



National Thrombectomy Service
Annual Report 2023

OVERVIEW

I am delighted to be able to present the 2023 National Thrombectomy Service (NTS) annual report. 2023 was the busiest year ever for endovascular thrombectomy (EVT) in Ireland with 566 patients treated, an increase of 17% since 2022. This report is the result of a huge amount of hard work from the clinical and administrative teams at the two thrombectomy centers in Beaumont and CUH, as well as all the referring stroke teams across the Republic of Ireland.

EVT is the gold standard treatment for patients with large vessel occlusion (LVO) stroke. Eligibility for EVT has expanded since the early 2015 randomised control trials (RCTs) with publication of late window studies in 2018 (extending the potential time window out to 24hrs in selected patients) as well as positive large core and basilar EVT RCTs in 2022 and 2023. This is all good news for patients suffering the most severe strokes who now have a far higher chance of a meaningful recovery than was the case just a few years ago. EVT is a remarkably efficacious procedure with a number needed to treat (NNT) of between just 2 and 5 to reduce disability and/or achieve functional independence across almost all patient groups. As well as greatly benefitting individual patients, EVT leads to considerable medium and long-term savings for the health service by reducing patient dependence and disability and the associated costs related to rehabilitation and nursing home care.

In 2023, 692 patients were transferred for emergency thrombectomy (486 to Beaumont Hospital and 206 to CUH). 566 of these patients underwent thrombectomy (409 Beaumont Hospital, 157 CUH). Given that in 2023 there were 5540 ischemic stroke discharges from primary stroke centers in Ireland, the national thrombectomy rate was 10.2%. This is nearly a 1% increase from 2022 when the rate was 9.4% and the first time that we have broken the 10% barrier.

As well as the absolute numbers of patients undergoing EVT, the speed of reperfusion is hugely important with up to 1.9 million neurons being lost per minute following symptom onset. A fast reperfusion time depends upon many steps, including out of hospital recognition of symptoms, ambulance transfer to and from the local stroke center, door to CT time and door in door out time (DIDO) (for patients not presenting directly to Beaumont or CUH). This is all before the patient arrives in the neuro-angiography suite for the EVT procedure itself. A short summary of EVT time metrics for 2023 vs 2022 is provided in Table 1 below.

The 2023 NTS data is encouraging, however, there is plenty more work to do. Door to needle time was up by 6 minutes across Ireland and the thrombolysis rate was down by 4% for the hospitals from the Beaumont catchment, both disappointing statistics. It is also estimated that between 15-20% of strokes are potentially eligible for EVT and therefore, with an EVT rate at just over 10%, we may only be halfway to the finish line.

Significantly increasing our EVT rate in Ireland to the 15-20% range within our current system will be challenging and will likely require significant investment and reconfiguration of referral pathways. With most of the low hanging fruit gone, it is time to reach further up the tree in order to achieve the best possible outcomes for all eligible stroke patients.

In 2023, 566 patients underwent emergency thrombectomy, Beaumont Hospital (409) and CUH (157). An overall increase of 17% compared to 2022. 10.2% of patients discharged from stroke centers with diagnosis of ischaemic stroke underwent thrombectomy

Table 1: Symptom onset & door time metrics:

	2023	2022
Onset** to arrival at Primary Stroke Centre (PSC):	1hr 32mins (n228)	1hr 39mins (n215)
Door* to CT time:	21mins (n444)	21mins (n382)
Door* to needle time (DTN)	49mins (n163)	43mins (n133)
Door* to EVT center contact time:	BH 51mins (n275) CUH 1hr 09mins (n62)	BH 49mins (n218) CUH 1hr 10mins (n53)
Door in Door out*(DIDO):	BH 1hr 30 mins (n275) CUH 1hrs 22mins (n48)	BH 1hr 30 mins (n219) CUH 2hrs 05mins (n22)
Witnessed** Onset to groin puncture:	4hrs 12mins (n297)	4hrs 10mins (n285)
Witnessed** Onset to reperfusion time:	4hrs 30mins (277)	4hrs 40mins (n267)

* Excludes inpatients at time of stroke.

** Witnessed onset, excludes unknown onset time of symptoms.



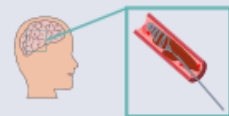
Dr. Matthew Crockett
Director National Thrombectomy service

Annual Report 2023 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 2023, of the 5540 patients diagnosed with acute ischaemic stroke, 566 (10.2%) patients underwent thrombectomy.

