

Post stroke dysarthria

Abstract

Background

A large number of people who experience a stroke are affected by dysarthria. This may be in isolation or in association with aphasia and/or dysphagia. Despite evidence highlighting the psychological and social impact of having post-stroke dysarthria and a number of clinical guidelines that make recommendations for appropriate management, little is known currently about United Kingdom (UK) service delivery issues relating to speech and language therapy (SLT) assessment and treatment for this group. Such evidence is necessary in order to plan, develop and research services for people with post-stroke dysarthria.

Methods

SLTs in the UK were asked to complete an online survey addressing referral patterns, caseload profiles, and their assessment and intervention methods for post-stroke dysarthria. In the absence of a national register of clinicians working with people with acquired dysarthria, a snowballing method was used to facilitate participant recruitment. Results were analysed using descriptive statistics.

Results

146 SLTs responded. The majority were employed by the National Health Service (NHS). Most patients were referred within a week post stroke. Almost half of respondents did not regularly use formal assessments and the use of instrumentation was rare, including the use of video recording. The focus of therapy for mild, moderate and severe dysarthria did not differ significantly for clinicians. A little under half of respondents endorsed nonverbal oral exercises in rehabilitation. The survey demonstrated some appreciation of the centrality of regular intensive practice to effect change, but this was in a minority.

Conclusions

Through this research it became clear that basic information regarding post-stroke dysarthria incidence, prevalence and core demographics is currently unavailable. More embedded NHS SLT reporting systems would make a significant contribution to this area. A more in-depth examination is required of the natural history of dysarthria over the months and years following stroke, of SLT practices in relation to post-stroke dysarthria, with investigations to more fully understand the choices SLTs make and how this relates to available evidence to support their clinical decision making.

Keywords: Dysarthria, stroke, speech-language therapy, management, service delivery

Declaration of interest: The authors declare no personal, institutional, or financial conflicts of interest in relationship to the conduct and reporting of this work.

Summary points:

What is already known: Dysarthria occurs in between a third and a half of people who have had a stroke. Even when intelligibility is not, or only mildly, affected, dysarthria can still exercise a strong negative impact. Numerous stroke guidelines and guidelines from the Royal College of Speech and Language Therapists (UK) indicate that a detailed assessment of dysarthria should take place and, if indicated, should be a priority for intervention.

What this study adds: Speech and language therapists in the UK are aware of dysarthria, the importance of early referral, comprehensive assessment and the centrality of speaker centred intervention. However, assessment appears to over-rely on non-standardised tools and/or measures that give little indication of targets for therapy; support is speaker focused, but appears to differ little in relation to stage of recovery and severity of impairment and impact and lacks systematic reference to the existing evidence base on rehabilitation. There is a

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paucity of information on the natural history of dysarthria after stroke and its relationship to other communication and stroke related disorders.

Clinical implications: Much more needs to be established regarding the natural history of dysarthria after stroke. More focus on standardised tools for assessment is recommended. Greater education on and implementation of the current evidence base for assessment and intervention is also recommended, but there remain considerable gaps in our knowledge that require future investigation.

Introduction

There are an estimated 1.2 million stroke survivors living in the United Kingdom (UK), about 1 in 53 of the population (StrokeAssociation, 2016). Taking as a conservative rough estimate that 30-40% are affected by dysarthria at some stage, then speech language therapists (SLTs) are serving a population of ca 400-500.000. Of course, not all people with dysarthria need to be seen for active treatment and not all the time. Nevertheless this represents a potentially large case-load. To date, however, little is known about the clinical issues surrounding dysarthria after stroke. This article aims to examine one aspect of these issues: what is the general management picture in SLT of people with dysarthria in the UK?

Dysarthria represents a common sequel of stroke. At 6-months post-stroke Wade et al., (1986) found only 12% of survivors had significant aphasia, but 44% of patients and 57% of carers thought speech was abnormal. In a postal questionnaire survey to people who had survived stroke but remained impaired Geddes et al., (1996) found that speech changes represented the third most common residual impairment, present in 51% immediately after stroke and 27% in the chronic phase. Prevalence of speech impairment rose from 4.7/1000 survivors age 55-64 years to 26.1/1000 age 85 onwards. In a further questionnaire study O'Mahony et al., (1999) showed 50% of stroke survivors were dysarthric at one week post-stroke, with 35% remaining so at 6-months. Flowers et al., (2013) examined 221 charts for a centre enrolled in the Canadian Stroke Network database and estimated incidence of stroke related dysarthria to be 42%. Dysarthria co-occurred with dysphagia in 28% of cases. More recently, based on retrospective analysis of pooled stroke clinical trial data Ali et al., (2015) found that at baseline 69.5% of 6192 cases had dysarthria, 4039 of 8904 (45.5%) had aphasia and 29.6% both. At 3-months 27% of survivors remained dysarthric.

