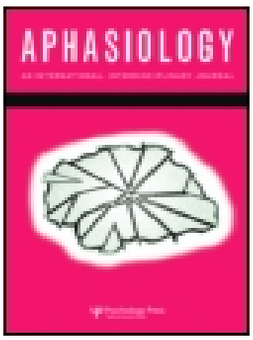

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Prevalence of aphasia and dysarthria among inpatient stroke survivors: describing the population, therapy provision and outcomes on discharge

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ABSTRACT

Background: Stroke causes communication impairments but we lack the real-world population-level data needed to inform inpatient and community services. Aims: To establish prevalence of aphasia and dysarthria within inpatient stroke survivors, describe those affected, the amount of therapy they receive and their outcomes.

Methods & Procedures: Secondary analysis of data from the Sentinel Stroke National Audit Programme, England, Wales and Norther Ireland, including inpatient stroke survivors after 72 hours, with completed National Institute of Health Stroke Scale data (communication items), excluding those already discharged, not conscious or with incomplete data.

Outcomes & Results: 64% of the 88,974 stroke survivors meeting our criteria were communication impaired: 28% had both aphasia and dysarthria, 24% had dysarthria only and 12% had aphasia only. Those in the older age range and with more severe stroke were more likely to have a communication impairment and had a worse outcome than those without communication impairment. On average, those with both communication impairments had a 21 day length of stay and 10 minutes of speech and language therapy for communication and/or dysphagia per day of stay.

Conclusions: Communication impairment is common during the inpatient phase of stroke care yet average therapy provision is below the recommended levels and is likely to include dysphagia assessment and intervention. Dysarthria is reported as more prevalent than aphasia at this early stage, although this is not necessarily diagnosed by a speech and language therapist. The most common presentation is to have a combination of aphasia and dysarthria for which there is limited clinical guidance.

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Stroke; aphasia; dysarthria; prevalence; speech and language therapy

Introduction

Communication impairments, whether aphasia (where language is affected) or dysarthria (where speech intelligibility is affected), are a common consequence of stroke which can

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lead to poor psychological well-being, health outcomes and increased social isolation compared to those with no communication impairment (Brady et al., 2011; Code, 2003; Dickson et al., 2008; Jorgensen et al., 1995). Despite the devastating impact of speech and language impairment on everyday life we lack adequate data on the prevalence of these impairments in a typical clinical population (Ali et al., 2015). Existing data are limited, vary between studies and often only include first stroke (Flowers et al., 2013; Lawrence et al., 2001; Tsouli et al., 2009). Furthermore, few studies characterise the individuals who are affected, the intervention they receive or their outcomes (Ali et al., 2015).

Understanding the prevalence of communication impairments in stroke survivors would allow informed decision making about service provision, improve the development of research protocols and provide more accurate information to stroke survivors and their families. Knowledge about the demographics and health status of people with and without communication impairment could support stratified health-care to provide the right rehabilitation intervention at the right time and support our understanding of functional recovery. Our study aimed to characterise the demographics of this population, the therapy they received and their outcomes.

Method

Data from the Sentinel Stroke National Audit Programme (SSNAP) were investigated. SSNAP is a national audit register of stroke care in England, Wales and Northern Ireland and involves over 95% of patients with stroke entering hospital (Rudd et al., 2018; Sentinel Stroke National Audit Programme, 2020).

The data extracted from the SSNAP database included all patients admitted with a confirmed diagnosis of stroke entering hospital between July 2013 and July 2015 (n = 149,560) in England and Wales, and Northern Ireland. For the present study our inclusion criteria were those who survived, and were still in hospital after three days, and had the relevant communication items (number 9 and 10) completed on the National Institute of Health Stroke Scale (NIHSS) (Brott et al., 1989). On admission to hospital for suspected stroke all patients, where possible, will have the NIHSS carried out and their data entered to SSNAP. We used the clinical level audit which records patient data and clinical status at first admission, stroke care during hospital inpatient stay and health outcomes at discharge from inpatient care. Data included: demographics; baseline stroke severity and characteristics from the NIHSS scores; level of pre-morbid dependency as measured by the modified Rankin Scale (mRS)(Vanswieten et al., 1988); frequency of cerebro-vascular related co-morbidities; minutes of speech and language therapy received; outcome at discharge (disability, mortality, length of stay, destination on discharge).

