



National Thrombectomy Service
Annual Report 2019

OVERVIEW

Emergency endovascular thrombectomy is a procedure performed by interventional neuroradiologists to remove a blood clot from an occluded intracranial vessel in a patient with an acute stroke, restoring blood supply to the affected brain tissue. In Ireland this is performed in Beaumont Hospital and Cork University Hospital (CUH).

Following multiple international randomised trials and subsequent meta-analysis, thrombectomy is the standard of care for patients with large vessel occlusion, acute ischemic stroke up to 24hrs following the onset of symptoms, as long as the patients meet certain clinical and radiological criteria. Every patient with such a stroke should expect to have the opportunity to receive this treatment.

In 2019, 445 patients were transferred for emergency thrombectomy to Beaumont Hospital (357) and CUH (88). In 2019 there were 4533 ischemic stroke discharges from public hospitals in Ireland, giving a thrombectomy rate of 8.3%. This is increased from a rate of 6.6% in 2018 and 5.6% in 2017.

In 2019, 445 patients were transferred for emergency thrombectomy, Beaumont Hospital (357) and CUH (88).

The provision of the thrombectomy service in Ireland remains unchanged with Beaumont Hospital providing 24/7 service and CUH providing a more limited service during working hours; approximately 8am – 8pm Monday to Friday. Otherwise, all patients present to their acute hospital and are treated using the drip and ship model. Patients within a 90 minute drive from Beaumont Hospital are repatriated immediately following treatment. Patients from further afield are admitted to Beaumont Hospital for 24hrs or more and repatriated as clinically appropriate. Drip and ship patients presenting to CUH are admitted for 24hrs or more prior to repatriation.

The National Thrombectomy Service performs continuous data collection and service audit for quality improvement (Registered with Beaumont Hospital Clinical Audit Department, CA210). Information is collected on all patients referred for thrombectomy, including those for whom a decision is made not to transfer the patient. Additional data is available on patients presenting with suspected acute stroke from hospitals around the country through a national QI programme.

Time is Brain and every minute does actually count. Every small incremental delay from the onset of symptoms results in reduced likelihood of the patient being suitable for thrombectomy or reduced likelihood of a good outcome following thrombectomy due to permanent tissue damage occurring. Every patient must be treated as fast as possible.

The National Thrombectomy Service measures time intervals in the patient care pathway between onset of symptoms and patient treatment. Time metrics are reflective of the efficiency of the stroke service in individual primary stroke centres (PSC's).

In patients who underwent thrombectomy the median times for key steps are as follows:

- Time between onset and arrival at primary stroke centre: 1 hour 55 minutes
- Door to CT time: 22 minutes
- Door to needle time: 50 minutes

- Door to Beaumont Hospital/CUH contact time: 54 minutes
- Door in Door out (DIDO): 1 hour 41 minutes
- Onset to groin puncture: 5 hours 32 minutes
- Onset to reperfusion time: 5 hours 51 minutes

Please see a full breakdown of these time metrics per hospital below in the body of the report.

Door to needle times are 50 minutes nationally for all patients who underwent thrombectomy.

Door to needle times are 50 minutes nationally for all patients who underwent thrombectomy. This figure is stable from 2018 figures (Door to needle of 50 minutes), and there is still a long way to go to improve this specific time metric. Data from the Helsinki Stroke Thrombolysis Registry have reported a reduction in the door to needle times to 20 minutes in 2011. In a recent paper from Stockholm regarding LVO bypass and pre-notification the DTN was 13 minutes in the endovascular centre

The DIDO time is the time between arrival in the PSC and departure for Beaumont Hospital/CUH. We consider 1hr 41mins to be too long.

A new protocol was tested in Naas General Hospital with the ambulance crew that brings the FAST Positive patients into the hospital waiting for the decision and when appropriate immediately transferring to Beaumont. This resulted in a decrease in DIDO from 96 minutes to 48 minutes. It is an excellent achievement with very efficient work flows and positive feedback from Ambulance services. The National Thrombectomy Service QI Project has been working towards the aim of achieving door to decision in 30 minutes for all hospitals so that the ambulance waiting protocol could be extended.

Thrombectomy procedures should be performed with high quality biplane angiographic equipment. The project to replace the existing unit in Beaumont and install an additional unit to ensure continuous access for all patients is now underway and expected to be complete in early 2021. In CUH the biplane unit will be replaced in 2020 also.

CUH continues to provide a thrombectomy service from 8am to 8pm Monday to Friday. A third interventionalist has not yet been appointed. In spite of this the service is growing and achieving some well published successes.

‘Time is brain’ and the earlier an occluded vessel can be reopened, the better for the patient. This is well documented in the literature. Studies and modeling have shown that moving patients with large vessel occlusion stroke directly to the thrombectomy centre can improve onset to recanalisation times by an hour or more. The CAG to the National Stroke Program have agreed in principle that it is appropriate that patients in Dublin with LVO stroke would benefit from going directly to Beaumont for thrombectomy and that outside Dublin/CUH patients would benefit from not moving away from BH/CUH for initial assessment. There are lots of challenges to this change of model, not least recognising LVO stroke at the scene by emergency services. This is being considered by CAG/NTS /Stroke program.

Finally, clinical outcomes obtained through National Thrombectomy Service continue to match those of best international practice in the patients who are fortunate enough to access the service. 47% of the patients treated by thrombectomy recovered to full independence (modified Rankin Score 0-2) following their large vessel occlusion stroke. The mortality rate was 19%. This real world experience matches that achieved in multinational randomised controlled trials.

We look forward to further growth and development in the National Thrombectomy Service with the aim of treating more patients in faster times, having further significant impact on the outcomes of patients suffering from acute ischaemic stroke. There are many staff members at all levels involved in the management of these patients from the moment someone calls the ambulance service, through the many steps in the PSC's and the stroke and interventional neuroradiology teams in the endovascular centres, including, Portering, Nursing, Radiographers and Medical Personnel. I would like to thank and congratulate each and every one of those on the commitment shown for treating these patients as quickly and efficiently as possible. In addition, in order to give such a detailed audit of this service, large volumes of data need to be collected and analysed. Many thanks and congratulations to the stroke teams around the country and to the Department of Radiology in CUH and BH. Their commitment to this process is crucial to the service development and quality assurance.

A handwritten signature in red ink, appearing to read 'John Thornton', is positioned above the printed name.

John Thornton
Director of National Thrombectomy Service

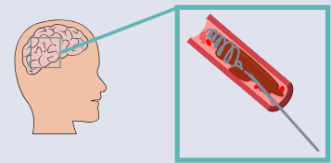
Annual Report 2019 Overview

Emergency thrombectomy is considered standard of care for up to 24hrs following the onset of acute ischaemic stroke. In Ireland, this procedure is carried out in two thrombectomy centres, Beaumont Hospital and Cork University Hospital. In 2019, of the 4533 patients diagnosed with acute ischaemic stroke, 384 patients underwent thrombectomy.

"Time is Brain" every minute of time saved before treatment gains on average one week of healthy life

What is thrombectomy?

Emergency endovascular thrombectomy is a procedure performed by interventional neuroradiologists for treating acute ischaemic stroke. It involves mechanically removing the obstructing blood clot from arteries within the brain, restoring blood flow and minimising permanent tissue damage (NICE 2018)



714



Referrals

EVT centres received 714 referrals from 26 public hospitals.

384



Thrombectomies

In 2019, 384 patients underwent emergency thrombectomy, 306 at Beaumont Hospital and 78 at Cork University Hospital.

47%



Functional Independence

47% of patients had a modified Rankin Score of 0-2 indicating achievement of full functional independence after thrombectomy.

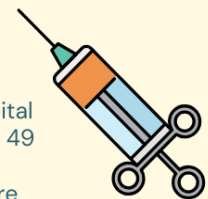
21 mins Door to CT

Median time from arrival at hospital to CT Brain was 21 mins for patients undergoing thrombectomy, a reduction from 25mins in 2018.



