. (2009) reported seven core symptoms of PTA (measured by the Confusion Assessment Protocol: CAP) as disorientation, cognitive impairment, fluctuation of presentation, restlessness, night-time sleep disturbance, daytime decreased arousal, and psychotic-type symptoms [32].

Disruption of communication has also been identified as a key feature of the early recovery stage [20, 33, 34] although the term and construct of PTA has not been included consistently in studies. In studies reporting on patients as being in PTA, or the lower stages of the Rancho Levels of Cognitive Functioning (LOCF) scale [35], or demonstrating post-injury confusion, communication impairment has been reported in the areas of naming ability [36], cognitive communication [37], auditory comprehension [38], and discourse and social communication [39]. Aphasic disorders have also been identified in 'amnesic' patients during very early recovery [36, 40]. It is well established that CC disorder is a common, long lasting, and devastating consequence of traumatic brain injury (TBI) [41-43]. However, to date, there is a lack of information about the presentation and course of recovery of CC impairment during PTA.

1.3 Assessment during PTA

In INCOG's expert consensus guide specific to PTA [1], there are multidisciplinary recommendations for assessment and management of patients who are in PTA/delirium. Relevant recommendations from this guide, and others found in the literature specific to CC assessment of patients either in PTA or described as 'confused' in the early stage after injury (including material using the LOCF scale) are shown in Table 1. Due to the lack of empirical

research in this area, recommendations were based on expert opinion. Hagen et al. (1984) and Kennedy and DeRuyter (1991) provided the most detailed SLP-specific guide on this period of recovery, using the LOCF scales as a structure rather than PTA.

Insert Table 1 around here

Previous research on early TBI recovery has reported on SLP involvement during coma and minimally conscious state (MCS), up to the point of PTA emergence (e.g. [44-46]). In these studies, the Western Neuro Sensory Stimulation Profile (WNSSP) [47], a standardised tool which measures behaviours, was used to evaluate degree of consciousness [44], to measure the behaviours that define MCS [46], and to describe a profile of the patient in MCS to plan interventions [45]. Scales have been designed for use with disordered consciousness to monitor recovery such as the Wessex Head Injury Matrix (WHIM) [48] and others [49]. Observation of basic communicative functions forms a critical component of these measures. Indeed, emergence from minimally conscious state is determined largely by return of communication function [46]. The CAP and the Mississippi Aphasia Screening Test (MAST) [50] evaluate aspects of CC (e.g. auditory comprehension and screening of basic communication function). These have been reported in use during early recovery, to describe patterns of recovery of symptoms [31] and to compare comprehension ability between confused and non-confused patients after TBI [38]. While standardised measures such as these have been used throughout the stages of disordered consciousness and PTA, they are limited in scope and, with the exception of the MAST, are not specific to communication. Standardised assessment tools for CC were developed for use with neurologically stable patients, and are not considered appropriate for use during PTA [51].

1.4 Reasons for assessing

As stated in the ANCDs guide [12] there are various purposes for assessment of CC, including for 'diagnosis, prognosis, acquisition of services, legal testimony, research,

planning intervention, or monitoring intervention' (p. 225). Cognitive communication assessments may be initial, ongoing, or outcome-focused. Reasons for conducting CC assessment after TBI differ at various stages of recovery and may be affected by the type of hospital setting. In the acute setting, for example, communication assessment may be conducted in order to facilitate interactions on the ward [52], or to identify impairments that may require ongoing services [53], while in inpatient rehabilitation a purpose may be to identify goals for therapy. If the patient is in PTA, clinicians' rationales for CC assessment may be influenced by how much they perceive CC impairments are transient effects of memory and orientation disruption resulting from PTA, or whether they are likely to be symptoms of persisting CC disorder [8].

1.5 Aims

In view of the limited information available on current SLP practice during acute and inpatient rehabilitation care with people with TBI and lack of formal SLP recommendations on CC assessment practice, the purpose of the current study was to extend on previous research in this area [8]. This research aimed to understand SLPs' rationales for CC assessment during PTA, and to examine their perspectives on assessment methods during the early recovery period.

1.6 Method

This descriptive qualitative study formed part of a larger mixed methods research project investigating SLP practice during PTA. In the current study, in-depth semi-structured interviews were undertaken to explore SLPs' perspectives on their rationales and methods for CC assessment during PTA and early recovery. Ethical approval for this study was provided by the University of Newcastle Human Research Ethics Committee.

