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**Speech pathologists' current practice with cognitive-communication assessment during
post-traumatic amnesia: A survey**

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To Brain Injury

Abstract

Primary Objective: To investigate speech pathologists' current practice with adults who are in post-traumatic amnesia (PTA).

Method: Speech pathologists with experience of adults in PTA were invited to take part in an online survey through Australian professional email/internet-based interest groups.

Results: Forty-five speech pathologists responded to the online survey. The majority of respondents (78%) reported using informal, observational assessment methods commencing at initial contact with people in PTA or when patients' level of alertness allowed, and initiating formal assessment on emergence from PTA. Seven respondents (19%) reported undertaking no assessment during PTA. Clinicians described using a range of techniques to monitor cognitive-communication during PTA, including static, dynamic, functional and impairment-based methods.

Conclusions: The study confirmed that speech pathologists have a key role in the multidisciplinary team caring for the person in PTA, especially with family education and facilitating interactions with the rehabilitation team and family. Decision-making around timing and means of assessment of cognitive-communication during PTA appeared primarily reliant on speech pathologists' professional experience and the culture of their workplace. The findings support the need for further research into the nature of cognitive-communication disorder and resolution over this period.

Introduction

There has been limited reporting on speech pathology involvement with people who are in post-traumatic amnesia (PTA) after traumatic brain injury (TBI). Post-traumatic amnesia is a transient stage of memory disruption and confusion in the early stages of recovery, which may last for several weeks after severe injury [1]. Although definitions of PTA vary, most widely accepted is Levin and colleagues' description of PTA as 'an interval

during which the patient is confused, amnesic for ongoing events, and likely to evidence behavioral disturbance' [2, p. 675], occurring between coma and gradual return to activities of daily living. Communication during PTA has been described anecdotally as confused, confabulatory (i.e. reporting of events that never occurred), repetitive and perseverative (i.e. returning to the same topic over and over). Although many of these early features of communication resolve, some persist over the long-term, requiring ongoing therapy.

Cognitive-communication impairment may be one of the most persistent long-term consequences of injury, affecting ability to return to work and socialise [3]. Rehabilitation after severe injury may span the course of decades and speech pathologists provide a range of services at different stages of recovery to meet the needs of the injured person and their family [4]. Recent studies have investigated the role of the speech pathologist and family at later stages of recovery [citation withheld for review]. However, there is very little information about speech pathology management of people with TBI in the acute and inpatient rehabilitation stages, particularly with reference to PTA.

Cognitive-communication and PTA

Research has highlighted some of the difficulties speech pathologists face in cognitive-communication assessment after TBI, such as the heterogeneity of the population and limitations of standardised assessment tools [5,6]. There are few specific guidelines regarding the optimum timing and methods of speech pathology assessment after TBI, or recommendations for practice during PTA. Clinical management and evaluation during PTA is challenging in the presence of fluctuating level of function and a range of medical, cognitive and neurobehavioural factors [7,8]. The definitive features of PTA are impaired memory, confusion and inability to take on new learning. For these reasons, active rehabilitation is generally reported to begin when the patient is cleared of PTA [9]. For people in extended PTA, this delay coincides with acute and inpatient admission, when there

is most access to intensive multidisciplinary therapy services. There may also be significant communication needs for the patient during hospital admission [10]. Little information is available on when speech pathologists begin their evaluation of cognitive-communication, and their role in the early stages after injury requires clarification.

Current speech pathology practice

In Australia and internationally, recommended practice for people with severe traumatic brain injury is through the specialist TBI pathway [11]. Not all clients with severe injury have immediate access to specialist brain injury services, and may be treated by speech pathologists with varying knowledge levels of TBI and PTA. It is unknown how both specialist and non-specialist clinicians are managing patients during PTA. In the absence of specific guidelines or recommendations for cognitive-communication assessment practice during PTA, speech pathologists seeking information about best practice at this time have limited sources. There is literature on current practice with cognitive-communication assessment after TBI in general [12,13] which may not be feasible or valid for people who are in PTA. There is information on management of communication difficulties in the early stages of recovery after acquired brain injury (ABI) [14], with a focus on stroke and resultant aphasia and dysarthria, rather than cognitive-communication. Speech pathology requirements after TBI differ from those post-stroke, and people in PTA present with highly specific challenges. Practice guidelines on cognitive-communication after TBI are listed on the Academy of Neurological Communication Disorders and Sciences (ANCDS) website [15], and texts provide expert opinion on cognitive-communication assessment after TBI [e.g. 16,17]. An exception is found in Ponsford, Sloan and Snow (1995), with discussion on patient and family management in PTA [18].

