National Clinical & Integrated Care Programmes
Person-centred, co-ordinated care

STROKE

ROYAL COLLEGE OF PHYSICIANS OF IRELAND

National Stroke Register Report 2018

National Stroke Programme
July 2019

Document Reference Number – CSP040/2019

Executive Summary

Introduction

The 2018 National Stroke Register Annual Report is the seventh report since its inception in 2012 and it continues to reflect the increased commitment to data collection and reporting. The data used for this analysis is based on the national HIPE data and additional clinical data inputted onto the stroke portal by individual hospitals' stroke services. We remain thankful for the on-going support of the Clinical Nurse Specialists and Advanced Nurse Practitioners who continue to co-ordinate and input the data collection on stroke patients. The National Stroke Register (NSR) remains under the governance of the National Stroke Register Steering Group, however, it will be taken over by the National Office for Clinical Audit (NOCA) in 2019. NOCA was established in 2012 to create sustainable clinical audit programmes at national level. NOCA enables those who manage and deliver healthcare to improve the quality of care through national clinical audit. NOCA is funded by the Health Service Executive Quality Improvement Division, governed by an independent voluntary board and operationally supported by the Royal College of Surgeons in Ireland. The NSR, once within NOCA, will be named the Irish National Audit of Stroke (INAS) and will come under a new cardiovascular audit programme. This programme has appointed Ms Joan McCormack as the dedicated audit manager and Professor. Joe Harbison as the specific clinical lead for stroke and I wish them every success in their new roles.

Results

This report of the national stroke register will be the last in its' current format. The report presents an analysis of all cases that were discharged from acute public hospitals between January 1st and December 31st 2018 with a principal diagnosis of Intracerebral Haemorrhage (i61) or Cerebral Infarction (i63, i64) that have additional stroke register data recorded in >80% of cases.

Within the acute public hospitals, 18 met this criterion. In those hospitals, a total of 4817 cases were uploaded onto the stroke register, of these 3602 were coded with a principal diagnosis of Intracerebral Haemorrhage (i61) or Cerebral Infarction (i63, i64). As this report is based on primary diagnosis cases only, the sample size obtained for analysis is 3,602 which is similar to 2016 and 2017. As in previous reports there remains concerns around the completeness of the data and this is reflected in the reduced cohort for analysis in some areas e.g. onset times and medical review times.

Demographics

The demographic data reported is consistent by and large with that found in the 2015 Irish Heart foundation / HSE National Stroke Audit (McElwaine et al 2015) with approximately 75% of strokes occurring in over 65s. The proportion of strokes occurring in men of traditional working age remained at 28%.

	2015	2018
Median time of symptom onset to hospital arrival	2hrs 30mins	2hrs 55mins

Data recorded on time of onset suggests high levels of 'wake-up' or unwitnessed stroke with time of onset recorded as 'unknown' in 48% of cases. The date and time of stroke onset was only recorded in 49% of cases therefore caution is advised when reviewing onset to admission results. The median time of symptom onset to hospital arrival has increased by 25 minutes since 2015 and in nine hospitals the median time to hospital was >3hrs, including four Model 4 hospitals. This would support the need for increased public awareness campaigns such as the FAST campaign. The UK SSNAP 2018 report a median time to hospital arrival of 3hrs 04 mins (IQR 1:34-9:29) slightly above Irish results of 2hrs 55mins (IQR 1:29-08:06).

Acute Stroke Treatment

Hospital arrival date and time was available in 87% of cases. In terms of delivery of acute treatment, 71% of patients were seen by the stroke team within 3hrs of admission an increase from 54% in 2016.

Median door to imaging times in 2018 have reduced by 30mins to 1hr 25mins, from 1hr 55mins in 2017.

Data on thrombolysis was available in 97% of ischaemic stroke (i63, i64) cases treated. Thrombolysis was administered in 11.2 % of cases of cerebral infarction in this stroke population comparable to the UK report an 11.5% thrombolysis rate. Median 'door to needle' times are now under an hour for the first time ever at 58mins, reduced from 71mins in 2017.

	2015	2018
Door to medical review	2hrs 36mins	34mins
Door to Imaging	2hrs 13 mins	1hr 25mins
Door to thrombolysis	1hr 3mins	58mins

The significant reduction in all three acute stroke processes are a direct result of the quality improvement projects undertaken by 20 hospitals through the RCPI Stroke QI Collaborative and all teams are to be congratulated.

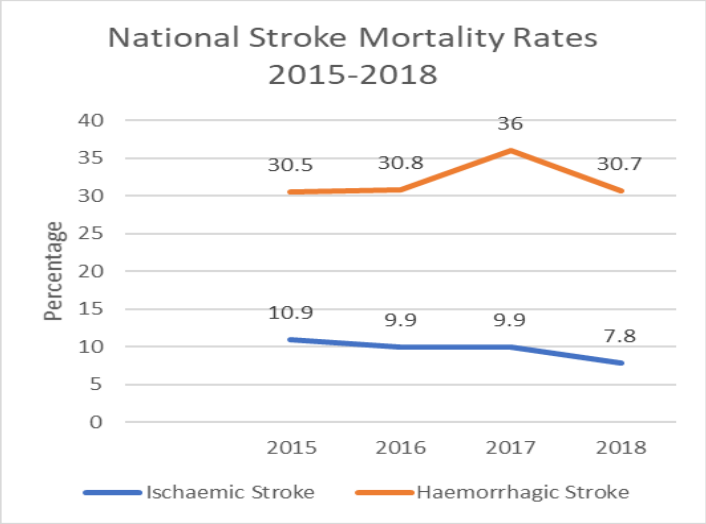
Data on antithrombotic therapy and atrial fibrillation (AF) is reported in 91% of cases. Of those with known AF 80% were on anticoagulation pre-stroke, an increase from 53% in 2017. On discharge, inclusive of pre-existing and new diagnosis AF, 93% of patients were anticoagulated. There appears to be a strong preference for non-vitamin K antagonist oral anticoagulants (NOACs) in line with European Cardiac Society and European Stroke Organisation recommendations.

71 % of patients were admitted to an acute stroke unit and spent a median of 7 days in a stroke unit. Data on stroke severity and intensity of rehabilitation is not captured so comparisons about stroke unit length of stay cannot be made. However, data suggests the quality of care in stroke units is higher than on general wards and again it is demonstrated that patients are more likely to have a swallow screen and a mood screen compared to those who do not access stroke unit care.

This report for the first time presents the Health and Social Care Professional data which reports on >1400 cases from 16 hospitals. This is a work in progress, and we are sure that the practice of reporting stroke specific HSCP data within INAS will become increasingly embedded in practice and a benchmark by which to monitor quality of provision of care.

Outcomes

The Modified Rankin Score (MRS) continues to be increasingly recorded with 71% of cases now having data on pre-stroke and discharge MRS inputted.



Challenges remain in our definition of mortality when comparing to other European figures where 30-day mortality or standardised mortality ratios are often used. In-hospital mortality, in this sample, without a standardised mortality ratio is 11.6%, reduced from 14.2% in 2017. When mortality is reported by stroke type, ischaemic stroke mortality is 7.9% and haemorrhagic stroke is 32.7%. This is comparable to the official HIPE data to be reported shortly in the 2018 National Audit of Hospital Mortality (NAHM).

The accuracy of the data related to discharge to nursing home remains a concern. An analysis of HIPE discharge destination to nursing home (16.1%) compared to the discharge destination recorded in the stroke portal (8.7%) is conflictual and can be explained to some extent by discharge to non-acute rehabilitation hospitals incorrectly categorised as nursing homes within the HIPE system. The NSP will continue to work with the Health Pricing Office in this matter.

Recommendations

- This registry report highlights that patient presentation times to hospital after symptom onset remain poor and the need for a sustained public health campaign on stroke. It also highlights the high proportion of 'wake-up' strokes and need for appropriate neuroimaging of all such patients to ensure they are not denied evidence based and disability-saving thrombectomy treatment, which is no longer based solely on time but rather on favourable neuro-imaging.
- The 'door to CT' and 'door to needle' times have improved significantly, though maintaining and improving times in this area to support rapid access to acute stroke treatment will be an on-going challenge requiring ongoing Quality Improvement (QI) focus in hospitals.
- Thrombolysis rates remain low in some hospitals although this is also impacted by delayed presentations.
- Admission rates to an acute stroke unit are inadequate against a national target of 90% and highlights the need for both a stroke unit capacity review and a stroke unit accreditation process.
- Overall the data coverage of the national register continues to improve but work remains to ensure a more complete capture particularly from large centres missing in this report, and to understand the gap between registry and HIPE stroke case finding. In this regard both the definition of stroke and stroke mortality need universal agreement.
- The 2018 data has shown significant improvement in ischaemic stroke mortality and in process improvements and highlights the medical challenge around intracerebral haemorrhage.
- It is essential that as we transfer to NOCA that all stroke teams work with NOCA to ensure it becomes a sustainable professional audit responsive to the data needs of individual stroke services and the country, to monitor trends, highlight service needs, effect change and allow for international comparison

Ronan Collins, Clinical Lead, National Stroke Programme

Joan McCormack, Programme Manager, National Stroke Programme **Sept 2019**

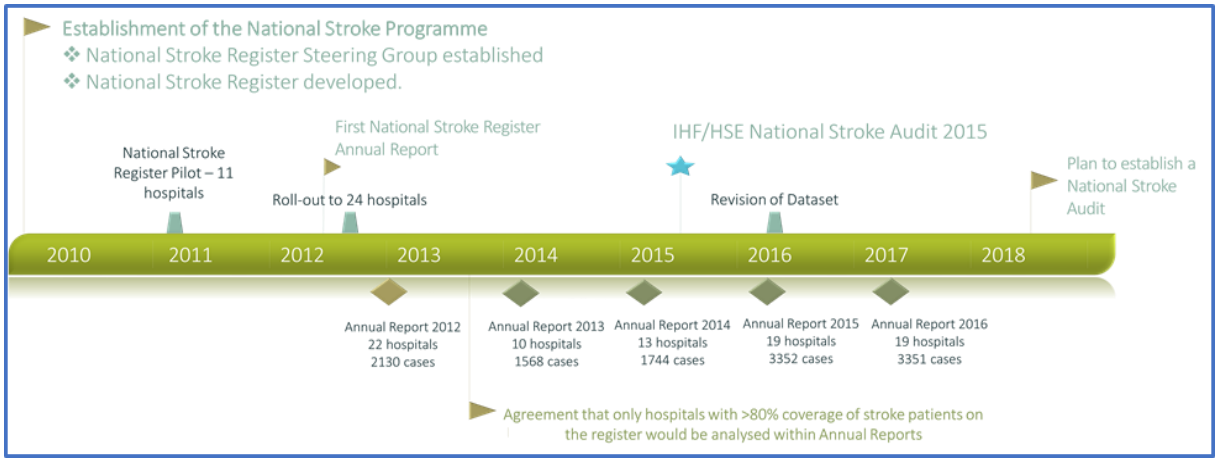
Contents

Introduction

The National Clinical Programme for Stroke was launched in 2010 and included nine different work streams, one of which was the development of a National Stroke Register. The National Stroke Register (NSR) was developed in partnership with the Health, Research and Information Division at the Economic and Social Research Institute (ESRI)[1]. The NSR is considered a fundamental component of integrated stroke services being developed by the National Stroke Programme. It is essential to measure the effect of the implementation of the National Stroke Programme, in addition to providing data for planning and estimation of resource requirements for stroke services, evaluation and clinical audits, and hospital accreditation. The NSR was developed and is governed by a Steering Group derived from the project team, together with expert input from the Healthcare Pricing Office, clinical practitioners, coding managers and the Irish Heart Foundation Council on Stroke (Appendix 1). In 2019, the NSR will transfer governance to the National Office of Clinical Audit (NOCA) and will be named the Irish National Audit of Stroke (INAS).

The NSR was developed within the existing HIPE data collection system. The Healthcare Pricing Office provides an 'add-on screen' to HIPE where the stroke team enters the data (Appendix 2) while the patient is still in hospital. This is merged automatically with the HIPE discharge record to provide enhanced information on the hospital care of the stroke patient.