Participants

Ten qualified and practising SLPs responded to invitations to participate that were distributed via adult neurological interest groups listed on the Speech Pathology Australia website, and an Internet listserv for SLPs working with adults across a range of settings. The participant sample comprised nine female SLPs and one male, which is reflective of the gender distribution of the profession [54]. Nine of the SLPs interviewed worked in four Australian states (NSW: 3 participants, Victoria: 3, South Australia: 2 and Tasmania: 1) and one was employed in New Zealand. All SLPs who participated had at least 4 years clinical SLP experience (mean = 9.7 years, range = 4-20 years) and were experienced working with people with TBI who were in PTA. They described their workplace setting as 'Acute' (2 SLPs), 'Subacute/rehabilitation' (3 SLPs), 'Inpatient rehabilitation' (4 SLPs), and 'Multiple care settings' (1 SLP). Pseudonyms are used throughout this paper to maintain participant confidentiality.

Procedure

The first author conducted all interviews, with eight occurring by telephone and two undertaken face-to-face. Interviews were audio recorded on an Olympus WS-832 digital recorder and ranged from 30 to 90 minutes duration. While a broad topic questioning guide was used, questions were asked in a conversational manner and were not presented formally in a predetermined order. All interviews were transcribed verbatim by the first author and analysis commenced immediately after transcription, which guided areas of questioning for subsequent interviews. Participants were informed that any material they did not wish to be included in the study could be removed from the transcript, and this could be requested either during or after the interview. Three participants asked for the recorder to be switched off at points in the interviews, or for parts of the interview to be removed from the study. This

material was not included in the analysis. Quotes from participants were cleaned by removal of excess mazes (e.g. um, you know) to enhance readability.

Data analysis

Data were analysed using NVivo 9 qualitative software [55], a program that assists with management and organisation of data in qualitative research. Content analysis was conducted by the first author in the following steps [56]. Coding began after the first interview was transcribed, and progressed through subsequent interview texts, using an iterative process of comparing coded material within and between codes and between texts. Initially, the first author gained familiarity with the texts, through undertaking transcription and repeated readings of interview transcripts. Following this, open coding of each transcript commenced. This process involved identifying concepts or patterns within the text of individual interviews, and grouping these into categories. As each interview was coded, categories were refined and compared until these were stable and no new categories were identified. Analysis provided for bottom-up coding, without *a priori* assumptions, although broad areas of 'What', 'When' and 'How' categories were established before beginning the coding. Classification of categories was discussed between the four authors throughout the process of data analysis.

Rigour

As part of the larger survey by the authors, findings were triangulated with results from the online questionnaire [8]. All participants were invited to view transcripts afterwards for accuracy. One interviewee elected to do this, and the checked transcript was used in the research. Co-authors and one SLP peer not directly involved in the study conducted peer scrutiny of analysis during and after coding.

Results

1.7 Speech-language pathology assessment practice with cognitive communication during PTA

SLPs referred to organisational systems, staffing and caseload issues affecting their practice with CC assessment. Five SLPs (from both acute and inpatient settings) discussed having a blanket referral system for communication assessment at their facility for all patients with acquired brain injury, including those 'walking and talking and already on a full diet and thin fluids' (Caitlyn, rehabilitation). One described her setting as having 'an informal blanket expectation' rather than a formal policy. Two SLPs working in subacute/inpatient rehabilitation were required to report on a baseline level of CC function at the person's admission and again on discharge, regardless of PTA status. Fiona described her facility's practice with CC practice as follows:

So I think as a discipline we have some basic, unwritten, guidelines of: we don't [formally] assess, we wait until they're emerged, and this is what we do, we promote the optimum environment for someone who's in PTA, we do the education and we engage the client in activities that will facilitate that attention and information processing type skills. And that, I suppose, as a senior clinician is what I orientate new staff to, and it's been passed down from when I started here. (Fiona, rehabilitation)

The funding status (i.e. public or private) and setting type of the facility also affected the decision-making on assessment practice. For example, one SLP in a private facility reported increased pressure in her current position to commence formal assessment immediately on PTA emergence than she had previously in the public system. Both SLPs who worked in acute settings discussed their difficulties finding time to see people in PTA, and the competing demands of attending to patients with dysphagia.