Supplementing the printed literature relating to TBI and PTA, there are now two online evidence-based resources for TBI and spinal cord injury [19], with syntheses of

evidence for neurotrauma: Global Evidence Mapping (GEM) Initiative, and the Acquired Brain Injury Evidence-Based Review [20]. Although not specific to speech pathology, a recent module that is publicly available from ERABI gives a summary of evidence for timing and intensity of inpatient rehabilitation [21]. This module gives the recommendations based on literature reviews that early, intensive, inpatient rehabilitation is related to better functional outcomes, shorter length of stay and preferable discharge destination.

Assessment during PTA

Previous speech pathology research on the assessment of communication impairment early after TBI has documented involvement during the minimally conscious state [22,23], although this research did not include the period of PTA. Very little of the minimal literature related to PTA reports on early recovery of communication impairments or on cognitive-communication presentation within the time of PTA. Some information on resolution of neurobehavioural deficits during PTA is included in an intervention study investigating dysarthria therapy during PTA [24], however the focus of this study was not cognitive-communication. There is literature from other disciplines (i.e. originating from psychology, rehabilitation medicine, neuroscience and occupational therapy) with reference to evaluation and management of various functions within PTA [see 25], including confusion, memory, orientation, agitation, and cognitive functions. Timing of assessment has been examined in other disciplines. For example, Hanks and colleagues conducted neuropsychological testing on people with TBI on admission to inpatient rehabilitation, and found that results were predictive of outcome, whether patients had emerged from PTA or not [26]. Research has investigated the relationship between constituent symptoms of confusion in PTA and outcome [27,28]. This research suggested that severity and rate of resolution of confusion within PTA was more predictive of outcome than PTA duration. Neuropsychological testing during PTA has been examined for feasibility [29]. Kalmar and colleagues found that testing

was feasible early after moderate to severe TBI, regardless of PTA status. Pastorek and colleagues examined language and attention as part of neuropsychological testing during PTA and concluded that testability itself during PTA was indicative of outcome [30]. These studies indicate that assessment of various cognitive functions may be feasible and productive during PTA. The timing and manner of speech pathology assessment of communication during PTA has not been examined previously.

Aims

Minimal data exist on current practices during acute and inpatient care and no formal guidelines have been found recommending evidence-based practice for speech pathology assessment during PTA. The aims of the study were therefore:

- To investigate the nature of involvement currently undertaken by Australian speech pathologists with patients during the period of PTA
- To examine the views and perspectives of speech pathologists about PTA and their role at this time.

The research was approved by the University of Newcastle Human Research Ethics Committee [H-2011-0269].

Method

Participants

Speech pathologists with experience of adults in PTA were invited to take part in an online survey through professional email- and internet-based interest groups. Groups identified as likely to have members with experience of this population were the Speech Pathology Email Chats (SPECS) group and several other adult neurogenic special interest groups sourced through the Speech Pathology Australia website. Group moderators were sent an email invitation for distribution to their members, with an attached information statement containing the survey link. Reminders were sent to the groups between four and six weeks

after the first contact.

As with all online surveys, it is not possible to calculate response rate from this manner of distribution, as the number of eligible potential participants who had exposure to the invitation, were eligible to participate and/or had survey access is unknown. At the time of reporting, the number of speech pathologists in Australia working with people who experience PTA is unknown. On the Speech Pathology Australia database, approximately 570 speech pathologists identified themselves as working with adults with language disorders in Australia. Information on how many of these clinicians have contact with people with traumatic brain injury and with PTA is not available, and this reflects the lack of knowledge of practice currently under investigation.

Forty-five speech pathologists responded to the online survey and there was a completion rate of 74%. Not all participants completed all questions, and of the forty-five who commenced the survey, thirty-five answered questions through to the end. Information and demographics on survey respondents is presented in Table 1 below.

Sixty percent of survey respondents worked in generalist settings, 35% in specialist TBI facilities, and 8% in other settings such as private practice or with a brain injury funding body. Twelve clinicians worked in multiple settings or in mixed services.

[Insert Table 1 around here]

Survey

A survey was developed to address the aims of the research. An open-ended question format was used, with the aim of generating comments and opinions from participants in a non-directive way. A possible disadvantage of this format is respondents may view the survey as requiring more effort and time, deterring participation, and categorisation of responses may be more difficult in analysis. However, the aim of using this short answer

format was to encourage individual responses in this previously unresearched area. The survey consisted of 19 questions in three sections: questions relating to workplace, to experience and assessment practice, and to knowledge and confidence level of cognitive-communication assessment and of PTA. A final question encouraged further comments and contact for discussion with the researcher. The survey was piloted by three practising clinicians and three academic speech pathologists. After initial feedback and discussions, revisions were made to address ambiguity and to focus the area of interest. The questionnaire is presented in Appendix 1.

The survey was designed for online delivery, and there are advantages and disadvantages of online survey methods. Benefits include access to a wide range of potential participants, shorter response times and minimal costs compared with postal surveys [31,32]. Disadvantages of online delivery include incalculable response rate and lack of control over targeted population [33]. Further discussion on survey limitations is provided in the Limitations section.