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The disparities in figures clearly stem from whom precisely is assessed, when assessments take place, who conducts the assessments and what the assessments entail. Further, dysarthria seldom occurs in isolation. Whether or not it is separated in prevalence figures from other underlying communication and/ or swallowing difficulties constitutes another factor clouding the prevalence picture.

Dysarthria does not need to be severe to exercise a significant psychosocial impact on people's lives. In parallel to the impact of dysarthria in progressive neurological disorders it has been shown that even apparently fully intelligible speech can still represent a considerable barrier to activity and participation in social and civic life (Mackenzie, 2011, Mackenzie et al., 2011, Walshe and Miller, 2011, Walshe et al., 2008, Miller et al., 2008). Speakers indicate that the effort to maintain clear speech and the consequences of slowed speech and altered prosody and rhythm for entering and remaining in conversations are sources of perceived impact for speakers. Furthermore, presence of dysarthria may constitute a negative factor in health related quality of life prognosis.

Contrary to earlier claims that persisting dysarthria arises only after second or subsequent strokes (Darley et al., 1975) it has since been made clear that dysarthria may be associated with single strokes. For 80% of respondents in Geddes et al. Geddes et al., (1996) it was experienced at their first stroke. Urban et al., (2001) reported a series of 68 cases of sudden onset dysarthria associated with a single infarction.

Numerous clinical guidelines refer to the importance of referral of individuals with dysarthria to SLTs for assessment and possible treatment, whether this involves direct work on impairment level changes or intervention addressing activity limitations, participation

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restriction or psychosocial impact (Dykstra et al., 2007, Hartelius and Miller, 2011, RCSLT, 2005).

The British National Institute for Health and Care Excellence (NICE) Stroke Guideline CG162 (2013) <https://www.nice.org.uk/guidance/cg162> (accessed 18 July 2016) recommends to screen for communication difficulties within 72 hours of onset of stroke symptoms; that each stroke rehabilitation service should have a standardized protocol for screening for communication difficulties; that people with suspected communication difficulties should be seen by a SLT for detailed analysis of speech and language impairments and their impact and intervention where indicated. The training role of SLTs with multidisciplinary team members as well as with the family of the person who has had a stroke is emphasized. Evaluation for possible benefits from communication aids is stipulated. Re-referral to SLT at review points is flagged if deemed necessary.

Very similar recommendations appear in the UK RCP (Royal College of Physicians) National Clinical Guideline for Stroke (2016)

<https://www.strokeaudit.org/SupportFiles/Documents/Guidelines/2016-National-Clinical-Guideline-for-Stroke-5th-ed.aspx> (accessed 15 November 2016). Any patient whose speech is unclear or unintelligible should be assessed by SLT to determine the nature and cause of the speech impairment and communication restriction. Intervention should target techniques to improve the clarity of their speech and alternative and augmentative communication (AAC) should be considered where necessary. A patient and family education role is stressed. The same strategy applies to people with apraxia of speech. The SIGN (Scottish Intercollegiate Guideline Network) national stroke guidelines 118 (2010)

<http://www.sign.ac.uk/guidelines/fulltext/118/> (accessed 18 July 2016) reiterate the same advice as NICE and RCP.

However, what continue to be matters of conjecture are: whether or to what extent guidelines are followed, what actually takes place in assessment, even if a protocol is in place what the nature of this might be, what patterns of intervention are delivered, and how, when, by whom and to what effect. Surveys in other countries and in germane areas have indicated that there may be considerable variability amongst SLTs in terms of assessment and intervention practices and set-up of service delivery (Conway and Walshe, 2015, Lof and Watson, 2008, Skahan et al., 2007, Archer et al., 2013, Lawson et al., 2015). This reflects findings in the UK for SLT management of communication for groups such as people with Parkinson's disease (Miller et al., 2011), motor neurone disease (Collis and Bloch, 2012), dysphagia (Bateman et al., 2007), aphasia (Code and Heron, 2003), and for children with cerebral palsy (Watson and Pennington, 2015).

Such information is important not just from a general health services research perspective.