Hospitals commenced participation in the NSR on a phased basis, with 24 hospitals currently participating out of the 27 that were provided with access to the Stroke Register. It is noted that some hospitals are not yet entering data on all acute stroke patients although this is improving over time.



[1] From January 1st 2014 the National Casemix Programme and the Health Research & Information Division at the ESRI became the Healthcare Pricing Office (HPO

Method

Coverage is the term used to describe the proportion of stroke patients discharged from a hospital with an ICD 10 code of i61, i63 or i64 that have additional data inputted onto the National Stroke Register. Table 1. Identifies all HIPE cases that were discharged from acute public hospitals between January 1st and December 31st, 2018 and the cases with additional stroke register data. This report presents an analysis of all National Stroke Register cases that were discharged from acute public hospitals between January 1st and December 31st 2018, with >80% coverage.

TABLE 1. 2018 HIPE I61, I63, I64 CASES WITH ADDITIONAL NSR DATA.

Hospital	HIPE i61, i63, i64 cases	HIPE cases with additional stroke register data	Coverage
Our Lady of Lourdes Hospital Drogheda	217	217	100
Cavan General Hospital	151	151	100
Beaumont Hospital	578	576	99.7
Bantry University Hospital	82	80	97.6
Letterkenny University Hospital	163	158	96.9
St Lukes's Hospital Kilkenny	126	121	96
University Hospital Waterford	139	132	95
Mayo University Hospital	162	153	94.4
St James's Hospital	264	240	90.9
Tallaght University Hospital	266	241	90.6
Connolly Hospital	168	152	90.5
Galway University Hospital	304	273	89.8
Cork University Hospital	527	469	89
Portiuncula University Hospital	75	64	85.3
St Vincent's University Hospital	428	358	83.6
Mercy University Hospital	95	80	84.2
Our Lady's Hospital Navan	81	66	81.5
Naas General Hospital	203	164	80.8
Wexford General Hospital	160	124	77.5
Midland Regional Hospital Mullingar	126	93	73.8
Mater Misercordiae University Hospital	382	262	68.6
University Hospital Limerick	366	211	57.7
South Tipperary Hospital Clonmel	112	65	58
Sligo University Hospital	143	82	57.3
Kerry University Hospital	194	87	44.8

Analysis is based on the aggregate data of these 18 hospitals and measured against previous annual reports and comparative data from the UK SSNAP 2017/18 results. For the purposes of this annual report, as was the case for the all previous reports data are presented on Intracerebral Haemorrhage and Cerebral Infarction patients, based on the cohort of patients that have been added to the NSR and have been assigned a principal diagnosis in HIPE of Intracerebral Haemorrhage (ICD-10 I61) or Cerebral Infarction (ICD-10 I63), table 2.

Hospital Name	Total cases recorded on stroke register	Total cases on register with i61/i63/i64 as PDx
Bantry University Hospital	102	82
Beaumont Hospital*	602	481
Cavan General Hospital	193	151
Connolly Hospital	204	152
Cork University Hospital	547	469
Our Lady of Lourdes Drogheda	239	217
University Hospital Galway**	469	273
St James's Hospital**	413	240
St Luke's Hospital Kilkenny	150	121
University Hospital Letterkenny**	339	158
University Hospital Mayo	191	153
Mercy University Hospital	112	80
Naas General Hospial	194	164
Our Lady's Hospital Navan	88	66
University Hospital Portiuncula	66	64
St Vincent's University Hospital	438	358
Tallaght University Hospital	299	241
University Hospital Waterford	171	132
Totals	**4817**	**3602**

If the aggregate data from these 18 hospitals is used for any comparison by individual hospitals it is important that stroke teams:

- *Compare like with like by only analyzing cases with a principal diagnosis of Intracerebral Haemorrhage (ICD-10 I61) or Cerebral Infarction (ICD-10 I63. I64)*
- *Consider the implications of differences between national and local demographic profiles*

TABLE 2. 2017 NSR DATA I61, I63, I64 CASES

**Beaumont Hospital data excludes cases discharged from radiology*

*** Large disparities between totals on register and HIPE are due to additional cases added by HSCPs.*

For the time period in question, there were 4, 951 discharges recorded in the National Stroke Register across the 18 hospitals. However, not all the 4,951 cases recorded on the National Stroke Register were ultimately assigned a principal diagnosis of Intracerebral Haemorrhage or Cerebral Infarction in HIPE. When cases coded as TIA or recorded as in-patient strokes are excluded it is found that 10.9% of cases recorded on the stroke register did not have a primary diagnosis of stroke (figure 1). The i64 Cerebral Infarction Undifferentiated was recorded in 114 (4%) of cases.

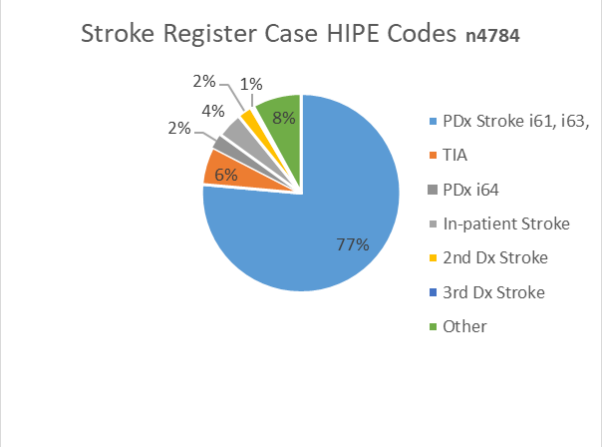


FIGURE 1. STROKE REGISTER CASE

Results

In this report the data are presented in table and chart format along with a brief commentary. The analysis is broken down into several sections:

- Demographics
- Admission/discharge data
- Acute Stroke Interventions
- Stroke Unit Care
- Outcome & Mortality
- Health and Social Care Professional Dataset

1. Demographics

As in all previous reports, over half, 57 % of all stroke cases coded as ICD-10 I61, I63 or I64 in the 18 hospitals in 2018 were male (table 3). This is similar to the gender breakdown when compared to the Irish Heart Foundation/HSE National Stroke Audit 2015 where males accounted for 57% of stroke cases (McElwaine et al, 2015). This figure was 52% in the Irish National Audit of Stroke Care in 2008 (Horgan et al, 2008).

TABLE 3: GENDER (N=3,602)

	N	%
Male	2068	57
Female	1534	43

There remain some differences in age profile by gender (table 4). The Irish National Audit of Stroke Care 2008 found the mean age of stroke onset to be 72 years for males and 78 years female (Horgan et al, 2008), in 2018 NSR the mean age for female stroke is now 3.5yrs younger (74.5yrs) and for males 2yrs younger (70.1), though the methodology used was slightly different .

	<65yrs	65-79yrs	80+yrs	Mean
Male	28.5	46.2	25.3	70.1
Female	18.1	38.3	43.7	74.5

TABLE 4: AGE PROFILE (%) (N=3,602)

FIGURE 2: AGE PROFILE

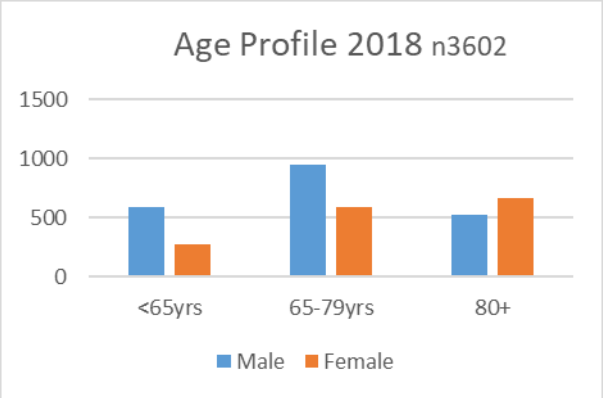
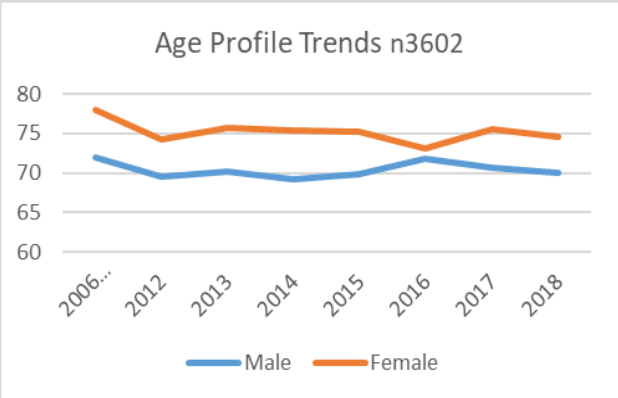


FIGURE 3: MEAN AGE OF PATIENTS BY GENDER 2012-2018



Using data from the 2012 to 2018 the trend in mean age by gender is shown in (Figure 3). While most strokes occur in those aged 65 years and over, 28.5% of male strokes occur in traditional working age an increase from 26% in 2016 (figure 4).

FIGURE 4: MALE STROKES BY AGE GROUP 2012 TO 2018

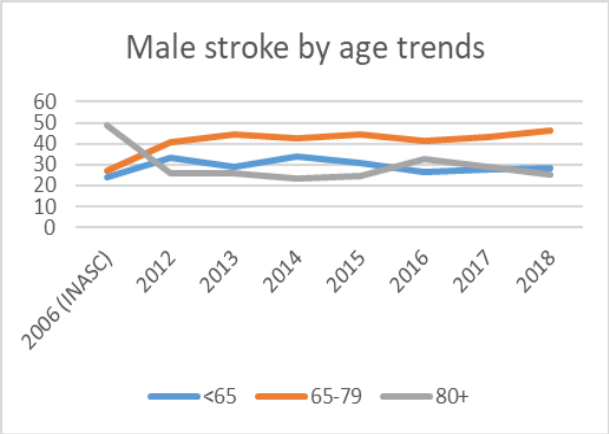
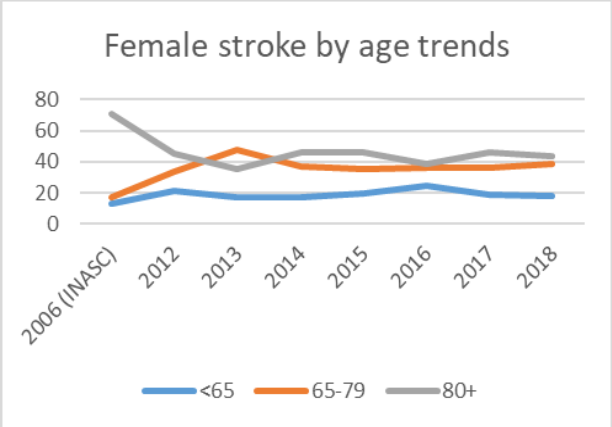


FIGURE 5. FEMALE STROKES BY AGE GROUP 2012 TO 2018



2. Admission/Discharge Data

HIPE records data on a number of variables relating to the admission and discharge of each patient, such as the type of admission (e.g. elective or emergency), admission source and discharge destination. The patient's length of stay is also collected, in addition to clinical codes recording what diagnoses were made during the hospital stay.

Admission Type

As expected, the vast majority (98%) of stroke cases registered were classified as emergency admissions (table 5).

TABLE 5: ADMISSION TYPE OF STROKE REGISTER CASES (N=3,602)

	N	%
Emergency	3521	98
Elective	40	1
Emergency readmission	19	0.5
Elective readmission	21	0.5

Analysing admission source without any other morbidity or stroke severity data does not inform to any great extent. However, it does provide useful information when analysed in conjunction with discharge destination to provide data on outcomes for stroke patients. The admission source data for cases entered onto the National Stroke Register (table 6) shows that the majority of stroke patients (87.2%) are living at home prior to their stroke.

