

Clinical neurology: patients' laterality audit

Abstract

Background: Clinicians dealing with neurology consults may overlook inquiring patients' laterality i.e. handedness/ footedness. In this audit, we looked at the proportion of compliant vs. non-compliant clinicians at different levels.

Methods: We retrospectively collected data from patient records, files and clinical letters as well as double blindly observed physicians. This totaled to 186 patients with a mean age of 60.4 ± 19.2 (\pm SD), range 16-99 years, and a male to female ratio of 0.74. Data was collected from patients with various neurologic disorders.

Results: We found an overall 33.9% of compliant clinicians inquiring laterality including Neurologists: 43.7%, Stroke Consultants: 3.1%, Registrar's: 48.7%, Neurosurgeons: 50.0% and Specialist Trainee's: 37.5%.

Conclusions: In essence the results lead to the question which asks why compliance percentages are low. Is it because we are unaware of the relation between laterality and hemispheric dominance or have we simply disregarded this detail during consultations.

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Background & rationale

Most people tend to have left hemispheric dominance for speech,¹ as the left side of the brain controls the right side of the body supported by the overall higher proportion of right handers to left handers.² However studies have shown that some left handed neurologic patients may have bilateral hemispheric control or solely right hemispheric control of speech.³ Hence, due to the relationship between handedness and language lateralization,¹ it is essential doctors ask neurologic patients of their handedness in order to predict which side of the brain is more likely dominant for speech. We also observed whether patient's were asked if they were forced to become right handed or was it natural, as some studies show that the proportion of left handers may be less due to forced dexterity.^{4,5} Some studies have also shown that footedness might actually be preferred over handedness in determining lateralization especially in left handed people.⁶ This audit was carried out in order to test a potential shortfall of inquiring patients' laterality during neurology consults. It was developed in order to find out the proportion of doctors asking patients of their laterality i.e. handedness and/or footedness i.e. right or left.

Using such predictors of language lateralization may also help in predicting the degree of anomia due to neurologic insults in the speech dominant hemisphere.⁷

Aims & objectives

- To determine the proportion of healthcare professionals that ask neurologic patients' laterality.
- To analyse whether these healthcare professionals are inquiring of forced dexterity.
- To integrate findings of this audit in a conclusion based manner to promote improvement to the quality of neurologic history taking.
- To form significant grounds for a re-audit and improvement in findings

Standards & evidence base

The National Institute for Neurological Disorders and Stroke and the Canadian Stroke Network convened researchers in clinical diagnosis,

epidemiology, neuropsychology, brain imaging, neuropathology, experimental models, biomarkers, genetics, and clinical trials to recommend minimum, common, clinical and research standards for the description and study of vascular cognitive impairment which included handedness.⁸

An evidence based article from the American Academy of Neurology (AAN) showed that 96% of right-handed subjects showed functional MRI changes lateralized to the left hemisphere, whereas 4% showed a bilateral activation pattern. In contrast, left-hemisphere lateralization occurred in 76% of left-handers, bilateral activation in 14%, and right-hemisphere lateralization in the remaining 10%.³ This clearly suggests that handedness and language lateralization are interlinked.

Another article from the AAN states that in epilepsy patients with a left-sided seizure focus, language lateralization is correlated to handedness. The increased frequency of left-handedness and associated atypical language lateralization is most likely related to the left-hemispheric seizure focus, influencing hemispheric specialization for both domains.⁹

Methods

Audit type

This local clinical audit was an indicator and evidence based study.