Thrombectomy – Standard of care

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).



In patients experiencing LVO ischaemic stroke, 1.9 million neurons are lost every minute (JL Saver, 2006).

566

Thrombectomies

In 2023, 566 patients underwent emergency thrombectomy. 409 at Beaumont Hospital and 157 at Cork University Hospital.



Onset to Reperfusion 4hrs 30mins

In patients who underwent thrombectomy and had a witnessed onset of their stroke symptoms, had a median time from onset to establishment of reperfusion of 4hrs 30mins in 2023.



45% Functional Independence

45% of patients had a modified Rankin Score of 0-2 indicating achievement of full functional independence after thrombectomy.



Door to CT – 21mins

Median time from arrival at hospital to CT Brain was 21 mins for patients undergoing thrombectomy. This metric has stayed static in comparison to 2022.



Door to Needle Time – 49mins

Median time from arrival at hospital to receiving IV thrombolysis was 49 mins for patients undergoing thrombectomy.



Door to EVT Referral – 54 mins (BH & CUH)

Median time from arrival in primary hospital to contacting Beaumont EVT Centre to make a decision about transfer for thrombectomy was 51 mins (n275) and for those referring to CUH it was 69mins (n62).



Door In Door Out – 1hr 41mins (BH & CUH)

Median time from arrival in primary hospital to departure for BH EVT centre was 1hr 30mins (n275), this metric for CUH was 1hr 22mins (n48).



"Time is Brain" Every minute saved from onset of symptoms to treatment restores one week of healthy life (Meretoja et al, 2017).

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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. 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 PSC by the awaiting ambulance crew and accompanying medical team.

The National Thrombectomy Service Governance Group has developed a pathway for the transfer of patients for thrombectomy. 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 PSCs. Patients are evaluated clinically and radiologically and if deemed suitable for endovascular thrombectomy are transferred to Beaumont Hospital/CUH. We collect information about all patients admitted with suspected acute stroke (FAST Positive). The majority of these will not require any consultation with thrombectomy centers at Beaumont Hospital/CUH. These patients are picked up in the national QI programme. For others, there is a phone conversation with Beaumont Hospital/CUH and the patient may or may not be transferred. Once transferred most patients undergo thrombectomy but some become unsuitable for treatment. Data concerning patients are entered into the thrombectomy database, an electronic purpose built database designed by the National Thrombectomy Service (NTS) and Beaumont IT department. All data for this 2023 annual report has been extracted from the NTS/stroke database which is housed on the Beaumont Hospital network.

CUH have a separate database (excel based) for their cohort of patients. Their data is sent to the thrombectomy service team in Beaumont to analyse and collate which gives an overall review of data nationally for those presenting to the two endovascular centers in Ireland.

OVERVIEW OF DATASETS

FAST POSITIVE (SUSPECTED STROKE PATIENTS) DATASET

Through the National Thrombectomy Service QI programme, data is captured by local stroke teams 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 of whether or not EVT centre was contacted, or if the decision is not for thrombectomy).
- Departure time if transferred for thrombectomy.
- Final diagnosis

The decision time regarding need for thrombectomy is applicable to all patients. A yes/no decision reflects how long an ambulance crew would need to wait before being released, or completing the transfer of the patient to Beaumont Hospital or CUH.

REFERRALS DATASET

Previously, once a call was made to Beaumont Hospital thrombectomy service regarding possibility of thrombectomy, we recorded a minimum dataset as per QI dataset. As the volume of cases collected in each hospital for QI programme has increased we no longer keep this dataset, reducing duplication. We recognise however, that not all hospitals keep the full FAST positive database and some patients are not captured.

PATIENTS TRANSFERRED TO THE THROMBECTOMY CENTRE BUT UNSUITABLE FOR EVT DATASET

On arrival at Beaumont Hospital from PSC for thrombectomy patients are re-evaluated. Generally if >2hrs since original imaging, this is repeated. Some patients are found to be unsuitable for treatment due to a number of reasons (various reasons for unsuitability are noted in table 12 below). 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, allowing detailed analysis of the service from onset of stroke to point of recanalisation and final clinical outcome at 90 days. This is the only national dataset which measures stroke outcomes at 90 days.

Patients who are transferred for thrombectomy are presented and discussed at the monthly stroke/EVT MDM held in Beaumont Hospital. Video conferencing system allows referring sites to join this meeting remotely and have an input into the discussion regarding their patients. Each PSC receives an email with a list of their patients who are on the list for discussion at these meetings. They also receive a feedback form for each patient who is transferred and has treatment; this gives a summary of their time metrics and procedure/clinical outcomes.