In order to plan and develop services for people with post-stroke dysarthria it is necessary to gain insights into current practices and organisation. This is also a prerequisite for conducting principled research into the natural history and treatment of dysarthria after stroke, an area that has been largely neglected in the past. Audits and improvements of services, locally and nationally, presuppose there is a baseline against which to measure progress. Accordingly, the aim of the current work was to gain an overview of the nature of SLT practices in the management of people with dysarthria after stroke in the UK; to gain an estimate of how many SLTs work with people with post-stroke dysarthria; where they work; how much of their caseload comprises people with post-stroke dysarthria; when, how, why and from whom

people with post-stroke dysarthria are referred; what assessment and management practices SLTs employ; and how this might vary across the time course of recovery. We aimed also to compare outcomes to professional guidelines and standards recommendations. The views of people with dysarthria are also being considered in a parallel survey and will be published later, in due course.

Method

Ethical approval

The study entailed an online questionnaire survey. Ethical approval was granted by the Research Ethics Committee, University of Newcastle, Great Britain. Information was gathered on the nature of facilities in which people worked, but individual clinic addresses were not identifiable. These were received and stored separately from the main survey.

Participants

The survey targeted SLTs of any grade or place of employment in England, Scotland, Wales and north of Ireland. In the absence of a national register of SLTs working with people with acquired dysarthria, participant recruitment proceeded via a combination of contact with SLT services, notifications in general SLT publications and contacts with key clinical excellence network hubs with requests to cascade information to members.

Specifically, SLTs were recruited via an article in *The Bulletin* publicising the survey. This is distributed to all members (around 15,000) of the Royal College of Speech and Language Therapists (RCSLT) in the UK. Publicity and details of the web address for the survey were distributed to six Clinical Excellence Networks (estimated membership 300) of the RCSLT where members might be expected to have contact with people with post-stroke dysarthria. Details and contact methods for the survey appeared in the newsletter of the Association of

SLTs in Independent Practice to access those working outside of the National Health Service. The survey was available online between December 2014 to March 2015. It was possible for respondents to complete sections over several visits.

Recruitment information stressed we were interested to involve any SLTs who assess and/ or treat people with dysarthria after stroke – whether dysarthria represents the main remit of their post or whether they see an occasional person with post-stroke dysarthria as part of another or varied caseload. We emphasized this does not have to be people with isolated dysarthria, but could include people who also present with aphasia, apraxia of speech or dysphagia. Severity of the dysarthria could range from mute, causing major intelligibility issues, to dysarthria undetectable by listeners. Their experience of managing dysarthria could encompass acute phase through to late chronic stages.

The questionnaire

The tool was designed specifically for this study. The survey development group was led by two SLTs with experience of working with people with post-stroke dysarthria and other groups with acquired neurological disorders. It also included participants who have/had dysarthria after stroke and members of the National Institute for Health Research Stroke Research Network Dysarthria writing group, with backgrounds in speech-language pathology, clinical psychology, stroke physicians and stroke rehabilitation. Question development and shaping the overall structure of the survey proceeded with iterative feedback from wider group members and feedback from pilot testing with ten SLT colleagues.

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The survey document comprised 31 questions concerning work with people with post-stroke dysarthria (appendix 1). These covered:

- 1: The SLTs current and past degree of involvement with people with dysarthria after stroke.
- 2: The pattern and pathway of referrals to their service
- 3: The team(s) with whom they work
- 4: The profile of their caseloads in relation to dysarthria
- 5: The profile of people on their caseload in terms of other communication or swallowing changes apart from dysarthria
- 6: Specific assessments used
- 7: Support and intervention methods provided

Information was elicited via closed multiple choice or rating scale questions and free text boxes where responses could not be pre-classified or additional views were sought.

Data storage and analysis

Consent for storage of responses was gained on the first page of the questionnaires. The online questionnaire allowed us to store all answers to the questionnaires, complete or otherwise. These were stored directly on a university based server. Separate files were derived for the different sections and sub-questions and transferred to SPSS 24. Descriptive statistics were used to characterise numerical data. Free text responses were coded according to key themes arising from the responses.

Results

One hundred and forty-six complete questionnaires were received. Table 1 details the geographical distribution of replies.

Table 1 about here

Ninety-one percent of respondents were employed in the National Health Service, 9% were self-employed, 3% worked for a private provider, 5% worked in higher education institutions, one person worked for social services (if respondents had a split post they could tick two or more employers). Sixty-nine percent were grade 6 and 7, 19% grade 5 (entry grade) and 12% grade 8 (highly specialist). Fifty-six percent of respondents had been working in the field of stroke related dysarthria for less than 10 years. Figure 1 summarises the number of years' experience of working with people with dysarthria in post stroke rehabilitation.