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Like most acute hospitals, communication's certainly a low priority, and my patients [in PTA] will wait, while they're in the acute stage, you know, they're the last that we get to. (Bridget, acute)

This low prioritisation of communication assessment in the acute setting was also discussed by inpatient rehabilitation SLPs. Two rehabilitation SLPs commented that patients were regularly transferred from the acute setting, while in PTA, with no evidence that their communication had been assessed previously. The patient's stage in the rehabilitation pathway affected decision-making regarding when and how to start assessment too. Two rehabilitation setting SLPs indicated if the patient's discharge/transfer was imminent, they sometimes postponed the patient's formal CC assessment so that it could be conducted in the community setting, and to avoid reuse of standardised tests in both settings.

1.8 Speech-language pathologists' reasons for assessment

There was consensus from SLPs that regular assessment of CC during PTA was a relevant and useful allocation of their time, and they provided a number of rationales for conducting assessment. Following analysis, these were categorised as follows: *(1) Documenting changes and monitoring progress, (2) Feedback to team, family, and patient, (3) Diagnosis of communication disorder, (4) Planning: to guide future decision-making, and (5) Prognosis.*

(1) Documenting changes and monitoring progress throughout PTA

All SLPs reported they measured and reported on changes in the patient's CC and behaviour during PTA. This was described as providing information about progress through PTA (i.e. rate of CC recovery) in addition to scores on the WPTAS, and gave evidence of functional differences in cognitive skills. Fiona discussed her practice with patients in PTA as 'ongoing, informal assessment of change', and gave the following account of her practice:

Changes in their ability to focus during conversation or follow instructions and be able to reference can reflect their progress through the stages of PTA. I wouldn't

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use any of that assessment as an indicator of deficits. Just looking at change throughout that phase. (Fiona, rehabilitation)

(2) Feedback to team, family, and patient

All interviewees reported they conducted assessment in order to feed back to the team, family, and patient with current information about the patient's improving level of function. This helped facilitate interaction with the patient for PTA testing, functional needs on the ward, and participation in physical therapy. Two SLPs reported they used assessment to increase the patient's insight into the effects of the injury. This feedback formed part of a wider process of education about the injury and the likely impact of injury for the person with TBI and their family.

I'll take that person, and normally [they'll] be accompanied by a relative as well, and we might go over some of things to do with orientation; you know, just seeing if they can write down where they are, anything to, kind of, lessen that confusion and begin to facilitate their understanding of the process that they're going through. (Edward, subacute/rehabilitation)

(3) Diagnosis of cognitive communication disorder

Seven SLPs reported that they began to note areas of CC strength and weakness during PTA and to identify presence of disorder. As well as observation of impaired CC and social communication issues, this included evaluating the relative contribution of impaired cognitive processes (e.g. attention and memory), versus 'pure language' impairments (e.g. aphasia), as well as determining the functional consequence of these to the person's communication. Although this process of diagnosis was commenced during PTA, assessment results appeared to be used more as a starting point rather than to produce a definitive diagnosis. Edward described a process of monitoring CC to begin to identify the patient's individual strengths and weaknesses, and to determine which functions persisted over time:

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But I'd be talking to them about things like employment, I'd get a, you know, just getting a picture from them, all the time building to that picture of whether there is this, sort of, cognitive communicative disorder. (Edward, subacute/rehabilitation)

(4) Planning: to guide future decision-making

The PTA stage was also used to gain familiarity and rapport with the patient, inform decision-making about when to begin formal assessment and therapy, and for discharge and service planning. Five SLPs discussed how their regular involvement during PTA helped to determine their approach for the patient once emerged from PTA, as illustrated by Imogen as follows:

I try to chart all those things [language processes] while they're in PTA, like I don't assess them formally but I'm really interested to see if they have them, because then it tells me what I want to look for or what sort of tests to do first when they come out. (Imogen, subacute/rehabilitation)

(5) Prognosis

It was acknowledged that patients' individual response to injury was a key variable in relation to outcome, particularly during the early stages of recovery. Four SLPs indicated that they used evaluation of CC during PTA to contribute to judgements on possible communicative outcome, particularly with language issues from focal left hemisphere damage. All expressed their views on how variable outcomes could be after severe TBI.

I suppose, those behaviours that translate into their communication like that confabulation, I suppose I've never thought about it in terms of being poorer outcome but yeah it is that, that, I think more that this may be a persisting issue post PTA, the rate of change of any cognitive issues, the impact on the person's presentation, I think, yeah it does have an impact for their outcome definitely. (Caitlyn, rehabilitation)

In addition to the lack of published material on early CC recovery after TBI, four SLPs reported on their limited knowledge of individuals' CC outcomes due to patients discharging from their service, as they were involved with clients in one rehabilitation setting only (i.e. acute or inpatient rehabilitation).