Clinical follow up for patients post thrombectomy is given to us by the stroke CNS in each hospital. Our audit approval includes capturing the final outcome data and going forward we are collecting enough patient demographics to facilitate direct contact with patients/families to assess outcome if this is not otherwise available.

For this annual report, we analyse the above datasets. Data quality is checked by reviewing patient entries soon after input and again in preparation for the report. Outlying metrics are reviewed for accuracy of data. Imaging pre and post procedure, the procedure details and images including final revascularisation scores are reviewed by neuroradiology SPRs and consultants so that each study is double read.

Completion of the report can only occur after the 90 day follow up assessments and the number of stroke discharges from all hospitals are available from HIPE. This report is compiled by members of the thrombectomy/stroke service team in Beaumont Hospital.

RESULTS

According to HIPE data, 5540 patients were discharged with primary diagnosis of cerebral infarctions in 2023 (i63 & i64) from hospitals with acute stroke services. 486 patients were transferred to Beaumont Hospital with a view to thrombectomy & 409 underwent thrombectomy, including 71 patients who presented directly to Beaumont Hospital or were inpatients at the time of their stroke. 77 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 206 patients transferred to CUH with a view to thrombectomy and 157 underwent thrombectomy, including 64 patients who presented directly to CUH. 49 patients were transferred but did not undergo thrombectomy.

THROMBECTOMY PATIENT DEMOGRAPHICS (N=566)

- Male: 303 (54%)
 - Female: 263 (46%)
- Median Age: 73 (16-99)
- ≤65 years: 177 (31%)
- >65 years: 389 (69%)

MEDIAN NIHSS & ASPECTS PRE EVT (RANGE)

Pre NIHSS: 14 (2-33)

Pre ASPECTS: 8 (1-10)

VESSEL OCCLUSION SITES

76 (18.5%) patients had more than 1 vessel occlusion site or had additional significant carotid stenosis.

Table 2: Occlusion sites

Occlusion site	2023 N (%)
M1	188 (39)
M2 proximal	92 (19)
ICA cervical	63 (13)
Carotid T	49 (10)
Basilar	24 (5)
M2 distal+	28 (6)
ICA tandem stenosis	10 (2)
ACA:	15 (3)
Other (Vertebral/PCA)	17 (3)