49 mins Door to Needle Time

Median time from arrival at hospital to receiving IV thrombolysis was 49 mins for patients undergoing thrombectomy. In 2018, this figure was 50mins.



Door to EVT Referral 53mins

Median time from arrival in hospital to contacting EVT Centre to make a decision about transfer for thrombectomy was 53 mins.



Door In Door Out 1hr 41mins

Median time from arrival in primary hospital to departure for EVT centre was 1hr 41mins.



A pilot project between Naas & Beaumont saw a reduction to 48mins.

Onset to Reperfusion 5hr 46mins

Median time from onset of symptoms to establishment of reperfusion was 5hrs 46mins in patients undergoing thrombectomy in 2019.



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INTRODUCTION

Emergency thrombectomy is considered standard care for up to 24 hours following the onset of acute ischemic stroke following multiple RCT's. Based on this evidence, our inclusion criteria for thrombectomy includes all patients with large vessel occlusion within 24 hours of onset of symptoms, with ASPECTS of >5 and good (>50%) collateral circulation on multiphase CTA. We employ a drip-and-ship model for the transfer of patients for thrombectomy, and in most cases a drip, ship, retrieve and leave model for those patients coming from hospitals within a 90 min drive - meaning immediate repatriation to the primary stroke centre.

The National Thrombectomy Service Governance Group has developed a pathway for the transfer of patients for thrombectomy. This was due for review in September 2019. However as some consideration is being given to changing model to include LVO bypass or redirection, this is currently on hold while CAG/Stroke Program investigate and plan this. The group meets quarterly to discuss the service, monitor activity and consider future development.

DESCRIPTION OF AUDIT PROCESS FOR ANNUAL REPORT

A prospective database is maintained for suspected stroke patients who are admitted to any of the PSC's. Patients are evaluated clinically and radiologically and if deemed suitable for endovascular thrombectomy are transferred to Beaumont Hospital. We collect information about all patients admitted with suspected acute stroke (FAST Positive). Many of these will not require any consultation with thrombectomy centre BH/CUH. For others there is a phone conversation with BH/CUH and the patient may or may not be transferred. Once transferred most patients undergo thrombectomy but some become unsuitable for treatment.

Data is gathered prospectively on the basis of ongoing clinical service evaluation. This is registered with Beaumont Hospital's Clinical Audit committee (CA210). A database is maintained on a secure Beaumont Hospital server. Limited access is available on certain secure PCs by password held only by key personnel in the National Thrombectomy Service. Only relevant medical, timing and procedural information is kept in this part of their patient record.

OVERVIEW OF DATASETS

FAST POSITIVE (SUSPECTED STROKE PATIENTS) DATASET

Through the National Thrombectomy Service QI Programme, data is captured on any patients who present to any stroke centre with symptoms suggestive of acute stroke.

Data points include:

- Onset date/time
- Arrival date/time at PSC
- Time of CTB/CTA/CTP
- IV lysis time
- If EVT centre was contacted

- Time EVT centre contacted
- Time of decision re thrombectomy (regardless or whether or not EVT centre was contacted).
- Departure time if transferred for thrombectomy.
- Final diagnosis

The decision time regarding need for thrombectomy is applicable to all patients and reflects how long an ambulance crew would need to wait before being released or else taking the patient for transfer to Beaumont Hospital or CUH.

This data is used for QI purposes to assess the performance of each stroke service and forms the basis for initially identifying service quality improvements (see below for further discussion). The ability of each team to capture this information varies from hospital to hospital.

REFERRALS DATASET

We record a minimum dataset for all external referral calls that come through to Beaumont Hospital National Thrombectomy Service. A decision is made between the referring clinician and the neuroradiologist whether or not to transfer the patient for thrombectomy.

All patients have baseline data collected (as per QI programme); if a patient is not accepted for transfer the reason for this is recorded.

PATIENTS TRANSFERRED TO THE NATIONAL THROMBECTOMY CENTRE BUT UNSUITABLE FOR EVT DATASET

On arrival at Beaumont Hospital from PSC for thrombectomy patients are re-evaluated. If >2hrs since original imaging, this is repeated. Some patients are found to be unsuitable for treatment. Relevant data points and reasons for no treatment are noted. Avoiding unnecessary transfers and improving efficiency of transfer are targeted with this information.

THROMBECTOMY PATIENT DATASET

The most extensive and largest data set is of the patients who proceed to thrombectomy. There are approximately 65 data points on each patient. Having all of these data points allows detailed analysis of the service from onset of stroke to point of recanalisation and final clinical outcome.

Minimum dataset for all patients is:

- Onset date/time
- Arrival in PSC time
- CTB/CTA/CTP date & time
- Decision time regarding need for thrombectomy

Patients who were transferred for thrombectomy are presented and discussed at the monthly stroke MDM held in Beaumont Hospital. We have WebEx video conferencing system which now allows referring sites to join this meeting remotely and have an input to the discussion regarding their patients. Monthly reports regarding thrombectomy are presented at this meeting.

Results

According to HIPE data, 5005 patients were discharged from hospitals with primary diagnosed cerebral infarctions in 2019 (i63 & i64). 357 patients were transferred to Beaumont Hospital with a view to thrombectomy & 306 underwent thrombectomy, including 40 patients who presented directly to BH. 51 patients were transferred but did not undergo thrombectomy as they were deemed unsuitable after clinical evaluation, repeat imaging or following catheter angiogram on arrival.

Furthermore, there were 88 patients transferred to CUH with a view to thrombectomy and 78 underwent thrombectomy, including 43 patients who presented directly to BH. 10 patients were transferred but did not undergo thrombectomy.

In addition, the thrombectomy service in Beaumont hospital received a further 289 external referral calls regarding potential thrombectomy, who were not transferred. CUH received an additional 41 external call referrals but these patients were not transferred.

THROMBECTOMY DATASET

The total thrombectomy rate for 2019 was 378*/4533** which equates to 8.3%. In 2018, the rate was 317/4765 (6.6%). In 2017 the rate was 279/4319 (5.6%). Of the public hospitals 18/25 increased their rate of referral.

Table 1. Thrombectomy Rate 2019 Vs. 2018

Hospital	2019 Referral N (%)	2019 Total N Of Ischaemic Strokes	2018 Referral N (%)	2018 Total N Of Ischaemic Strokes
Beaumont	40 (13)	315***	41 (19)	221*
Mater Misericordiae University Hospital	47 (15)	321	36 (11)	316
St. James Hospital	23 (10)	221	26 (11)	229
Naas General Hospital	19 (10)	181	19 (11)	179
Mullingar Regional Hospital	11 (10)	109	9 (9)	104
Navan General Hospital	3 (4)	72	6 (9)	67
St. Lukes Hospital Kilkenny	9 (9)	103	7 (7)	104
Tallaght University Hospital	21 (10)	215	17 (7)	228
OLOL	17 (9)	187	11 (6)	187
CUH	43 (10)	423***	37 (9)	399
SVUH	28 (8)	351	19 (5)	347
Letterkenny General Hospital	6 (4)	151	5 (3)	147
Cavan General Hospital	4 (4)	107	2 (1)	134
University Hospital Waterford	14 (9)	123	9 (8)	117
University Hospital Limerick	13 (5)	237	16 (5)	317
JCMH	5 (3)	184	7 (4)	172
Sligo General Hospital	6 (4)	165	10 (6)	138

Mayo University Hospital	11 (6)	178	8 (6)	133
Galway University Hospital	21 (8)	258	14 (5)	256
Wexford General Hospital	10 (9)	114	3(2)	133
Midland Regional Hospital Tullamore	2 (3)	72	1(1)	73
University Hospital Kerry	11 (9)	123	2 (1)	166
South Tipperary General Hospital	6 (6)	95	4 (4)	88
Portiuncula University Hospital	2 (4)	53	0	58
Mercy University Hospital	7 (9)	82	2 (2)	86
Bantry General Hospital	2 (2)	93	1 (1)	72
Private Hospitals & other	6	N/A	N/A	N/A
TOTAL	384	4533	317	4765

*This total excludes 6 patients who were referred from private hospitals and hospices

**This figure excludes ischemic stroke discharges from BH and CUH that were originally transferred from another primary hospital

***This number excludes external referrals; it reflects no. of patients admitted directly to Beaumont Hospital or CUH

TIME METRICS

Door to CT and door to needle times reflect internal hospital processes related to early patient clinical and radiological evaluation with a view to intravenous thrombolysis which is standard of care for 20 years. AHA guidelines recommend door to needle times of less than 60 mins, aiming for less than 45 mins. The most efficient hospitals in the world achieve times of approximately 15mins. Every minute counts. Save a minute, save a week!!

