COVID-19 STROKE REPORT

ISSUE 1

IMPACT OF COVID-19 ON STROKE SERVICES: ANALYSIS BASED ON DATA FROM THE HOSPITAL IN-PATIENT ENQUIRY (HIPE) AND THE IRISH NATIONAL AUDIT OF STROKE (INAS)

MARCH 2018 - JUNE 2020
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IMPACT OF COVID-19 ON STROKE SERVICES: ANALYSIS BASED ON DATA FROM THE HOSPITAL IN-PATIENT ENQUIRY (HIPE) AND THE IRISH NATIONAL AUDIT OF STROKE (INAS) MARCH 2018 –JUNE 2020

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Terms of disclosure and usage

Recipients should acknowledge the National Office of Clinical Audit and the HealthCare Pricing Office as the source of the data.
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GLOSSARY

Explanation of acronyms, abbreviations and other key terms used in this report.

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI</td>
<td>Confidence Interval (at the 95% level)</td>
</tr>
<tr>
<td>CT</td>
<td>Computed tomography – a scanning technique that uses X-rays to take highly detailed images of the body/brain.</td>
</tr>
<tr>
<td>Door to imaging</td>
<td>This is a term used to indicate the time between the arrival of the patient at the hospital and the time of the first brain scan. Once the patient has a brain scan, the decision about treatment can be made.</td>
</tr>
<tr>
<td>Door to needle</td>
<td>Door to needle – this is a term used to indicate the time between the arrival of the patient at the hospital and the time of thrombolysis treatment.</td>
</tr>
<tr>
<td>ED</td>
<td>Emergency Department</td>
</tr>
<tr>
<td>ESD</td>
<td>Early Supported Discharge</td>
</tr>
<tr>
<td>Haemorrhagic stroke</td>
<td>Haemorrhagic stroke occurs when a blood vessel in the brain leaks or ruptures.</td>
</tr>
<tr>
<td>HIPE</td>
<td>Hospital In-Patient Enquiry</td>
</tr>
<tr>
<td>HPO</td>
<td>Healthcare Pricing Office</td>
</tr>
<tr>
<td>HSE</td>
<td>Health Service Executive</td>
</tr>
<tr>
<td>Ischaemic stroke</td>
<td>This is the most common type of stroke. It happens when the brain’s blood vessels become narrowed or blocked, causing severely reduced blood flow (ischaemia).</td>
</tr>
<tr>
<td>INAS</td>
<td>Irish National Audit of Stroke</td>
</tr>
<tr>
<td>LOS</td>
<td>Length of stay</td>
</tr>
<tr>
<td>NPHET</td>
<td>National Public Health Emergency Team</td>
</tr>
<tr>
<td>Stroke unit</td>
<td>A geographically discrete area in a ward where patients with stroke are cared for by a multidisciplinary team that has specialist knowledge, protocols, training and skills in stroke care and the ability to monitor and regulate basic physiological function</td>
</tr>
</tbody>
</table>
CHAPTER 1: INTRODUCTION

In December 2019, a novel strain of coronavirus disease commonly known as COVID-19, was identified in the city of Wuhan in the Hubei province of China. This SARS (severe acute respiratory syndrome)-CoV-2 virus has spread globally and continues to cause huge disruption and strain on healthcare services, societal life and the economies all over the world.

On the 27th January 2020, the National Public Health Emergency Team (NPHET) for COVID-19 was created to co-ordinate the Irish response to the pandemic. Following this the Coronavirus Expert Advisory Group, a subgroup of NPHET met for the first time in Dublin on the 5th February 2020. The first confirmed case in Ireland was identified on the 29th February 2020. Containment measures were put in place initially. In early March a number of other cases were diagnosed with the first fatality recorded on the 11th March 2020. On the 12th March 2020 Taoiseach Leo Varadkar announced the closure of all schools, colleges and childcare facilities until 29th March. This followed the announcement by the World Health Organization on the previous day that the outbreak was a pandemic. By the 27th March 2020 the Taoiseach announced a national stay-at-home order. This was extended on the 10th April until 5th May 2020. By the 1st May 2020 there were 20,833 cases and 1,265 deaths leading the Taoiseach to announce a further extension of restrictions until 18th May 2020. On the 15th May 2020 the Government of Ireland confirmed that phase one of easing the COVID-19 restrictions would begin on 18th May.