THROMBECTOMY DATASET

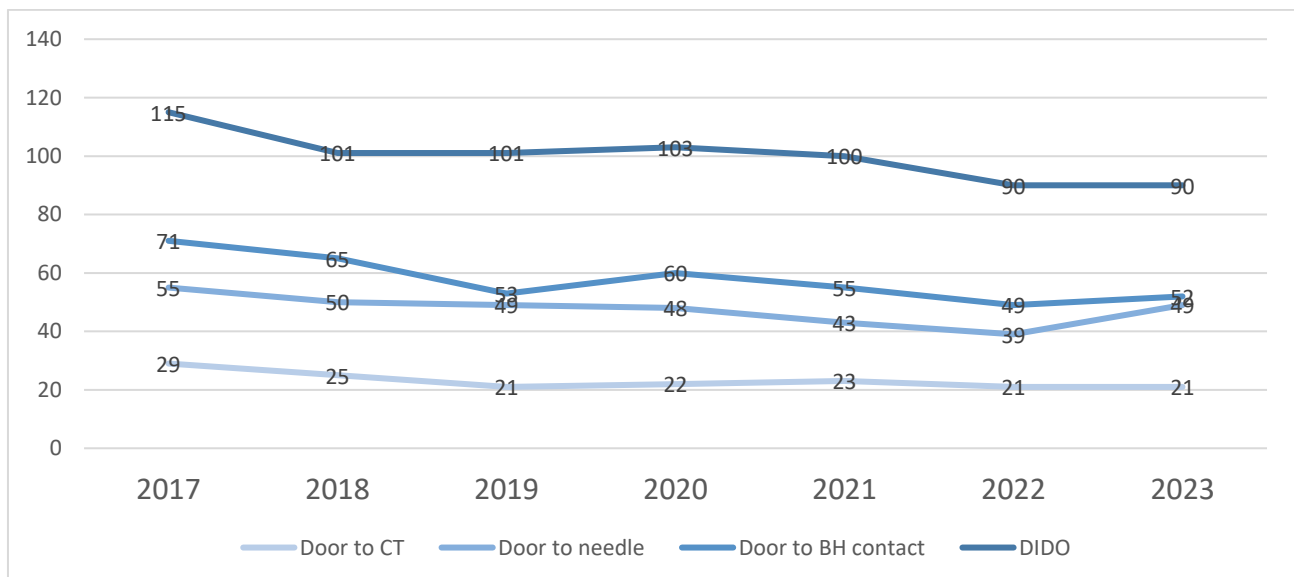
Table 3: EVT Rate 2023 vs 2022

Hospital	2023		2022	
	N of pts presenting to Hospital with Ischaemic Strokes	EVT rate N (%)	N of pts presenting to Hospital with Ischaemic Strokes	EVT rate N (%)
Bantry General Hospital	55	7 (13)	69	7 (10)
Beaumont Hospital	481*	71 (15)	434*	62 (14)
Cavan General Hospital	146	13 (9)	151	7 (5)
Connolly Hospital Blanchardstown	267	15 (6)	206	9 (4)
Cork University Hospital	448*	64 (14)	362*	60 (16)
Galway University Hospital	326	27 (8)	239	19 (8)
Letterkenny General Hospital	185	10 (5)	200	13 (7)
Mater Misericordiae University Hospital	282	36 (13)	283	42 (15)
Mayo University Hospital	191	10 (5)	190	6 (3)
Mercy University Hospital	80	9 (11)	69	6 (9)
Midland Regional Hospital Tullamore	117	0	100	3 (3)
Midland Regional Hospital Mullingar	138	34 (25)	160	17 (11)
Naas General Hospital	169	12 (7)	208	23 (11)
OLOL Drogheda	276	20 (7)	206	22 (11)
OLOL Navan	77	0	56	1 (2)
Sligo University Hospital	213	10 (5)	167	14 (8)
South Infirmary Victoria Hospital	N/A	0	N/A	1
St. James Hospital	222	26 (12)	216	19 (9)
St. Lukes General Hospital Kilkenny	139	13 (9)	134	11 (8)

St. Vincents University Hospital	352	52 (15)	369	34 (9)
Tallaght University Hospital	320	52 (16)	266	28 (11)
Tipperary University Hospital	124	10 (8)	121	9 (7)
University Hospital Kerry	177	14 (8)	136	9 (7)
University Hospital Limerick	469	40 (9)	428	40 (9)
University Hospital Waterford	177	13 (7)	163	15 (9)
Wexford General Hospital	109	6 (5)	144	7 (5)
Belfast	N/A	0	N/A	0
Private Hospitals (Bons, SVUH Pri, BRC)	N/A	2	N/A	0
National Maternity Hospital	N/A	0	N/A	0
TOTAL	5540	566 (10.2)	5150	484 (9.4)

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

Figure 1: Median values for thrombectomy patients at Beaumont Hospital



TIME METRICS

BEAUMONT EVT CENTRE

Table 4: Door metrics of patients who underwent thrombectomy procedures at Beaumont Hospital. Inpatients who had a stroke are not included in these calculations.