Data Analysis

Questionnaire responses were collected from SurveyMonkey and copied into NVivo qualitative software for categorisation and analysis. Open-ended responses were coded into categories by the first author, and data were analysed using descriptive statistics and qualitative methods. For classification of non-categorical, subjective questions, responses were discussed throughout coding with the co-authors, and a colleague blind rated responses into categories to check agreement.

Results

Awareness of guidelines

Clinicians were asked about their understanding of current recommendations for practice with people in PTA. Of the 33 speech pathologists who responded to this question, the majority (17 clinicians) stated they were not aware of any formal guidelines or recommendations regarding speech pathology management of patients in PTA. Four reported they were unsure of current recommendations, and 14 participants had site-specific guidelines they followed during PTA. For some respondents these site-specific guidelines were insufficient or unclear, and clinicians reported on the range of practice at this time, e.g.:

I am aware that a significant amount of SPs e.g. in the acute setting, have been informed at some stage of their training that it is not appropriate to assess a patient's communication whilst in PTA, or they focus on swallow and trache, and find it difficult to capture the person's communication at this stage of their recovery within the context of the marked cognitive and behavioural issues (SP19, Inpatient rehabilitation)

Experience and confidence level

Speech pathologists were asked how confident they felt about their knowledge of cognitive-communication assessment after TBI. In the upper range of responses, 14 respondents out of 34 (41%) indicated they had a 'fairly good' or better level of confidence with cognitive-communication assessment, and nine of those participants described themselves as being 'highly confident'. Thirty-five percent of clinicians described a moderate level of confidence with cognitive-communication assessment, e.g. 'somewhat', 'understand the basics', 'lots to learn' or similar. Twenty-four percent of speech pathologist (8) reported a poor confidence level with cognitive-communication assessment. Clinicians discussed the ambiguity of their role in cognitive-communication in relation to other multidisciplinary team

members (e.g. occupational therapists), and reported on the lack of research in this area, e.g.:

I feel reasonably confident however I have learnt most from dealing with patients and discussion with my colleagues rather than from the literature, as there isn't a lot out there. Cognitive-communication appears to be an area of speech pathology that doesn't have a large body of literature to support treatment method (SP11, Acute)

Regarding their knowledge of PTA, the majority of survey respondents related having a 'fairly good' to 'excellent' knowledge of PTA (53%). Thirty-eight percent reported they had a 'basic knowledge' or felt there was 'a lot to learn', e.g. knowledge around the key points of PTA measurement, and that a patient must score 12/12 on the Westmead PTA scale (WPTAS) for three consecutive days to be deemed 'out' of PTA. Three clinicians described their knowledge of PTA as 'poor'.

When speech pathologists start cognitive-communication assessment

The majority of speech pathologists (78% of participants) reported starting informal assessment of cognitive-communication from their first contact with the person in PTA or when the patient was medically able. Seven survey respondents (19%) reported they did not conduct any formal or informal assessment of the person during PTA. One respondent started informal assessment at the 'tail-end' of PTA. Of the clinicians who conducted informal assessment throughout PTA, fourteen participants (38%) reported that they began formal assessment on emergence from PTA or when the patient was diagnosed with amnesic syndrome. Two survey respondents reported starting formal assessment towards the end of PTA in some cases, e.g.: 'as a team, we generally wait until they are at least at the tail-end of

PTA, but not always waiting until they are formally ‘out of PTA’. Bit of a case-by-case basis’ (SP27, Mixed caseload).

Factors that influence start of assessment

Speech pathologists listed factors that influenced commencement of cognitive-communication assessment after TBI. These were coded into the following categories: patient behaviours, service provision factors, PTA score, medical status, and discharge planning. Categories and examples of survey responses are listed in Table 2.

[Insert Table 2 around here]

There was reference to the competing issues clinicians encountered in the process of determining when to start assessment, e.g.:

Practically there is limited involvement by speech pathologists while a patient is in PTA at my hospital. This is not just due to a patient’s PTA score however things like time and prioritisation of cognitive-communication in an acute setting where dysphagia dominates means that communication generally is not able to be prioritised. (SP42, Mixed caseload)

Aspects of PTA testing that influence decision-making

Individual scores on memory or orientation did not appear to influence commencement of assessment for the majority of clinicians; however full score on WPTAS (i.e. emergence from PTA) prompted the commencement of formal assessment for many speech pathologists. Of the 31 survey respondents to this question, 15 (48%) reported scores on individual factors of the WPTAS did not affect when they started assessment. Seven

clinicians (23%) stated they used total PTA score or aspects of the score in their decision to start assessment. Nine clinicians (29%) responded that they did not assess during PTA.

Aspects of the PTA test that were reported to be relevant were: consistency of PTA scores or errors: i.e., clinicians were less likely to assess if the score in general was fluctuating, or if different elements were wrong consistently.