The median door to CT is 21mins for patients receiving thrombectomy and the door to needle is 49 mins (n=116).

Having the decision makers in place and prepared to give IV tPA in CT would reduce the time between CT and IV lysis. A door to needle of less than 30 minutes is achievable in our system.

In 2019 the median door to Beaumont Hospital contact is 53 mins and the DIDO time is 1 hour 41 mins.

The interval between CT and BH contact is too long and could be significantly improved. Improved communication between radiology and the physician could significantly improve this.

Door to contacting Beaumont times as well as DIDO times reflect the ability to rapidly process patients for a decision about thrombectomy and get them transferred to Beaumont. This is due to a combination of internal processes and the time taken to get an ambulance transfer.

If the door to decision time was <30 mins the ambulance crews could be asked to wait and bring the patient immediately potentially achieving a DIDO of 30-40 mins.

In 2018/2019 a new protocol was introduced in Naas General Hospital in conjunction with the National Ambulance Service and Beaumont Hospital/National Thrombectomy Service QI. The Ambulance crew which brings the FAST Positive patient to Naas waits for a decision re thrombectomy and if the patient is for transfer, they immediately make the transfer. This has resulted in reduction of DIDO from 96 minutes to 48 minutes. This is a target for all others to aim for and is considered achievable.

Table 2. Door Metrics Of Patients Who Underwent Thrombectomy Procedures At Beaumont Hospital

Hospital	Total (IP)	Door To CT Median (Hr:Min) {Range}	Door To Needle Median (Hr:Min) {Range}	Door To BH Contact Median (Hr:Min) {Range}	DIDO Median (Hr:Min) {Range}
Beaumont Hospital	40 (10)	00:21 {00:06 – 00:48}	00:44 {00:18 – 02:14}	N/A	N/A
Cavan	4 (1)	00:13 {00:10 – 00:48}	00:30 {00:16 – 00:44}	00:44 {00:24 – 01:08}	01:54 {01:42 – 02:11}
Galway	21 (1)	00:19 {00:04 – 01:50}	00:54 {00:24 – 01:30}	01:04 {00:19 – 03:44}	01:56 {00:49 – 05:20}
Connolly	5 (1)	00:20 {00:14 – 00:26}	00:28 (n=1)	00:35 {00:25 – 00:39}	00:50 {00:31 – 01:09}
Kerry	5 (1)	00:21 {00:09 – 00:47}	01:25 {01:24 – 01:27}	01:07 {00:54 – 01:53}	02:35 {01:34 – 03:24}
Kilkenny	9	00:39 {00:19 – 01:53}	00:27 (n=1)	01:02 {00:30-02:35}	01:45 {01:00– 03:07}
Letterkenny	6 (1)	00:39 {00:19 – 01:46}	01:19 {00:44 – 01:55}	01:08 {00:44 – 02:28}	02:10 {01:43 – 03:49}
Limerick	7 (1)	00:42 {00:10 – 00:54}	01:20 {00:54 – 01: 44}	01:35 {01:20 – 01:46}	02:15 {01:59 – 02:42}

Mater	47 (7)	00:18 {00:05 – 01:28}	00:47 {00:20 – 02:39}	00:44 {00:17 – 03:09}	01:02 {00:30 – 06:50}
Mayo	11 (1)	00:36 {00:20 – 01:20}	01:05 (n=1)	00:59 {00:26 – 02:13}	02:17 01:22 – 03:15}
Mullingar	11	00:15 {00:06 – 00:30}	00:47 {00:22 – 01:10}	00:51 {00:15 – 01:22}	01:49 {01:31 – 02:00}
Naas	19 (3)	00:10 {00:04 – 00:39}	00:23 {00:21 – 00:30}	00:32 {00:17 – 00:59}	00:56 {00:23 – 05:05}
Navan	3 (1)	00:24 {00:22 – 00:26}	01:17 {01:05 – 01:30}	01:19 {01:13 - 01:25}	02:25 {02:25 – 02:25}
OLOL	17 (5)	00:14 {00:05-00:32}	00:58 {00:37-01:23}	00:51 {00:31-01:33}	01:31 {01:00-01:47}
Portiuncula	2 (0)	01:00	(n=0)	00:51 {00:45 - 03:25}	01:31 {01:58-04:30}
Sligo	6 (0)	00:22 {00:08- 00:49}	00:37 {00:15-00:57}	00:59 {00:35 -01:22}	01:53 {01:12-03:00}
South Tipperary	2	00:58 {00:57- 01:00}	01:24 {01:21 - 01:45}	01:29 {01:37-01:22}	02:05 {01:40-02:31}
St James	23 (1)	00:25 {00:04 -01:00}	01:04 {00:22 - 02:09}	00:55 {00:15 - 03:42}	01:35 {00:54 - 04:30}
SVUH	28 (2)	00:16 {00:04 -00:52}	00:40 {00:15 - 01:47}	00:58 {00:25 - 01:45}	01:45 {00:53 - 05:05}
Tallaght	21 (1)	00:20 {00:05 - 01:46}	00:25 {00:18 - 02:40}	00:45 {00:19 - 02:40}	01:34 {00:45 - 04:00}
Tullamore	2 (1)	00:37 (n=1)	(n=0)	02:25	(n=0)
Waterford	8 (0)	00:37 (00:09 – 02:37)	01:01 {00:56 - 03:37}	01:56 {00:37 - 03:04}	02:28 {01:25 - 05:35}
Wexford	8	00:47 {00:22 - 01:21}	00:35 {00:29 - 01:21}	01:07 {00:45 - 02:04}	01:57 {01:10 - 03:09}
TOTAL	303	00:21 {00:02 - 2:51}	00:49 {00:15 -03:37}	00:53 {00:15 - 05:35}	01:41 {00:23 - 06:50}

Table 3. Cork University Hospital Data On EVT Patients

Hospital	Total (IP)	Door To CT Median {Range}	Door To Needle Median {Range}	Door To CU Contact Median {Range}
Cork University Hospital	43 (4)	00:24 {00:11 – 03:10}	00:48 {00:18 – 02:25}	N/A
Bantry General	2	00:37 {00:10 – 01:00}	01:05 {00:17 – 01:20}	00:42 {00:25 – 01:50}
Bons Cork	(1)	N/A	N/A	N/A
Kerry General Hospital	6	00:20 {00:05 – 00:45}	00:50 {00:50 – 01:15}	00:52 {00:25 – 02:30}
Mercy University Hospital	7 (1)	00:20 {00:19 – 00:40}	00:48 {00:35 – 01:00}	00:47 {00:34 – 08:35}
St Francis Hospice	2 (2)	N/A	N/A	N/A
South Tipperary General Hospital	4 (1)	00:50 {00:45 – 00:55}	N/A	01:25 {01:22 – 01:29}
University Hospital Limerick	8	00:25 {00:08 – 01:18}	N/A	00:54 {00:33 – 02:30}
University Hospital Waterford	5	00:40 {00:12 – 01:17}	01:12 {00:47 – 02:20}	01:10 {00:33 – 02:30}

Time from arrival in Beaumont Hospital & CUH to groin puncture reflects efficiency in interventional stroke services and like all time intervals, affects patient outcome.