1.9 How speech-language pathologists assess cognitive communication during PTA

All SLPs in the study reported using mainly informal methods of CC assessment while the patient was in PTA. To varying degrees, the timing of standardised assessment was directed by policy at their facility, tradition, or adherence to guidelines in the literature. Five SLPs stated that they commenced their formal assessment after PTA had resolved (as indicated by score on WPTAS), with use of standardised, published test materials. Four interviewees reported at times assessing with formal tests in late PTA, on an individualised basis. One participant (Caitlyn) stated that she did not routinely use formal or standardised materials for patients even after PTA resolution. Reasons SLPs gave for not using formal tests during PTA included lack of validity (e.g. tools were not designed to be used at this time) and tradition (e.g. formal assessment historically started at the point of PTA emergence), and perception of inappropriateness. Fiona discussed the lack of stability of performance even after PTA as follows:

If they've just emerged from PTA you might as well just assume they're going to continue to improve for another couple of months, so I think it's hard to do a standardised assessment during that time and say: this is it, [when] it's likely that they'll improve beyond that, quite quickly. (Fiona, rehabilitation)

Non-standardised assessment methods

Informal methods largely consisted of clinical judgements of performance; however, SLPs also reported using informal assessment tools to measure the patient's CC ability. Methods included regular subjective evaluation of conversation, observation of interactions, use of

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games, and repeated use of checklists and unpublished CC screeners. Bridget (acute) described her approach with informal assessment of CC as involving conversation and questioning with the patient, and documenting general observations on communication style in the medical notes (e.g. 'tangential, slow to respond'). Grace (rehabilitation) described administering an informal screener on first contact and then continuing to use the same screener while the patient was in PTA. One SLP described noting improvements in communicative function as the symptoms of PTA resolved:

[I would be looking at] ability to stay on topic a bit more, ability to listen a little bit more, and follow instructions or conversation better, less confused content, demonstrating some improving awareness of their immediate situation. Some more appropriate communication, any capacity to show some carryover of memory. (Fiona, rehabilitation)

Although the majority of assessment took place individually with the patient, family and/or multidisciplinary staff, Grace (rehabilitation) reported conducting CC assessment in a group setting from 'tail-end' PTA and afterwards. One acute SLP commented that patients were generally transferred out of the acute setting once out of PTA, so that she did not get the opportunity to conduct CC assessment using more formal methods.

Five SLPs described using discourse analysis during PTA and after emergence. This practice was conducted informally and could be described as macro-level (e.g. evaluating the quality of a narrative). Hannah referred to discourse analysis as being 'time-consuming', but nevertheless acknowledged the value of discourse samples to provide good pre and post measures 'when you're trying things' (Hannah, subacute/rehabilitation). Imogen reiterated this as follows:

Sometimes I don't actually score [discourse samples] out properly, either, I have to admit, but I definitely have found that if I pick something that is a verbal description and take a narrative review now, and then go back and take a

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narrative of a similar sort of thing later, when you actually go back and compare the two, like you definitely see that- you know, you see the complexity. (Imogen, subacute/rehabilitation)

Standardised methods

Seven SLPs reported they used published assessment tools designed for use with disorders of consciousness. Three SLPs used the WHIM [48], and two SLPs used WNSSP [47] during PTA. Published tests/subtests of language or CC ability were used in a non-standardised manner during PTA to establish the patient's ability with specific communication functions, and to inform optimal interactions with the patient on the ward. For example, two SLPs discussed using the Western Aphasia Battery [57] yes/no questions to clarify patients' comprehension ability.

Standardised measures were used during PTA in moderation by SLPs in this study, and one described usual practice of a colleague at a different facility as follows: 'She was saying very blanket: no formal assessment while they're in PTA. Once they're out of PTA, that's when we do that formal assessment' (Grace, rehabilitation). Edward reported his perception that there were few standardised assessments suitable for use with patients in PTA, and that available tests were 'not that great quality'. However, he suggested that it would be useful to have a formal test of CC ability to use 'for consistency' during PTA, rather than reliance on non-standardised measures (Edward, subacute/rehabilitation).