The NIHSS is a measure of stroke severity and is recorded on admission by a specialist stroke professional, not usually a speech and language therapist (Brott et al., 1989). It is a simple, valid, and reliable measure of stroke severity (Dancer et al., 2017) measuring 15-items: levels of consciousness; facial paresis; cognition (language and neglect); vision; motor control (weakness of the limbs; ataxia, dysarthria) and sensory loss

Patients were identified as having aphasia from task 9 of the NIHSS (mild/moderate = 1, severe = 2, very severe or no language evident = 3) and dysarthria from task 10 of the NIHSS (mild/moderate = 1, severe = 2), both and none. Task 9, best language

assessment, involves the patient describing a picture, naming pictures and reading sentences and rated accordingly. Task 10, to assess dysarthria, the patient reads or repeats words and is rated according to the scale. We did not investigate the accuracy of the diagnosis of aphasia and dysarthria carried out by stroke health professionals using the NIHSS.

Therapy is described by SSNAP as the total number of minutes of therapy received and the total number of days with therapy during the inpatient length of stay. A simple ratio of minutes/days would produce the average therapy received per day on which they received treatment (i.e. the average duration of a treatment session), however patients rarely received therapy every day, and given the potential for self-reporting bias, a more valid definition the *"average therapy per day of stay"* as an inpatient was used (i.e. the total minutes divided by the total length of inpatient stay). Due to concerns about patient confidentiality, we were unable to obtain information regarding the date of admission or when therapy was received which limited a more detailed analysis of the days on which therapy was received. There is no detail about whether therapy time was spent on communication and/or dysphagia therapy.

Characteristics in terms of demographics, stroke characteristics, intervention and outcomes were reported using standard descriptive statistics. Statistical inferences were not performed. Due to the large sample size, it would be highly likely that any simple comparison (e.g. t-test) would be statistically significant regardless of the size of effect. The data structure and confounding present in this observational records based dataset would require complex methodology to produce robust conclusions. Given the papers objective to describe the sample population, these were not planned for apriori or reported here.

Results

This study focussed on the 88, 974 (out of the total admissions n = 149,560) stroke patients who survived, were in hospital care three days after admission and had suitably complete NIHSS assessments (communication items). We have provided missing data as supplementary information Table S1. As shown in Table 1, within this cohort 64% had a communication impairment (57,150 of 88, 974) with 41% having aphasia (37,537 of 88, 974) and 52% with dysarthria (46,330 of 88,974). Dysarthria without aphasia (24%) was almost twice as prevalent as aphasia alone (12%).The most common communication impaired presentation observed was to have both aphasia and dysarthria (28%).

Demographic data (Table 1) shows an older age was linked to the presence of communication impairment, but there is no striking difference between men and women for the presence of either aphasia or dysarthria.

A higher level of pre-stroke dependency was observed in those with aphasia (48% of those with mRS>2 had aphasia but only 40% of those with mRS≤2). However the opposite pattern was seen for dysarthria, which was observed in 40% of those who were dependent compared to 50% who were independent.

Having a higher number of existing cerebro-vascular co-morbidities was found with increasing rates of aphasia and dysarthria. In those with facial palsy on admission 19% had no communication impairment present, 32% had dysarthria only, 10% had aphasia only and 38% both aphasia and dysarthria.

Table 1. Descriptive statistics of the baseline demographics and stroke characteristics specific to presence/absence of aphasia and/or dysarthria.