It is analysed separately for those presenting directly to Beaumont Hospital & CUH versus those on a Drip & Ship model transferred from elsewhere.

Table 4. Time From Arrival To Groin Puncture

Beaumont Door to Groin (n=30)	01:04
Drip & Ship Model (n=263)	00:14
Cork University Hospital Door to Groin (n=20)	01:19
Drip & Ship Model (n=34)	00:46

Table 5. Time Metrics For Thrombectomy Procedures Carried Out In Beaumont Hospital

Median length of procedure (hr:min)	00:32
Median time groin puncture to 1 st reperfusion (hr:min)	00:20

Table 6. Time Metrics For Thrombectomy Procedures Carried Out In Cork University Hospital

Median length of procedure (hr:min)	00:43
Median time groin puncture to 1 st reperfusion (hr:min)	00:23

HOSPITAL RANKINGS

Thirteen hospitals had a rate of referral for thrombectomy of >8.3% which is above the national average and 13 hospitals referred ≤8.3%. To rank the time metrics for these hospitals reflecting their efficiency, we have split them into two groups for more appropriate comparison. This data includes referrals to both Beaumont Hospital and Cork University Hospital.

Table 7. Hospital Rankings Where Referral Rate >8.3%

Hospital	Ref Rate	Door To Ct Rank	Door To Needle Rank	Door To Contact Rank	DIDO Rank
Mater	15%	4	5	2	2
Beaumont Hospital	13%	9	4	N/A	N/A
Naas	10%	1*	1*	1*	1*
St James	10%	11	12	8	6
Cork University Hospital	10%	10	8	N/A	N/A
Mullingar	10%	3	5	6	8
Tallaght	10%	5	2	3	4
OLOL	9%	2	11	6	3
Waterford	9%	5	5	3	4
Kerry	9%	5	13	9	10
Wexford	9%	13	10	11	9
Kilkenny	9%	12	3	10	7
Mercy University Hospital	9%	5	8	5	N/A

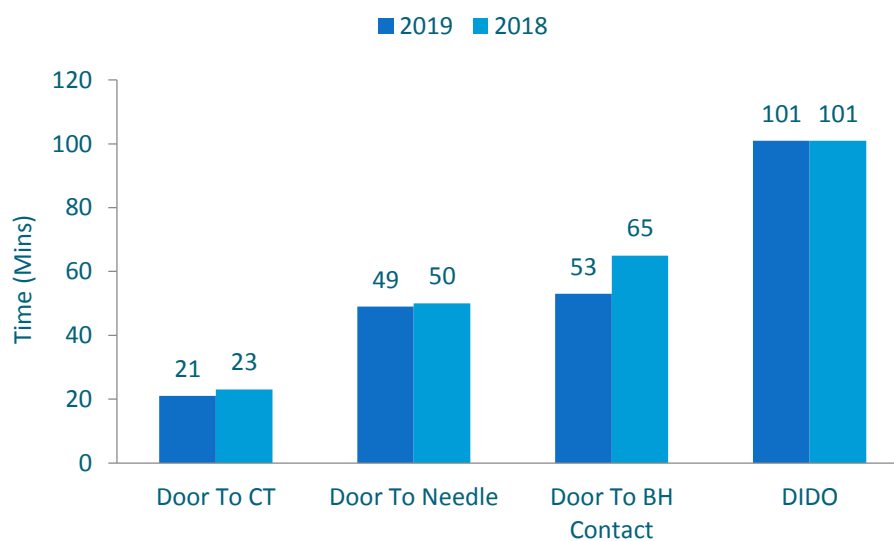
*Note the success of NGH with the introduction of the ambulance-waiting protocol. Many congratulations to all involved.

Table 8. Hospital Rankings Where Referral Rate ≤8.3%

Hospital	Ref Rate	Door To Ct Rank	Door To Needle Rank	Door To Contact Rank	DIDO Rank
Galway	8%	3	5	8	6
SVUH	8%	2	4	5	3
South Tipperary	6%	12	11	12	7
Mayo	6%	8	6	6	10
Limerick	5%	7	8	11	9
Navan	4%	6	8	10	11
Letterkenny	4%	11	10	9	8
Portiuncula	4%	13	N/A	4	2
Cavan	4%	1	2	3	5
Sligo	4%	5	3	6	4
Tullamore	3%	9	N/A	13	N/A*
Connolly	3%	4	1	1	1
Bantry General	2%	9	6	2	N/A*

* Missing departure times

Figure 1. 2018 vs. 2019 Median Values For Patients Who Underwent Thrombectomy Procedures At Beaumont Hospital



Outcomes

TICI RECANALISATION

TICI recanalisation reflects the technical success of the Thrombectomy procedure for anterior circulation strokes only. Rates of 2b, 2c & 3 are considered good and expected rates internationally are 80%.

In 2019 we achieved TICI 2b or better in 86% in anterior circulation strokes.

Table 9. TICI Recanalisation Rates

TICI Post Scores	N (%)
2c-3	236 (64)
2b:	68 (22)
2a:	25 (7)
0-1	12 (6)

MODIFIED RANKIN SCORE (MRS)

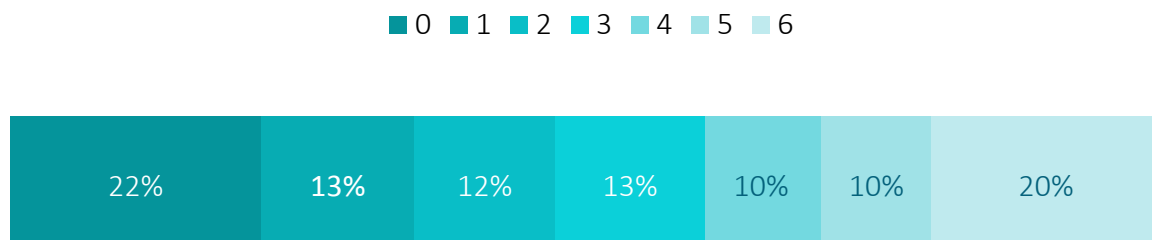
The Modified Rankin Score (mRS) is a 6 point scale indicating the level of disability. mRS 90 day outcome indicates the 90 day clinical outcome and is an international standard in literature reporting.

A mRS score of 0-2 indicates the achievement of functional independence. The Hermes meta-analysis of the main five randomised trials of Thrombectomy reports that mRS of 0-2 is achieved in 46% of patients. Typically real life experience is not as good as that in trials as patients are included who would be excluded from trials.

In 2019, 90 day mRS of ≤ 2 was achieved in 47%.

In 2019, 90 day mRS of ≤ 2 was achieved in 47% of patients undergoing thrombectomy at Beaumont Hospital and CUH.

Figure 2. Modified Rankin Score at Day 30



Patients Transferred to National Thrombectomy Centre but Unsuitable for EVT

Some patients will not be suitable for thrombectomy despite being referred. Some patients will improve with thrombolysis or spontaneously. Other patients will progress rapidly with or without thrombolysis. Factors involved in patients becoming unsuitable include the time from stroke onset, the type of artery blocked, the collateral score and the distance between their PSC and the endovascular centre.*51 patients were unsuitable for thrombectomy on arrival to Beaumont Hospital*

This table outlines the time metrics for the 51 patients transferred to Beaumont Hospital for thrombectomy but deemed unsuitable on arrival.