Sample

A total of 186 patients were selected over a period of 2 weeks from the 8th-22nd of February, 2016. Selective sampling was used based on the criteria below;

Inclusion Criteria

- Patient ages from 16-99 years
- Patients with neurologic conditions
- New/Follow up outpatients in Neurology clinics
- Inpatients in Neurology and Stroke wards
- Patients with QEHB (Queen Elizabeth Hospital Birmingham) records
- Patients seen as neurology consults

Exclusion Criteria

- i. Patients younger than 16 or older than 99 years
- ii. Patients with no history of neurologic conditions, signs or symptoms
- iii. Patients with no record of a Neurology or Stroke service clinical letter
- iv. Any patients from outside QEHB
- v. Data collection tool

The audit was undertaken using a simple audit tool, which consisted of the following details:

- i. Ward/Clinic:
- ii. New/Follow up:
- iii. Patient MRN:
- iv. Patient gender:
- v. Patient D.O.B:
- vi. Reason for admission/diagnoses:
- vii. Plan/Management:
- viii. Treatment (if applicable):
- ix. Handedness: Yes/No, Right/Left
- x. Footedness: Yes/No
- xi. Natural/Forced: N/F
- xii. Recorded in Notes: Yes/No
- xiii. Doctor designation:
- xiv. Doctor initials:
- xv. Admitted under:

Pilot

An audit tool pilot was tested with 9 patients to make sure all data necessary was collected. This was done in a neurology clinic collecting double blinded data and observing the consultation. The pilot helped adjust and make changes to the audit tool, and a finalized version was used for the remaining of the audit.

Data source

The data utilized for the audit included patient files, health records, clinical letters via online internal clinical portal and observing healthcare professionals during consultation.

Data collection

The finalized audit tool approved by Clinical Audit Registration & Management System (CARMS) was used to collect data of 186 patients from the 3 main areas shown in the Table 1 below:

Data was collected by the project lead in wards and clinics. This was a retrospective audit looking at health records and clinical letters of patients uploaded on clinical portal and patient hardcopy files present on related wards. All relevant clinical letters and records were scanned through to find any evidence of handedness and/or footedness being recorded as well as forced dextrality. When collecting data during observation in clinics, the doctor's notes were read thoroughly.

Retrospective analysis of outpatient clinic visits from the 1st-22nd of February were also looked at using the online clinical portal.

Table 1 Locations of Data collection

#	Location of Selection	Number Out of Total (n=186)	Percentage of Total (1 d.p)
1.	Neurology outpatient clinic (including neuromuscular, neurorehabilitation, Parkinson's, epilepsy and movement disorder clinics)	85	45.7%
2.	Neurology inpatient ward	37	19.9%
3.	Stroke Unit/Service inpatient ward	64	34.4%

All data was validated using the clinical portal and any relevant neurologic clinical letters for mention of handedness or footedness were double checked. Patient sensitive data such as patient name or address were not taken into record. Patient MRN's were recorded for data validation, however these were used internally within the NHS, the data was hidden after it served its purpose. Patient genders were recorded in order to derive statistics and ratios of patients included within the audit. Patient ages were calculated using their date of births. Names of clinicians were not recorded, however initials were recorded to support data validation. Patients were not interviewed for data collection and clinicians under observation were blinded to the audit to avoid skewed results, thus making this a double blinded audit since both clinicians and patients were unaware.

Data analysis

Data collected each day was then input into an MS excel spreadsheet which used the same titles as the audit tool. A key system was created to help identify results more easily, any cells with Yes were coloured green, whereas cells with No were coloured red. Right or left was entered in green cells for handedness. Formulas such as =COUNTIF(S), =MAX, =MIN, =AVG were used to derive simple statistics in order to help analyse data more efficiently. =DATEDIF was used to calculate ages using patients' date of births, this was necessary in order to comply with inclusion and exclusion criteria and to calculate an average age towards the end of data collection.

Caveat

Factors affecting or skewing the results include:

- i. Not all follow up patients in clinic were entered for data collection in order to maintain a balanced new to follow up patients ratio, however all new patients were included.
- ii. Not all 36 beds in neurology and stroke service wards were occupied at some points during data collection, however all available inpatients were included in the audit as well as retrospective cases.
- iii. Some neurosurgery patients were admitted to the neurology ward which were included as they had underlying neurologic disorders as well.