Speech pathology roles reported in PTA

Speech pathologists described undertaking a range of direct and indirect roles during PTA. These roles reflected clinicians' varied functions and responsibilities at different stages of the recovery journey (i.e. acute/inpatient/community service). For example, providing education to the family and consulting with the team may be prioritised over more direct assessment or intervention in the acute setting. Roles that clinicians reported are listed within categories in Table 3.

[Insert Table 3 around here]

Clinicians provided details of their involvement in these roles, and reported their close liaison with other multidisciplinary team members, particularly occupational therapists. There was some discussion of the lack of delineation of roles within the team around the area of cognition, e.g.:

I think sometimes with these patients we feel as though we do have a lot to offer, but are unsure about when to become involved and how much to tackle the 'cognitive' stuff without trying to seem like we are doing the OT's job (SP3, Acute)

Education, support and counselling

I am aware that in rural areas, not all SPs are involved with patients in PTA or TBI in general; assessment can often fall to OTs and I believe this means patients and families are often not receiving timely information about cognitive-communication changes post TBI. (SP32, Mixed caseload)

Provision of education was the most frequently reported role in PTA cited. This included general information about brain injury, PTA and recovery for the patient and family, and discussion of the speech pathologist's role broadly after TBI, and during PTA. One clinician described this process of communicating with the family throughout PTA as 'supportive informational counselling' (SP22, Acute).

Dysphagia and dysarthria management

Although speech and swallowing disorders were not the focus of this study, 58% of clinicians reported on their role with dysphagia management with patients in PTA. For acute clinicians, referral for swallowing may be the impetus for initial contact with the patient in PTA. Three clinicians stated they were undertaking dysarthria therapy during PTA.

Facilitation and consultation

Half the respondents in the survey reported on their role with facilitation of the patient's communication as well as consultation about communicative function during PTA. Speech pathologists discussed being consulted by the multidisciplinary team and family about the following: decision-making about the patient's ability to participate in PTA testing, informing the team and family about the best ways of interacting with the patient, and providing information to the team about the likely level of cognitive and communicative function.

Communication assessment and monitoring progress

Assessing cognitive-communication was reported as a key speech pathology role

during PTA, and assessment methods will be discussed in detail below. Although most clinicians stated they did not undertake formal assessment with people in PTA, over 30% of clinicians (11 respondents) reported ‘monitoring’ changes as part of their role with patients during PTA, e.g.:

Monitoring communication over time gives information of patient’s communication recovery over time and the effectiveness of strategies (SP19, Inpatient rehabilitation)

Respondents gave rationales for monitoring patients’ progress in PTA, including: to gain information about communication recovery, to assist with identifying goals for the patient at different stages of their recovery, to provide updates about the patient’s current status, and for evaluation of the rate of recovery.

Behaviour management

As well as providing education on PTA behaviours, five survey respondents described involvement in behaviour management, e.g. providing strategies for family or team members, trouble-shooting with multidisciplinary team members, making recommendations about reducing environmental stimulation, and reducing number of visitors.

Intervention

Speech pathologists (5) reported participating in therapy activities in PTA, e.g.: ‘group participation in Karaoke group’; ‘treatment around orientation and memory’; and ‘low level activities focussing on orientation, attention/concentration, social appropriateness’. The approach taken by the majority of participants appeared to be functional rather than impairment-based.

PTA scale administration

Four speech pathologists reported that they were either the prime person responsible for administering the PTA scale at their facility, or jointly shared this role with another team member, from nursing or occupational therapy.

Methods of cognitive-communication assessment reported

As discussed above, the majority of survey respondents reported starting informal assessment of communication immediately with the patient, at all levels of PTA. Most frequently reported methods included conversational, functional and observational methods, informal facility-developed screeners, and use of formal or published assessment instruments for specific purposes. Examples of responses given by clinicians are shown in Table 4. Three respondents reported using discourse analysis with people in PTA.

[Insert Table 4 around here]

Conversational, observational, functional methods

Clinicians described the informal assessment methods they used during PTA. These included clinical observations of the patient's abilities while conducting conversation or during functional interactions with the patient, e.g. supervising a meal. Other methods listed by clinicians involved asking the person with TBI to name family members and familiar objects, observation of the person during different communication contexts and when exposed to different types and levels of stimulation, and family interviewing. A range of functional methods appeared in use, e.g.:

Would include conversation around previous life [looking at] comprehension, expression and cognition/long term memory, may include discussion of articles in

paper, may include problem solving group, may include sequencing/organising tasks (SP23, Inpatient rehabilitation)

In addition to auditory comprehension and verbal expression, clinicians reported observation of social communication and pragmatic function. The following features were listed as being observed: eye contact, ability to initiate verbal and non-verbal responses, and presence of tangential, verbose conversation. Cognitive functions, e.g. working and long-term memory were also informally assessed.