Table 10. Patients Transferred But Unsuitable For Thrombectomy On Arrival To Beaumont Hospital

Hospital	Total (IP)	Door To Ct Median {Range}	Door To Needle Median {Range}	Door To BH Contact Median {Range}	DIDO (Hr:Min) Median {Range}
Bantry	1 (1)	Inpatient	Inpatient	Inpatient	Inpatient
Cavan	4 (1)	00:11 {00:05 – 00:17}	00:44 {00:40 – 00:48} (n=2)	00:34 {00:29 – 00:40}	01:37 {01:00 – 02:14}
Clonmel	1 (1)	Inpatient	Inpatient	Inpatient	Inpatient
Galway	5 (1)	00:14 {00:12 – 00:25}	00:44 {00:34 – 00:54} (n=2)	00:43 {00:32 – 00:59}	01:19 {01:12 – 02:04}
Kilkenny	2	00:30	00:45 (n=1)	00:48 {00:45 – 00:52}	01:15 (n=1)
Limerick	2 (1)	08:00 (n=1)	00:30 (n=1)	00:41 (n=1)	02:20 (n=1)
Mater	2 (1)	00:44 (n=1)	(n=0)	01:12 (n=1)	02:07 (n=1)
Mayo	4	01:04 {00:44 – 01:38}	01:27 (n=1)	01:28 {01:12 – 01:57}	02:55 {02:07 – 03:09}

Mullingar	9	00:35 {00:06 – 00:40}	01:24 (n=4)	01:26 {00:37 – 01:37}	02:20 {02:00 – 02:50}
Naas	1	00:48	no lysis	01:36	01:45
Navan	(1)	N/A	N/A	N/A	N/A
Sligo	2 (1)	01:06 (n=1)	01:16 (n=1)	01:33 (n=1)	03:08 (n=1)
St. James	1	00:16 (n=1)	01:04 (n=1)	N/A	N/A
SVUH	5	00:08 {00:07 – 00:56}	00:42 {00:39 – 00:58}	00:56 {00:42 – 01:39}	01:32 {01:08 – 02:09}
Tallaght	3	00:24 {00:19 -00:30}	00:47 {00:38 – 00:56} (n=1)	00:50 {00:36 – 00:50}	01:16 {01:11 – 01:22}
Waterford	2	00:34 {00:22 – 00:46}	02:08 (n=1)	03:13 {01:17 – 05:09}	04:43 {02:53 – 06:24}
Wexford	4	00:52 {00:13 – 01:01}	01:51 {01:12 – 02:30} (n=2)	03:46 {00:36 – 05:57}	02:54 {02:51 – 07:49}
Private Hospitals	1	N/A	N/A	N/A	N/A
TOTAL	51 (8)	00:30 {00:05-01:38}	00:57 {00:10 - 02:30}	01:17 {00:29-05:11}	02:08 {01:00-07:49}

Table 11. Reasons For Unsuitability For Thrombectomy

Unsuitability Reason	N (%)
Recanalisation	32 (63)
Established infarct	15 (37.5)
Haemorrhagic transformation	1 (2.5)
Other	3 (6)

REFERRALS DATASET

There were 605 calls to Beaumont regarding patients for thrombectomy in 2019. Of these, 289 (48%) were not transferred. Time metrics for external referrals for thrombectomy but not transferred are recorded.

This group of patients which whom contact is made with Beaumont Hospital to discuss the possibility of thrombectomy. A high rate of non-transfer in a particular hospital perhaps reflects a lack of availability of decision making expertise in spite of good workflow attempting to identify candidates. Nonetheless, the data gives good additional information about the quality of service in each hospital. For the majority of patients the local radiology and stroke teams make the decision that the patient is not a candidate for thrombectomy.

We know from previous analysis (3) that patients with delayed onset to arrival times, those from the remote region group of hospitals (>90 minute drive from Beaumont Hospital) or those presenting out of hours are less likely to be transferred for thrombectomy.

Table 12: External Referrals Not Transferred To Beaumont Hospital

Hospital	Total Calls	Calls Not Transferred	% Of Calls Not Transferred	Door To CT Median Hr:Min {Range}	Door To Needle Median Hr:Min {Range}	Door To BH Contact Median Hr:Min {Range}
Cavan	15	7	47%	00:15 {00:05 – 01:28}	n=0	00:45 {00:40 – 03:52}
Clonmel	3	2	67%	00:27	n=0	01:08
Cork	1	1	100%	00:40	n=0	01:30
Galway	42	16	38%	00:20 {00:15 – 00:27}	00:20 (n=2)	00:50 {00:29 – 01:16}
Kerry	20	15	75%	00:22 {00:11 – 00:58}	01:10 (n=1)	01:55 {00:45 – 06:00}
Kilkenny	22	11	50%	00:23 {00:15 – 00:32}	00:28 {00:27 – 01:45} (n=4)	01:28 {00:54 – 01:55}
Letterkenny	20	14	70%	00:44 {00:15 – 02:05}	00:38 {00:28 – 01:30} N=4	01:30 {00:29 – 03:27}
Limerick	24	17	71%	00:41 {00:04 – 01:43}	00:58 {00:45 – 01:40} (n=7)	01:52 {00:38 – 03:23}
Mater	67	18	27%	00:27 {00:12 – 00:40}	01:15 {00:48 – 01:35} (n=3)	01:19 {00:20 – 04:18}
Mater Private	2	1	50%	N/A	N/A	N/A

Mayo	42	27	64%	00:44 {00:28 – 01:33}	n=0	01:25 {00:58 – 07:14}
Mullingar	33	13	39%	00:33 {00:07 – 01:01}	00:54 (n=1)	01:10 {00:33 – 02:15}
Naas	32	12	38%	00:25 {00:05 – 01:42}	n=0	00:42 {00:28 – 07:10}
Navan	15	11	73%	00:44 {00:16-01:13}	01:21 {01:05 - 01:37} N=2	01:47 {01:18 - 04:30}
OLOL	46	29	63%	00:23 {00:09 – 02:57}	n=0	01:26 {00:20 – 03:20}
Portlaoise	1	1	100%	00:44 {00:31 – 00:58}	n=0	03:46 {03:32 – 04:00}
Sligo	32	24	75%	00:53 {00:13 – 01:44}	00:49 {00:26 – 01:25} (n=4)	01:43 {00:36 – 06:40}
South Tipp	4	2	50%	00:30	n=0	00:38
St James	45	21	47%	00:49 {00:13 – 02:37}	00:44 (n=1)	01:40 {00:26 – 03:12}
SVUH	50	17	34%	00:26 {00:09 – 03:01}	00:40 (n=1)	01:14 {00:18 – 03:40}
Tallaght	26	2	8%	01:15	n=0	02:06
Tullamore	4	2	50%	01:35	n=0	03:58
Waterford	16	6	38%	00:37 {00:28 – 00:47}	00:52 (n=1)	01:31 {01:22 – 01:40}
Wexford	32	20	63%	00:46 {00:27 – 01:27}	01:04 (n=1)	01:06 {00:45 – 01:48}
Total	605	289	48%	00:35 {00:04 - 03:01}	00:54 {00:20 – 02:08 (n=32)	01:24:00 {00:18:00 – 07:14:00}

Table 13. Reasons For Not Transferring For Thrombectomy

Reason	Count	%
No LVO	111	38%
Large or established Infarct	97	33%
Distal Occlusion	13	4%
Clinical Improvement	6	2%
Low Presenting NIHSS	19	7%
Poor Baseline	17	6%
No CTA performed	2	1%

OVERALL EVT DATASET

Comparing these data groups we get a better picture for larger number of stroke patients. We note that patients with shorter door to CT and needle as well as DIDO are more likely to be transferred and then actually treated.