Once the patient had emerged from PTA, SLPs used a range of published tests. Those named by interviewees included: the Mt Wilga High Level Language Test [58] (cited by one acute and four rehabilitation SLPs); Caulfield Language for Cognition Screening Assessment [59] (three rehabilitation SLPs); Cognitive Linguistic Quick Test (CLQT) [60] (one acute and one rehabilitation SLP); Measure of Cognitive Linguistic Abilities (MCLA) [61] (two rehabilitation SLPs); Scales of Cognitive Ability for Traumatic Brain Injury (SCATBI) [62]

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(two SLPs); Controlled Oral Word Association Test (COWAT) [63] (two rehabilitation SLPs); Functional Assessment of Verbal Reasoning and Executive Strategies (FAVRES) [64] (two rehabilitation SLPs); Communicative Abilities in Daily Living (CADL) [65] (two rehabilitation SLPs); Boston Diagnostic Aphasia Examination (BDAE) [66] (two SLPs); La Trobe Communication Questionnaire (LCQ) [67] (two rehabilitation SLPs); Mississippi Aphasia Screening Test (MAST) [50] (one acute SLP); Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)[68] (one rehabilitation SLP); The Babcock [69] (one rehabilitation SLP); Boston Naming Test (BNT) [70] (one rehabilitation SLP); Test of Linguistic Competence (TLC) [71] (one rehabilitation SLP); Psycholinguistic Assessments of Language Processing in Aphasia (PALPA) [72] (one rehabilitation SLP); Speed and Capacity of Language Processing Test (SCOLP) [73] (specifically the Speed of Comprehension Test) (one rehabilitation SLP), and the Dice game (one rehabilitation SLP) [74].

SLPs primarily described used these standardised assessments at PTA emergence to provide a baseline level of functioning preceding active intervention for CC impairments. The timing of when SLPs began using standardised assessment differed across participants in this study, ranging from immediately after emergence from PTA to weeks later, when the patient appeared to be more stable in general presentation. Five SLPs also reported that their timing varied according to patient presentation in addition to PTA status. There were several issues noted with available standardised assessment measures, such as administration restrictions (e.g. the number of times a test may be used in a timeframe) and timing of establishing a baseline for CC function. Grace discussed a dilemma around finding an objective, standardised measure to use during PTA, while preferring to use a test with more robust psychometric properties once out of PTA:

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If they were coming to the end of PTA and looking like they were sort of end stage, if the team was really keen to do some assessment I would use something like the Mt Wilga, because I wouldn't want to waste [laugh] my high level language, you know, I wouldn't want to waste any of the other assessments and then I would wait until they were officially out of PTA, and then do full assessment. (Grace, rehabilitation)

The Mt Wilga High Level Language Test has been reported as one of the most widely used assessments in Australia, NZ and the UK for adults with CC impairment [5], and in the acute setting with adults post-stroke [7]. This test is freely available online, however has no normative data or stated theoretical underpinnings.

Flexible use of assessment tools

SLPs described using both standardised and non-standardised assessment measures flexibly, as determined by their clinical judgement. The focus of interest was the patient's performance during tasks rather than test score, and SLPs reported manipulating contextual variables during testings, as noted by Grace:

How [patients] approach [the task], how they're able to sustain their attention, whether they ask you a million questions, whether they become distracted when you start shuffling some papers. I often find myself doing those types of things, particularly during the reading comprehension activities, I'll often shuffle through some papers and see how they can cope with that, and, you know, so it's not so much what score they get in the end. (Grace, rehabilitation)

There was some explicit description of the process of hypothesis testing in assessment. Edward described the process of integrating knowledge of language, cognition and recovery within his clinical decision making for people who were in PTA:

And trying to tease out, you know, beginning to form hypotheses, whether it's more attention affecting comprehension, or fatigue, or whether it's the true language-, looking at site of lesion as well, all leads you to, you know, that kind of assessment. (Edward, subacute/rehabilitation)

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Collaborative practice

Three SLPs reported conducting CC assessment sessions in collaboration with multidisciplinary team members, such as engaging in joint SLP Occupational therapy and/or physiotherapy sessions, consultation with neuropsychologists, and with family members incorporating communication partner training. Hannah described the contribution of joint sessions as follows:

I've been with physio, um, tilt tabling a patient and working on her eye gaze when she's standing because it's a lot easier when she's standing. If I didn't do that, if I just saw her in a chair, I wouldn't know her potential because her range of movement is much better when she's standing. And that's also looking at her memory, because I don't know if she can remember things week from week, because I don't know if she can remember how to use the eye gaze board, so you know, [I] rely on the cognition assessment and also my own assessment of memory, and processing. (Hannah, subacute/rehabilitation)

SLP assessment of CC was affected by perceived scope of practice with assessment of cognition within individual multidisciplinary teams. Composition of teams varied, for example not all teams included a full-time neuropsychologist. Six SLPs interviewed described their preeminent role in identifying cognitive impairment during and after PTA, and were often the first in the team to report on cognition. However, for three SLPs, cognitive assessment was perceived as falling more within neuropsychology or occupational therapy scope of practice. In these cases, discipline-specific roles in the team were more clearly delineated so that SLPs focused primarily on assessing linguistic functions and breakdown, and identified cognitive deficits only as they directly impacted on communication.

The impact of experience

SLPs discussed how their level of experience and knowledge of CC had affected their practice with CC assessment methods. For example, Grace described how administering the

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same assessment tools over the years had contributed to her knowledge of expected ability and individual differences, and stated this often gave 'more information than the actual assessment' (Grace, rehabilitation).

Seven SLPs reported the difficulties they had undergone in gaining that experience, or recounted lack of preparedness whilst practising as a novice in this area of speech-language pathology. The following quotation by Fiona exemplified the experiences of other participants on the difficulties they experienced as novice SLPs assessing CC:

Well- in hindsight the amount of mental energy that went into analysing those clients in the early days and getting a sense of, well what *is* cognitive communication impairment, and now it's quite automatic. You know you assess the first time you say hello to someone and you don't even realise you're doing it. But yeah, I think it was hard work at the time, having very little content in the Uni course on cognitive communication impairment and cognition, and that's the bulk of the work that we do here, as opposed to speech, language and dysphagia. (Fiona, rehabilitation)

Development of skills and knowledge of CC assessment and PTA was described as being a challenging process, exacerbated by the lack of literature and guidelines on PTA.

Discussion

In this study, SLPs discussed their reasons for assessing patients during PTA and the early recovery period, and described their use of CC assessment methods. They reported assessing CC during PTA for a number of reasons, including for monitoring the patient's recovery and identifying early communicative strengths and weaknesses. This was mainly undertaken using an individualised approach during PTA with a combination of methods; SLPs subsequently used formal, standardised measures after PTA resolution to formulate a baseline level of function. Assessment practices that SLPs described in this study corresponded with those reported in our previously published survey of current practice [8]. As in the previous

study, SLPs began their CC assessment process on first contact with the patient, and continued to monitor informally throughout PTA. Those SLPs working in the acute setting reported a low priority for CC assessment of patients in PTA, and expressed some concern regarding this.

Findings reflected the view that standardised assessment tools, other than those tests specifically designed for use with disorders of consciousness, were inappropriate as a stand-alone, or baseline measure of ability for use during PTA, but these were used for hypothesis-testing purposes when needed. This practice was aligned with recommendations in practice guidelines for CC assessment [11, 12, 75] and corresponded with previous published recommendations for informal monitoring of communication throughout PTA [1, 51].

Clinical expertise in assessment

In discussion on using a case-by-case, individualised approach, SLPs described an assessment process that was strongly reliant on clinical reasoning and skills rather than standardised instruments or scores on particular assessment tools. That is, the focus was on *how* the patient performed during the assessment process, rather than on test scores, and SLPs used materials flexibly as relevant to the patient and situation. This individualised approach, with collaborative, contextualised hypothesis testing appeared particularly relevant to use with patients in PTA in view of the invalidity of standardised, norm-referenced test materials for static testing of function during very early recovery. These methods require clinical judgement and interpretation. The practice of using assessment instruments flexibly corresponds with Carney et al.'s (1999) comments on rehabilitation after TBI, which concluded that 'the best clinicians are providing both a standard protocol and individualised treatment dictated by their clinical expertise' [76, p. 305]. As reported previously [6, 10] and stated by several participants in the study, these skills generally are not acquired during university training. Further knowledge of the processes involved with dynamic assessment

and advanced clinical reasoning would prepare novice practitioners in assessment of complex populations, including patients during PTA.