TABLE 6: ADMISSION SOURCE (N=3,602)

	N	%
Home	3,144	87.2
Acute hospital Transfers	312	8.7
Nursing home	125	3.5
Non-acute Hospital Transfers	11	0.3
Temporary place of residence	8	0.2
Other	2	0.1

In 2016, an anomaly was identified in the coding of patients going to nursing homes and to external rehabilitation facilities. Table 7 outlines the discharge destination of cases as coded by HIPE and also the discharge destination as recorded within the NSR. The comparative data suggests that there is variance in how cases are coded particularly when discharged to nursing home and/or rehabilitation facilities. The National Stroke Programme is working with the Health Pricing Office to correct this anomaly. At present, the discharge to nursing home data should be viewed with caution as it is probable that it is a lower rate than the 16.1% recorded in HIPE.

TABLE 7: DISCHARGE DESTINATION

	HIPE n=3602		Stroke Register n=3397 (205 missing)	
	N	%	N	%
Home	1945	54	1961	57.7
Nursing home	581	16.1	295	8.7
Died	418	11.6	412	12.1
Transfer to acute hospital – Non-emergency	428	11.9	121	3.6
Emergency hospital transfer	100	2.8	149	4.4
Transfer to external rehab – non-HIPE facility	93	2.6	410	12.1
Transfer to non-acute hospital	11	0.3		
Other			49	1.4
Hospice	5	0.1		
Temporary Residence	5	0.1		
Self-discharge	14	0.4		
Absconded				
Transfer to Psychiatric Hospital	2	0.1		

Stroke Onset and Admission

While HIPE records date of admission to hospital, time of admission is not recorded. Stroke teams are asked to enter hospital arrival date and hospital arrival time. This can then be used to calculate delays to hospital arrival from stroke onset in hours and minutes, which is more appropriate for stroke care when "Time is Brain".

However, both the date and time for stroke onset and hospital arrival must be known and recorded in order to calculate accurately the delay between stroke onset and hospital arrival. In 2018, this data is available in 48.5% (1747) of cases.

This analysis excludes cases of stroke occurring in in-patients admitted for other reasons.

Table 8 below outlines the median time from stroke symptom onset to hospital arrival but note the reduced cohort available for this analysis, signifying a large proportion of unknown, incorrect and/or missing dates/times. For those cases that had times available, 59.3% arrived at hospital within four hours of symptom onset and 80.7% within 12 hours (table 9). The Irish Heart Foundation/HSE National Stroke Audit reported that 56% of patients arrived at hospital within 3 hours (McElwaine et al, 2015).

TABLE 8: TIME FROM STROKE SYMPTOM ONSET TO HOSPITAL ARRIVAL N=1747

	Median (IQR)*
Time (hh:mm)	2:55 (1:29-8:06)

*IQR = interquartile range, time by which 25% and 75% of patients arrived

The most recent clinical audit report from SSNAP states that the median time from onset to hospital arrival in SSNAP was 3 hours and 4 minutes (IQR 1:34-9:29) (Royal College of Physicians 2017/18).

TABLE 9: DISTRIBUTION OF TIME FROM STROKE SYMPTOM ONSET TO HOSPITAL ARRIVAL (N=1,747)

	< 2.5 hours	< 3 hours	< 4 hours	<12 hours
Time (%)	44.3%	51%	59.3%	80.7%

Table 10 indicates a wide variation of onset to hospital arrival times. In 2017, there was a trend towards delayed hospital arrival in rural hospitals, in 2018 four Model 4 hospitals have arrival times >3hrs.

TABLE 10. TIME FROM STROKE SYMPTOM ONSET TO HOSPITAL ARRIVAL BY HOSPITAL

Onset to Hospital Arrival	Median	IQR	
Our Lady's Hospital Navan	01:12	00:54	02:34
St Luke's Hospital Kilkenny	02:05	01:37	07:28
St Vincent's University Hospital	02:05	01:15	03:50
Cavan General Hospital	02:08	01:32	02:51
Naas General Hospital	02:15	01:28	04:23
Mayo University Hospital	02:36	01:38	10:13
Tallaght University Hospital	02:36	01:22	05:59
Letterkenny University Hospital	02:37	01:28	05:20
St James's Hospital	02:38	01:11	07:53
National	**02:55**	**01:29**	**08:06**
Our Lady of Lourdes Hospital Drogheda	03:01	01:17	11:04
Mercy University Hospital	03:17	01:28	13:53
Cork University Hospital	03:17	01:43	09:15
Galway University Hospital	03:24	01:53	14:36
University Hospital Waterford	03:39	01:37	07:44
Portiuncula	03:42	02:25	09:00
Beaumont	03:56	01:30	08:03
Connolly	04:58	01:45	03:03
Bantry	05:00	02:31	00:55

Hospital Length of Stay

Table 12 outlines the overall length of stay for stroke patients recorded on the stroke register. Hospital length of stay can be related to the age of the patients and table 13 highlights the hospital length of stay by age group. As expected, older patients have longer lengths of stay. The overall median length of stay of stroke patients recorded on the stroke register remains at 9 days.

	Median (IQR)	Mean (±SD)
Length of stay	9 (5 – 19)	18.2 (±28.4)

TABLE 12: HOSPITAL LENGTH OF STAY (DAYS, N=3,481)

TABLE 13: HOSPITAL LENGTH OF STAY (DAYS) BY AGE GROUP (N=3,281)

	< 65 Years	65 – 79 Years	80+ Years
Median (IQR)	7 (4 – 14)	9 (4 – 19)	11 (9-24)
Mean (±SD)	15.1 (±26.3)	18.3 (± 31.1)	20.3 (±25.9)

3. Acute Stroke Interventions

Assessment by Stroke Team

Timely emergency department (ED) evaluation and stroke team assessment is paramount in review of all stroke patients but in particular regarding the potential time sensitive treatments of ischaemic stroke with thrombolysis and thrombectomy. Guidance from the American Heart Association/American Stroke Association advises that ED patients with suspected acute stroke should be triaged with the same priority as acute myocardial infarction or serious trauma, regardless of the severity of neurological deficits (Jauch et al, 2013). Figure 7 shows that where data was available, 71.4% of stroke patients were seen by the stroke team within 3hrs of admission. This is up from 54% in 2016.

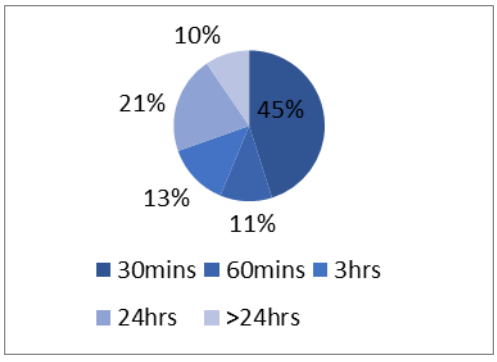
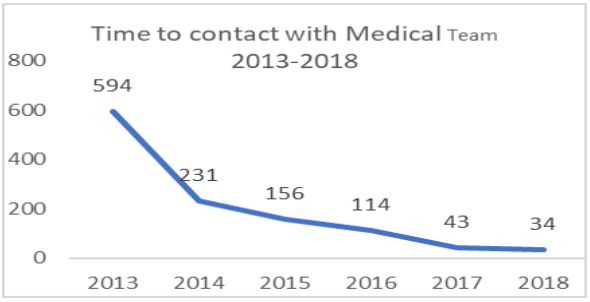


FIGURE 7. TIME SEEN BY STROKE TEAM N=2101

Within the National Stroke Register, stroke teams are asked to document the date and time of hospital arrival and also the date and time that the patient was seen by the stroke team. This enables calculation of the delay to review by the stroke team. However, the reduced cohort available for this analysis (2,101) must be noted, signifying a large portion of missing dates/times.



Quality Improvement initiatives taken by hospitals to improve 'Door to Decision' times in 2017 and 2018 are evident in all key time points. The median time to contact with the medical team after admission was 34 minutes reduced again from 43 minutes in 2017, fig 8.

FIGURE 8. NUMBER OF MINUTES TO BE SEEN BY MEDICAL TEAM 2013 - 2018.

Brain Scanning (CT or MRI)

Data in relation to CT or MRI brain scanning was available for 94% (3,395) patients, this includes the patients who had a stroke as an inpatient. In total, 95% of patients had a CT or MRI scan after their stroke in their hospital of admission with a further 4.5% of patients having a CT or MRI scan performed pre-admission or in a previous hospital in cases of hospital transfer (Table 14).

TABLE 14: BRAIN CT OR MRI PERFORMED N=3395, (MISSING DATA = 207)

	N	%
Yes	3236	95.3
No	5	0.1
Performed pre admission/hospital transfer	153	4.5
Unknown	1	0.03

TABLE 15: DOOR TO IMAGING MEDIAN AND INTERQUARTILE RANGE BY HOSPITAL.

Door to Imaging	Median	IQR	
Cavan	00:40	00:39	01:02
Naas	00:45	00:23	02:59
GUH	00:51	00:20	03:52
Bantry	01:05	00:39	01:29
Beaumont	01:06	00:28	04:47
CUH	01:11	00:33	03:40
SJH	01:18	00:25	03:46
Navan	01:23	00:45	04:14
SVUH	01:24	00:38	03:48
National	**01:25**	**00:35**	**04:42**
Waterford	01:29	00:33	03:47
Kilkenny	01:34	00:45	11:37
TUH	01:36	00:42	04:22
Letterkenny	01:37	00:56	17:48
Drogheda	01:43	00:38	04:09
MUH	02:08	01:16	06:01
Connolly	03:19	00:57	17:44
Mayo	03:44	01:46	15:31
Portiuncula	04:01	02:18	17:27

Data in relation to the timeliness of imaging has always been important in order to ensure prompt decision to treat, however given recent advances in the acute phase of stroke it is even more important to become increase timeliness of access to imaging and treatment within each hospital.

Door to Imaging is another key time point within the National QI Stroke Collaborative. In 2017, the National median door to imaging was 1hr 55mins, reduced by 30mins in 2018 to 1hr 25mins. Table 15 indicates the 'Door to Imaging' times for each hospital. Improvements in this key time point has the potential to change processes to support the provision of thrombectomy.

- **Thrombolysis**

Administration of recombinant tissue plasminogen activator (tPA/thrombolysis) is a proven effective treatment for ischaemic stroke and should be administered as soon as possible after onset of symptoms and within the 4.5-hour licensing window in the absence of contraindications. In this analysis the denominator for the thrombolysis data is different from the rest of this report at 3,066 as it interrogates only i63 and i64 codes (ischaemic stroke).

TABLE 16. THROMBOLYSIS RATES N=2975 (91 MISSING).

IV Thrombolysis	N	%
Yes	334	11.2
No	816	27.4
Contraindicated	1825	61.4

Table 16 shows that for patients with a principal diagnosis of i63 or i64, the IV thrombolysis rate was 11.2% when unknown and missing/not recorded cases were removed. SSNAP reported a thrombolysis rate of 11.5% in their most recent report (Royal College of Physicians, 2017/18). Table 17 indicates the IV thrombolysis rates by hospital.

TABLE 17: PRINCIPAL DIAGNOSIS OF I63 OR I64 N=3066 AND THROMBOLYSIS RATES.

Thrombolysis Rates	I63/i64 Cases	I63/I64 cases with TPA Data	Number Thrombolysed	% Thrombolysed
National	3066	2975	334	11.2
Bantry	70	70	3	4.3
Beaumont	382	379	41	10.8
Cavan	135	134	11	8.2
Connolly*	129	127	6	4.7
CUH	402	399	55	13.8
Drogheda	184	184	20	10.9
GUH	240	227	28	12.3
SJH	211	202	28	13.9
Kilkenny	100	93	19	20.4
Letterkenny	142	137	18	13.1
Mayo	135	131	9	6.9
MUH	74	44	5	11.4
Naas	146	144	22	15.3
Navan	55	55	8	14.5
Portiuncula**	48	48		
SVUH	293	287	23	8.0
TUH	210	206	22	10.7
Waterford	110	110	16	14.5

*Monday-Friday Thrombolysis service ** By-pass for FAST +ve stroke

The 'Door to Needle' (DTN) time was available in 90% (297) cases. The median DTN time nationally was 58 minutes, down from 71 minutes in 2017. This is the first year that the National DTN is below

60 minutes. Ten hospitals have a median 'DTN' below 60 minutes. SSNAP UK reports a median door to needle time of 50mins (IQR 35 – 113).