Table 14. Overview of Beaumont Hospital Group Figures

Beaumont Hospital Group	Year	% (N)	Door To CT Median	Door To Needle Median	Door To BH Contact Median	DIDO (Hr:Min) Median
EVT	2019	47(306)	00:21	00:49	00:53	01:41
	2018	45 (263)	00:25	00:50	1:05	1:41
Transferred But Deemed Unsuitable On Arrival At BH	2019	8 (51)	00:30	00:57	01:17	02:08
	2018	10 (68)	00:31	01:02	01:29	02:14
External Referral Call – No Transfer	2019	45 (289)	00:35	00:54	01:24	N/A
	2018	44 (257)	00:43	01:07	01:48	N/A
TOTAL	2019	(643)	00:26	00:50	01:09	N/A
	2018	(588)	00:30	00:52	01:20	N/A



National Thrombectomy Service 2019-2020 Projects

The National Thrombectomy Service is committed to improving patient outcomes through the initiation, leadership and support of projects that improve pre-hospital and in-hospital pathways, processes and the infrastructure that supports the delivery of care.

FAST+ Pre Alert

To pre-notify ED staff of FAST+ positive patient en route to enable advance preparation and improve stroke pathway metrics.

In 2019, Beaumont Hospital, Dublin Fire Brigade and the National Ambulance Service collaborated to maximise the number of times that Emergency Department staff were pre-alerted that a FAST+ patient was en route. Median times for all key metrics reduced significantly.



Door to CT



Door to Needle



Door to Decision

Ambulance Waiting

To reduce the delay in transferring a patient for thrombectomy without increasing ambulance waiting time.



Door In Door Out

In 2018-2019, a Pilot project was carried out between Naas General Hospital, the National Ambulance Service and Beaumont Hospital. Ambulance crew wait with the patient on arrival to NGH until a decision is made regarding need for thrombectomy.

The median time from arrival in Naas to departure for Beaumont was 96mins in the control group and 48mins in the test group. Ambulance usage time did not increase significantly.



Automated Imaging Software

To improve decision making efficiency by alerting physicians involved that a patient's scans are available to view.



Automated imaging software can aid in the speeding up of decision making by sending an automated email and an app notification to the physicians involved in the patient's care.

Median time from CT to contacting EVT Centre was 40 mins in hospitals without automated software and 15mins in hospitals with software.



CT to Contact EVT

Door to Decision in 30!

To reduce the time between arrival and a decision being made regarding the suitability for EVT to 30mins.

A QI Project for the care of patients with acute ischaemic stroke commenced in 2018 and now includes 24 hospitals.

The median door to decision time reduced from 71mins in 2018 to 37mins in 2019.



Door to Decision

Thrombectomy Database

The project aims to establish an easy to use database that can be integrated with National Reporting Systems.

Together with Beaumont IT, the NTS is developing a database with associated data entry system, interactive dashboard, automated reporting and accessible dataset.

The Pilot Phase of the system is currently in use at Beaumont Hospital.



NATIONAL THROMBECTOMY SERVICE PROJECTS

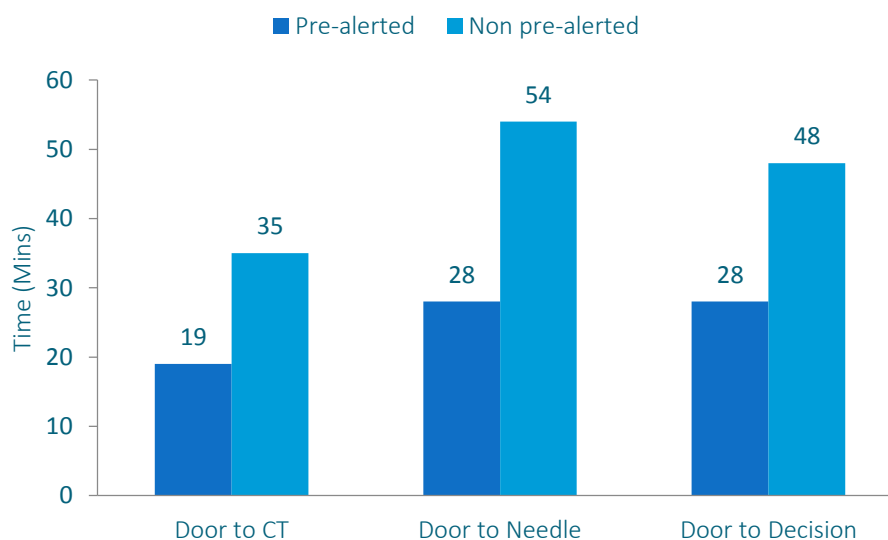
1. Emphasis on Pre-Alerts

The sending of a 'pre-alert' message in suspected stroke patients travelling to hospital via ambulance can significantly improve the timeliness of diagnosis and treatment.

Throughout early 2019 a quality improvement initiative was commenced in order to maximise the number of FAST-positive patients that were pre-alerted by ambulance staff to Beaumont Hospital, and to optimise the hospitals response to the incoming patient. The Dublin Fire Brigade (DFB) and the National Ambulance Service (NAS) were contacted, while education was arranged for Beaumont triage and Emergency Department (ED) staff in order to establish a rapid and efficient response. The results were presented at monthly FAST meetings, and circulated back to DFB, NAS and the ED department.

A significant improvement can be seen in the stroke time metrics for pre-alerted patients compared to non-pre-alerted patients in 2019 (Figure 2).

Figure 3: A Comparison of Median Values for 2019 Pre-Alerted Vs Non Pre-Alerted Fast-Positive Patients Presenting To Beaumont Hospital



2. Naas/Beaumont Hospital Ambulance Pathway

A pilot programme was launched in October 2018 in conjunction with the National Ambulance Service (NAS) for patients with suspected ischaemic stroke who present to Naas General Hospital (NGH). Currently there are delays with regards to the transport of patients to the endovascular centre once a decision has been made to transfer. Reducing the time spent in the PSC (ie reducing the DIDO) is necessary to avoid delays in time to treatment. On a national level, the median DIDO times are 1hr 41minutes. The purpose of this pilot is to reduce the delay in the transfer of

patients who require thrombectomy from NGH to Beaumont Hospital without increasing ambulance usage time. During this project, the ambulance crew waits with the patient on arrival to NGH until a decision is made whether or not to transfer the patient to the endovascular stroke centre. In order for this to operate the door to decision time must be reduced to under 30 minutes.

During the trial period, eleven patients had an LVO amenable for mechanical thrombectomy. There was a significant reduction in the DIDO times for the new protocol group compared to the historical control group (median 48 mins vs 96 mins; $p < 0.0001$). There was no statistically significant difference in ambulance usage time between the two time periods (median 52 mins vs 48 mins; $p = 0.6203$). Ambulance usage time for FAST positive patients that were not for transfer were also compared in the pre-trial and trial period. There was an increase in ambulance usage time in FAST positive patients not for transfer in the pilot group compared to FAST positive patients not for transfer in the historical group (27 mins vs 55 mins) ($p < 0.001$). In addition, door-to-needle times in those eligible for thrombolysis improved compared to historical data (34 mins vs 60 mins) ($p = 0.0532$) and door-to-CT times improved (14 mins vs 39 mins) ($p = 0.0001$).

Our data shows a significant reduction in the DIDO for patients transferred for thrombectomy, with no adverse effects on ambulance usage time. Our study highlights that same crew ambulance waiting for thrombectomy decision and subsequent transfer to the thrombectomy centre is a feasible and effective way to significantly reduce DIDO times, with the additional various non-thrombectomy benefits. The protocol developed is widely applicable and can easily be adopted by other hospital sites where a rapid door-to-decision can be achieved. By showing that there was no increase in ambulance usage time in the thrombectomy cohort, our study demonstrates that it is acceptable to the ambulance service.

3. Automated Software

Beaumont Hospital currently has installed imaging processing software on a trial basis for CT brain, CT angiography and CT perfusion imaging. As part of the trial the installation of this software was extended to a further 9 sites. The aim of this software is to make the decision making process quicker regarding suspected stroke patients who present to PSC's. Improving decision making gives patients the best possible chance of receiving endovascular thrombectomy and restoring blood flow to affected vessel to regain independent living or back to baseline health pre ischemic stroke. This software can aid in the speeding up of decision making by both sending an automatic email and alerting with an app notification to the physicians involved in the patient's care. The introduction of the software and its adaptation is a difficult process and many challenges were encountered. Hospitals engaged to varying degrees and full availability of this software for usage varied between sites.