During this period of extreme societal and economic strain, the healthcare system was under huge stress and turbulence in preparation for a surge of severely unwell patients with COVID-19. The requirements undertaken by the healthcare system in preparation for this surge meant most elective and routine work stopped abruptly. Work was undertaken to create capacity in the acute hospitals and in particular in the intensive care units around Ireland. The preparedness of the healthcare service enabled the hospitals to cope with the influx of COVID-19 admissions and prevent the health service becoming acutely overwhelmed as was seen in other countries such as Italy and Spain.

STROKE IN IRELAND

Stroke remains the third leading cause of death in Ireland and Western Europe, and the leading cause of severe, adult-onset physical disability (NOCA, 2020). It is an important health issue for people in Ireland, with approximately 5,500 adults admitted to hospitals with a stroke in 2019. Stroke can affect people physically, emotionally and socially. It has a significant impact on Health Service Executive (HSE) resources, accounting for up to 4% of total health expenditure annually (Health Information and Quality Authority, 2017). Although the economic costs of stroke in terms of lost employment and the cost of support in the community are significant, the impact on family members or friends who care for stroke survivors is massive. It is therefore important that all hospitals providing acute stroke services deliver high-quality and equitable stroke care (NOCA, 2020).
The Irish National Audit of Stroke (INAS) is a clinically led, web-based audit established in 2012 and is under the governance of the National Office of Clinical Audit since 2019. The overarching aim of the audit is to use data to improve the care provided to patients with stroke.

Data is collected through the Hospital In-Patient Enquiry (HIPE) system which is supported by the Healthcare Pricing Office (HPO). The INAS data is merged with the HIPE data and each episode is only completed upon discharge.

**The aim of this report is to:**

Assess the impact of COVID-19 on the care and outcomes of cases with stroke included in the Irish National Audit of Stroke and Hospital In-Patient Enquiry.

**The objectives of this report are to:**

- Assess the change in case-mix for cases with stroke before and during COVID-19 (2018-2020).
- Assess the care and outcomes provided by hospitals to cases with stroke using Key Quality Indicators (KQIs) before and during COVID-19 (2018-2020).

**Target Audiences**

- Sharing of early learnings with the management of the HSE and the Department of Health to help support the planning and management of the healthcare system during the COVID-19 pandemic.
- Wider healthcare community
- General Public
- Research community
CHAPTER 2: METHODS

The Irish National Audit of Stroke (INAS) and the Hospital In-Patient Enquiry (HIPE) provided data for this report. The INAS data is collected in each hospital admitting acute stroke patients, the data is merged with the individual HIPE file and exported to the HPO. The anonymised data are extracted and routinely sent to NOCA from the HPO on a quarterly basis. 2020 data for this report were extracted on 10th November 2020, this was the most recent extract received by NOCA. INAS, 2018 and 2019 data were merged with the 2020 extract to form the final INAS dataset. Not all stroke cases are submitted to INAS therefore the complete HIPE file for the relevant periods are utilised to present on demographics and case-mix for completeness.

For this report, key case-mix and outcome variables were examined over time. The time variable used was the date of admission rather than the date of discharge. Therefore, cases with stroke admitted to hospital between 1st March and 31st May in each of the three years were reported on.

DATA COVERAGE

Data coverage was calculated for the reporting periods as follows:


HIPE cases >=17 years with ICD-10-AM codes:

Data coverage for INAS in 2018 was 84%, 2019 was 83% and for quarter one and two in 2020 was 85%.

INCLUSION CRITERIA

HIPE: Analysis is based on records as captured on the Hospital In-Patient Enquiry (HIPE). It includes cases that were:

(i) Admitted to hospital between 1st March and 30th May in 2018, 2019 and 2020.
(ii) Diagnosed, on HIPE, as a principal diagnosis with ICD-10-AM codes I61, I63 and I64.

INAS: Analysis is based on records as captured on the Hospital In-Patient Enquiry (HIPE) inclusive of data on the INAS Portal. It includes cases that were:

(i) Admitted to hospital between 1st March and 30th May in 2018, 2019 and 2020.
(ii) Diagnosed, on HIPE, as a principal diagnosis with ICD-10-AM codes I61, I63 and I64.
(iii) Have clinical information recorded.
(iv) Aged 17 years or over.
EXCLUSION CRITERIA

HIPE:

(i) Cases aged 16 years or younger.

INAS:

(ii) Cases aged 16 years or younger.

(iii) Cases discharged from radiology ward (RAD). This excludes cases admitted for thrombectomy and transferred back to referring hospital on same day.