TABLE 18. DOOR TO NEEDLE TIMES TO PATIENTS WHO RECEIVED THROMBOLYSIS N=278.

Door to Needle	Median	IQR	
Bantry	00:40	00:36	00:57
Naas	00:42	00:32	01:04
GUH	00:46	00:33	01:09
Kilkenny	00:50	00:37	01:18
CUH	00:51	00:30	01:11
MUH	00:51	00:50	01:51
Waterford	00:53	00:37	01:19
Beaumont	00:55	00:38	01:08
Connolly	00:55	00:43	01:03
TUH	00:57	00:37	01:22
National	**00:58**	**00:38**	**01:30**
SVUH	01:01	00:47	01:33
Drogheda	01:01	00:44	01:29
SJH	01:09	00:38	01:37
Letterkenny	01:17	00:46	01:36
Mayo	01:35	01:25	01:54
Cavan	01:38	01:30	02:22
Navan	01:43	01:21	02:00

- **Thrombectomy**

Thrombectomy in stroke is the mechanical removal of a blood clot within the large vessels of the cerebral circulation. Thrombectomy for acute stroke is provided by Beaumont Hospital on a 24-hour basis, 7 days a week. Additionally, Cork University Hospital provides an 8-8-hour service, 5 days a week for their surrounding network. Outside these hours, suitable patients may be transferred to Beaumont Hospital for treatment. Data on thrombectomy is collected in Beaumont Hospital and Cork University Hospital and recorded on the National Stroke Register. The National Thrombectomy Service produced an annual report in 2018 and provides further detailed analysis of the thrombectomy service.

In 2018, 250 cases were recorded as having had a thrombectomy on the National Stroke Register. These cases were referred from hospitals throughout the country including those not analysed in this report therefore thrombectomy rate is not reportable in this report. The rate of thrombectomy reported in the National Thrombectomy Service Annual Report 2018 is 6.6%.

- **Antithrombotic therapy**

91.1% (3280/3602) had data recorded on use of antithrombotic therapy. Figure 9 indicates the number of patients who were treated with antithrombotics. In 2018, 72.3% (2605/3602) were reported as treated with antithrombotics. Figure 10 shows that 83% (2161/2605) of cases were commenced on antithrombotics within 24hrs. These figures must be interpreted bearing in mind that 15% of cases are intracerebral bleeds and that there are multiple reasons that antithrombotics are contraindicated.

FIGURE 9. ANTITHROMBOTIC THERAPY N=3185

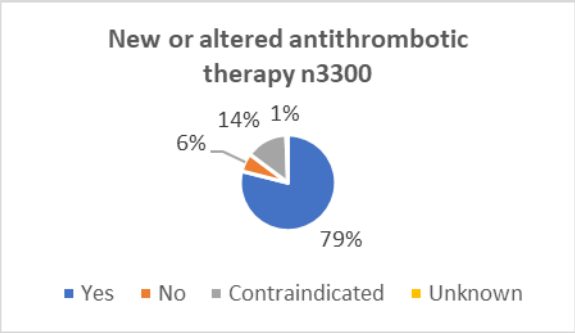
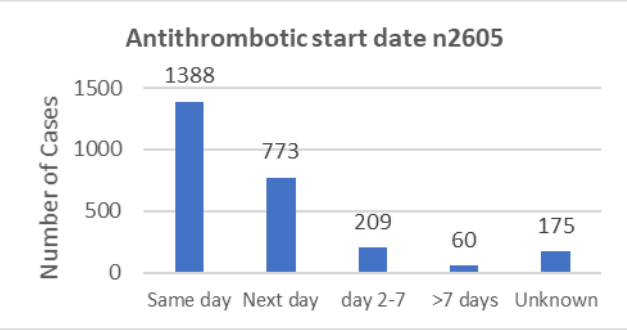


FIGURE 10. START TIMES FOR ANTITHROMBOTICS N=2605



Atrial Fibrillation

91% (3285/3602) had data recorded on atrial fibrillation (AF). 30% (995/3285) of cases were reported to have AF and 63% (630/995) of those cases were known to have AF prior to stroke.

Of the cases that were known to have AF pre stroke 80% (505/630) were prescribed anticoagulation pre stroke, two thirds of which were prescribed NOACs. 47% (54/111) of cases on warfarin pre stroke were not within the 2-3 INR range on admission. Table 19 indicates the breakdown of AF data by stroke type.

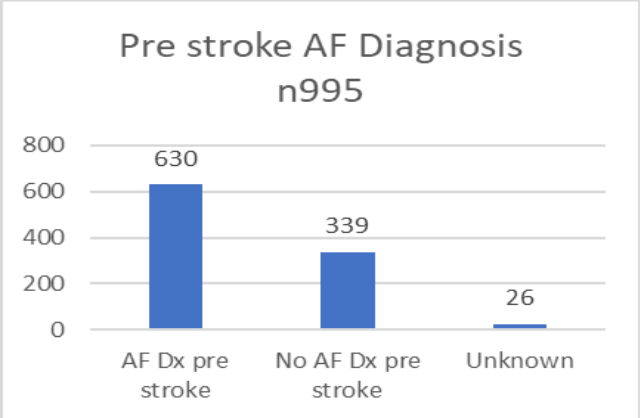


FIGURE 11. ATRIAL FIBRILLATION DIAGNOSIS PRE STROKE.

TABLE 19 BREAKDOWN OF ISCHAEMIC AND HAEMORRHAGIC ATRIAL FIBRILLATION DATA.

Stroke Type	Afib known prior to stroke % (n)	On anticoagulation prior to stroke % (n)	Prescribed NOACs % (n)	Prescribed Warfarin % (n)	If on Warfarin was INR 2-3 on admission % (n)
Ischaemic n3066	60.4% (545/902)	79.1% (431/545)	57.1 (246/431)	21.8 (94/431)	41.5 (39/94)
Haemorrhagic n536	91.4 (85/93)	87.1 (74/85)	63.5 (47/74)	22.9 (17/74)	35.3 (6/17)

Secondary prevention data for patients with AF was available in 85.9% (871/995) cases.

75.3% (656/871) of cases were prescribed antiplatelet and/or anticoagulation on discharge.

On discharge, 93% (610/656) of cases with AF are on anticoagulation with the preference for NOAC prescribing.

Secondary Prevention for AF	**% (n)**
NOAC	86% (567/656)
Warfarin	4% (27/656)
Antiplatelet Therapy	5% (33/656)
Antiplatelet and Anticoagulant	2% (16/656)

TABLE 20. SECONDARY PREVENTION FOR AF CASES N=656 (MISSING DATA).

4. Stroke Unit Care

The admission of patients to stroke units, staffed by appropriate specialists, has been shown in numerous studies to reduce the rates of mortality and morbidity after stroke (European Stroke Organisation, 2008, Jauch et al, 2013).

Table 21 shows that 71% of stroke patients were admitted to a stroke unit after excluding 'not recorded' data. Reasons for non-admission are documented also below for the 1,006 patients who were not admitted to an acute stroke unit (Table 22).

TABLE 21: ADMISSION TO STROKE UNIT (N=3477, MISSING DATA = 125 (3.5%)

	N	%
Yes	2471	71.1%
No	1006	28.9%

A free text box was added in 2014 to provide further explanation for non-admission if required. The four main reasons for selecting 'other' were: '*patients transferring to or from another hospital*'; '*end of life care'; 'stroke not severe' and 'intensive care unit admission'.*

TABLE 22: REASONS FOR NON-ADMISSION TO STROKE UNIT N=1006

	N	%
No stroke unit	225	22.3
Other	385	38.3
Bed not available	313	31.1
Infection control risk	41	4.1
Unknown	42	4.2

Table 23 indicates the percentage of cases admitted to a stroke unit by hospital. This is a National Stroke KPI and the 2018 KPI result is 69.2%, slightly less than the outcome of this report. The national target is 90%.

TABLE 23. ADMISSION TO A STROKE UNIT

Hospital Name	Total cases on register with i61/i63/i64 as PDx	Total cases admitted to Stroke Unit	% Admitted to Stroke Unit
University Hospital Mayo	153	138	90.2%
St Luke's Hospital Kilkenny	121	109	90.1%
Tallaght University Hospital	241	210	87.1%
University Hospital Galway	273	222	81.3%
Bantry University Hospital	82	64	78.0%
Our Lady of Lourdes Drogheda	217	169	77.9%
St James's Hospital	240	181	75.4%
University Hospital Waterford	132	99	75.0%
Beaumont Hospital	481	358	74.4%
Naas General Hospital	164	120	73.2%
Cork University Hospital	469	323	68.9%
Cavan General Hospital	151	99	65.6%
St Vincent's University Hospital	358	225	62.8%
Connolly Hospital	152	91	59.9%
University Hospital Portiuncula	64	32	50.0%
Mercy University Hospital	80	31	38.8%
University Hospital Letterkenny*	158		
Our Lady's Hospital Navan*	66		
Total	2573	1993	77.5%

*No Stroke Unit

- **Swallow Screening in Stroke Units**

Swallow screening is considered a good indicator of organized stroke care. In 2018, 71.5% (2301) of cases had a swallow screen completed, increased from 66% in 2017, of those 40.4% (929) had the swallow screen completed within four hours, increased form 32% in 2017.

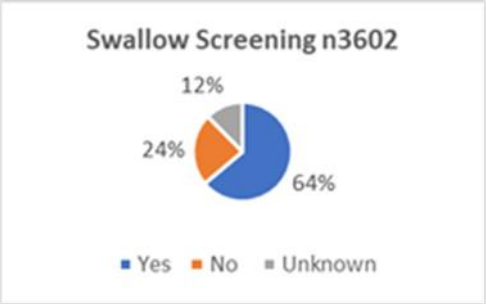


FIGURE 13. SWALLOW SCREENING N=3481

Table 24 indicates that admission to a stroke unit increases the rate of having a swallow screen completed.

	Admitted to a Stroke Unit n=2471	Not admitted to a Stroke Unit n=855
Swallow Screen completed	76% (1878/2471)	49% (420/855)

TABLE 24: SWALLOW SCREENING RATES IN STROKE UNITS

- **Mood Screening**

The reporting of mood screening was added into the dataset in 2017 and there was a 78.8% (2837) response rate to this data point. The completion of a mood screen remains low at 31.7% (900), excluding blank cases, and work is on-going within the National Stroke Programme to complete a mood guidance document. At present a depression pathway is available on the National Stroke Programme website

https://www.hse.ie/eng/services/publications/clinical-strategy-and-programmes/management-of-post-stroke-depression-care-pathway.pdf

As with the swallow screening admission to a stroke unit increases the rate of receiving assessment of mood as part of comprehensive stroke care.

	Admitted to a Stroke Unit n=2471	Not admitted to a Stroke Unit n=855
Mood Screen completed	30.4% (750/2471)	17.3% (148/855)

TABLE 25: MOOD SCREENING RATES IN STROKE UNITS

- **Stroke Unit Length of Stay (LOS)**

The National Stroke Register captures the dates of admission and discharge from the stroke unit, which allows calculation of length of stay for each patient in the stroke unit and also the proportion of the patient's overall stay in the hospital that was in the stroke unit.

There were 2,471 (71.1%) patients admitted to the stroke unit and the length of stay was available for 2,429 (98%) patients. Of these cases 70.4% (33552/47692) of the total hospital length of stay (bed days used) was in the stroke unit. This correlates with the 2018 National KPI result of 71.2%.

TABLE 26: LENGTH OF STAY IN STROKE UNIT DAYS, N=2429 (MISSING DATA = 42)

	Median (IQR)	Mean (±SD)
Stoke unit LOS	7(4 – 15)	14 (±22.7)

5. Outcome & Mortality

Physical functioning

In 2017, the addition of pre-stroke and discharge Modified Rankin Score (MRS) was introduced. In 2018, 82% (2950) of cases had a pre-stroke MRS and 80% (2889) had a discharge MRS. 78% (2472) had a pre-stroke MRS and discharge MRS recorded. Mortality results within this domain need to take into account the sample size for analysis (78%). Online training was offered to all data inputters to support accurate recording of the tool. It was agreed that results would be grouped as: no disability (0), Mild disability (1 or 2) and Moderate/Severe (3, 4 or 5), figure 14.