We performed an audit that analysed the time between diagnostic CT and the time of referral to BH in patients with suspected acute ischemic stroke who presented to hospitals with such automated software currently in use, compared to those hospitals without the software. This audit examined referrals for potential thrombectomy in January-March 2020. Median time from diagnostic CT to referral time in hospitals with automated software was 15 mins ($n = 23$), compared with a median time of 40 mins ($n = 24$) in hospitals without software. These figures can

also be compared to the overall median for all hospitals in 2019, which was 37 min (n=520). These findings support the introduction of automated software in stroke identification across Ireland, with the goal of speeding-up time to referral and therefore time to treatment.

4. National Thrombectomy Database

In 2019, significant progress was made towards the development of a National Thrombectomy Database. This project aims to establish an easy to use database with associated data entry system, interactive dashboard, automated reporting and accessible dataset (for ad hoc reporting) that can be integrated with National reporting systems.

A pilot version of the data entry system went live earlier this year, and is currently in use at Beaumont Hospital to capture real time information on all potential and actual thrombectomies from the point of referral through to procedure and follow up. The process to develop data visualisation capabilities and automated reported is ongoing.

5. National Thrombectomy Service Meetings

The first National Thrombectomy Service meeting took place in October 2017. In 2018 we did not hold a specific NTS meeting but joined in the BNSR/ISNR meeting which was held in October. This year, the NTS/QI meeting took place on 9th of October at the Royal College of Surgeons. We were delighted to have Prof. Meretoja as our guest speaker for this event.

The meeting was well attended and there was lively debate. Several of the hospitals presented their own experience and data in an excellent shared learning experience.

6. National Stroke Quality Improvement Project

In 2018, the National Thrombectomy Service and Beaumont Hospital Stroke team, in conjunction with the Royal College of Physicians of Ireland and the Royal College of Surgeons of Ireland, established a national Quality Improvement (QI) Collaborative Project “Door to Decision in under 30!” The aim of this collaborative was to improve the interval between the time of the arrival of the patient in hospital and the clinical and radiological diagnosis and decision making process.

The primary outcome metric is the “door to decision” time i.e. the time interval between arrival at hospital and a decision being made regarding the suitability of the patient for emergency thrombectomy.

The “door to decision” time is the time interval between arrival at hospital and a decision being made regarding the suitability of the patient for emergency thrombectomy

The official collaborative process comprising formal learning sessions and action periods ended in June 2019, however all participating hospitals have committed to continue engaging with the programme and to continue collecting data and testing service improvements into 2020.

2019 saw ongoing engagement from hospitals in attempting to improve their pathways and streamline the management of FAST+ and suspected patients with stroke.

Table 15. Comparison of Fast Positive Data 2018 vs. 2019

Date Range	Fast+ Patients Total	Total "Time Of Decision" Recorded (%)	Median Door To CT ¹ {IQR}	Median Door To CTA ¹ {IQR}	Median Door To Decision ¹ {IQR}
Jan – Dec 2018 ⁵	383	59 (15.4%)	30mins {17-78mins} n358	35mins {24-66mins} n272	71mins {42-131mins} n54
Jan – Dec 2019 ⁶	3740	1562 (43.4%)	32mins {18-61mins} n3050	34mins {22-59mins} n2131	37mins {23-62mins} n1462

- ⁵ 17 hospitals included
- ⁶ 22 hospitals included (St.James and not included)

Substantial improvements have been made so far, with the national median Door to Decision time for all FAST+ patients decreasing from 71mins in 2018 (n54), to 37mins in 2019 (n1462) (Table 15).

The median door to decision time for FAST+ patients nationally in 2019 was 37mins.

Furthermore, the amount of data collected increased substantially in 2019 (3740 patients) compared to 2018 (383 patients). This reflects both an increased number of hospitals taking part in the QI Programme and increased data collection across participating hospitals.

Table 16. Fast Positive Patient Data by Individual Hospital

	Date Range	Fast+ Patients Total (Total Ischaemic Strokes)	Total "Time Of Decision" Recorded (%)	Median Door To CT ¹ {IQR}	Median Door To CTA ¹ {IQR}	Median Door To Decision Regarding Thrombectomy ¹ {IQR}
Bantry	Jan – Nov 2019	57 (93)	51 (89.5%)	8 mins {4-26mins} n57	23 mins {19-59mins} n7	15 mins {9-33mins} n51
Beaumont	Jan – Dec 2019	625 (315)	493 (78.9%)	30 mins {19-48mins} n526	33 mins {23-53mins} n507	38 mins {26-57mins} n416
Cavan ² General Hospital	May – Dec 2019	61 (107)	2 (3.3%)	62 mins {31-133mins} n49	44 mins {27-68mins} n25	39 mins {34-44mins} n2
Connolly Hospital	Jan – Dec	116 (184)	116 (100%)	24mins {17-51mins}	27mins {20-37mins}	25mins {18-37mins}

	2019			n109	n60	n112
Cork University Hospital	Jan – Dec 2019	519 (423)	48 (9.2%)	50mins {25-156mins} n474	32mins {19-74mins} n192	48mins {29-127mins} n46
LOL Hospital Drogheda	Jan – Dec 2019	44 (187)	34 (77.3%)	22mins {14-25mins} n40	27mins {21-35mins} n39	56mins {36-69mins} n33
University Hospital Galway	Jan – Dec 2019	181 (258)	1 (0.6%)	23mins {16-46mins} n175	26mins {19-50mins} n138	73mins n1
University Hospital Kerry	Jan – Dec 2019	167 (123)	108 (64.7%)	18mins {12-27mins} n156	27mins {19-36mins} n132	36mins {25-64mins} n106
St Lukes Hospital Kilkenny	Jan – Dec 2019	26 (103)	8 (30.8%)	35mins {23-45mins} n23	37mins {35-52mins} n17	64mins {49-84mins} n7
Letterkenny University Hospital	Jan – Dec 2019	93 (151)	9 (9.7%)	55 {37-73mins} n85	61 {40-80mins} n69	73 {63-130mins} n9
University Hospital Limerick	Jan – Dec 2019	147 (237)	32 (21.8%)	41 {26-62mins} n142	39 {28-55mins} n76	54mins {43-74mins} n32
Mater Misericordiae	Mar – Dec 2019	491 (321)	28 (5.7%)	25 {15-40mins} n197	30mins {22-47mins} n176	40mins {25-52mins} n9
Mayo University Hospital	Jan – Dec 2019	146 (178)	53 (36.3%)	59mins {37-97mins} n137	69mins {41-100mins} n104	64mins {41-100mins} n52
Mercy University Hospital	Jan – Dec 2019	49 (82)	20 (40.8%)	66mins {33-160mins} n44	43mins {30-145mins} n13	49mins {43-60mins} n17
MRH Mullingar	Jan – Dec 2019	101 (109)	93 (92.1%)	20mins {12-27mins} n92	27mins {18-33mins} n78	31mins {22-45mins} n93
Naas ³ General Hospital	Jan – Dec 2019	142 (181)	13 (9.2%)	17 {10-32mins} n137	22 {14-37mins} n103	35 {25-55mins} n13
Portlinculla University Hospital	Jan – Dec 2019	29 (53)	n0	132mins {56-296mins} n24	n0	n0
Sligo General Hospital	Jan – Dec 2019	92 (165)	75 (81.5%)	50 {25-92mins} n90	46 {25-85mins} n48	37 {18-67mins} n74
South Tipperary General Hospital	Jan – Dec 2019	86 (95)	74 (86%)	35mins {22-67mins} n84	55mins {33-119mins} n33	46mins {27-80mins} n71
St. James ⁴ Hospital		(221)		28 mins (8-64mins) n30		
St.	Jan –	165	23	27mins	35mins	53mins