Hospital	Total N 2023 {↑/↓ on 2022}	Door To CT Median {Range}	Door To Needle (DTN) Median {Range}	PSC door to BH contact Median {Range}	DIDO Median {Range}
Beaumont Hospital	71 {↑9}	00:19 ↑1min {00:07-00:39} IQR{00:13-00:25}	00:33(n=16) ↑4mins {00:18-01:36} IQR{00:23-00:47}	N/A	N/A
Blackrock Clinic	1	N/A	N/A	N/A	N/A
Cavan General Hospital	13 {↑6}	00:29 ↑8mins {00:20-01:23} IQR{00:22-00:38}	01:48(n=2) ↑51mins	01:19 ↓19mins {00:54-02:03} IQR{01:10-01:44}	02:25 ↓2mins {01:37-03:41} IQR{01:55-02:51}
Connolly Hospital Blanchardstown	15 {↑6}	00:16 ↑8mins {00:03-01:08} IQR{00:10-01:23}	00:36 (n=5) {00:20-01:11} IQR{00:29-00:49}	00:54 ↑25mins {00:21-04:42} IQR{00:30-01:08}	01:16 ↑11mins {00:41-05:17} IQR{01:14-01:39}
Galway University Hospital	27 {↑8}	00:20 ↑3mins {00:10-00:42} IQR{00:16-00:24}	00:57(n=5) ↑18mins {00:50-01:09} IQR{00:53-01:04}	00:55 ↑9mins {00:25-01:50} IQR{00:42-01:08}	01:35 ↓6mins {01:04-02:47} IQR{01:20-02:15}
Letterkenny University Hospital	10 {↓3}	00:31 ↑6mins {00:18-00:54} IQR{00:22-00:40}	01:12(n=4) ↑36mins {00:36-02:47} IQR{00:54-01:05}	01:12 ↑28mins {00:45-01:53} IQR{00:59-01:31}	02:34 ↑44mins {01:30-04:17} IQR{02:09-02:58}
The Mater Misericordia University Hospital	36 {↓6}	00:15 ↓8mins {00:03-00:34} IQR{00:12-00:20}	00:47(n=13) ↓6mins {00:15-01:16} IQR{00:37-01:04}	00:42 ↓6mins {00:14-01:28} IQR{00:27-01:03}	01:15 ↓14mins {00:29-02:34} IQR{00:50-01:44}
Mayo University Hospital	10 {↑4}	00:38 ↓13mins {00:12-01:14} IQR{00:28-00:43}	01:05(n=5) {00:53-01:34} IQR{00:57-01:25}	01:11 ↓18mins {00:54-02:50} IQR{01:03-02:06}	02:32 ↓8mins {01:30-04:15} IQR{02:01-03:24}
Midland Regional Hospital Mullingar	34 {↑17}	00:22 ↓2mins {00:08-01:40} IQR{00:16-00:28}	00:53(n=10) ↓6mins {00:18-01:35} IQR{00:41-01:04}	00:46 ↓17mins {00:13-02:37} IQR{00:33-01:09}	01:25 ↓10mins {00:35-04:07} IQR{01:03-01:44}

Naas General Hospital	12 {↓11}	00:18 ↓1min {00:07-00:55} IQR{00:15-00:23}	01:08(n=2) ↑33mins {00:59-01:17} IQR{01:03-01:12}	00:56 ↑16mins {00:18-01:20} IQR{00:32-01:08}	01:15 ↑5mins {00:25-02:15} IQR{00:41-01:45}
Our Lady of Lourdes, Drogheda	20 {↓2}	00:16 ↓6mins {00:08-02:07} IQR{00:12-00:21}	00:51(n=6) ↓6mins {00:30-02:42} IQR{00:36-01:01}	00:52 ↓6mins {00:24-02:36} IQR{00:40-01:11}	01:34 ↓6mins 00:38-03:28 IQR{01:05-02:06}
Sligo University Hospital	10 {↓4}	00:35 ↑11mins {00:01-01:44} IQR{00:29-00:41}	00:56 (n=2) ↑14mins {00:55-00:57} IQR{00:55-00:56}	01:09 ↑16mins {00:55-02:45} IQR{01:03-01:41}	02:26 ↑20mins {01:48-04:30} IQR{02:02-02:45}
St James Hospital	26 {↑7}	00:17 ↓2mins {00:04-01:08} IQR{00:13-00:21}	00:45 (n=9) ↓6mins {00:28-01:58} IQR{00:35-00:55}	00:45 ↓6mins {00:30-01:23} IQR{00:37-00:54}	01:28 ↓10mins {00:48-02:28} IQR{01:15-01:45}
St. Lukes Hospital Kilkenny	13 {↑2}	00:24 ↑1min {00:12-00:34} IQR{00:14-00:27}	00:37 (n=5) ↑4mins (00:21-00:56) IQR{00:33-00:51}	00:55 ↑10mins {00:40-01:13} IQR{00:50-01:01}	01:41 ↓9mins {01:10-02:13} IQR{01:26-01:53}
St. Vincents University Hospital	52 {↑18}	00:25 ↑2mins {00:03-06:29} IQR{0017:-00:33}	00:41 (n=15) ↑3mins {00:15-02:30} IQR{00:34-00:56}	00:45 ↓3mins {00:08-09:13} IQR{00:35-01:05}	01:23 ↓7mins {00:29-09:43} IQR{01:00-01:47}
St. Vincent Private Hospital	1	00:09	00:15	00:46	01:50
Tallaght University Hospital	52 {↑24}	00:18 ↑1min {00:01-2:21} IQR{00:14-00:29}	00:45(n=22) ↑5mins {00:20-01:30} IQR{00:28-01:01}	00:45 ↑3mins {00:15-03:05} IQR{00:33-01:02}	01:25 ↑17mins {00:28 -04:00} IQR{01:02-01:41}
Wexford General Hospital	6 {↓1}	00:57 ↑30mins {00:33-01:29} IQR{00:34-01:20}	00:42(n=2) ↑10mins	01:43 ↑63mins {00:35-04:55} IQR{00:57-04:40}	02:51 ↑211mins {01:00-06:00} IQR{01:48-03:40}
TOTAL	409	00:20 ↓1min (n317) {00:01-06:29} IQR{00:14-00:30}	00:49 ↑10mins (n124*) {00:15-02:47} IQR{00:33-01:01}	00:51 ↑2mins (n275) {00:08-10:16} IQR{00:35-01:10}	01:30 ↔ (n275) {00:25-11:45} IQR{01:10-02:00}