Baseline Descriptive (Row % where denominator is corresponding number with an assessment)		Aphasia present[a] n = 37,537(41)	Dysarthria present[a] n = 46,330(52)	Neither present[b] n = 31,824(36)	Only aphasia present[b] n = 11,202(12)	Only dysarthria present[b] n = 21,058(24)	Both aphasia & dysarthria present[b] n = 24,890(28)
		Included if NIHSS Aphasia completed(row%)	Included if NIHSS Dysarthria completed(row%)	**Includes only those with both NIHSS aphasia and dysarthria assessments completed (row%)**			
Age	Mean[S.D]	78[13]	77[13]	74[14]	77[13]	75[13]	78[13]
	Min;Max	18;114	18;114	18;112	18;114	18;114	18;112
Gender	Female	20481(44)	23895(52)	15927(35)	6049(13)	10143(22)	13544(30)
	Male	17056(39)	22435(52)	15897(37)	5153(12)	10915(25)	11346(26)
Pre-stroke mRS	Independent ≤2	28218(40)	35914(50)	26988(38)	8867(12)	17099(24)	18312(26)
	Dependent >2	8819(48)	7209(40)	4836(27)	2335(13)	3959(22)	6578(37)
No. Co-morbidities	0	8233(38)	10574(49)	8265(39)	2509(12)	5066(24)	5416(25)
Overall:Med = 1,	1 to 2	23867(42)	29345(52)	19930(35)	7158(13)	13299(24)	15811(28)
IQR = 1,2	3 to 5	5437(46)	6411(55)	3629(31)	1535(13)	2693(23)	3663(32)
Co-Morbidity Present	Congestive Heart Failure	2511(47)	3019(57)	1588(30)	655(12)	1260(24)	1729(33)
	Hypertension	20737(41)	25808(52)	17565(35)	6236(13)	11868(24)	13742(28)
	Atrial Fibrillation	9999(50)	11267(57)	5690(29)	2824(14)	4445(23)	6723(34)
	Diabetes	7380(40)	9402(51)	6691(37)	2247(12)	4447(24)	4885(27)
	Stroke/TIA	11228(45)	13320(54)	8257(33)	3228(13)	5685(23)	7509(30)
On arrival facial palsy evident		24543(50)	34273(70)	9168(19)	5186(11)	15606(32)	18415(38)
Infarction		33331(41)	41300(52)	28202(36)	9977(13)	18866(24)	22105(28)
Intracerebral Haemorrhage		3956(43)	4748(52)	3256(36)	1131(12)	2058(23)	2638(29)
NIHSS Score	Mean[S.D]	12[6,19]	10[5,17]	3[1,5]	6[3,13]	6[4,11]	14[8,21]
0 not impaired 42 most impaired	Min;Max	1;42	1;42	0;42	1;42	1;42	2;42
Stroke Severity	Mild <5	6146(17)	9375(26)	22428(63)	3851(11)	7106(20)	2178(6)
total score from	Moderate 5-14	15900(45)	21671(61)	8663(25)	4953(14)	10992(31)	10499(30)
NIHSS	Moderate/ Severe 15-0	6537(69)	7263(79)	600(7)	1275(14)	2312(25)	4868(54)
	Severe >20	8954(92)	8021(86)	133(1)	1123(12)	648(7)	7345(79)

(a) Based on all patients with aphasia/dysarthria assessment (n = 90,513/89, 453), b. based only on patients with both aphasia and dysarthria assessment (n = 88, 974)

Stroke type (intracerebral haemorrhage or infarction) appears to have no connection with the likelihood of communication impairment but stroke severity does. Although it is worth noting that people with mild stroke did experience communication impairment, e.g. 17% had aphasia and 26% had dysarthria, far higher rates were seen in those with more severe stroke and only 1% survived a severe stroke with communication intact.

The severity of aphasia and dysarthria on admission is shown in Table 2. Those with aphasia alone or dysarthria alone were observed to have mild/moderate impairments (36% and 35% respectively). Where aphasia and dysarthria co-occurred most patients had severe impairments (69%).

The number of patients who were deemed to require speech and language therapy (for communication and/or swallowing) and the number receiving it is shown in Table 3. The percentages reported are column percentages to reflect the impact of stroke impairment on therapy required/received. Seventy-six percent of patients with aphasia and 71% of patients with dysarthria were deemed to require speech and language therapy. If dysarthria was the only communication condition present then only 64% were considered to require intervention. If aphasia only was present 73% were considered to require speech and language therapy but we don't know why 27% were not. Ninety-eight percent of those requiring speech and language therapy received it. It is not known whether this was for a communication difficulty or dysphagia or both.

Table 2. Crosstabulation of the severity of aphasia and dysarthria using NIHSS on arrival (row%).

	No dysarthria = 0	Mild/moderate = 1	Severe = 2	Total
No aphasia = 0	No communication impairment 31,824(60)	no aphasia & mild dysarthria 18,710(35)	no aphasia & severe dysarthria 2,348(5)	52,882(100)
Mild/moderate aphasia = 1	Mild aphasia & no dysarthria 5,346(36)	Mild aphasia & mild dysarthria 8,390(56)	Mild aphasia & severe dysarthria 1,165(8)	14,901(100)
Severe aphasia = 2	Severe aphasia & no dysarthria 3,769(30)	Severe aphasia & mild dysarthria 3,580(28)	Severe aphasia & severe dysarthria 5,398(42)	12,747(100)
Very severe/no language = 3	Very severe aphasia & no dysarthria 2,087(25)	Very severe aphasia & mild dysarthria 517(6)	Very severe aphasia & severe dysarthria 5,840(69)	8,444(100)
Total	43,026(48)	31,197(35)	14,751(17)	88,974(100)

Table 3. Descriptive statistics of the speech/language therapy required and provided, specific to presence/absence of aphasia and/or dysarthria (Note, table reports column statistics).