Figure 1 about here

Figure 2 details the number of referrals of people with dysarthria received during the past year and table 2 represents the estimated time therapists spent in different settings. As regards people with dysarthria in their current active caseload 17 (11.6%) of replies had none, 94 (64.4%) had between 1-5, 26 (17.8%) between 6-10, 7 (4.8%) 11-15 and 2 (1.4%) 16-20. Regarding people with dysarthria on their caseload but not currently in active treatment 66 (45.2%) respondents had none, 63 (43.2%) had between 1-5, 11 (7.5%) had 6-10, 3 (2%) 11-15 and 3 (2%) 16-20. Amongst respondents only 3.5% indicated that they had received

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referrals with dysarthria and no aphasia, whilst only 1.4% stated their dysarthria referrals had had no accompanying dysphagia.

Figure 2 and table 2 about here

We asked from whom colleagues receive referrals of people with dysarthria. Table 3 shows the number of respondents whose referrals came from the different sources, with SLTs representing the main referral source followed by other health professionals including physiotherapists, occupational therapists and GPs. Just over 28% were self or carer/family referrals. The majority of referrals were seen within two days, though there was variation between services and settings, with community settings typically having longer reaction times. The same variation is reflected in wait times to commencement of therapy between hospital/ rehabilitation clinic settings and community services.

Table 3 about here

Assessment

For assessment a variety of standardised tools are employed, though with marked emphasis on (largely non-speech) motor impairment and little attention to activity limitation, participation restriction and impact (though see below regarding general measures of impact). Table 4a illustrates the range.

Table 4a and 4b about here

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A range of informal, non-standardised assessments was also reported as being always/ usually used (table 4b). These included oro-facial examination, 93%, intelligibility ratings, 91%, and conversation/ interaction descriptions, 91%. One reply, which appeared to offer a justification for employing only informal assessments, stated ‘Part of my role is NOT to use formal assessments, so I don't invalidate them for current SLT’. Some more general measurement of communication related status also took place. Eighty-eight percent of those replying ‘always’ or ‘usually’ included an estimation of communicative effectiveness beyond clinic, with 90% always or usually evaluating environmental barriers to communication. Seventy-five percent always or usually asked about attitudinal barriers to communication. Fifty-seven percent always or usually carried out an assessment or estimation of depression/ mental wellbeing. Quality of life (79%) and psychosocial impact of dysarthria were also always or usually considered.

Only one respondent usually used instrumental assessment (Praat: Boersma, Paul & Weenink, David (2016). Praat: doing phonetics by computer [Computer program]. Version 6.0.19, , whilst six others sometimes used the Computerised Speech Lab Multispeech system, or Visispeech. Other instrumental assessments such as an electroglottograph were used by three or fewer respondents.

Respondents were invited to indicate any areas of assessment they would like to address but felt they did not have adequate tools for. Thirty-seven percent of respondents indicated further areas. Of these 38% (14) expressed an interest in using more objective instrumentation and/or apps, 27% (10) would like to use video and/or audio recording, and 21% (8) would like more assessments to support real life functional communication and/or psychosocial issues. Of particular note was the comment from two respondents who reported that Trust

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(administrative unit in the English national health service serving a geographical area or a specialised service) policy prevented them from making video recordings as part of their assessment process. Additionally, participants referred to a lack of time as one reason why their assessments are not more detailed/objective.

Another question sought opinions on the general aspects of assessment. Overall 114 (78%) SLT clinicians agreed or strongly agreed they felt confident in their ability to manage post stroke dysarthria. Twenty-eight (19%) agreed or strongly agreed they used the Mayo clinic classification of dysarthria (Darley et al., 1975). Sixty-six (45%) vs 57 (39%) indicated they agreed/strongly agreed they did not employ formal assessments (the others neither agreed nor disagreed). Seventy-five (41%) assessed people with post stroke dysarthria differently to dysarthria associated with progressive neurological conditions. The majority (n 82, 56%) did not routinely include an audio-recording of speech as part of the assessment. Nineteen (13%) routinely made a video recording.

Treatment

For 69 (47%) of respondents their average treatment sessions lasted 30-45 minutes whilst for 35 (24%) it was between 15-30 mins. Thirty-six (25%) held sessions on average 45-60 mins, with one respondent >60 mins. The number of sessions offered varied across settings, as illustrated in table 5.

Table 5 about here

Table 6 presents the range of interventions respondents would expect to offer in mild dysarthria (speech largely intelligible). The range utilized in moderate (speech intelligible

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only in ideal conditions) and severe (little or no intelligible speech) dysarthria is given in tables 7 and 8.