Clinicians reported using materials at hand to gather information in creative ways e.g.:

Conversation with patient, information gathered from nursing staff and family, and increasingly, families are showing me text messages patient has sent whilst in PTA and can often see the coherence of these increasing! (SP32, Mixed caseload)

Informal hospital based screeners

Twenty-eight percent of participants (12) reported using unpublished, informal screeners or behavioural checklists developed at their facility or other settings.

Communicative areas tested included traditional language functions, e.g. auditory comprehension, verbal expression, object and picture naming, written expression and reading comprehension, as well as higher-level cognitive-linguistic tasks, e.g. divergent naming, sequencing, problem solving. Screening tool comprehensiveness varied widely, from observation of basic communicative functions to more detailed assessment. For example, one participant described the following as included in their informal screening:

orientation questions, personal/environmental/complex yes/no questions, 1/2/3 stage commands, repetition, picture description, confrontation and divergent naming, word and short phrase reading, descriptive/problem solving tasks, inferencing tasks,

proverb explanation tasks, monitoring use and understanding of extra-linguistic features (e.g. pragmatics/nonverbals/ affect) in conversation (SP31, Acute)

Published tests

In addition to the informal and observational methods described above, 14 clinicians (40% of respondents to this question) reported using published test materials with people in PTA (listed in Table 4). These were mainly utilised in specific circumstance (e.g. to confirm comprehension prior to asking PTA scale questions) rather than consistently with people in PTA.

Prediction, knowledge, and confidence: cognitive-communication assessment in PTA

Speech pathologists were asked if they felt evaluation of cognitive-communication during PTA contributed to prediction of long-term communication impairments. Results are shown in Table 5. There was a mixed response to this question, and although 35 speech pathologists responded, many referred to the lack of evidence supporting their clinical impressions or opinion. Most responses contained qualifiers about their views on prediction (whether these were positive or negative); as one clinician stated, '[cognitive-communication evaluation results] can be indicative, but not a reliable correlation (just my gut feeling)'.

[Insert Table 5 around here]

Forty percent of respondents felt there were predictive aspects of cognitive-communication evaluation in PTA, e.g.: 'Yes, particularly during the later stages of PTA. You can normally get an idea of where the areas of difficulty will lie' (SP11, Acute).

Verbal fluency, or divergent naming, was the function clinicians most reported finding suggestive of future level of impairment after PTA. Verbal fluency tasks involve generation of words within one minute, either in a category (e.g. animals) or starting with a given letter (e.g. FAS). Clinicians reported they felt language deficits resulting from left-hemisphere focal injury persisted throughout PTA and afterwards, separate to issues arising from diffuse neural injury typical of TBI.

Four clinicians reported their observations of communication during PTA were useful for planning therapy rather than predictive of functional or communication outcomes. The rate of recovery observed over the duration of PTA was also felt to be predictive of outcome, e.g.:

Yes, it may provide some information around potential issues that may persist or be apparent post this period. e.g. naming difficulties, aspects of social communication, discourse. The close monitoring over time provides information about the person's rate of recovery – which perhaps may be a prognostic indicator (SP19, Inpatient rehabilitation)

Speech pathologists who reported they were unsure of the predictability of communication evaluation during PTA cited the following factors in their responses: no knowledge of clients' outcomes after discharge from their service, their lack of experience, the perceived variability of outcomes of people with TBI, and inadequacy of assessment measures.

Other clinicians reported they felt patients' communication changed significantly following PTA, and therefore impairments seen during this time were not predictive, e.g.:

Not particularly, I have seen many clients emerge from PTA and the cognitive-

communication problems that were present in PTA phase quickly resolve (SP36, Inpatient rehabilitation)

To determine the influence of experience on clinicians' perception of predictability during PTA, categories were examined for this variable, as is shown in Figure 1. Speech pathologists with a high level of experience (over ten years -14 participants) equally either felt positive (43%) about the predictive value of assessment results or were unsure (43%), and the remaining 14% felt evaluation was not predictive. The majority of clinicians with a moderate level of experience (5 -10 years: 8 participants) felt positively (50%) about prediction of long-term communication impairments, or negatively (37.5%), and 12.5% were unsure. Of the less experienced clinicians, (under 5 years – 13 participants), the majority felt unsure about prediction (61%), or positive (31%), and one participant with low experience felt evaluation was not predictive.

[Insert Figure 1 around here]

Discussion

This study investigated current speech pathology management of people with TBI during the period of PTA, and the timing and methods of cognitive-communication assessment with this population. This is the first study to report on speech pathology practice in relation to PTA.

The research showed that speech pathologists are assessing cognitive-communication from early contact with patients while they are still in PTA. This assessment was described as informal, functional monitoring of cognitive-communication ability over the time of PTA. Clinicians reported they commenced formal testing once the patient had emerged from PTA.