COVID-19 DEFINITION

Cases with stroke were defined as having a positive COVID-19 status if they had a secondary ICD-10-AM code recorded as:

I. U07.1: Coronavirus identified, confirmed by laboratory testing
II. B34.2: Coronavirus infection unspecified site
III. B97.2 Coronavirus as the cause of diseases classified to other chapters to identify the infectious agent

COVID-19 DATA PERIOD

For the purpose of the analysis in this report, we defined the pre-COVID-19 period as 1st March 2018 - 31st May 2018 and as 1st March 2019– 31st May 2019, and the COVID-19 Wave 1 period from 1st March 2020 to 31st May 2020. The same periods were applied and compared between the HIPE and INAS datasets.

DATA ANALYSIS

Data analysis was conducted using STATA and SPSS. The analysis focused on identifying differences between the pre-COVID-19 period (March –May 2018 and 2019) and the Wave 1 period (March – May 2020) in terms of number of admissions, case-mix of admitted cases, and standards of care. Graphical presentations show the weekly data for the two periods. Where appropriate, statistical tests assessed the statistical difference between the two periods. Chi-squared statistical tests (for binary and categorical variables) were used to determine whether there was a statistical difference in the distribution of cases between the pre-COVID-19 and COVID-19 (Wave 1) periods for key outcome and process variables. Where appropriate, t-tests (continuous variable outcomes) were used, to determine the statistical difference in the means between the pre-COVID-19 and COVID-19 (Wave 1) periods. Mann-Whitney Test was used to determine the statistical difference in the medians. As measure of statistical uncertainty 95% confidence intervals were presented for means of numerical variables such as number of cases and length of stay. Where the observed p-value was less than or equal to 0.05 this was considered to indicate statistical significance.

DATA LIMITATIONS

Due to the evolving nature of this pandemic, the analyses in this report should be interpreted with the following caveats:
I. Testing for COVID-19 is new and evolving

II. HIPE coding for COVID-19 is guided by classification releases from World Health Organisation and the Independent Hospital Pricing Authority, Australia. Further guidance is awaited

III. Timelines for HIPE coding of COVID-19 have been expedited

IV. The HIPE dataset for this report has been created much earlier than normal i.e. without the usual validation processes in order to facilitate rapid learning from this evolving situation and therefore the HIPE dataset is still subject to change until the file is closed in 2021

V. The data excludes any cases with stroke who were admitted in the COVID-19 period but who had not been discharged by the date of HIPE file extract (Nov 2020). This means that any cases with stroke with an extended LOS may not be captured.

VI. There were 35 confirmed COVID-19 cases who had a stroke diagnosis recorded during the reporting period, we have not reported on these cases or carried out any statistical analyses due to the size of this cohort. In subsequent reports we will provide more detailed analyses as the numbers will have increased.

VII. In March 2020, the Irish Government approved a proposal from the Department of Health to allow for a formal partnership with private hospitals which would make their facilities and capacity available to meet the challenges of the COVID-19 pandemic. This made 2,200 beds and approximately 8,000 staff available to the public health service (Kennelly et al, 2020). A small number of cases with stroke may have been treated in a private hospital between 1st March and 31st May 2020, their information has not been included in this report.

REPORT STRUCTURE

This report focuses on data of cases with stroke analysed from two data sources:

1) HIPE data has been used to look at all cases with stroke admitted to hospital, representing the national level of stroke service provision, with the following ICD-10-AM diagnoses: I610, I611, I612, I613, I614, I615, I616, I618, I619 (Haemorrhagic Stroke) I630, 1631, I632, I633, I634, I635, I636, I638, I639, I64 (Ischaemic Stroke) as a principal diagnosis (N=4,714).

2) INAS data has been used to look to at the quality of care provided to stroke inpatients, which is not routinely captured in HIPE data (N=3,455). The same ICD-10-AM diagnoses codes as stated above have been used to identify stroke cases.

The above two data sets were used to capture the overall impact that the COVID-19 pandemic had on the care of patients with stroke. HIPE collects information on all cases with stroke admitted to all public hospitals in Ireland, whereas the INAS dataset captures key quality indicators specific to stroke care in hospitals that provide acute stroke care. Audit co-ordinators enter data onto the stroke audit portal on HIPE, and while INAS is not as complete as HIPE it does represent between 83-85% of all HIPE cases.
CHAPTER 3: STROKE ACTIVITY BASED ON HIPE DATA

There were a total 4,714 cases with stroke admitted to hospital between March 1st – May 30th in 2018, 2019 and 2020 and included on the Hospital In-Patient Enquiry (HIPE). The number of cases admitted with haemorrhagic and ischaemic stroke in March, April and May of 2018, 2019 and 2020, broken down by week is illustrated in Figures 1 and 2. There was no statistically significant difference in the number of cases admitted with haemorrhagic (p=0.577, CI: 18.9-22.2) or ischaemic stroke (p=0.315, CI: 86.5-94.4) during the pre-COVID-19 period (March-May 2018 and 2019) and the COVID-19 period (March –May 2020).