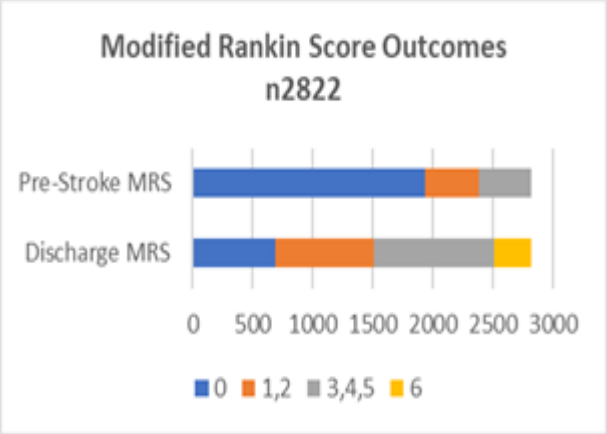


FIGURE 14. PRE-STROKE AND DISCHARGE MODIFIED RANKIN SCORE N=2472

MRS and Stroke Type

In 2018, the National Stroke Register data set was made up of 85% (3,066) ischaemic strokes (i63) and 15% (536) haemorrhagic strokes (i61). Figures 15 and 16 indicates the outcomes by stroke type. An increased level of disability and mortality is shown for haemorrhagic stroke compared to ischaemic stroke reflecting the lack of an acute treatment for haemorrhagic stroke. The mortality in this cohort is remarkably similar to the national mortality by stroke type in NQAIS.

FIGURE 15. ISCHAEMIC MRS OUTCOMES.

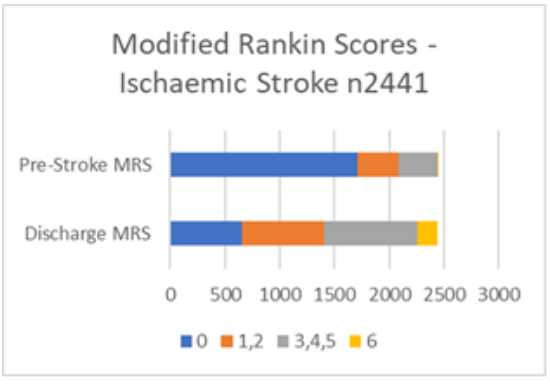
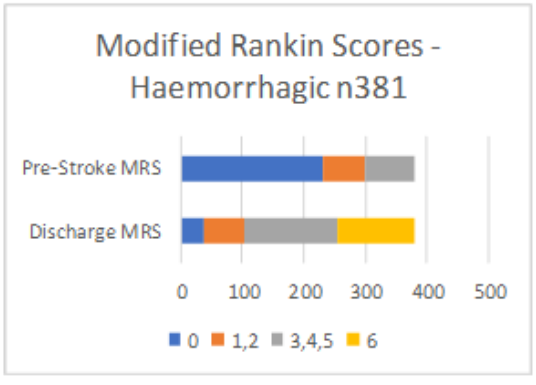


FIGURE 16. HAEMORRHAGIC MRS OUTCOMES.



- Mortality

The in-hospital mortality rate was 11.6%. The Irish Heart Foundation/HSE National Stroke Audit 2015 reported a mortality rate of 14% and the Sentinel Stroke National Audit Programme, SSNAP (Royal College of Physicians 2017/18) report a 14.3% in-hospital mortality rate.

When reported by stroke type the NSR shows that the mortality for ischaemic stroke is 7.9% (243/3066) and 32.7% (175/536) for haemorrhagic stroke.

FIGURE 6. NATIONAL MORTALITY RATES NQAIS 2015-2018

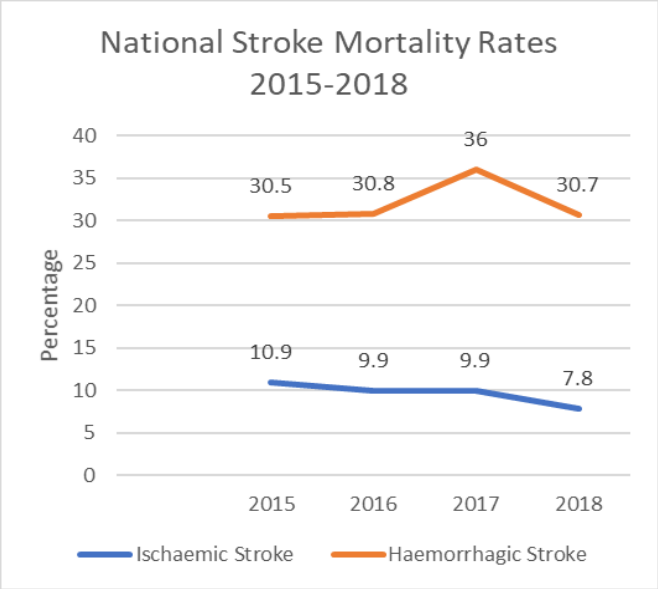


Figure 6. indicates the mortality data for all hospitals admitting stroke acutely based on stroke type using the National Quality Assurance & Improvement System (NQAIS) of all i61, i63 and i64 cases from 2015 to 2018. These results reflect the correlation between NSR results and national HIPE data results.

Some caution is advised in particular in comparing Irish stroke mortality rates in individual institutions with International and National mortality rates (such as the National Audit of Hospital Mortality (NAHM)or the National Healthcare Quality Reporting System (NHQRS) where the data is adjusted for casemix and expressed as standardised mortality ratios.

Health and Social Care Professionals – National Stroke Register

Background

In 2016 a Health and Social Care (HSCP) National Stroke Register (NSR) Working Group was established with representation from Physiotherapy (PT), Occupational Therapy (OT), Speech and Language Therapy (SLT), Medical Social Work, Dietetics and NSP representation with a view to developing a HSCP dataset as an expansion of the NSR. A limitation of the NSR was that it did not capture useful data related to stroke rehabilitation services or measure stroke specific outcomes.

It was agreed that contribution to the NSR was:

- Essential for continuous quality improvement recommended in national and international stroke guidelines
- Enables comparison of the clinical and organisational quality of stroke services
- Enables services to plan and deliver service developments

Due to very limited capacity of stroke specific professionals in Medical Social Work and Dietetics it was agreed that the proposed expansion would include, in the first iteration, datasets from physiotherapy, occupational therapy and speech and language therapy.

A pilot dataset was agreed in collaboration with stroke rehabilitation staff in acute hospitals nationally and the Health Pricing Office (HPO) provided an 'add-on screen' to the existing Stroke Register HIPE data collection system. A pilot phase was rolled out in Quarter 1 2017 to three sites, amendments were made to the final dataset (appendix xx) and in Quarter 4 2017 there was full roll-out to the participating sites.

2018 is the first year of complete roll out of the HSCP register and 16 sites contributed to the data collection. As in the early years of the NSR it is expected that it will take time to embed into practice.

In 2018, seven sites have data recorded from all three disciplines:

- ✓ Beaumont Hospital
- ✓ Our Lady of Lourdes Hospital, Drogheda
- ✓ Mater Misericordiae University Hospital
- ✓ Midland Regional Hospital, Mullingar
- ✓ Naas General Hospital
- ✓ St James's Hospital
- ✓ Tallaght University Hospital

In this first year, data will be presented by discipline using aggregated data.

We would like to thank all therapists who have participated in this important expansion of the NSR and look forward to seeing this work develop into a wealth of understanding of the needs of stroke patients in Ireland.

Method

The data used for this analysis is taken from the 2018 NSR dataset. All cases with an i61/i63/i64 principle diagnosis have been used in the analysis of HSCP data. Cases with other codes are not analysed as is the case in the main NSR analysis.

All participating hospitals have been included without filtering for coverage as data will be presented by discipline in aggregate form. As such, data from three hospitals are represented within this analysis that do not form part of the main report. When coverage increases the data will be analysed by hospital and will be presented using the same criteria as that of the main NSR analysis.

Results

In 2018, 16 hospitals participated in the NSR HSCP Dataset and 11 hospitals had input from the three disciplines (table 27)

Hospital Name	Physiotherapy n1438	Occupational Therapy n1241	Speech and Language Therapy n704
Beaumont Hospital	√	√	√
Cavan General Hospital	√		
Connolly Hospital	√	√	√
Cork University Hospital		√	
Our Lady of Lourdes Hospital, Drogheda	√	√	√
University Hospital Galway	√	√	√
St James's Hospital	√	√	√
St Luke's Hospital Kilkenny	√	√	√
Mater Misericordiae University Hospital	√	√	√
Mayo University Hospital	√	√	
Mercy University Hospital		√	√
Midland Regional Hospital Mullingar	√	√	√
Naas General Hospital	√	√	√
St Vincent's University Hospital	√	√	√
Tallaght University Hospital	√	√	√
University Hospital Limerick		√	√

TABLE 27 PARTICIPATING HOSPITALS BY DISCIPLINE N16

Referral to rehabilitation services.

The Irish Heart Foundation Stroke Guidelines 2010 and the British Association of Stroke Physicians 2016 recommend that all disciplines within the multidisciplinary team must have adequate staff, time and resources to ensure patients have timely and appropriate assessment and rehabilitation.

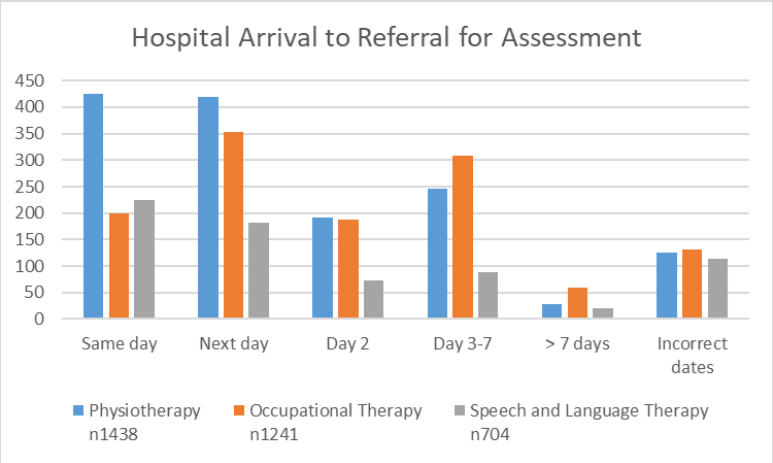


Figure 17 indicates that there is a variance around the timeliness to referral to rehabilitation. PT referrals within 24hrs are at 58% (846/1438), OT referrals within 24hrs are at 45% (554/1241) and SLT referrals within 24hrs are at 58% (407/704).

FIGURE 17. HOSPITAL ARRIVAL TO REFERRAL FOR ASSESSMENT

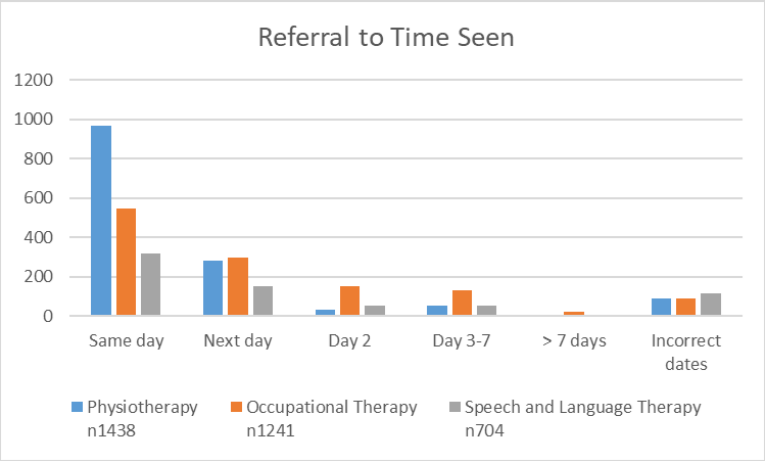


Figure 18 indicates the that the majority of cases referred for physiotherapy (PT), Occupational Therapy (OT) and Speech and Language Therapy (SLT) are seen within 24hrs of referral.