Tables 7 to 8 about here

Sixty-eight (47%) agreed or strongly agreed that treatment of oromotor skills was important, with 43 (29%) agreeing or strongly agreeing with the notion that if intervention does not work directly on speech, speech will not improve. Fifty-eight (40%) agreed/strongly agreed that intensive daily practice of specific exercises was necessary to bring about change in speech. One hundred respondents (69%) agreed or strongly agreed that in order to make progress speech and non-speech drills/ items should be repeated several times, but only 14 (10%) supported the notion that simple repetitive tongue movements contributed to enhanced articulation.

One hundred and thirty-five (93%) believed treatment of intelligibility was important. Even more (99%) felt addressing functional communication was important, 97% that intervention to allow participation in social events was important and 98% that addressing interaction with significant others was key.

The structure of feedback for clients was considered important and varied according to needs of an individual. Attitudes are illustrated in table 9.

Table 9 about here

Finally, 27% (40) of respondents indicated that there are areas they would like to address in intervention but do not have the tools for. Of these, 28% (11) would like to work on function/ conversation and 17% (7) would like to offer more biofeedback/ self-monitoring.

Discussion

We have reported the responses of 146 UK SLTs concerning their management of post-stroke dysarthria. The absence of national data concerning how many of the approximately 15,000 SLTs in the UK work in stroke rehabilitation settings renders indications of the representativeness of this figure problematic. The response rate is not dissimilar to comparable survey returns in the UK. Using a similar recruitment methodology Miller et al., (2011) received 185 replies and Collis and Bloch, (2012) 119. Code and Heron, (2003) had replies from 74 of 264 (28%) SLT managers whom they contacted. Bateman et al., (2007) gained 296 (29%) responses from 1029 directly contacted SLTs in GB and Ireland; Conway and Walshe, (2015) had 67 complete questionnaire returns (but as with the current survey with no indication of the possible denominator) from SLTs in Ireland; Lawson et al., (2015) received 160 SLT replies from 1000 approached in the USA.

All regions of the UK were represented but responses were not spread equally. SLTs in Scotland, for example, represented just over 18% of the sample, whilst Wales and the North of Ireland together amounted to less than 7%. Again without accurate figures on numbers employed in the different regions it is hard to estimate the proportion of responses to expect. What is clear is the overwhelming majority of clinicians are employed by the NHS, with a large majority at specialist level (NHS grade 6) and advanced level (NHS grade 7) and most having worked with post-stroke dysarthria for more than 6 years.

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On the assumption that the survey was publicised to all UK SLTs irrespective of employer these results show that the NHS remains the predominant provider of SLT services for post-stroke dysarthria. Where clients are seen varied considerably across hospital and community settings. The findings suggest that services are flexible enough to deal with clients in a range of environments. These findings tie in with those presented for progressive conditions (Collis and Bloch, 2012, Miller et al., 2011).

With reference to referral patterns the picture is complex. Most patients are referred within a week post-stroke with stroke teams being a key source of referral, suggesting National guidelines are followed. The majority of referrals are seen within 2-days, though this possibly reflects standards of care for people with stroke in general and dysphagia rather than (solely) dysarthria. However, a considerable number of respondents report referrals only from 6 months post-stroke onwards. It may be that some of these people have previously received assessment/ treatment for the acute effects of their stroke whilst an inpatient, but are not picked up in the community until some time later. The survey did not capture how many people with post-stroke dysarthria were not referred to SLT who probably ought to have been, nor the appropriateness of referral for those who were notified to SLT. Specific detail on the communication profile (e.g. severity of dysarthria, presence of other communication impairments) of those referred was also not elicited. The current findings would be complemented by a prospective longitudinal study examining the patterns of referral in relation to the natural history of dysarthria in the months following stroke.

Assessment practices

The returns highlighted some important issues around assessment. Positively, over 90% of SLTs conduct some form of assessment of people with dysarthria. However, over 45% of

respondents did not (regularly) use formal, validated, standardised assessments. Partly this may reflect a high proportion of respondents who work in the acute setting where a rapidly evolving picture invites use of screening tools rather than detailed assessments that would soon be out of date. Nevertheless for SLTs working with people with dysarthria later in recovery more formal assessment appears still to be neglected. This would run contrary to guideline recommendations that indicate referral to SLT for a detailed assessment, and to tenets of evidence based practice, where use of such assessments represents a sine qua non to arrive at a detailed differential diagnosis and set of targeted and targetable goals and to evaluate whether an intervention has helped the person with dysarthria to attain their goals. Feedback on the assessment of intelligibility provides an example. Over 90% of respondents assess it and improvement of intelligibility is endorsed as a major aim of intervention. Nevertheless, less than 30% report utilization of a diagnostic intelligibility test that would enable identification of target contrasts for therapy, preferring to administer informal rating scales that fail to deliver indications for rehabilitation and demonstrate poor inter- and intra-rater reliability (Miller, 2013, Hustad et al., 2015, Lousada et al., 2014).