Results & analysis

Findings

186 cases were identified for inclusion in the audit of laterality thus n=186. More studies and research need to be carried out in order to fully prove a direct link between handedness and lateralization. The initial theory was established by Paul Broca during the 19th century

that a person's handedness was contralateral to its corresponding language specialized cerebral hemisphere. Since then, several studies and researches have shown a correlation between handedness and lateralization of the brain, thus providing solid evidence based standards to include in a full clinical neurology history.^{6,10-13}

Standard: All patients seen by a clinician dealing with neurologic consults especially Stroke patients should be asked of their handedness and footedness as predictors for language lateralization and cerebral hemispheric dominance. This also complies with the standards set by the National Institute for Neurological Disorders and Stroke (NINDS) and the Canadian Stroke Network (CSN).⁸

Exceptions: None until proven otherwise (Table 2)

Table 2 Legend: 1= handedness, 2= footedness, 3= recorded in notes, 4= forced dexterity, P=compliance, O=non-compliance

Code	Compliance	Percentages (I d.p)
1	P	63/186 (33.9%) patients were asked by clinicians of their handedness
2	O	0/186 (0%) patients were asked by clinicians of their footedness
3	P	61/186 (32.8%) patients had recorded notes of handedness
4	O	0/186 (0%) patients were asked of forced dexterity
1	O	123/186 (66.1%) patients were not asked of handedness
2	O	186/186 (100.0%) patients were not asked of footedness
3	O	125/186 (67.2%) patients had no record of handedness
4	O	186/186 (100%) patients were not asked of forced dexterity

Patient type

Keeping in mind n= 186

The following were the type of patients included within the audit:

- i. 61/n were follow up i.e. 32.8%
- ii. 24/n were new i.e. 12.9%
- iii. 101/n were inpatients at i.e. 54.3%

Clinician distribution

The pie chart below shows the distribution of clinicians who dealt with neurology consults. It shows the number of clinicians out of n=186 and percentages (Figure 1).

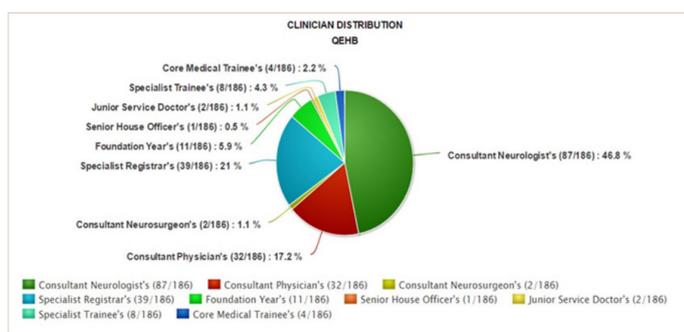


Figure 1 Clinician Distribution.

Observations

n=186 showed statistics of 79/186 (42.5%) male patients and 107/186 (57.5%) female patients with a mean age of 60.4 ± 19.2 (±SD) years and a range of 16-99 y/o (83).

Patients selected from the 3 mentioned areas had a wide range of neurologic illnesses falling under the main categories of neurologic conditions categorized by NICE i.e. Stroke, brain cancers, epilepsy, cerebral palsy, delirium, dementia, epilepsy, faecal and/or urinary incontinence, headaches, metastatic spinal cord compression, motor neuron disease, multiple sclerosis, neuropathic pain, Parkinson's, spasticity, spinal conditions, transient loss of consciousness movement disorders etc.

Of the 63 patients who were asked of their handedness the following observations were made:

- i. 59/63 (93.7%) were right handers
- ii. 4/63 (6.3%) were left handers (Figure 2).