Vincent's University Hospital	Dec 2019	(351)	(13.9%)	{16-58mins} n138	{21-66mins} n82	{37-93mins} n22
Tallaght University Hospital	Jan – Dec 2019	209 (215)	202 (96.7%)	29mins {16-51mins} n148	33mins {19-56mins} n127	35mins {19-66mins} n185
University Hospital Waterford	Jan – Dec 2019	92 (123)	16 (17.4%)	33mins {20-74mins} n63	45mins {30-90mins} n59	65mins {46-162mins} n15
Wexford General Hospital	Jan – Dec 2019	103 (114)	96 (93.2%)	46mins {35-58mins} n60	59mins {42-71mins} n45	32mins {12-54mins} n96

- ¹Excluding inpatients
- ²Commenced QI initiative in May 2019
- ³Limited raw data not provided.
- ⁴Raw data not provided. Range for Door to CT time is min/max (IQR not available)

In 2019, eleven hospitals attained median Door to Decision times of less than 40mins, an increase from seven hospitals in 2018. Of these eleven hospitals, six have achieved a median Door to Decision time of 35mins or less, with 2 hospitals attaining median Door to Decision times of less than 30mins.

*11 hospitals attained median door to decision times of less than 40mins.
Of these, 5 achieved a time of 35mins or less, with 2 hospitals attaining
median door to decision times of less than 30mins*

It is worth noting that data collection practices and definitions can vary between hospitals; therefore the comparison of individual hospitals should be undertaken with caution. The QI process involves the collaboration and cooperation of the wider MDT, however special thanks must go to the Clinical Nurse Specialists and Advanced Nurse Practitioners for their ongoing commitment to the collection of this data and leadership of local improvement efforts.

Abstracts summarising the QI Project to date have been accepted for presentation at both the European Stroke Organisation Conference 2020 and the International Society for Quality in Healthcare Conference 2021 (postponed from 2020).

Door to Decision in 30! 2019 QI Review

A Quality Improvement Project for the care of patients with acute ischaemic stroke commenced in 2018. The aim of this collaborative is to reduce the door to decision time to 30 mins. In 2019, the collaborative formally ended, but all 24 hospitals have committed to continuing to collecting data and testing improvements into 2020 with the support of a dedicated Quality Improvement Lead.

24



Hospitals

In 2019, the QI Collaborative expanded to incorporate 24 hospitals around the country.

3740



FAST + Patients

3740 FAST patient journeys were documented as part of the QI project in 2019, an increase from 383 in 2018.

384



Thrombectomies

In 2019, 384 patients underwent emergency thrombectomy.



Door to Decision 37 mins

Median time from door to decision for treatment for all FAST+ patients was 37 mins (n 1462), a reduction from 71 mins (n 54) in 2018.



Decisions Recorded 1562

1562 patients had the time of decision regarding their suitability for thrombectomy recorded in 2019, a significant increase from 59 patients in 2018.

Door to CT 32 mins

The median time from arrival at hospital to CT Brain was 32 mins (n 3050).



Door to CTA 34 mins

The median time from arrival at hospital to CT Angiography was 34 mins (n 2131).

Examples of Interventions Tested to Date



Pre-alert call from ambulance



Notify relevant staff



Clear roles for MDT (pre-book scans, label bloods etc)



Ambulance crew waits (patient stays on trolley)



Straight to CT & IV lysis in CT



Decision makers in place



Early contact with EVT

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Special mention must be made of the stroke CNSs and ANPs around the country who have lead roles in rolling out the QI process in their hospitals and gathering the large volume of data which gives us a clear vision of the acute stroke pathway in their hospitals.

We acknowledge the hard work and dedication involved in data collection at time of referral or acute admission by the Neuroradiologists and Radiology Registrars in Beaumont Hospital.

Great efforts were made to ensure accuracy and analysis of the data to the best of our ability.

MOST RECENT ARTICLES RELATED TO OUR THROMBECTOMY SERVICE

1. Griffin E, Murphy S, Sheehan S, Power S, Brennan P, O'Hare A, Looby S, McWilliams S, Moynihan B, Williams D, Boyle K, O'Neill D, Collins R, Dolan E, Cassidy T, Harbison J, O'Connor M, Alderson J, Thornton J. Early repatriation post-thrombectomy: a model of care which maximises the capacity of a stroke network to treat patients with large vessel ischaemic stroke [published online ahead of print, 2020 Apr 15]. *J Neurointerv Surg*. 2020;neurintsurg-2019-015667. doi:10.1136/neurintsurg-2019-015667
2. Ganesh A, Menon B K, Assis Z, Thornton J, Goyal M. Factors Associated with Discrepancy Between Post-treatment Infarct Volume and 90-day Functional Outcome in the ESCAPE Randomized Controlled Trial (S47.008) May 2019 · *Neurology* 92(15):S47.008 Project: · Acute stroke: treatment, systems, outcomes, and challenges
3. Damien C, O'Neill, E. Griffin, Karen M Doyle K M, Power S, Brennan P, Sheehan M, O'Hare A, Rossi A, J Thornton_A Standardized Aspiration-First Approach for Thrombectomy to Increase Speed and Improve Recanalization Rates July 2019 · *American Journal of Neuroradiology* 40(8) DOI: · 10.3174/ajnr.A6117
4. Adams N C, Griffin E, Motyer R, Farrell T, E Carmody, O'Shea A, Murphy A, O'Hare A, Looby S, Power S, Brennan P, Doyle K, Thornton J. Review of external referrals to a regional stroke centre: it is not just about thrombectomy. *Clinical Radiology* 74(12) September 2019. DOI: 10.1016/j.crad.2019.07.021
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6. Rizwan Barkat R, Griffin E, Alderson J, Power S, Thornton J, O'Hare A, Brennan P, Larkin C M, Anaesthesia workload implications of a 24/7 national stroke thrombectomy service. *BJA British Journal of Anaesthesia* 124(3) December 2019. DOI: 10.1016/j.bja.2019.11.024
7. Hill MD, Goyal M, Menon BK, Thornton J, Nomani A, Mctaggert R, Demchuk A, Poppe A, Buck B, Field T S, Dowlatsgai D, [...], Tymianski M. Efficacy and safety of nerinetide for the treatment of acute ischaemic stroke (ESCAPE-NA1): a multicentre, double-blind, randomised controlled trial. · *The Lancet* 395(10227):878-87 March 2020
8. Griffin E, Murphy S, Sheehan M, Power S, Brennan P, O'Hare A, Looby S, McWilliams S, Moynihan B, Williams D, Boyle K, O'Neill D, Collins R.D, Dolan E, Cassidy T, Harbison J, O'Connor M, Alderson J, Thornton J. Early repatriation post-thrombectomy: a model of care which maximises the capacity of a stroke network to treat patients with large vessel ischaemic stroke. *Journal of Neurointerventional Surgery* April 2020 DOI: 10.1136/neurintsurg-2019-015667.

Additionally, the articles have been presented both Nationally and Internationally at the Irish Heart Foundation, European Congress of Radiology, European Society of Stroke and are due to be presented at the World Society of Stroke in 2020.

PRIOR ARTICLES RELATED TO THE THROMBECTOMY SERVICE

1. Griffin E, Herlihy D, Hayden R, Murphy M, Walsh, Murphy S, Shanahan J, O'Brien P, Power S, Brennan P, Motyer R, Thornton J. A Quantitative Analysis of CT Angiography, Large Vessel Occlusion and Thrombectomy Rates in Acute Ischaemic Stroke. *Clin Rad.* May 2019. Available from: <https://doi.org/10.1016/j.crad.2019.04.014>.
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