Similar issues arose around evaluation of activity limitation, participation restriction and impact. These were acknowledged as favoured targets of rehabilitation and key areas of assessment and outcome measurement. However, reliance on local informal assessments of these variables appeared to be to the fore, whilst ignoring the several well designed validated and standardised assessments now available - e.g. Baylor, Yorkston, Eadie, et al, (2013), Bennett, Thomas, Austen, et al, (2006), Bloch, & Wilkinson, (2009). Doyle, Mcneil, Mikolic, et al, (2004), Hartelius, Elmberg, Holm, Lövberg, Nikolaidis, (2008), Miller, Noble, Jones, Allcock, Burn, (2008), Walshe, Peach, Miller, (2009).

Issues around following evidence based guidelines are recurrent themes, not just in post stroke dysarthria (McCurtin and Roddam, 2012, Walker et al., 2013, Olswang and Prelock, 2015, Donnellan et al., 2013, Rousseau et al., 2016). This research has linked several factors to difficulties with compliance, some of which may apply here. The preference for informal evaluation may be due to lack of knowledge of available standardised tests. It may stem from limited perceived value of validated instruments, e.g. the impression that they do not deliver the information the clinician desires (and/or in the form they desire). Clinicians may believe that the time investment to conduct full valid and reliable assessment does not bring sufficient payback in terms of clinical gains in a busy clinic schedule. Qualitative comments in the survey suggest that availability of more functional based assessments would be of value. This correlates with the emphasis on function found in the respondents' informal assessment choices and desires of people with dysarthria in rehabilitation. This suggests lack of awareness of the need for more formal functional based assessment for dysarthria for use in everyday clinical practice is not the issue. Why the instruments available are not employed remains unclear and a possible subject of further investigation.

Whilst SLTs are assessing a comprehensive range of areas from oro-motor performance through to environmental barriers to communication, the use of instrumentation for assessment in clinical practice is notably rare. It is unclear whether this relates to limited availability or perceived limited value. With fourteen respondents expressing an interest in more objective instrumentation and/or apps there is evidence to suggest that for some the issue is one of availability. Despite this potential interest less than 20% of respondents use video recording during assessment. For two of these, Trust policy or information governance prevented them from making video recordings as part of their assessment process. This is significant in terms of its potential impact on planning intervention, giving feedback and

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evaluating outcomes. What is unclear is why policies should prevent the use of videos, especially as several national guidelines point to the importance of such records. It is possible that difficulties are encountered in the secure storage of video data rather than making a recording per se.

With nearly 60% of respondents usually carrying out an assessment or estimation of depression/ mental wellbeing it is clear that the wider impact of dysarthria on mental health is being considered. It remains to be established how this estimation is being made. No specific formal assessments or tools were mentioned, suggesting that such estimates are currently based on clinical judgement. Further research may be warranted to establish on what such judgements are based and the actual incidence of mental health issues in people with post-stroke dysarthria.

Approximately a fifth of respondents recorded they employ the Mayo Clinic classification of dysarthrias (Darley et al., 1975). This is despite reservations expressed regarding the value and reliability of such a classification, difficulties in replicating Darley et al's findings, and calls for alternative perspectives (Lansford and Liss, 2014, Lansford et al., 2014, Weismer, 2006, Kim et al., 2011). It is not clear what, if any, other schema of impairment based diagnosis was being employed, and to what ends – e.g. for objective measures of severity; for identification of acoustic, voice quality, articulatory (subsystem) targets for rehabilitation; to complement diagnostic intelligibility assessments. This may represent another avenue of further investigation, to examine how the (differential) diagnostic process is structured and how this relates to identification of targets for intervention and for outcome evaluation.

Therapy practices

The focus of therapy for mild, moderate and severe dysarthria did not differ significantly for clinicians. For all levels explanation/information and environmental change advice were highly rated. This may reflect the recognition that information is central to the therapy process and that wider contextual adaptations are integral to effecting change, especially as the vital component of disability for some individuals may not be intelligibility per se but rather maximisation of their communicative ability in adverse conditions and finding solutions to reduced confidence at communicating. Also of high focus was conversation/interaction and participation, reflecting the widely prevalent view that interaction and participation are important aspects of intervention. All the same, direct work on articulation and speech rate remained of high focus for mild and moderate dysarthria but only dropped slightly for severe dysarthria. The survey was not detailed enough to reveal exactly what intervention programmes and targets were employed – partly as this is liable to be tied to specific cases. However, some general indications were gleaned.