*Missing IV lysis times on 1 patient

CUH EVT CENTRE

Table 5: Door metrics of patients who underwent thrombectomy procedures at Cork University Hospital. Inpatients who had a stroke are not included in these calculations.

Hospital	Total N 2023 {↑/↓ on 2022}	Door To CT Median {Range}	Door To Needle Median {Range}	Door To CUH Contact Median {Range}	DIDO Median {Range}
Bantry General Hospital	7	00:18 ↑11mins {00:03–00:45} IQR{00:14–00:24}	00:23 ↓117mins (n=3) {00:10–00:27} IQR{00:16–00:25}	00:39 ↓4mins (n=6) {00:07–00:53} IQR{00:27–00:50}	01:20 ↑34mins (n=7) {01:07–01:39} IQR{01:13–01:25}
Cork University Hospital	64 {↑4}	00:24 ↑7mins {00:05–00:53} IQR{00:18–00:30}	00:31 ↓11mins (n=13) {00:19–01:15} IQR{00:21–00:40}	N/A	N/A
Mercy University Hospital	9 {↑3}	00:21 ↓1min {00:13–00:36} IQR{00:14–00:33}	01:40 (n=1)	01:04mins ↓7mins (n=3) {00:57–01:21} IQR{01:00–01:21}	00:10 (n=3) {00:10–00:13} IQR{00:10–00:11}
Tipperary University Hospital	9	00:30 ↑2mins {00:21–00:41} IQR{00:28–00:33}	01:15 (n=2) {01:11–01:20}	01:15 ↑8mins (n=5) {00:45–01:55} IQR{01:00–01:40}	01:08 (n=3) {00:54–01:11} IQR{01:01–01:09}
University Hospital Kerry	14 {↑5}	00:16 ↑2mins {00:07–00:27} IQR{00:12–00:20}	01:03 ↑6mins (n=3) {00:40–01:22} IQR{00:51–01:12}	01:10 ↓9mins (n=9) {00:33–01:29} IQR{00:58–01:25}	01:35 ↓63mins (n=8) {01:21–01:57} IQR{01:31–01:50}
University Hospital Limerick	40	00:21 ↓10mins {00:07–01:05} IQR{00:15–00:28}	01:06 ↑2mins (n=14) {00:14–01:46} IQR{00:47–01:23}	01:07 ↓7mins (n=28) {00:28–01:54} IQR{00:40–01:23}	01:23 ↓42mins (n=21) {01:08–01:45} IQR{01:13–01:27}
University Hospital Waterford	13 {↓1}	00:17 ↓5mins {00:12–02:28} IQR{00:15–00:23}	01:45 ↑39mins (n=2) {01:36–01:55}	01:16 ↑27mins (n=10) {00:55–03:01} IQR{01:11–01:31}	01:27 ↑24mins (n=4) {01:21–01:47} IQR{01:24–01:33}
Total	157	00:22 ↔ (n127) {00:03–2:28} IQR{00:15–00:29}	00:51 ↑1min (n39*) {00:10–01:46} IQR{00:30–01:13}	01:09 ↓1min (n62**) {00:07–03:01} IQR{00:48–01:24}	01:22 ↓43mins (n48***) {00:10–01:57} IQR{1:11–01:30}

*Missing IV lysis times on 1 patient.

***Missing Dept time on 32 patients.

**Missing contact times on 18 patients

Door to CT and DTN 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 over 20 years, following the pivotal NINDS trial in 1995. The American Heart Association guidelines recommend DTN times of less than 60 mins, aiming for less than 45 mins. The most efficient hospitals in the world achieve DTN times of approximately 15mins. Every minute counts. Save a minute, save a week!!

The median door to CT is 21mins (n445) and the door to needle is 49mins (n=163) for patients receiving thrombectomy in BH and CUH.

The overall IV thrombolysis rate for patients referred to Beaumont & CUH thrombectomy centers who underwent EVT in 2023 was 32% (n=182). IVT remains the standard of care for all eligible patients with large vessel occlusion, in addition to thrombectomy.