Repeated measures

Since by definition patients in PTA are cognitively impaired, the main purpose reported for CC assessment during PTA was for monitoring communication recovery, rather than for differentiation from normal or to diagnose CC deficits. As has been reported previously, ongoing, dynamic rather than static measures (i.e. reporting of function at a point in time) may generate a more meaningful account of change [12]. Monitoring was undertaken by use of repeated measures, ranging from regular evaluation of conversational interactions to serial use of informal unpublished screeners or tests. Research originating in neuropsychology has reported on the benefits of using serial bedside cognitive assessments with patients in acute and inpatient rehabilitation settings to provide information about ongoing cognitive function over time [37, 38]. Sherer et al. (2014) listed several reasons for serial bedside cognitive assessments including 'documentation of the course of recovery and detection of unexpected worsening, assessment of effects of medication and other interventions, determination of decision making capacity, determination of safety judgment, and others' [77, p. 49]. These rationales were apparent in the current study when monitoring CC function. Preferred methods for monitoring CC assessment during PTA were informal, individualised measures, and the limited use of standardised measures that SLPs reported corresponds with findings from our survey of methods [8]. However, Kennedy and DeRuyter (1991) reported on the practice of using standardised measures early in recovery, as did Hagen (1984) who stated that this provided 'controlled, identifiable, and systematic conditions' [78p. 264] as a structure for clinical judgements. This approach has not been described in recent literature, and from our research in this area it appears that SLPs view standardised measures as unsuitable and inappropriate for general use during PTA.

Vogel et al. (2010) discussed several issues with currently available communication assessment measures used in the acute stages after acquired brain injury [7]. These relate to sensitivity (e.g. to changes in performance over spontaneous recovery), and the reliability and validity of repeated testing with standardised measures not designed for serial use. There are few standardised measures designed for repeated use during very early recovery that have the scope and sensitivity to document individualised data on change over time [7, 12, 79]. Other screening tests formulated for use with aphasia (see [80] for review) have been reported in use during early recovery after TBI, both in the current study and in previous research [8, 38, 81]. The MAST has been suggested as suitable for repeated use to monitor language recovery in the acute and subacute stages after stroke [81]. However, these tests were not designed to delineate more complex CC functions after TBI.

Five SLPs in the current study reported on their use of discourse analysis techniques to gain samples of performance over time. This included repeated observation and evaluation of conversation, and simple narrative discourse analysis. Observation of conversation ability has been reported previously as a common informal CC assessment method [5, 9]. There is consensus that discourse analysis is one of the most appropriate forms of CC assessment after TBI [12, 82, 83]; however, there is little research on use of repeated measures of discourse, or discussion of how and which discourse measures could be used to monitor CC recovery during PTA and the early stages after TBI. Subjective rating of conversation has been reported in use in the acute stages after stroke [7] and as an assessment method after TBI [5], with reasonable validity and reliability reported [84]. A recent study used a conversational discourse rating instrument with patients with TBI in the acute stage once they were medically stable [39], however this was used as a single occasion measure. Further investigation of the utility of discourse measures for monitoring change would be of benefit.

Timing

SLPs in this study had varied views on the appropriate time to commence using standardised tools to establish a baseline measure of CC function. This finding illustrates the complexity around conceptualising PTA as a distinct stage of recovery. The resolution of PTA is traditionally considered a signal for commencing active multidisciplinary involvement, particularly with cognition [24]. However, the pathophysiological mechanisms of PTA are poorly understood, particularly relating to why and how PTA resolves [28]. Recovery of function of the various impaired processes during PTA does not occur simultaneously [32, 85, 86]. The relationship between communication recovery, and memory (as measured by the WPTAS) has not been examined, and formal assessment of CC at the point of PTA emergence may be no more valid than in the time immediately preceding PTA resolution, or weeks afterwards. The current study increased understanding of the practice of evaluating each case individually to determine the optimal time to conduct formal assessment for the purpose of obtaining a baseline level of function.

Study limitations

The small sample size is reflective of research using semi-structured interview methods and qualitative analysis, but must be considered when interpreting results. This issue is countered to some extent by the diversity within the sample of participant setting (acute, inpatient rehabilitation) service type (generalist and specialist TBI service) and of practice reported. All participants currently work in Australia and New Zealand, although three had worked overseas. SLPs in other countries may have differing practices and experiences. However, findings were consistent with international literature on CC assessment practice [5, 6].