Figure 1: Monthly and weekly Haemorrhagic stroke activity based on admission date (March -May 2018, 2019 and 2020)
Figure 2: Monthly and weekly Ischaemic stroke activity based on admission date (March -May 2018, 2019 and 2020)
SEX AND AGE

Table 1 and Table 2 show the number and percentage of cases with stroke admitted to hospital during the two time periods, pre-COVID-19 and COVID-19 Wave 1 broken down by sex and age group. The mean age of cases diagnosed with stroke was 72 years. During COVID-19, the majority of cases with stroke were male (58%) and aged 65 to 79 years of age (43%). Overall, there was no statistically significant difference in the sex (p=0.303) or age (p=0.053) of cases with stroke in the two time periods.

Table 1: Sex of cases with stroke admitted to hospital during the pre-COVID-19 and COVID-19 time periods

<table>
<thead>
<tr>
<th>SEX</th>
<th>PRE-COVID-19</th>
<th></th>
<th>COVID-19</th>
<th></th>
<th>TOTAL</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Male</td>
<td>1,763</td>
<td>57%</td>
<td>937</td>
<td>58%</td>
<td>2,700</td>
<td>57%</td>
</tr>
<tr>
<td>Female</td>
<td>1,344</td>
<td>43%</td>
<td>670</td>
<td>42%</td>
<td>2,014</td>
<td>43%</td>
</tr>
<tr>
<td>Total</td>
<td>3,107</td>
<td>100%</td>
<td>1,607</td>
<td>100%</td>
<td>4,714</td>
<td>100%</td>
</tr>
</tbody>
</table>

(Note: percentages may not sum to 100% due to rounding)

Table 2: Age of cases with stroke in the pre-COVID-19 and COVID-19 time periods

<table>
<thead>
<tr>
<th>AGE</th>
<th>PRE-COVID-19</th>
<th></th>
<th>COVID-19</th>
<th></th>
<th>TOTAL</th>
<th></th>
</tr>
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<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>17-64 years</td>
<td>820</td>
<td>26%</td>
<td>418</td>
<td>26%</td>
<td>1,238</td>
<td>26%</td>
</tr>
<tr>
<td>65-79 years</td>
<td>1,236</td>
<td>40%</td>
<td>694</td>
<td>43%</td>
<td>1,931</td>
<td>41%</td>
</tr>
<tr>
<td>&gt;80 years</td>
<td>1,050</td>
<td>34%</td>
<td>495</td>
<td>31%</td>
<td>1,545</td>
<td>33%</td>
</tr>
<tr>
<td>Total</td>
<td>3,107</td>
<td>100%</td>
<td>1,607</td>
<td>25%</td>
<td>4,714</td>
<td>100%</td>
</tr>
</tbody>
</table>
ADMISSION SOURCE

Figure 3 and Figure 4 shows where haemorrhagic and ischaemic stroke cases were admitted from during the two time periods. Home was the main source of admission during both periods. During the COVID-19 period, 81.4% (n=263) of haemorrhagic and 82% (n=1052) of ischaemic cases were admitted from home. There was no statistically significant difference in admission source between the two periods for haemorrhagic stroke cases (p=0.443) however there was a statistically significant difference for ischaemic stroke cases (p<0.01). The number of ischaemic stroke cases admitted from home decreased during Wave 1 of the pandemic.

Figure 3: Admission source of Haemorrhagic stroke cases in the pre-COVID-19 period and COVID-19 period
LENGTH OF STAY

Figures 5 and 6 show the median length of stay of haemorrhagic and ischaemic stroke cases during the reporting period. For haemorrhagic stroke there was no statistically significant difference ($p=0.145$) in the median length of stay of cases admitted during the pre-COVID-19 period (median LOS=9 days) and the median length of stay of cases admitted during the COVID-19 Wave 1 period (median LOS=7 days). However, for ischaemic stroke, there was a statistically significant difference ($p<0.01$) in the median length of stay of cases admitted during the pre-COVID-19 period (median LOS=9 days) and the median length of stay of cases admitted during the COVID-19 Wave 1 period (median LOS=8 days). Further work is required to understand the mechanisms leading to and implications of the reduction in LOS both positive and negative.
Figure 5: Median Length of stay of Haemorrhagic stroke cases (March - May 2018, 2019 and 2020)

Figure 6: Median Length of stay of Ischaemic stroke cases (March - May 2018, 2019 and 2020)
DISCHARGE DESTINATION

The discharge destination for haemorrhagic stroke cases was not statistically significantly different in the two time periods (p=0.145). However, the difference was statistically significant for ischaemic stroke cases (p=0.036) (Figure 7 and Figure 8), with more cases discharged home during the COVID-19 period compared to the pre-COVID period.