It was generally perceived that formal assessment tools were not appropriate for people who were in PTA, although clinicians discussed using published tests on occasion for specific purposes. This accords with general guidelines for cognitive-communication assessment after TBI, which recommend using patient-centred, contextual, dynamic assessment and clinical judgement to gain a comprehensive picture of performance [5,34]. Clinicians described the diverse roles they perform with people during PTA, of which education, assessment and facilitation were reported as the most frequent roles undertaken along with dysphagia and dysarthria management.

Speech pathologists discussed their opinions on how predictive they felt their clinical observations during PTA were of communication impairments longer term. Overall, the majority of clinicians were either unsure of predictability, or they felt communication during PTA was more likely to be predictive of long-term presentation than not. Speech pathologists reported more confidence with their knowledge of PTA than with cognitive-communication assessment after TBI.

Cognitive-communication assessment in PTA

Despite anecdotal report that cognitive-communication assessment does not generally take place during PTA, speech pathologists in this study indicated that they are highly involved with monitoring cognitive-communication during PTA. This occurred for a range of reasons, including for facilitation of communication on the ward, to assist with PTA testing, and for predictive and prognostic purposes. Nevertheless, patients in PTA were reported to be a lower priority than patients with other speech pathology diagnoses across service settings, and some respondents reported their perception that assessment during PTA was not standard practice. Several clinicians in the current study stated they would prefer to have increased involvement with patients during PTA but were unable, due to cognitive-communication being a low priority and lack of recognition by the team. Participants gave further reasons for

their reduced involvement with patients during PTA. The precedence of dysphagia management over communication in the acute setting has been reported previously [14], and this was confirmed in the current study. Participants described PTA-specific challenges they were managing during their informal monitoring, including the medical, behavioural, and cognitive aspects of early injury. Other barriers to assessment were associated with the workplace; and in some cases, clinicians reported their site-specific guidelines directed them not to assess cognitive-communication during PTA. The lack of professional guidelines or recommendations for this population was acknowledged by the majority of participants and was cited as a concern by some clinicians.

Assessment methods

As in previous research [13], speech pathologists reported wide use of unpublished screening materials for assessment of cognitive-communication. The current study provided some detail on which areas of communication are being evaluated in screeners, and there was a range of informal functional assessments methods reported in use after TBI. Published tests were mainly described as being used as one component of a wider evaluative process, rather than a stand-alone method, in accordance with recommendations in current guidelines, i.e. for standardised test materials to be used with caution for people with TBI [15] regardless of when undertaken. There has been no research investigating the validity of commencing formal testing on emergence from PTA, or of optimum timing of standardised assessment. Further research into the rationales and views of speech pathologists about their practice with these methods during PTA would be of benefit.

Monitoring and prediction

In the current study, speech pathologists expressed their uncertainty about the communicative outcomes of their patients after emergence from PTA and over the long-term. This corresponds with previous reporting on the challenges associated with cognitive-

communication assessment after TBI, including the heterogeneity of the population and the limitations of available measures [5]. The majority of clinicians who participated in the survey worked in a single service setting (i.e. acute, inpatient rehabilitation, or community), managing patients at one stage of the recovery continuum. It is challenging for clinicians to make predictions about outcome and provide prognostic information without having individual follow-through of patients throughout stages of PTA and later recovery. This difficulty may be compounded by the absence of supporting speech pathology literature on the impact of PTA on communication or research on communication recovery early after TBI. Early prognostic factors relating to communication are still largely unknown, although recent research into the predictive value of neuropsychological testing during and shortly after PTA has indicated that there are aspects of clinically observable behaviour that may provide valuable information about outcome [26,30,35].

The clinical impression by survey respondents that verbal fluency is associated with communication outcome after TBI has been supported by research. Douglas found that poor performance in verbal fluency (FAS) was predictive of pragmatic impairment following TBI [36]. Marsh and Knight found a relationship between reduced verbal fluency (indicating processing inflexibility) and social abilities after TBI [37]. Recent research into the nature of FAS ability after TBI has indicated that poor performance may be related to impairments with working memory and slowed processing [38] or executive function [39]. The clinical relevance of reduced verbal fluency ability during PTA and the course of improvement on this measure require further investigation.

Education and counselling

One of the main roles that speech pathologists reported undertaking during PTA was education and counselling of patients and their families. Education provision has previously been reported as a key role after mild TBI [13], and has been found to contribute to improved

outcomes after injury [40]. The current study highlighted that patients may be discharged either while still in PTA, or on emergence from PTA, without having had education or monitoring by speech pathologists about their cognitive-communication. Previous research has indicated patients with mild TBI may miss being identified with cognitive-communication impairment in the acute setting [13,41]. This is of concern, particularly in view of the long-term impact of social communication impairments on relationships and functional outcomes [42]. Education may assist with improving impaired insight, a key feature of TBI [43], and development of self-awareness is a prerequisite to starting therapy [44].