Table 6: Beaumont Hospital & CUH EVT group IV lysis rates:

EVT Centre	2023	2022	2021	2020	2019
Beaumont Hospital	34% (n140)	38% (n127)	32% (n134)	43% (n131)	42% (n130)
Cork University Hospital	27% (n42)	23% (n33)	21%	N/A	N/A

DOOR TO GROIN PUNCTURE

Time from arrival in Beaumont Hospital & CUH to groin puncture reflects efficiency in interventional radiology and stroke services, as each time interval affects patient outcome. In-patient strokes are excluded. The analysis of this has been done (table 7) separately for those presenting directly to Beaumont Hospital & CUH and for those on a Drip & Ship model transferred from elsewhere versus direct presentation to Beaumont Hospital and CUH.

Table 7: Time from arrival to groin puncture

EVT Centre	Door to Groin (direct to EVT centre)	EVT centre door to Groin (Drip & Ship Model)
Beaumont Hospital	01:10 ↑7mins (n42) IQR {00:49- 01:27}	00:12 ↑1min (n278) IQR {00:08- 00:22}
Cork University Hospital	01:10 ↓13mins (n47) IQR {00:54-01:35}	00:36 ↑3mins (n92) IQR {00:27-00:45}

Table 8: Time metrics for thrombectomy procedures carried out in Beaumont Hospital and CUH

EVT Centre	Median length of procedure	Median time groin puncture to 1 st reperfusion
Beaumont Hospital	00:31 ↑5mins	00:19 ↔ (n382)
Cork University Hospital	00:39 ↓7mins	00:20 ↓3mins (n143)

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% for 2b-3 inclusive. Thrombectomy can be performed using aspiration technique or stentriever. Randomised trials have shown equivalence. We have published our experience using a standardised aspiration first approach which in our experience gives better recanalisation in a shorter time. Evidence also suggests that the fewer passes performed, the better the likely clinical outcome. First pass effect is a measure of the success of recanalisation after a single pass.

In 2023 we achieved TICI 2b or better in 86% in anterior circulation strokes (ie excluding basilar occlusion).

Table 9: First pass TICI Recanalisation rates (Beaumont only)

TICI post scores post 1 st pass	2023 N (%)	2022 N (%)
2c-3:	116 (37)	136 (42)
2b:	60 (19)	58 (18)
2a:	49 (16)	56 (17)
0-1:	88 (28)	73 (23)

Table 10: Final TICI recanalisation rates (Beaumont and CUH)

TICI Post Scores	2023 N (%)	2022 N (%)	2021 N (%)	2020 N (%)	2019 N (%)
2c-3:	304 (66)	237 (73)	189 (64)	192 (66)	183 (63)
2b:	93 (20)	65 (20)	93 (32)	74 (25)	68 (24)
2a:	25 (6)	11 (4)	9 (3)	11(4)	25 (7)
0-1	38 (8)	10 (3)	4 (1)	14 (5)	12 (6)

THE NIH STROKE SCALE

The NIH Stroke Scale (NIHSS) measures stroke related neurologic deficit. This assessment is carried out when a patient presents to their PSC with stroke symptoms, before patients proceeds to endovascular thrombectomy, at 24hrs & Day 5 post endovascular thrombectomy. When measured at 24hrs a score of ≤ 8 is highly predictive of long term functional outcome for anterior circulation stroke (Meyer *et al.*, 2020).

In 2023, 24hr NIHSS of ≤ 8 was achieved in 46%.

Table 11: NIHSS post EVT treatment (BH & CUH)

	2023	2022	2021
NIHSS @ 24hrs	7 (n491)	8 (n423)	6 (n394)

MODIFIED RANKIN SCALE

The Modified Rankin Score (mRS) is a 6 point scale reflecting the level of disability/dependence in daily activities of people who have suffered a stroke. 90 day mRS indicates the 90 day clinical outcome and is an international standard in stroke literature reporting.

Clinical outcomes obtained through the NTS continue to match those of international practice in the patients who are fortunate enough to access the service. 45% of the patients treated by thrombectomy recovered to full independence (modified Rankin Score 0-2) following their LVO stroke. The mortality rate was 20%. This real world experience matches that achieved in multinational randomised controlled trials (HERMES). However, stroke centres around the world continue to strive to improve outcomes by changing systems of care and have made progress.