Figure 7: Discharge destination of Haemorrhagic stroke cases in the pre-COVID-19 period and COVID-19 period
Figure 8: Discharge destination of Ischaemic stroke cases in the pre-COVID-19 period and COVID-19 period

(Note: percentages may not sum to 100% due to rounding)
CHAPTER 4: STROKE ACTIVITY BASED ON INAS DATA

There were 3,455 cases with stroke admitted to hospital in March, April and May of 2018, 2019 and 2020 and included on the Irish National Audit of Stroke (INAS). The number of cases admitted with stroke in March, April and May of 2018, 2019 and 2020, broken down by week is illustrated in Figures 9. There was no statistically significant difference (p=0.478) in the number of cases admitted with stroke during the pre-COVID-19 period (March-May 2018 and 2019) and the COVID-19 period (March – May 2020).

Figure 9: Monthly and weekly stroke (Haemorrhagic and Ischaemic) activity based on admission date (March -May 2018, 2019 and 2020) (N=3455)

SEX AND AGE

Table 3 and Table 4 show the number and percentage of cases included in the INAS during the two time periods, pre-COVID-19 and COVID-19 Wave 1 broken down by sex and age group. The mean age of cases with stroke was 72 years. Overall, there was no statistically significant difference in the sex (p=0.434) or age (p=0.519) of cases with stroke in the two time periods. Fifty-eight percent of cases with stroke included in INAS were male and 75% were aged 65 years or more during both time periods.
Table 3: Sex of cases with stroke admitted to hospital during the pre-COVID-19 and COVID-19 time periods (INAS data)

<table>
<thead>
<tr>
<th>SEX</th>
<th>PRE-COVID</th>
<th></th>
<th>COVID</th>
<th></th>
<th>TOTAL</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td></td>
<td>n</td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Male</td>
<td>1307</td>
<td>57%</td>
<td>682</td>
<td>59%</td>
<td>1989</td>
<td>58%</td>
</tr>
<tr>
<td>Female</td>
<td>982</td>
<td>43%</td>
<td>484</td>
<td>41%</td>
<td>1466</td>
<td>42%</td>
</tr>
<tr>
<td>Total</td>
<td>2289</td>
<td>100%</td>
<td>1166</td>
<td>100%</td>
<td>3455</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4: Age of cases with stroke in the pre-COVID-19 and COVID-19 time periods (INAS data)

<table>
<thead>
<tr>
<th>AGE</th>
<th>PRE-COVID</th>
<th></th>
<th>COVID</th>
<th></th>
<th>TOTAL</th>
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<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td></td>
<td>n</td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>17-64 years</td>
<td>566</td>
<td>24.7%</td>
<td>287</td>
<td>24.6%</td>
<td>853</td>
<td>25%</td>
</tr>
<tr>
<td>65-79 years</td>
<td>945</td>
<td>41.3%</td>
<td>514</td>
<td>44.1%</td>
<td>1459</td>
<td>10%</td>
</tr>
<tr>
<td>&gt;80 years</td>
<td>778</td>
<td>34.0%</td>
<td>365</td>
<td>31.3%</td>
<td>1143</td>
<td>65%</td>
</tr>
<tr>
<td>Total</td>
<td>2289</td>
<td>100.0%</td>
<td>1166</td>
<td>100.0%</td>
<td>3455</td>
<td>100%</td>
</tr>
</tbody>
</table>
In 2012, the National Stroke Programme agreed on three national KPIs to support the implementation of the Stroke Model of Care (HSE, 2012). These KPIs inform the *HSE National Service Plan* (HSE, 2019). The three KPIs are:

- **KPI 1.** Percentage of acute cases with stroke who spent all or some of their hospital stay in a stroke unit, Target 90%.
- **KPI 2.** For cases with acute stroke admitted to an acute stroke unit, the percentage of their hospital stay spent in the stroke unit, Target 90%.
- **KPI 3.** The percentage of cases with confirmed acute ischaemic stroke who received thrombolysis, Target 12%.