Therapy descriptive (Col%)		Aphasia present	Dysarthria present	Neither Present	Only aphasia present	Only dysarthria present	Both aphasia & dysarthria present
Patient required speech/ language therapy (SLT) at first entry		28,529(76)	32,977(71)	9424(30)	8211(73)	13501(64)	19230(77)
If required SLT, Did they receive it (first entry)?	No	490(2)	531(2)	140(2)	152(2)	200(2)	328(2)
	Yes	28039(98)	32446(98)	9284(98)	8059(98)	13301(98)	18902(98)
Total patients		37537	46330	31824	21058	11202	24890
SLT minutes per day of stay	Mean[sd]	10.2[9]	9.5[9]	7.4[7]	10.9[9]	8.7[8]	10.0[9]
	Min;Max	0;220	0;220	0;90	0;155	0;105	0;220

For those receiving speech and language therapy, those with both aphasia and dysarthria did not appear to have markedly more therapy (10 min per/day of stay) compared to those with aphasia (11 min per/day of stay) or dysarthria alone (9 min per/day of stay). Those with neither communication impairment but who still needed speech and language therapy, possibly for dysphagia (swallowing impairment), had an average of 7 min per day of inpatient stay.

The health outcomes for patients with aphasia and/or dysarthria are described in Table 4. Length of inpatient stay was observed to be longer for those with both aphasia and dysarthria (21 days) than those with aphasia or dysarthria alone (13 and 14 days respectively) and less again for those with no communication impairment (9 days). Death as an inpatient was more likely to be observed in those with communication impairment, as seen with individuals with both aphasia and dysarthria (23% died) but this was less likely with no communication impairment (6% died). Discharge to a care home was also observed when individuals had both aphasia and dysarthria (18%) and less likely with no communication impairment (9%). Finally, dependence at discharge (MRS >2) was observed more in patients with both aphasia and dysarthria than those with no communication impairment: 73% and 44% respectively.

Discussion

The opportunity to analyse this data-set of 88,974 stroke patients across England, Wales and Northern Ireland gives us unprecedented information to explore communication impairment after stroke in a real-world population. Using these observational data has allowed us to explore certain elements of prevalence, demographics, speech and language therapy and outcome but causation cannot be inferred from this. Exploring these data in greater detail has enabled us to tease out four key areas including: 1) number of stroke survivors reported as presenting with aphasia and dysarthria; 2) the demographics of this population, and clinical characteristics such as levels of dependency pre-stroke, stroke type and severity, co-morbidities, presence of facial palsy; 3) speech and language intervention required and delivered during inpatient care; 4) the immediate and medium-term outcomes for those with aphasia and/or dysarthria compared to those with no communication impairment.

Sixty-four percent of inpatient stroke survivors at 3 days presented with a communication impairment. This number is higher than is often presented although many studies only consider first strokes and often focus only on aphasia (Ali et al., 2015; Ellis et al., 2012; Wade et al., 1986). The higher prevalence of dysarthria than aphasia, although reported in other research (Ali et al., 2015), remains at odds with the amount of research on these two topics with a predominant focus on aphasia research. The most recent Cochrane review of interventions for aphasia identified 57 randomised controlled trials for inclusion (Brady et al., 2016) while that for dysarthria only included five randomised controlled trials (Mitchell et al., 2017). Also of interest is the finding of how often dysarthria and aphasia occur together as there is very little research and no clinical guidance considering how to treat co-occurring dysarthria and aphasia (ICSWP, 2016) which is compounded by the poor numbers of dysarthria research trials. We found only one study in the Cochrane reviews actively recruited stroke survivors with aphasia and/or dysarthria (Bowen et al., 2012). The larger evidence base for aphasia may

Table 4. Descriptive statistics of the health outcomes, specific to presence/absence of aphasia and/or dysarthria (Note, table reports column statistics).