FIGURE 18 REFERRAL TO TIME SEEN.

Access to Therapy

Patients should undergo as much therapy appropriate to their needs as they are willing and able to tolerate and in the early stages they should receive a minimum of 45 minutes daily of each therapy that is required (IHF 2010, BASP 2016). Therapists were asked if they believed that the patients received the appropriate amount of therapy. In addition, they were given an option to calculate, in minutes, the amount of therapy the patient received against the standard of 45mins per day. Figure 19 reflects the judgement of each participating profession regarding the amount of therapy they perceived their patients received. In 48% of PT cases the intensity was calculated in minutes. This was 60% in OT and 55% on SLT.

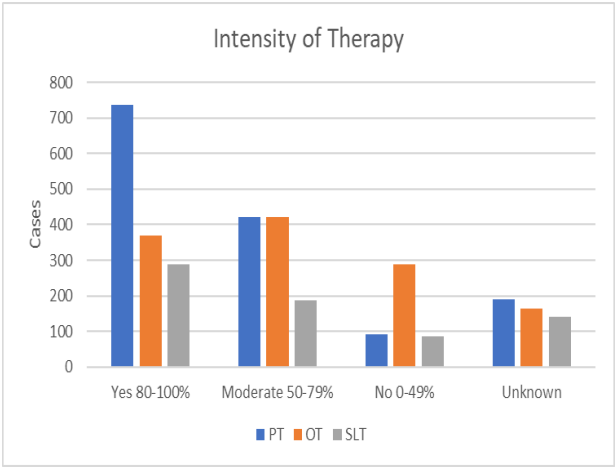


FIGURE 19 INTENSITY OF THERAPY

Physiotherapy

Data was available on 1438 cases within the PT section of the NSR HSCP Dataset. The physiotherapy dataset was designed to ensure that key areas were collected without creating an additional burden on data-collectors. They were particularly interested in the mobility outcomes of their patients (figure 20). They also wanted to gather information on the workload by measuring the percentage of cases that required a PT and an assistant.

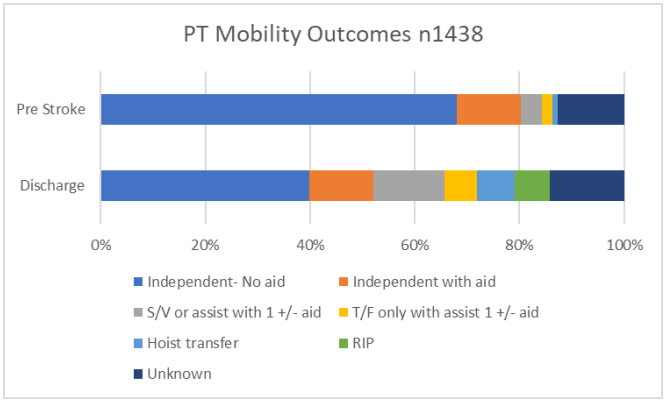


FIGURE 20 PT MOBILITY OUTCOMES

In 23% (327/1438) of cases the patient required 2 or more therapists for more than half of their overall treatment sessions. This information is important when planning staffing and designing physiotherapy services for stroke patients.

Guidelines recommend that patients should be referred on to appropriate community supports. Figure 21 indicates the onward referral patterns of the PT cases. In this cohort, it is not known if there had been an onward referral for rehabilitation in 26% (373/1438). This may simply reflect that the patient did not need any further follow-up.

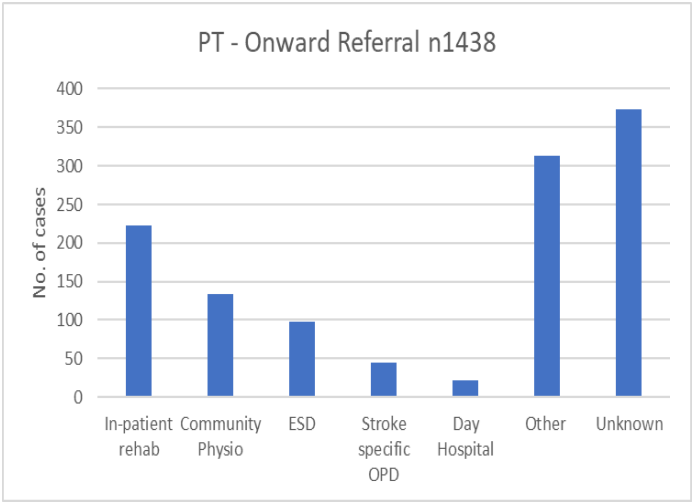


FIGURE 21 PT ONWARD REFERRAL

Occupational Therapy

There were 1,241 cases added to the OT section of the NSR HSCP Dataset.

The OT outcome measure reflected the pre-stroke status of the patient in relation to activities of daily living (ADLs) compared with the discharge status. Greater than 50% (521/1020) of cases with known discharge status required supervision/some assistance/full assistance to maintain their ADL's.

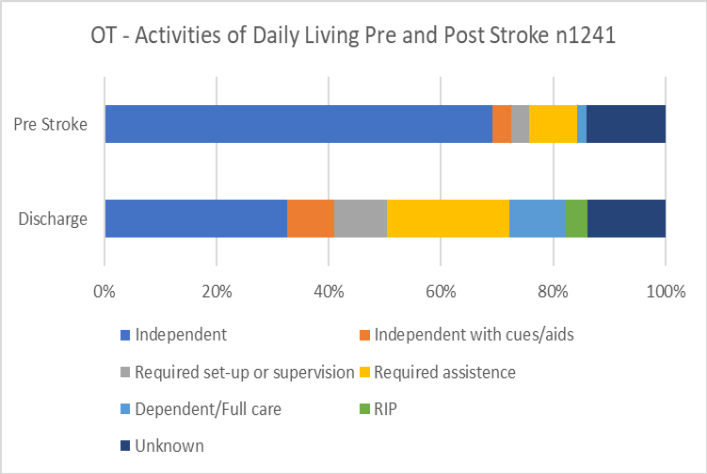


FIGURE 22 PRE AND POST ADL ASSESSMENT

Assessment and screening for vision and cognition are important following stroke and can often be missed in the acute phase of care. Visual fields were assessed in 69% (853/1241) of cases. Figure 23 presents the form that the assessments took. Figure 24 indicates the level of cognitive screening within this cohort, with 69% (857/1241) having or attempted to have a cognitive screen.

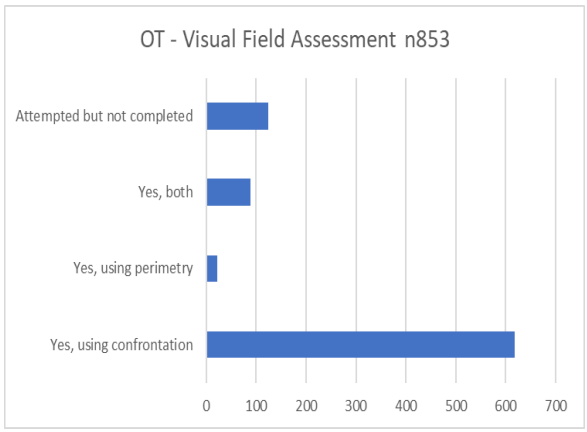


FIGURE 23 OT – VISUAL ASSESSMENT

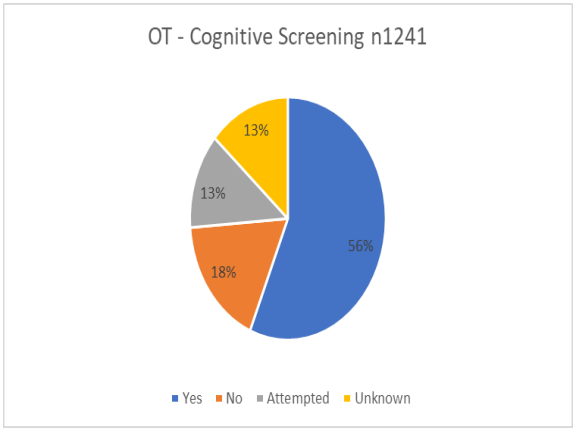


FIGURE 24 OT – COGNITIVE SCREENING

The OT dataset also collects data on driving and paid employment pre-stroke. It was found that 38% (474/1241) were driving pre-stroke. Of these, 83% (393/474) received information related to '*driving after stroke'* prior to discharge.

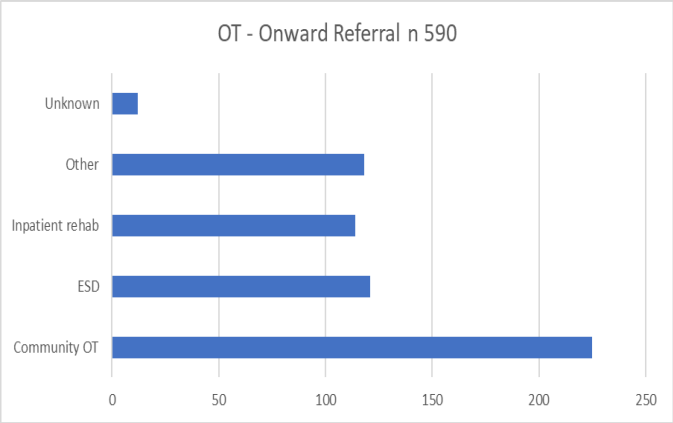


FIGURE 25 ONWARD REFERRAL TO OT SERVICES ON DISCHARGE

Within this cohort only 16% (203/1241) were in paid employment. Of these, 66% (133/203) received information related to 'work after stroke' prior to discharge. 48% (590/1241) were referred on for on-going OT.

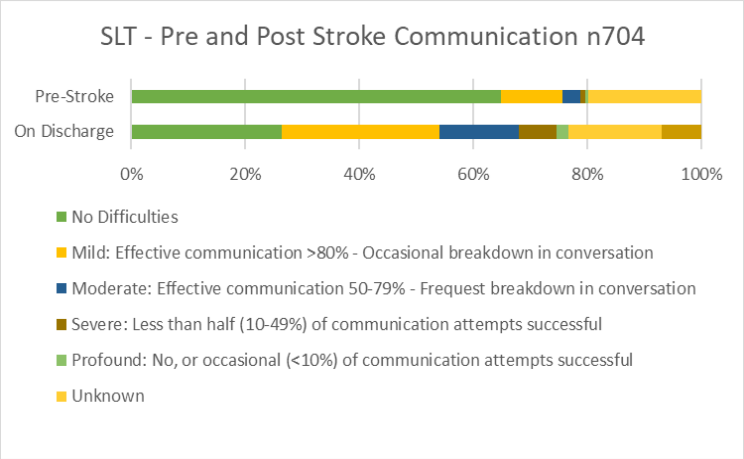
Speech and Language Therapy

2018 was the first complete year of data collection and 704 cases were recorded within the SLT section of the NSR HSCP dataset.

Data collected within the SLT dataset incorporate both communication and swallow difficulties.

Figure 26 indicate the Pre and Post stroke outcomes. Figure 27 and 28 indicate the outcomes in swallowing difficulties.