In 2023, 90 day mRS of ≤ 2 indicating achievement of functional independence was achieved in 45% ($\downarrow 5\%$) on 2022

In 2023, 90 day mRS of ≤ 2 was achieved in 45% (n240) of patients who underwent thrombectomy at Beaumont Hospital and CUH. 90 day mRS outcome was available in 95% (n539) of patient who underwent thrombectomy.

Figure 2: 2023 Modified Rankin Score at Day 90

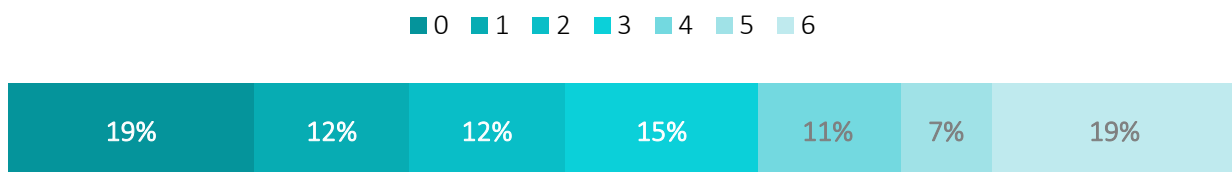
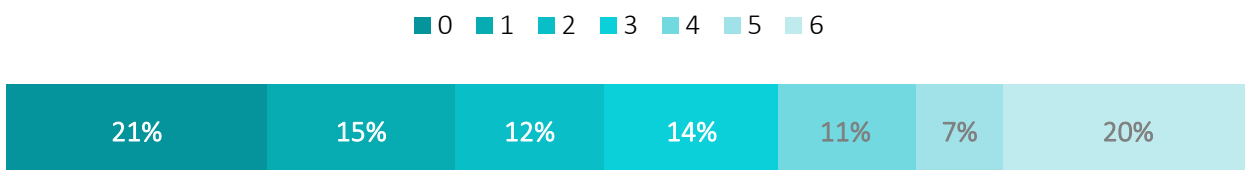


Figure 3: 2022 Modified Rankin Score at Day 90



PATIENTS TRANSFERRED TO 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 deteriorate 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.

Table 12: Reasons for unsuitability for thrombectomy for those transferred to Beaumont Hospital

Unsuitability Reason	N (%)
Clinical Improvement	21 (27)
No LVO/Recanalised	32 (42)
Established infarct	10 (13)
Haemorrhagic transformation	5 (6)
Other	9 (12)

OVERALL DATASET

Comparing these data groups we get a better picture for the larger number of stroke patients. We note that patients with shorter door to CT, DTN and DIDO times are more likely to be transferred and treated.

Table 13: Overview of Beaumont Hospital Group Figures

Beaumont Hospital EVT centre	Year	Door to CT median	Door to needle median	Door to BH contact median	DIDO (hr:min) median
EVT	2023 (n409)	00:20 (n317)	00:49 (n124)	00:51 (n275)	01:30 (n275)
	2022	00:21	00:39	00:49	01:30
	2021	00:23	00:43	00:55	01:40
	2020	00:22	00:48	01:00	01:43
	2019	00:21	00:49	00:53	01:41
	2018	00:25	00:50	01:05	01:41
Transferred but deemed unsuitable on arrival at Beaumont Hospital	2023 (n77)	00:27 (n47)	0:55 (n26)	01:07 (n48)	02:11 (n45)
	2022	00:30	00:54	01:07	02:11
	2021	00:22	00:55	01:04	02:03

	2020	00:35	00:51	01:12	02:04
	2019	00:30	00:57	01:17	02:08
	2018	00:31	01:00	01:27	02:20
TOTAL	2023 (n486)	00:21 (n364)	00:50 (n150)	00:53 (n323)	01:35 (n320)
	2022	00:22	00:43	00:51	01:35
	2021	00:23	00:45	00:56	01:42
	2020	00:27	00:52	01:10	N/A
	2019	00:26	00:50	01:09	N/A
	2018	00:30	00:52	01:20	N/A

Table 14: Overview of Cork University Hospital Group Figures

Cork University Hospital EVT centre	Year	Door to CT median	Door to needle median	Door to CUH contact median	DIDO median
EVT	2023 (n157)	00:22 (n127)	00:51 (n39)	01:09 (n62)	01:22 (n48)
	2022	00:22	00:50	01:10	02:05
	2021	00:23	00:43	00:56	N/A
	2020	00:30	00:42	N/A	N/A

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Great efforts were made to ensure accuracy and analysis of the data to the best of our ability. If any further information is required, please do not hesitate to contact any of the NTS team

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