**KPI 1. Percentage of acute cases with stroke who spent all or some of their hospital stay in a stroke unit**

The percentage of acute cases with stroke who spent all or some of their hospital stay in a stroke unit is presented in Figure 10. There was no statistically significant ($p=0.392$) difference in the proportion of cases with stroke who spent some of their time in a stroke unit in the pre-COVID-19 and COVID-19 periods. There was however a decline in the month of April 2020 when the first surge was at its peak, this may have been because stroke units were closed or stroke unit beds were allocated as general beds.

![Figure 10: KPI 1: Percentage of acute cases with stroke who spent all or some of their hospital stay in a stroke unit (N=3455)](image-url)
KPI 2. For cases with acute stroke admitted to an acute stroke unit, the percentage of their hospital stay spent in the stroke unit

When a patient is admitted to a stroke unit it is recommended that they spend at least 90% of their hospital stay in the stroke unit. Figure 11 suggests that cases who were admitted to a stroke unit were spending a larger percentage of their stay in the stroke unit during the COVID-19 period (77%, n= 8325) compared to the pre-COVID-19 (71%, n=22896). This difference was statistically significant (p<0.001, CI: 2.610-6.058). Figure 12 presents the difference between the median total length of stay of cases with stroke in hospital and their stay in a stroke unit. In the pre-COVID-19 period the median LOS for hospital inpatients was 11 days, while in the COVID-19 period the median LOS was 8 days. This represents a statistically significant difference (p<0.001). For cases with stroke who stayed in a stroke unit in the pre-COVID-19 period the median LOS was 8 days, while for the COVID-19 cohort the median LOS was 6 days. This was also statistically significant (p<0.001).

While both the total hospital length of stay and the stroke unit length of stay have reduced, the difference between both is less in the COVID-19 period which suggests that cases were spending a longer period of their stay in a stroke unit as indicated in Figure 11. This is likely due to reduced ward transfers to prevent cross contamination. Therefore, while less cases were admitted to stroke units, particularly in April 2020 (n=280), if they were admitted they were more likely to receive stroke unit care for a larger proportion of their total hospital stay (75%) versus 71% during pre-COVID-19 period.

Figure 11: KPI 2: Percentage of bed days spent in a stroke unit (N= 43,526)
Figure 12: Median Length of Stay of cases with stroke in hospital and in a stroke unit (N=43,526)
KPI 3. The percentage of cases with confirmed acute ischaemic stroke who received thrombolysis

The percentage of thrombolysis in ischaemic stroke is presented in Figure 13. In the pre-COVID-19 period the thrombolysis rate was 10% (n=196/1940), this increased to 13% (n=132/992) in the COVID-19 period and represents a statistically significant increase (p<0.01). Interestingly, the rate increased to a high of 21% in the first week of April 2020. In this period there was a reduction in ischaemic stroke admissions (Figure 9.), it is likely that predominantly severe cases with stroke came to hospital of whom a higher proportion are more likely to be eligible for thrombolysis.

Figure 13: KPI 3: Percentage of thrombolysis in ischaemic stroke cases (n=2932)¹

¹ Figure 13 displays cases that were diagnosed with ischaemic stroke only
TIME BETWEEN HOSPITAL ARRIVAL AND TIME REVIEWED BY MEDICAL TEAM

For cases with stroke early review by the medical team ensures that the patient has an initial stroke assessment and a brain scan completed as soon as possible. This facilitates prompt treatment, thus reducing brain cell death (Saver, 2016). Time and date of hospital arrival and time and date reviewed by the medical team were available and recorded correctly for 76% (n=2510) of cases. In the pre-COVID-19 period 60% (n=952/1587) of these were seen by the medical team within 1 hour of hospital arrival (Figure 14). In the COVID-19 period this increased to 70% (n=656/923). This represents a statistically significant increase (p<0.001, CI 29.720-258.518) and may have been due to less congestion in ED.

Furthermore, the overall median time from arrival to review by a medical team was 31 minutes (IQR 2-201), in the pre-COVID-19 period, compared to 14 minutes (IQR 0-87) in the COVID-19 period, again representing a statistically significant difference (p<0.01). Recent QI initiatives have improved this aspect of care since 2018/19.

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**Figure 14: Time between hospital arrival and time reviewed by medical team (n=2510)**

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2 Cases recorded as an inpatient strokes (n=162) and cases that did not have time information or had time information recorded incorrectly (n=783) were excluded from Figure 14
DOOR TO IMAGING

Door to imaging is a term used to indicate the time between the arrival of the patient at the hospital and the time of the first brain scan. Once the patient has a brain scan, the decision about treatment can be made. Cases with suspected acute stroke should receive brain imaging urgently – at most within one hour of arrival at hospital (Royal College of Physicians, 2016).