Content and structure of impairment based therapy

A little under half of respondents endorsed nonverbal oral exercises in rehabilitation. Given the ongoing debate regarding the precise role and efficacy of this approach (Mackenzie et al., 2010, Mackenzie et al., 2014, Lof and Watson, 2008, Watson and Lof, 2009, Ziegler and Ackermann, 2013, Weismer, 2006) it points to the importance of wider education and discussion (Maas, 2016) in evidence based approaches in motor speech disorders.

Awareness of other elements of motor learning were covered in some of the direct questions and in free text comments by respondents. The frequency and nature of feedback were viewed as important by the majority, though 12% still felt the content and structure of feedback was unimportant. The survey demonstrated some appreciation of the centrality of regular intensive

practice to effect change, but this was in a minority. Responses point to a need for further information for clinicians treating dysarthria around issues in motor learning (e.g. random vs blocked practice, invariable vs variable practice). Though there were no specific questions directly on these latter issues, they have been flagged as possible key factors in (re)acquisition, maintenance and generalisation of speech-sound contrasts (Bislick et al., 2012, Kleim and Jones, 2008, Tremblay et al., 2008, Page and Harnish, 2011).

As regards whether practices reflect guideline recommendations outlined in the introduction, results suggest people with dysarthria are being referred very soon after stroke, which corroborates information from the RCP Sentinel Stroke National Audit Programme (SSNAP) (www.strokeaudit.org accessed 15 November 2016) that largely referral time targets are met. As noted previously, further investigation needs to establish the proportion of appropriate referrals and why there appears to be an appreciable number of people who are not referred until much later, in particular for community rehabilitation. The current survey findings around time spent by people post-stroke in SLT also reflect results from SSNAP which show a low proportion of potential contact time in face to face therapy, especially for community rehabilitation. SSNAP figures do not permit a breakdown of how much of this time relates to aphasia, how much to dysarthria or dysphagia. Thus, as suggested in table 5, time devoted to dysarthria rehabilitation may be indeed sparse. Findings confirm the presence of a fixed protocol within stroke teams for the screening of people with possible dysarthria in the great majority of cases. They do not, however, support the view that the battery of assessments utilized fulfils guideline recommendations when a more detailed, comprehensive evaluation of the nature and causes of impairment and restriction is required. The data appear to suggest that the battery is neither sufficiently comprehensive nor necessarily valid and reliable. On the

positive side, acknowledgement that the person with dysarthria and their family should provide the focus of rehabilitative intervention is almost universal.

Future research

Through this current research it has become clear that basic information regarding post-stroke dysarthria incidence, prevalence and core demographics is currently unavailable. More embedded NHS SLT reporting systems would make a significant contribution to this area. People with post-stroke dysarthria are likely to experience other issues including aphasia, dysphagia and associated mental health issues. Understanding the relationship between these co-morbidities may enable services to be more responsive and efficient in prioritising the needs of patients and ensuring that their longer-term capabilities are maximised. SLTs make use of a number of assessment and treatment techniques but it is unclear why the full range of resources is not utilised. A more in-depth examination of SLT practice in this field is required to more fully understand the choices SLTs are making and how they make best use of the available evidence to support their clinical decision making.

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Appendix

Dysarthria after Stroke. Therapists practices.

Section A - Information about respondent Geographical location (broad areas not specific)

- First part of post code
- Type of service (acute, rehabilitation, community)
- Approx. % time spent in each setting
- Employer (NHS, self, charity etc – not specific organisation)
- NHS SLT band
- Gender
- Country of qualification
- Number of years worked with people with dysarthria post CVA

Section B – Caseload

- Number of clients with post CVA dysarthria on current caseload
 - Active treatment; on review
 - Time post stroke
- Referral sources
- Number of patients with CVA dysarthria referred over the past 12 months
- Response time target? (yes/no). If 'yes'
 - Acute response time
 - Rehab response time
 - Community response time
 - Waiting times for assessment; intervention?
- Status of clients at referral
 - Numbers immediate post-CVA onset (up to 1 week)
 - Numbers 1 week to 1 month post onset
 - Numbers 1 month to 1 year post onset
 - Numbers 1 year post onset+
- Average time period treated per session
- Average number of sessions offered – acute setting; post hospital discharge setting
 - Hyper-acute – hours/dates
 - Acute - up to one week
 - In-patient rehabilitation
 - Supported discharge/outpatient
 - Community
- Co-morbidity
 - how many clients seen have just dysarthria;
 - how many also have dysphagia and/or aphasia