Implications for future practice

The current study adds to the literature of speech pathology practice with cognitive-communication assessment after TBI, particularly during PTA. Although formal and prolonged assessment sessions would be neither valid nor appropriate for people who are in PTA, clinicians are currently undertaking a range of informal and formal practices. Further investigation of these processes would help to inform practice in this under-reported area.

The resolution of communication impairments during PTA has been poorly reported, and further research in this area is required. Despite increasing evidence for beginning intervention early after acquired brain injury [45,46] there remains little consensus on cognitive-communication evaluation prior to service planning. The current lack of knowledge of recovery may contribute to the low priority of cognitive-communication assessment during early recovery, and further research may assist with optimum service planning.

Limitations

As previously discussed, online survey methodology has inherent weaknesses, and this may have contributed to potential sample bias in the current study. The disadvantages of online survey delivery have been widely reported, and include sampling errors, unknown

respondent population, and coverage bias [31,47,48]. Due to the survey distribution method, i.e. through special interest groups, it is likely that speech pathologists sampled had an active interest in maintaining their knowledge of speech pathology practice. Many of the survey respondents were specialist speech pathologists working with people with TBI. Therefore, the findings may be more representative of expert practice than of the profession in general. Clinicians who were motivated to respond may have had an interest in PTA, and not reflect the knowledge-level of the wider speech pathology community on this topic. However, the findings provide an initial report on the practice of speech pathologists working with people in PTA, and this area of speech pathology has not been reported previously.

Conclusion

The study confirmed that speech pathologists have a key role in the multidisciplinary team caring for the person in PTA, particularly by facilitating interactions between the person with injury and the rehabilitation team and family, and monitoring cognitive-communication. Decision-making around timing and means of assessment of cognitive-communication during PTA appeared primarily reliant on individual speech pathologists' experience and site-specific guidelines. The findings support the need for clear recommendations on the role of speech pathologists during PTA and further research into the nature of cognitive-communication disorder and resolution over this period.

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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.

Appendix A: Questions contained in the survey

SPEECH PATHOLOGY ASSESSMENT DURING POST-TRAUMATIC AMNESIA

Your workplace

1. What is your workplace setting? (E.g. general caseload hospital, specialist brain injury hospital, private practitioner)
2. What is your workplace service? (E.g. acute, inpatient rehabilitation, outpatients, long-term rehabilitation)
3. Who do you work with? Typical diagnoses: (E.g. stroke, TBI, neurodegenerative disease, and approximate percentage of each)
4. What is the age range of your caseload: 18-30 (percentage), 31-60 (percentage), 61-75 (percentage), over 75 (percentage)
5. Which speech pathology diagnoses make up your caseload? (E.g. aphasia, apraxia of speech, cognitive-communication disorder, dysphagia, dysarthria? Please rank in order of most frequent)
6. How soon after injury are patients referred to your service? If it varies, what is the range of times post-injury?

Experience and assessment practice

7. How many years have you worked as a speech pathologist?
8. How many years experience do you have working with patients with traumatic brain injury?
9. When do you begin formal or informal assessment of cognitive-communication with a patient with traumatic brain injury?
10. What factors influence your decisions about when to start assessment of cognitive-communication after traumatic brain injury?
11. If assessing cognitive-communication during PTA, does performance on particular items of PTA scales influence when you begin assessment? If so, which items (e.g. scores on orientation, memory)?
12. What does your role usually involve with the patient and family while the patient is in PTA?
13. Do you use published assessment tools for cognitive-communication with people in PTA? If so, which ones?
14. Which informal methods (if any) do you use for cognitive-communication assessment during PTA?

Knowledge and Confidence Level

15. Do you feel that evaluation of cognitive-communication during PTA contributes to prediction of long-term communication impairments?
16. How confident do you feel about your level of knowledge regarding cognitive-communication assessment after traumatic brain injury?
17. How confident do you feel about your level of knowledge of post-traumatic amnesia?

18. What is your understanding of current speech pathology guidelines or recommendations regarding your role during PTA?
19. Further comments. Please feel free to add any more of your thoughts and experiences about these issues at the end of this survey, or in an email or letter to the researcher.