In the pre-COVID-19 period the door to imaging time was within one hour for 41% (n=785/1906) of cases (median = 85 minutes), there was a statistically significant improvement (p<0.01) in the COVID-19 period where 49% of cases (n=502/1030) were within this timeframe (median = 63 minutes) (Figure 15). Access to imaging may have been better as there was less pressure on scanners due to a reduction in elective work and a reduction in ED attendance (ESRI, 2020).

![Figure 15: Door to imaging time (n=2936)³](image)

³ Cases recorded as an inpatient strokes (n=162) and cases that did not have time information or had time information recorded incorrectly (n=357) were excluded from Figure 15
DOOR TO NEEDLE

Door to needle (DTN) is a term used to indicate the time between the arrival of the patient at the hospital and the time of thrombolysis treatment. The median DTN time in the pre-COVID-19 period was 59 minutes (Figure 16), while in the COVID-19 period the median DTN time decreased to 52 minutes, there was no statistically significant (p=0.128) difference.

Figure 16: Door to needle time, median in minutes (n=297)⁴

THROMBECTOMY

Availability of thrombectomy is increasing annually for patients with stroke in Ireland. NOCA (2020) reported a thrombectomy rate of 9% (n=361) in 2019. The reporting periods in this COVID-19 report are small and therefore the reporting of thrombectomy data is limited in this issue and will be expanded in later iterations. In this analysis we have compared the same Pre-COVID-19 14 week period in 2019 against the same period in 2020. In 2019, 90 cases with stroke had a thrombectomy of which 81% of cases were transferred to a thrombectomy centre, this was reduced to 75 cases with stroke in 2020 with 67% of cases transferred to the thrombectomy centre.

⁴ Figure 16 excludes in patients strokes (n=162) and displays cases that were diagnosed with ischaemic stroke and had thrombolysis performed (n=315). Cases that did not have time information or had time information recorded incorrectly (n=18) were excluded from Figure 16
SWALLOW SCREENING

Swallow screening should be performed on all cases with stroke within 4 hours of admission and before any oral intake (NSP, 2017; Royal College of Physicians, 2016; IHF, 2010). Swallowing difficulties are common in cases with stroke, and this can lead to food, fluid, and/or saliva entering the airway. This increases the risk of pneumonia (Bray et al., 2017) and therefore poor outcomes, including a longer hospital stay and a higher risk of disability and death (Martino et al., 2009). Swallow screening is a good indicator of organised acute stroke care. In the pre-COVID-19 period 37% (n=559/1505) of cases had swallow screening performed within four hours, this increased to 41% (n=331/805) in the COVID-19 period and represents a statistically significant increase (p<0.05, CI 0.69 – 0.99) (Figure 17).

Figure 17: Swallow screening within four hours (N=2310)\(^5\)

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\(^5\) Figure 17 displays cases that had swallow screen performed only
Most cases with stroke are generally assessed by a clinical nurse specialist after their admission to hospital. In the pre-COVID-19 period 83% (n=1901/2289) of cases were assessed by a clinical nurse specialist, this fell to 73% (n=850/1166) in the COVID-19 period and represents a statistically significant reduction (p<0.01) (Figure 18). This was most likely due to the redeployment of some Clinical Nurse Specialists (CNS) and Advanced Nurse Practitioners (ANP) to other roles during the pandemic. Thirteen CNS/ANPs were redeployed at some point during the first COVID-19 wave.

Figure 18: Assessed by clinical nurse specialist (N=3455)
MULTIDISCIPLINARY TEAM MEETINGS

Figure 19 Indicates if stroke patient care was discussed at a multidisciplinary team meeting. In the pre-COVID-19 period 82% (n=1792/2179) of cases with stroke had their care discussed at these meetings, this declined to 73% (n=818/1126) of cases with stroke in the COVID-19 period and represents a statistically significant reduction (p<0.01).

Figure 19: Discussed at a multidisciplinary team meeting (N=3305)⁶

⁶ Cases that did not have information recorded incorrectly (n=150) were excluded from Figure 19
DISCHARGE DESTINATION

The place in which cases with stroke were discharged to was significantly different (p<0.01) in the two time periods, particularly in regard to the proportion of cases discharged to long term care. In the pre-COVID-19 period 8% (n=190/2289) of cases were discharged to long term care compared to only 4% (n=52/1166) during the COVID-19 period (Table 5). It is important to caveat that the cases in this cohort are cases with stroke who were admitted within the COVID-19 phase (March –May 2020) and were discharged by November 20th 2020 (HIPE extract date). This excludes cases who have an extended length of stay, as do the majority of cases who are discharged to long term care.