Health Outcomes Descriptive (Col%)		Aphasia present n = 37,537(41)	Dysarthria present n = 46,330(52)	Neither present n = 31,824(36)	Only aphasia present n = 11,202(12)	Only dysarthria present n = 21,058(24)	Both aphasia & dysarthria present n = 24,890(28)
Length of Inpatient stay	Med(IQR)	18(7,45)	17(7,44)	9(5,23)	13(6,34)	14(6,38)	21(8,50)
survivors only	Min;Max	3;803	3;803	3;765	3;447	3;375	3;803
Total No. died 3 days+ (% of all patients)		7764(21)	8174(18)	1779(6)	1545(14)	2372(11)	5703(23)
Final inpatient discharge to care home		6257(17)	7016(15)	2927(9)	1540(14)	2525(12)	4406(18)
Final inpatient discharge home		13425(36)	17733(38)	17524(55)	4908(44)	9405(45)	8207(33)
Modified Rankin Score at	Indep(≤2)	11865(32)	15676(34)	17806(56)	8620(41)	4675(42)	6974(28)
discharge	Depend(>2)	25672(68)	30654(66)	14018(44)	12438(59)	6527(58)	17916(73)

influence treatment choices and the ongoing research agenda and a greater focus is clearly needed to consider developing interventions for co-occurring dysarthria and aphasia as well as dysarthria specifically.

People with communication impairment appear to show a different demographic to those without in that they tend to be older and have more severe strokes. Those with both aphasia and dysarthria were also more likely to have been dependent previously again adding to this picture of a frailer presentation. This communication impaired group were also observed to be more likely to present with a facial palsy on admission. There is very little information about facial palsy despite this being a key early identifier of stroke (Department of Health, 2009), which is known to have significant psychological implications (Kahn et al., 2001). Unsurprisingly, facial palsy was most likely to occur when dysarthria was present (70%). Perhaps more surprising was that 19% of those with no communication impairment also had a facial palsy. An individual with facial palsy but no communication impairment may not be seen by a speech and language therapist or other health professional about their facial palsy as this may not necessarily result in reduced intelligibility, or may have resolved. There are no clinical guidelines about managing facial palsy after stroke, either with or without communication impairment or which professional would be involved in this whether it is speech and language therapy, physiotherapy, occupational therapy or nursing. It may be that different areas offer different services but individuals may well not be offered any support or intervention. Thus, current lack of advice, information or clinical guidance around intervention and management of facial palsy (ICSWP, 2016) needs to be addressed.

The amount of speech and language therapy provided was ten minutes on average per day of stay, this is below the national clinical guidance recommendations of 45 minutes a day (ICSWP, 2016). However this measure simply includes the total number of minutes recorded and the total length of stay on discharge from inpatient services so we are wary of making any inferences about this therapy dose. This will not include self-directed practice or family facilitated therapy. We know little about the content of this intervention and whether it was for dysphagia or communication or both. We also don't know about the changes in dose as people are likely to have had more therapy at different time points in their recovery. It would be helpful to look at these data in more detail in future research to understand the timings, intensity and dose of therapy to find out more about what is delivered and how to understand the optimal frequency, intensity and content of interventions.

The immediate and medium-term health post-stroke outcomes for those with communication impairment were poorer, with higher chances of death, higher levels of dependency and a greater likelihood of entering nursing home care when compared to those without communication impairment. Understanding the possible impact of communication impairment on the stroke population highlights the importance of research that reflects these real-world findings and supports services to accommodate the likely needs of stroke survivors.

Our analysis was restricted to variables collected in the Sentinel Stroke National Audit Programme and further data validation was not possible. We categorised participants using the National Institute Health Stroke Scale which measures a limited number of impairments relatively crudely, so mild or rare impairments may have been missed although research does suggest the NIHSS is reliable at identifying stroke severity

regardless of experience but not necessarily accurate at identifying communication impairment (Dancer et al., 2017). The NIHSS is rarely carried out by a speech and language therapist and simply documents the clinical opinion of the assessor as to the presence or absence and severity of dysarthria and/or aphasia. Our inclusion criteria included completion of the NIHSS communication items and those without were excluded from our analysis which is a potential source of bias. There may have been a discrepancy in the completion of either the dysarthria or aphasia items on the NIHSS which may be due to mild communication impairments not being detected. Our method of descriptive analysis does not allow us to conclude causation nor association, these are simply observations from a large real-world data set without statistical adjustment. We can describe the process of care and outcomes for people with communication impairments but we cannot say whether these are associated with their communication rather than with other factors, such as their premorbid condition or their stroke severity.

However this comprehensive population data of all stroke admissions has allowed us to extract some key facts about the prevalence of aphasia and dysarthria, how this population presents, what speech and language therapy they receive and their outcomes on discharge. This data analysis can guide research direction, clinical management and service delivery to continue to be responsive to individual patient care when considering the broader presentation of those affected by communication impairment.

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