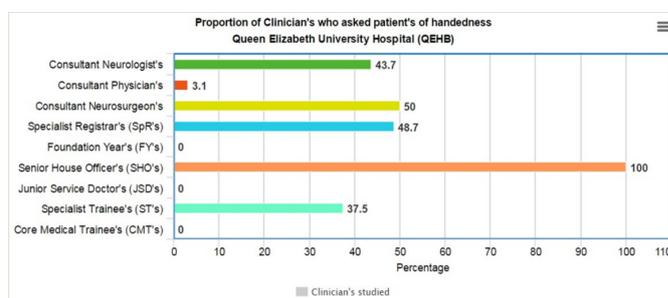


Figure 2 Proportion of Compliant Clinician's.

0% of the above clinicians asked of footedness and forced dexterity hence no graphs were drawn.

Discussion & conclusion

Figure 2 shows that Senior House Officers were the most compliant, however deems insignificant when compared amongst clinician distribution as only 0.5% of clinician distribution was of SHO's, which is a small sample to base conclusions on. In regards to Stroke Consultants (Consultant Physician's/Internists) only 3.1% adhered to inquiring patients' laterality, this is important as laterality is crucial for stroke patients. On the other hand, half of Consultant Neurosurgeon's were compliant, however again a larger sample of such will be needed in order to derive solid conclusions. The results also showed junior doctors i.e. FY's, JSD's and CMT's were non-compliant. As forced dexterity and footedness were both asked by 0% of physicians, no such observations were possible. Overall, inquiry of handedness was compliant by only 33.9% of clinicians, and the results showed similar findings relatable to our aims and objectives.

In conclusion, handedness/footedness are more important to ask among stroke and epilepsy patients, however there is no harm in doing so for all neurologic conditions.

Areas of good practice

- a. Almost 50% of SpR's were compliant in asking patients of their handedness
- b. Specialist Trainee's did almost as well as Specialist Registrar's
- c. 43.7% compliance of Consultant Neurologist's gives us a good base for re audit

Areas of improvement

- a. Non neurologists such as Consultant Physicians and internists should consider laterality a key aspect of neurology history taking
- b. Junior doctors such as FY's, JSD's and CMT's should be made aware that handedness and footedness should be asked during neurology history taking.
- c. Medical schools should further emphasize laterality when teaching students how to take a clinical neurologic history
- d. It would deem beneficial if clinicians dealing with stroke patients consider taking laterality into account during history taking based on these proportions.

Research Recommendations

- a. Further studies to prove if there is a direct link between laterality and language hemispheric dominance and whether or not asking patients of their laterality should be implemented in neurology guidelines
- b. Teach and involve junior doctors and medical students in research regarding why laterality is important and how it may be overlooked by many clinicians dealing with neurologic patients
- c. Re-audit using same plan and tool and notice if any change has been made in statistics and proportion of clinicians inquiring about laterality during neurology history taking.
- d. Add in more stroke patients to re audit sample to further dictate the proportion of internists inquiry of laterality.

Learning points

- a. Use a larger sample of patients with coverage of more new patients over a longer period of time
- b. Include a higher proportion of stroke patients to audit as language lateralization is most relevant to them.
- c. Include a higher proportion of epilepsy patients who proceed to pre surgical evaluation.

Acknowledgements & project team

Grades and roles of the team are as follow:

- i. Mr. Raheel Siddiqui, Final year medical student; the project lead and data collector
- ii. Dr. David Nicholl, Consultant Neurologist supervised the audit and informed colleagues during the Neurology grand round of its approval to make sure they were aware of data collection during ward rounds or clinics, no further details of the audit were provided except its beginning date.
- iii. Dr. Khurram A. Siddiqui, Consultant Neurologist, the corresponding author and editor
- iv. Dr. Mark Wilmot, Consultant Neurologist provided advice regarding procedures, approvals and applications along with time restraints and feasibility.

- v. Dr. Don Sims, Stroke Consultant and Head of Stroke Service, granted approval of the audit to be carried out on the Stroke service ward.
- vi. Mr. Alex Walton, Undergraduate office and the QEHB IT department provided login details to CARMS and clinical portal.

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None.

Conflicts of interest

None.

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