Section C - Assessment & outcome measures

- Types of assessment used (always, usually, sometimes, never options)
- Formal
 - Frenchay Dysarthria Assessment (Enderby 1983)

Post stroke dysarthria

- Frenchay Dysarthria Assessment 2 (Palmer & Enderby 2008)
- Robertson Dysarthria Profile (Robinson 1982)
- Assessment of Intelligibility of Dysarthric Speech (Yorkston & Beukelman 1981)
- Sentence Intelligibility Test (Yorkston, Beukelman & Tice 1996)
- The Quick Assessment for Dysarthria (Tanner & Culbertson 1999)
- The Drummond Dysarthria Examination Battery (Drummond 1993)
- Voice Handicap Index
- (add other relevant voice assessments here)
- (add relevant impact/participation/QoL measures)
- Other (please specify)
- Informal
 - Oro-facial examination
 - Informal speech rating
 - Intelligibility rating
 - Conversation/interaction rating
 - Other
- Do you use any of the following instrumentation in your assessment of people with non progressive dysarthria? (always, usually, sometimes, never options)
 - Computerised Speech Lab
 - Multispeech
 - system
 - Praat
 - Visispeech
 - Visipitch
 - Sona Speech
 - Analysis of Dysphonia in Speech and Voice (ADSV™)
 - Electroglottograph (EGG)
 - The Voice Range Profile
 - The MultiDimensional Voice Program (MDVP)
 - Other
- Types of outcome measures used (always, usually, sometimes, never options)
 - Formal
 - Informal

With reference to SLT assessment of people with dysarthria post CVA, to what degree do you agree/disagree with the following statements?

- I assess people with CVA dysarthria differently to people with progressive dysarthria
- I do not routinely use a formal assessment with his population
- I routinely use the Mayo Classification System in describing the type of Dysarthria
- I do not routinely use audio recording as part of my dysarthria assessment
- I do not routinely use video recording as part of my dysarthria assessment
- I am confident in my ability to accurately assess people with CVA dysarthria

- Are there any aspects of speech, communication, interaction, and/or participation that you would like to address in assessment but do not have the necessary tools to do so? (if so, what?)

Section D - Intervention

- List range of possible interventions and how likely each one is used if indicated as appropriate for client (+ free text to add additional interventions (always, sometimes, rarely, never selections))

e.g. If you need to work on the client's **SPEECH RATE**, which one of the following techniques would you use most frequently? (always, usually, sometimes, never options)

- Alphabet board
- Instrumental equipment (e.g oscilloscope)
- Pacing techniques (pacing board, metronome etc)
- Cued meter strategy (e.g underlining written words etc)
- Computer presenting words at altered rates
- Separate question on use of computer assisted therapy

Same question (with different selection options) for the following: **resonance, articulation, prosody, phonation, respiration**

If you use AAC strategies as part of your intervention:

- Which methods do you use? (select: light tech and high tech list options; always, usually, sometimes, never)
- With reference to different levels of dysarthria severity, what would be your main intervention strategies (provide options to select + free text option)
 - Mild (speech largely intelligible)
 - Moderate (speech intelligible only in ideal conditions)
 - Severe (little or no intelligible speech)
- With reference to SLT intervention for people with post-CVA dysarthria to what degree do you agree/disagree with the following statements part 1:
 - I think treatment of oro-motor skills is important
 - I think treatment of speech intelligibility is important
 - I think treatment of functional communication is important (e.g. ordering a meal)
 - I think treatment for participating in society is important (e.g. taking part in a social event)
 - I think work on interaction between the client and significant other(s) is important
- With reference to SLT intervention for people with post-CVA dysarthria to what degree do you agree/disagree with the following statements part 2:
 - When giving feedback to clients I always let them know how they have performed on tasks
 - When giving feedback to clients I always let them know how the results at the end of a task
 - I consider the frequency of feedback when I am devising a speech

- programme
 - I vary my feedback according to the client and his/her psychological needs rather than the task
 - I do not believe that it is necessary to consider how you structure your feedback in advance of a session
- With reference to SLT intervention for people with post-CVA dysarthria to what degree do you agree/disagree with the following statements part 3:
 - Speech training items or oromotor exercises need to be repeated several times in order to achieve change
 - Simple repetitive tongue movements do not enhance skilled movements involved in articulation
 - If intervention does not work directly on speech, speech will not improve
 - Change in speech can only be achieved through intensive daily practice of specific exercises
- Are there any aspects of speech, communication, interaction, and/or participation that you would like to address in intervention but do not have the necessary tools to do so? (if so, what?)