Appendix B: List of published test materials reported by participants

Tests reported in use during PTA	Number of responses
Sheffield Screening Test for Acquired Language Disorders (SSTALD)[49]	4
Mt Wilga High Level Language Test [50]	3
Boston Naming Test (BNT)[51]	2
Western Aphasia Battery (WAB). [52]	2
Brief Test of Head Injury [53]	1
Pyramids and Palm Trees [54]	1
RICE, Ric Evaluation of Communication Problems in Right Hemisphere Dysfunction [55]	1
Arizona Battery for Communication Disorders of Dementia (ABCD) [56]	1
Babcock Story Recall Test [57]	1
FAS verbal fluency test	1
Communication Activities of Daily Living (CADL) [58]	1
Test of Language Competence – Extended (TLC-E) [59]	1
Scales of Cognitive Ability for Traumatic Brain Injury (SCATBI) [60]	1
The Awareness of Social Inference Test (TASIT) [61]	1
Butt Non-verbal Reasoning Test (BNVRT) [62]	1
Western Neurosensory Stimulation Profile (WNSSP) [63]	1
JFK Coma Recovery Scale [64]	1
The Triple C: Checklist of Communication Competencies [65]	1

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Table 1: General information about participants

Survey/interview question	Participant responses (n)	
<i>Workplace setting</i>	<i>Survey respondents: (n=45)</i>	
Generalist	27	
Specialist TBI	16	
Other setting (e.g. private, funding body)	5	
<i>Workplace service</i>	<i>Survey respondents (n=45)</i>	
Acute	23 (51%)	
Inpatient rehabilitation	29 (64%)	
Outpatient/community	14 (31%)	
<i>Caseload</i>	<i>Survey respondents (n=45)</i>	
Mainly TBI	23	
Mainly other ABI	19	
50-50 TBI/ABI	3	
<i>SP Diagnoses</i>	<i>Survey respondents (n=44)</i>	
Mainly cognitive-communication	23	
Mainly swallowing	20	
Other SP diagnoses (aphasia)	1	
<i>Experience (years)</i>	<i>As a SP (n=39)</i>	<i>With TBI (n= 39)</i>
Under 5	15	20
5 to 10	11	12
11 to 20	8	5
Over 20	5	2

Note: These figures reflect duplicates as respondents worked in multiple settings and services. TBI: traumatic brain injury; ABI: acquired brain injury; SP: speech pathologist

Table 2: Survey responses on factors affecting commencement of assessment

<i>Category</i>	<i>Cited in response total no. = 43 (%)</i>	<i>Factors influencing assessment: Examples of responses</i>
Patient behaviours	33 (76%)	Alertness; awareness; attention; agitation; patient distress; responsiveness; ability to participate; follow commands; motivation; cooperation; ability to engage; level of irritability, cooperation level, compliance, willingness
PTA score	20 (46%)	Length of PTA; low PTA; out of PTA; PTA status
Service provision factors	18 (41%)	Staffing; liaison with OT and team; blanket referral system; caseload and priorities; environmental factors; time
Medical status	13 (30%)	Severity of injury; medical stability; patient health (priority of communication over other issues e.g. dysphagia); extubated; medical condition; prognosis
Discharge planning	6 (13%)	Expected discharge date; discharge destination; access to ongoing support on discharge

PTA = post-traumatic amnesia; OT = occupational therapist

Table 3: Survey responses of usual role during PTA

Categories of roles reported in PTA	Survey responses (n = 36)	Percentage
Provision of education, support and counselling	31	86%
Dysphagia, dysarthria and tracheostomy management	21	58%
Facilitation and consultation	18	50%
Communication assessment and monitoring progress	18	50%
Behaviour management	5	14%
Intervention	5	14%
PTA administration	4	11%

Note: Multiple categories cited within individual responses; PTA: post-traumatic amnesia

Table 4: Survey responses on informal and formal assessment methods

<i>Category</i>	<i>No. of times cited n=43 (%)</i>	<i>Factors influencing assessment: Examples of responses</i>
Conversation, observation, functional methods	38(88%)	Observation of interaction with caregivers/staff; observations of eye contact, initiating verbal/nonverbal responses, following commands, naming, if tangential/verbose in conversation, pragmatics; naming family, photos
Own screener	12 (28%)	Hospital based assessment; informal screener devised at facility: auditory comprehension, verbal expression, reading, writing; checklist behavioural observations
Named tests: 36 responses		Boston Naming Test, Sheffield Screening Test for Acquired Language Disorders, Mt Wilga High Level Language Test, Brief Test of Head Injury, Pyramids and Palm Trees, the RICE, Arizona Battery for Communication Disorders of Dementia, Babcock story retell, FAS verbal fluency test, Communication Activities of Daily Living, Test of Language Competence–Extended, Scales of Cognitive Ability for Traumatic Brain Injury, The Awareness of Social Inference Test, Western Aphasia Battery, Butt Non-verbal Reasoning Test, Western Neurosensory Stimulation Profile , JFK Coma Recovery Scale, Triple C

Note: Multiple methods cited in individual responses

Table 5. Survey question 15: Do you feel that evaluation of cognitive-communication during PTA contributes to prediction of long-term communication impairments?

Response category	n=35
Feel there is some predictive value of assessment results during PTA	14
Unsure whether it is predictive	15
Feel cognitive-communication assessment in PTA does not predict long term impairments	6

PTA: Post-traumatic amnesia