The proportion of cases with stroke who were discharged home with Early Supported Discharge increased during the COVID-19 period, this is most evident in the second week of April when Wave -1 of the pandemic was at its’ peak and in the first week of May 2020. The proportions discharged home with Early Supported Discharge was 13% and 14% respectively during these time points (Figure 20). This was most likely due to the increase of tele rehabilitation which was utilised early in the pandemic to support cases with stroke in the home and an enhanced number of Early Supported Discharge teams available nationally in 2020.

Table 5 Discharge destination of cases with stroke (N=3455)

<table>
<thead>
<tr>
<th></th>
<th>pre-COVID-19</th>
<th></th>
<th>COVID-19 Wave 1</th>
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<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
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<tr>
<td>Home</td>
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<td>56.4%</td>
<td>1638</td>
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<td>79</td>
<td>8.0%</td>
<td>233</td>
<td>7.9%</td>
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<tr>
<td>Discharge to long term care</td>
<td>154</td>
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<td>44</td>
<td>4.4%</td>
<td>198</td>
<td>6.8%</td>
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<td>Discharge to off-site rehab</td>
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<td>14.8%</td>
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<tr>
<td>Transfer</td>
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<td>71</td>
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<td>151</td>
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<td>96</td>
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<tr>
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<tr>
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<td>35.6%</td>
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<td>8.4%</td>
</tr>
<tr>
<td>Discharge to off-site rehab</td>
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<tr>
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<td>3.3%</td>
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<tr>
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<td>174</td>
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<td>523</td>
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Figure 20: Cases discharged home with Early Supported Discharge (n=177)
CONCLUSION

The preliminary data from INAS and HIPE presented in this report are intended to provide rapid learning for the health system during this ongoing pandemic. The data so far show that stroke admissions to hospital remained stable throughout wave one of the pandemic. Changes noted between the pre-COVID-19 and COVID-19 periods include:

- HIPE and INAS data are comparable in relation to casemix and activity.
- There was no statistically significant difference in the age and sex of cases with stroke in the pre-COVID-19 and COVID-19 periods (Tables 1 and 2).
- KPI 1- There was no statistical difference in numbers of cases with stroke admitted to a stroke unit in the pre-COVID-19 and COVID-19 periods (Figure 10).
- KPI 2- Cases with stroke who were admitted to a stroke unit were spending a larger percentage of their stay in the stroke unit during the COVID-19 period (Figure 11).
- KPI 3-The thrombolysis rate increased from 10% in the pre-COVID-19 period to 13% in the COVID-19 period (Figure 12).
- There was an increase in the number of cases with stroke who were seen by a doctor within 1hr, from 60% in the pre-COVID-19 period to 70% in the COVID-19 period (Figure 14).
- There was an increase in the number of cases with stroke who had a CT scan within 1hr, from 41% in the pre-COVID-19 period to 49% in the COVID-19 period (Figure 15).
- The number of cases with stroke who were assessed by a Clinical Nurse Specialist decreased from 83% in the pre-COVID-19 period to 73% in the COVID-19 period (Figure 18).
- The number of cases with stroke discharged home with Early Supported Discharge increased from 4% in the pre-COVID-19 period to 7% in the COVID-19 period (Figure 20).

When making assertions about cases with stroke based on the data analysed in this report we must err on the side of caution. The data analysed for this report has not been fully validated either by NOCA or by the HPO.
Nevertheless, based on the early findings presented in this report we can provide some points which should be considered when caring for cases with stroke during subsequent waves of the COVID-19 pandemic; these are:

- That the general public are encouraged to access emergency services in the event of any stroke like symptoms.
- That the stroke care pathway is kept in place. This includes the availability of stroke unit beds and specialist staff such as Clinical Nurse Specialists.
- That for cases with stroke who are discharged home earlier due to risk of infection or lack of access to rehabilitation in hospital have access to appropriate rehabilitation and supports in the community when they become available.

This report is part of a series of NOCA reports aimed at providing timely data to the health service which can in turn be used to improve patient care in the future. When new and validated data are included in HIPE and INAS, subsequent reports will provide a more accurate picture of patient care during each wave of the COVID-19 pandemic. Notwithstanding this, it is still essential to report on data (even if it is recent and not fully validated) that may help improve our understanding of patient care at a time when our health care system is experiencing unprecedented pressure.
REFERENCES


ACKNOWLEDGEMENTS

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