FIGURE 26 SLT PRE AND POST STROKE COMMUNICATION



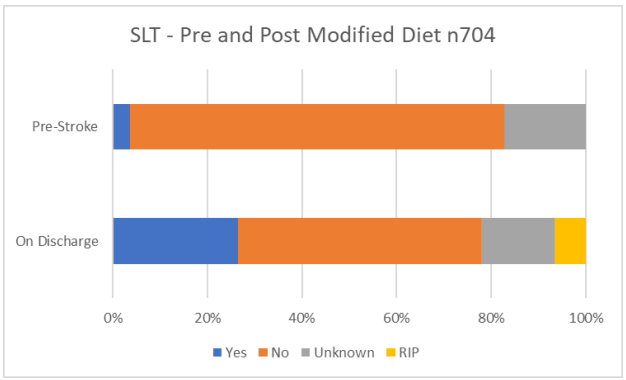


FIGURE 27 SLT-PRE AND POST MODIFIED DIET

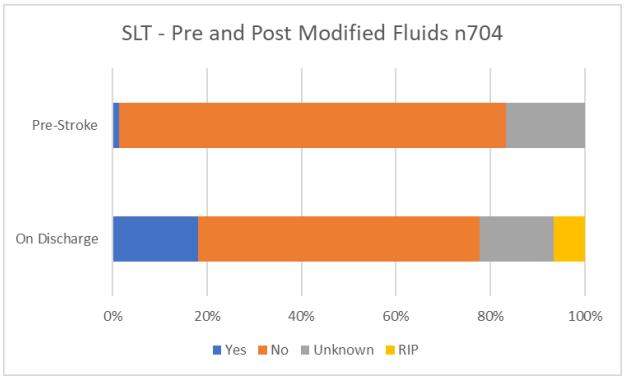


FIGURE 28 SLT PRE AND POST MODIFIED FLUIDS

In 81% (496/609) of cases, difficulties were identified. Other issues such as baseline intellectual disabilities, drowsiness, tracheostomy was identified as 'other' within this cohort.

52.9% (325/614) patients were fasting pending SLT assessment. 9.3% (57/614) had a videofluroscopy, a further five cases were indicated but the service was not available. 2.1% (13/614) has a FEES performed with one other identified as needing the procedure but service not available. 6% (36/605) were on enteral feeding on discharge.

Difficulty identified	% (n)
Swallowing difficulty	65.4% (321/491)
Dysarthria	56.2% (276/491)
Dyspraxia	8.7% (42/485)
Aphasia	40.4% (196/485)
Cognitive linguistic communication disorder	28.2% (137/486)
Voice difficulties	15.7% (75/479)

TABLE 28 SLT - IDENTIFIED DIFFICULTIES

Onward referral

83.5% (588/704) cases were referred onwards following discharge, fig 29.

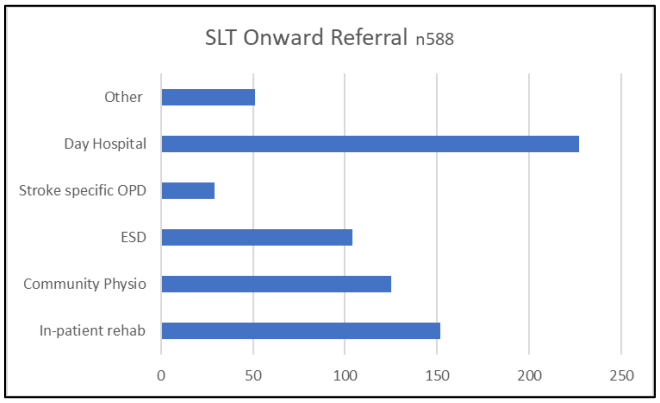


Table 29 Onward Referral to SLT services upon discharge

Summary

The 2018 National stroke Register (NSR) report is our largest most comprehensive stroke report to date. It is the last report in the current format as the NSR moves under the governance of the National Office of Clinical Audit and becomes the Irish National Audit of Stroke (INAS) sitting within the larger cardiovascular audit programme.

The 2018 NSR report highlights the continuing improvement in stroke processes of care and stroke outcomes. Mortality from ischaemic stroke is at an historic low of 7.8% though a medical challenge remains with intracerebral haemorrhage; our acute assessment of stroke and door to decision time for acute treatments is hugely improved reflecting success of the QI programme ran by the RCPI in conjunction with national thrombectomy service; access to stroke unit care continues to be improve but is below ideal and the challenge of staffing of our stroke services is reflected in the largest set of HSCP data to date regarding provision of treatment to stroke patients.

The 2018 NSR emphasizes that compliance with both standards of care and guidelines for stroke leads to improved clinical outcomes and reduced mortality, disability etc. It also highlights where we can improve further with the necessary interdisciplinary collaborative effort that seeks solutions to clinical challenges around stroke treatment, processes of care and resources. This is everyone's business in healthcare where stroke is one of our leading causes of adult disability, dementia and death and where we wish to #makebigstrokehistory.

Appendices

Appendix 1. National Stroke Register Steering Group Members

Prof. Joe Harbison, Consultant Stroke Physician, St. James's Hospital- Chairperson

Prof. Ronan Collin, Clinical Lead National Stroke Programme

Ms Ciara Breen, Occupational Therapist, University Hospital Galway

Deirdre Cunningham, Coding Manager, Beaumont Hospital

Ms Nora Cunningham, Clinical Nurse Specialist, University Hospital Limerick

Ms Trish Daly, Advanced Nurse Practitioner, Naas General Hospital

Dr Teresa Donnelly, Clinical Lead, MRH Tullamore

Dr Rachael Doyle, Consultant Geriatrician, Chairperson, IHF Council on Stroke

Mr Philip Dunne, I.T. Systems Support, Healthcare Pricing Office

Ms Emma Hickey, Clinical Nurse Specialist, Beaumont Hospital

Dr Frances Horgan, IHF Council on Stroke

Prof. Peter Kelly, Consultant Neurologist, Mater Hospital (Chair May2011–June 2013)

Ms Deirdre Lynch, Coding Manager, St Vincent's University Hospital

Ms Joan McCormack, National Stroke Programme, Programme Manager, RCPI

Jackie Naughton, Coding Manager, Mercy University Hospital

Ms Imelda Noone, Advanced Nurse Practitioner, St Vincent's University Hospital

Dr John Thornton, Consultant Radiologist, Clinical Stroke Lead, Beaumont Hospital

Ms Triona Dooley, Coding Manager, University Hospital Limerick

Appendix 2. National Stroke Register Dataset

HIPE Portal Data Entry / Stroke (V3.0.2) 06 Dec 2016		
Question	**Options**	**Short Name**
1. Which hospital was patient transferred from (if any)	0000 Not Applicable 0941 Children's Crumlin 0101 St Columcille's 0102 Naas General 0908 Mater Hospital 0910 SVUH 0925 Peamount Hospital 0955 Cappagh Orthopaedic 0940 Temple Street 0947 St Luke's Rathgar 0904 SJH Dublin 0108 Connolly Blanchardstown 0912 Michaels Dun Laoghaire 0950 RVEEH 0960 National Rehabilitation 0930 Coombe Hospital 0932 Rotunda Dublin 0931 National Maternity Hosp 1270 Tallaght Hospital 1762 Josephs Raheny 0954 Clontarf Orthopaedic 1001 Blackrock Hospice 0600 Waterford 0601 St Luke's KK 0605 Wexford 0602 Kilcreene 0607 Clonmel 0705 Finbar's Cork	Trans Hosp
1A. Why was the patient transferred	Thrombolysis Thrombectomy	Trans Reason
1B. If other transfer reason, please specify		Trans Reason
1C. If other transfer hospital, please specify		Trans Hosp
2. Symptom onset date		Onset Date
3. Symptom onset time (enter 9999 if unknown)		Onset Time

3A. If symptom onset time is unknown, what date was the patient last known to be well		Last Well Date
3B. If symptom onset time is unknown, what time was the patient last known to be well		Last Well Time
4. Did the stroke occur while the patient was in hospital for treatment of another condition	1 Yes, 2 No 9 Unknown	Hosp Str
4A. If no, date of presentation to hospital		Arr Date
4B. If no, time of presentation to hospital		Arr Time
4C. If presentation time is unknown, was presentation to hospital within 4.5 hrs of symptom onset	1 Yes, 2 No 9 Unknown	Arr 4.5hrs
5. Medical team / Stroke team assessment date		Assess Date
5A. Medical team / Stroke team assessment time		Assess Time
6. Brain CT or MRI performed	1 Yes, 2 No 3 Performed pre adm / hosp	Imaging
6A. If yes, First Brain Imaging date		Img Date
6B. If yes, First Brain Imaging time		Img Time
7. Did the patient receive I.V. Thrombolysis (Key Performance Indicator)	1 Yes, 2 No 5 Contraindicated	Thrombolysis
7A. If yes, enter date		Thromb Date
7B. If yes, enter time		Thromb Time
7C. If yes, was intracerebral bleed seen on scan within 36 hrs	1 Yes, 2 No	Intracereb Bleed
7D. If intracerebral bleed, was neuro deterioration associated with it	1 Yes, 2 No 9 Unknown	Neuro Deter Assoc
*8. Did the patient have thrombectomy in this hospital	1 Yes, 2 No	Thrombectomy
8A. NIHSS pre-thrombectomy		NIHSS Pre
8B1. Date of performance of non contrast CT		Non Con CT
8B2. Time of performance of non contrast CT		Non Con CT
8C1. Date of performance of non contrast CTA		Non Con CTA
8C2. Time of performance of non contrast CTA		Non Con CTA
8D1. Date of contact with the endovascular stroke centre		Contact Endo
8D2. Time of contact with the endovascular stroke centre		Contact Endo
8E1. Date of decision to transfer patient		Trans Dec Date
8E2. Time of decision to transfer patient		Trans Dec Time
8F1. Date of arrival at the endovascular stroke centre		Date Arr Endo
8F2. Time of arrival at the endovascular stroke centre		Time Arr Endo
8G1. Did the patient have repeat non invasive imaging in the endovascular stroke centre	1 Yes, 2 No 9 Unknown	Img Repeat
8G2. If yes, please specify	1 Non contrast CT 2 CTA Perfusion CT	Img Type
8H. Site of most proximal occlusion	MCA 1 MCA 2 Basilar	Most Prox Occ

8J. Second occlusion site		2nd Occ Site
8K. Associated carotid stenosis greater than 50%	1 Yes, 2 No	Assoc Carotid
8L1. TICI pre thrombectomy		TICI Pre
8L2. TICI post thrombectomy		TICI Post
8M1. Date of groin puncture		Groin Punc
8M2. Time of groin puncture		Groin Punc
8N1. Date of first pass		1st Pass Date
8N2. Time of first pass		1st Pass Time
8P1. Date of first reperfusion		1st Reperf Date
8P2. Time of first reperfusion		1st Reperf Time
8Q1. Date of final angio		Final Angio
8Q2. Time of final angio		Final Angio
8R. Immediate complications	0 Not Applicable Haemorrhage Embolus into separate vascular	Imed Comp
8S. NIHSS 24 hour post-thrombectomy		NIHSS Post
8T1. Following procedure was patient transferred immediately back to primary receiving hospital	1 Yes, 2 No 9 Unknown	Trans Prim Rec
8T2. If no, when was patient admitted to the endovascular stroke centre	0-3 hrs 3-12 hrs	Trans Endo Centre
9. Was a swallow screen completed	1 Yes, 2 No	Swallow
9A. If yes, was swallow screen completed within 4 hours of presentation	1 Yes, 2 No 9 Unknown	Swallow 4hrs
10. Modified Rankin Scale pre stroke	0 Zero One Two Three	Pre Strk Rankin
11. Admitted to Stroke Unit (Key Performance Indicator)	1 Yes, 2 No	Stroke Unit
11A. If yes, date admitted to Stroke Unit (Key Performance Indicator)		SU Adm
11B. If yes, date discharged from Stroke Unit (Key Performance Indicator)		SU Dis
11C. If no, reason why	No Stroke Unit Bed Not Available	SU No
11C2. If other reason, please specify		SU No Other
12. Allied Health Professional (AHP) Assessment	1 Yes, 2 No	AHP
12A. If yes, Physiotherapy	1 Yes, 2 No 3 Not Indicated	Physio
12B. If yes, Occupational Therapy	1 Yes, 2 No 3 Not Indicated	Occup