Conclusion

This research adds to knowledge on CC assessment practices during PTA and the early recovery period after TBI. The acute and inpatient rehabilitation stage of recovery encompasses a time of rapid change in function, and CC assessment during PTA is a challenging practice. The current study provided description of an individualised approach in CC assessment, with use of both standardised and non-standardised measures to monitor recovery. The findings of both the survey [8] and this in-depth interview study indicated that even experienced clinicians would like more evidence-based guidance on timing and methods of assessment to use with people with CC impairments. These two studies have prompted further investigation by the researchers into how CC impairment resolves during PTA and on the nature of CC disorder during early recovery, which will be discussed in a forthcoming publication.

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Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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Table 1: Current recommendations for cognitive communication assessment during early recovery after TBI

Reference	Stage of recovery	Type of document	Focus of document	Recommendation directly relating to cognitive communication assessment
Ponsford, et al., 2014 [1]	PTA	Journal article	INCOG: Multidisciplinary recommendations for PTA/delirium	<ul style="list-style-type: none">- ‘Establish most reliable means of communication’ (p. 312)- ...[assess] swallowing and expressive and receptive communication to optimize clarity of communication between the injured individual and others’ (p. 313)- ‘While physical and speech and language therapy for swallowing and communication are important, cognitive assessment and therapies may be of limited benefit during PTA’ (p. 316)- ‘Once the individual is deemed to have emerged from PTA, full-team assessment and therapy may proceed within the limits of agitation and fatigue’ (p. 316)
Snow & Ponsford, 2013 [51]	PTA	Chapter in published text	Multidisciplinary assessment and management of impairment of consciousness	<ul style="list-style-type: none">- ‘It is, therefore, usually misleading to attempt to assess and prognosticate during PTA. Formal assessment and treatment is likely to serve only to distress the injured person’ (p. 49)- ‘Establish a reliable yes/no response as soon as possible’ (p. 49)- ‘Respect and build on the work of families’ (p. 50)
Snow, 2013 [87]	PTA	Chapter in published text	Managing communication competence following TBI	<ul style="list-style-type: none">- ‘... no formal evaluation should commence until the person has emerged from PTA’ (p. 134)
Royal College of Speech Language Therapists, 2010 [2]	Not reported	Speech pathology professional body publication	Resource manual for SPs working in TBI	<ul style="list-style-type: none">- ‘Initial assessment, both informal and formal, is made in the acute phase for individuals with a BI, and when symptoms become apparent. The SLT having assessed the individual’s communication strengths and weaknesses in a number of settings will establish a baseline from which to measure change and outcomes’ (p. 10)

College of Audiologists and Speech-Language Pathologists of Ontario (CASLPO), 2002 [88]	Rancho LOCF	Speech pathology professional body publication	Preferred practice guideline for Cognitive-communication disorders	<ul style="list-style-type: none"> - ‘All individuals with acquired brain injury should be screened for cognitive-communication disorders’ (p. 8) - [SLP’s role in screening] ‘In patient Acute Care: SLP should screen’. (p. 9) - [SLP’s role in screening] ‘In patient Neurorehabilitation unit: SLP must screen or move directly to assessment if a referral has been received’. <p>[During Rancho Levels V and VI]: ‘1. Assess and treat cognitive-communication deficit. 2. Provide emotional support and education to the family’ (p. 15)</p>
Kennedy and DeRuyter, 1991[89]	Rancho LOCF	Chapter in published text	Assessment of cognitive-language disorder	<ul style="list-style-type: none"> - ‘A combined approach using rating scales, standardized instruments, and non-standardized methods should be used when individuals are progressing in an acute rehabilitation program’ (p. 160) - ‘Standardized tests should become a part of the assessment process when the individual has adequate selective attention and inhibition to cooperate with testing (sometimes at Level V, confused and inappropriate, but usually at Levels VI through VIII)’ (p. 160) - [During Rancho Levels IV and V]: ‘Use of standardized tests is at times not practical, although baseline data (gathered as early as possible) can clarify the pattern of recovery and provide prognostic information ... As soon as standardized methods can be used, they should be incorporated into the evaluation’ (p. 172)
Hagen, 1984 [90]	Rancho LOCF	Chapter in published text	Language assessment following TBI	<ul style="list-style-type: none"> - ‘... it is important [to assess] in a categorical and systematic fashion as early as possible... Tests administered to such severely involved patients will generate very important information regarding language fluctuating under controlled, identifiable, and systematic conditions’ (p. 264)

BI = Brain injury; SLT = Speech-language therapist; SLP = Speech=language pathologist; LOCF = Levels of Cognitive Functioning