12C. If yes, Speech and Language	1 Yes, 2 No 3 Not Indicated	SLT
12D. If yes, Dietetics	1 Yes, 2 No 3 Not Indicated	Dietet
12E. If yes, Medical Social Work	1 Yes, 2 No 3 Not Indicated	MSW
12F. If Yes, Psychology	1 Yes, 2 No 3 Not Indicated	Psyc
13. Was the patient assessed by Stroke Nurse Specialist	1 Yes, 2 No	Assess SNP
13A. If no, reason why		Assess SNP No
14. Multidisciplinary Meeting Case assessment	1 Yes, 2 No 3 Not Indicated	Multidisc
14A. Was an assessment of mood completed and documented by a member of the multi- disciplinary team	1 Yes, 2 No 3 Not Indicated	Mood Assess
15. Does the patient have Symptomatic Carotid Stenosis	1 Yes, 2 No	Stenosis
15A. If Symptomatic Carotid Stenosis, was the patient referred for Carotid Endarterectomy	1 Yes, 2 No 9 Unknown	Refer Endarterectom
15B. If Symptomatic Carotid Stenosis, was the patient referred for Carotid Stenting	1 Yes, 2 No 9 Unknown	Refer Stenting
16. New or Altered Antithrombotic Therapy prescribed for acute treatment	1 Yes, 2 No 3 Contraindicated	Antithromb Acute
16A. If yes, Antiplatelet Or Anticoagulant (for acute		Antiplatelet
17. Does the patient have Atrial Fibrillation	1 Yes, 2 No 4 Results Pending	Atrial Fib
17A. If Atrial Fibrillation, was atrial fibrillation known prior to stroke onset	1 Yes, 2 No 9 Unknown	AFib Prior
17B1. If yes, please specify Antiplatelet / Anticoagulant - prior to stroke	0 NOAC 1 Warfarin Aspirin Should not	Anticoag Prior
17C. If atrial fibrillation known prior to stroke onset, and Warfarin, was INR 2-3 at Stroke onset	1 Yes, 2 No 9 Unknown	INR 2-3
17D. If Atrial Fibrillation, Anticoagulation prescribed for secondary prevention	1 Yes, 2 No 9 Unknown	Anticoag 2nd

17D1. If yes, please specify Antiplatelet / Anticoagulant - on discharge	0 NOAC 1 Warfarin Aspirin Clopidogrel Other Antiplatelet Dual Antiplatelet Therapy Antiplatelet & Anticoagulant	Anticoag Discharge
17D2. If no, please enter reason documented	No reason documented Major bleeding (prior history) Severe illness (e.g. cancer, dementia) 04 Poor compliance (known or suspected)	Anticoag Doc
18. Modified Rankin Scale on discharge	0 Zero One Two Three	On Dis Rankin
19. Discharge destination	Home Patient died Discharge to long term care 4 Discharge to off-site rehab 5 Transfer to referring hosp	Dis Dest

*Q8 is answered in Beaumont Hospital and Cork University Hospital only.

Appendix 3. National Stroke Register HSCP Dataset

HIPE Portal Data Entry / HSCP (V1.0.3) 02 June 2017		
Question	**Options**	**Short Name**
1. PT: Was the patient referred to Physiotherapy	1 Yes 2 No 9 Unknown	Referred
1A. If yes, please provide date of referral		Ref Date
2. PT: Was the patient seen	1 Yes 2 No 3 Discharged before seen 9 Unknown	Seen
2A. If yes, date of initial contact by physiotherapy		Seen Date
3. PT: Indoor mobility pre-admission	1 Indep no aid 2 Indep with an aid 3 S/V or assist of 1 person +/- aid 4 T/F only with assist +/- aid 5 Hoist transfer 9 Unknown	Indoor Mob
4. PT: Were standardised outcome measures used	1 Yes 2 No 9 Unknown	Standard
5. PT: Was the intensity of Physiotherapy sufficient	1 Yes 80-100% 2 Moderate 50-79% 3 No 0-49% 9 Unknown	Intensity
5A. Was intensity calculated on minutes of contact	1 Yes 2 No 9 Unknown	Intensity Minutes
6. PT: Did the patient require more than one therapist/PTA for more than half of their treatment sessions	1 Yes 2 No 9 Unknown	Multiple
7. PT: Indoor mobility on discharge	0 N/A RIP 1 Indep no aid 2 Indep with an aid 3 S/V or assist of 1 person +/- aid 4 T/F only with assist +/- aid 5 Hoist transfer 9 unknown	Dis Mob
8. PT: Onward physiotherapy referral to	0 N/A RIP 1 In-patient rehab 2 Community Physio 3 ESD PT 4 Stroke specific OPD physio 5 Day hospital 8 Other 9 Unknown	Onward
1. OT: Was the patient referred to Occupational Therapy	1 Yes 2 No 9 Unknown	OT Referred
1A. If yes, please provide date of referral		OT Ref Date
2. OT: Was the patient seen	1 Yes 2 No 3 Discharged before seen 9 Unknown	OT Seen
2A. If yes, date of initial contact by OT		OT Seen Date
3. OT: Prior to admission, which would **best describe** the patients ability to attend to their personal activities of daily living	1 Independent 2 Indep with cues/aids 3 Required S/V or set-up 4 Required assist 5 Dependent / full care 9 Unknown	Living
4. OT: Was the patient a driver prior to admission	1 Yes 2 No 9 Unknown	Driver
4A. If yes, was the patient advised prior to discharge about driving limitations post stroke	1 Yes 2 No 9 Unknown	Drive Limits
5. OT: Did the patient work in paid employment prior to admission	1 Yes 2 No 9 Unknown	Paid Emp

5A. If yes, was the person advised about return to work prior to discharge	1 Yes 2 No 3 Onward referral made 9 Unknown	Work Return
6. OT: Was the intensity of OT input sufficient	1 Yes 80-100% 2 Moderate 50-79% 3 No 0-49% 9 Unknown	OT Intensity
6A. Was intensity calculated on minutes of contact	1 Yes 2 No 9 Unknown	OT Intensity Minutes
7. OT: Did the patient require more than one therapist/OTA for more than half of the treatment sessions	1 Yes 2 No 9 Unknown	More Than
8. OT: Were visual fields assessed during the admission	0 No 1 Yes, using confrontation testing 2 Yes, using perimetry testing 3 Yes, using both confrontation and perimetry testing 4 Attempted, but assessment not completed due to patient factors 9 Unknown	Visual
9. OT: Was screening for cognitive impairment completed, using a valid screening measure	1 Yes 2 No 3 Unable to complete due to patient factors 9 Unknown	Screen Cog
10. OT: On discharge, which would best describe the patients ability to attend to their personal activities of daily living	0 N/A RIP 1 Independent 2 Indep with cues/aids 3 Required S/V or set-up 4 Required assist 5 Dependent / full care 9 Unknown	Dis Living
11. OT: Was an onward referral made for further Occupational therapy intervention	0 N/A RIP 1 Yes 2 No 9 Unknown	Onward Ref
11A. If yes, to what service	1 Inpatient rehab (off-site) 2 Comm OT 3 ESD OT 8 Other	On Ref Serv
1. SLT: Was the patient referred to Speech & Language Therapy	1 Yes 2 No 9 Unknown	SLT Referred
1A. If yes, please provide date of referral		SLT Ref Date
2. SLT: Was the patient seen	1 Yes 2 No 3 Discharged before seen 9 Unknown	SLT Seen
2A. If yes, date of initial contact by SLT		SLT Seen Date
3. SLT: Functional communication ability prior to admission.	1 No difficulties 2 Mild: Effective communication > 80% - Occasional breakdown in conversation 3 Moderate: Effective communication 50-79% - Frequent breakdown in conversation 4 Severe: Less than half (10-49%) of communication attempts are successful 5 Profound: No, or occasional (<10%) of communication attempts are successful 9 Unknown	Comms Prior
4. SLT: Modified diet recommended prior to admission	1 Yes 2 No 9 Unknown	Mod Diet Pre
5. SLT: Modified fluids recommended prior to admission	1 Yes 2 No 9 Unknown	Mod Fluids Pre
6. SLT: Initial assessment diagnosis	1 Difficulties identified 2 No issues identified	Assess Diag
6A. Does the patient have swallowing difficulty	1 Yes 2 No 9 Unknown	Diff Swallow
6B. Does the patient have dysarthria	1 Yes 2 No 9 Unknown	Diff Dysarthria

6C. Does the patient have dyspraxia	1 Yes 2 No 9 Unknown	Diff Dyspraxia
6D. Does the patient have aphasia	1 Yes 2 No 9 Unknown	Diff Aphasia
6E. Does the patient have cognitive linguistic communication disorder	1 Yes 2 No 9 Unknown	Diff Cog
6F. Does the patient have voice difficulties	1 Yes 2 No 9 Unknown	Diff Voice
6G. Other difficulties, please specify		Diff Other
7. SLT: Was the patient NPO pending swallow assessment	1 Yes 2 No 9 Unknown	NPO Pend
8. SLT: Was videofluoroscopy completed during episode	1 Yes 2 No 3 Indicated but not available 9 Unknown	Videofluoro
9. SLT: Was FEES completed during episode	1 Yes 2 No 3 Indicated but not available 9 Unknown	FEES
10. SLT: Was the intensity of SLT sufficient	1 Yes 80-100% 2 Moderate 50-79% 3 No 0-49% 9 Unknown	SLT Intensity
10A. Was intensity calculated on minutes of contact	1 Yes 2 No 9 Unknown	SLT Intensity Minutes
11. SLT: New enteral feeding required on discharge	0 N/A RIP 1 Yes 2 No 9 Unknown	Enteral
12. SLT: Newly modified diet recommended at discharge	0 N/A RIP 1 Yes 2 No 9 Unknown	Mod Diet Dis
13. SLT: Newly modified fluids recommended at discharge	0 N/A RIP 1 Yes 2 No 9 Unknown	Mod Fluids Dis
14. SLT: Functional communication ability at discharge	0 N/A RIP 1 No difficulties 2 Mild: Effective communication > 80% - Occasional breakdown in conversation 3 Moderate: Effective communication 50-79% - Frequent breakdown in conversation 4 Severe: Less than half (10-49%) of communication attempts are successful 5 Profound: No, or occasional (<10%) of communication attempts are successful 9 Unknown	Comms Dis
15. SLT: Further SLT requirements	0 None indicated 1 Communication 2 Swallow	Further Reqs
16. SLT: Onward SLT referral to	0 N/A RIP 1 Inpatient rehab 2 Comm SLT 3 ESD SLT 7 None 8 Other	SLT On Ref

References

European Stroke Organisation (2008) Executive Committee and the ESO Writing Committee. **Guidelines for the management of ischaemic stroke and transient ischaemic attack**. Cerebrovasc Dis 2008;25:457-507.

Horgan F, Hickey A, McGee H, O'Neill D, on behalf of INASC Team (2008). **Irish National Audit of Stroke Care**: Main Report. Dublin. Irish Heart Foundation.

Jauch EC, Saver JL, Adams HP Jr, Bruno A, Connors JJ, Demaerschalk BM, Khatri P, McMullan PW Jr, Qureshi AI, Rosenfield K, Scott PA, Summers DR, Wang DZ, Wintermark M, Yonas H; on behalf of the American Heart Association Stroke Council, Council on Cardiovascular Nursing, Council on Peripheral Vascular Disease and Council on Clinical Cardiology (2013) . **Guidelines for the early management of patients with acute ischaemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association**. Stroke 2013;44:870-947.

McElwaine P, McCormack J, Harbison J on behalf of the National Stroke Programme Audit Steering Group (2015). **Irish Heart Foundation /HSE National Stroke Audit 2015**.

National Office of Clinical Audit (2016) **National Audit of Hospital Mortality**. RCSI.

National Patient Safety Office (2017) **National Healthcare Quality Reporting System**. Department of Health. Dublin

National Quality Assurance and Improvement System (2018) https://www.healthatlasireland.ie/

Accessed on 17/7/18

Royal College of Physicians (2016) **National Clinical Guideline for Stroke**. 5th Edition. London. RCP.

Royal College of Physicians (2017) **Sentinel Stroke National Audit Programme**. London. RCP

Accessed on 17/7/18 https://www.strokeaudit.org/results/Clinical-audit/National-Results.aspx