NOCA National Office of Clinical Audit

INAS Irish National Audit of Stroke

Irish National Audit of Stroke

Organisational Audit Report 2021

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In the Irish National Audit of Stroke Organisational Audit Report 2021, data for Mercy University Hospital (MUH) was unintentionally excluded from five graphs within chapter 8 (Figures 8.3, 8.4, 8.5, 8.6 and 8.7). These graphs have now been amended to include MUH.

All pdf versions have been corrected

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ABOUT THE NATIONAL OFFICE OF CLINICAL AUDIT

The National Office of Clinical Audit (NOCA) was established in 2012 to create sustainable clinical audit programmes at national level. NOCA is funded by the Health Service Executive National Office of the Chief Clinical Officer and operationally supported by the Royal College of Surgeons in Ireland. The National Clinical Effectiveness Committee defines national clinical audit as "a cyclical process that aims to improve patient care and outcomes by systematic, structured review and evaluation of clinical care against explicit clinical standards on a national basis" (National Clinical Effectiveness Committee, 2015, p. 2). NOCA supports hospitals to learn from their audit cycles.

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ACKNOWLEDGEMENT OF KEY PARTNERS

This work uses data provided by hospitals providing acute stroke services to patients in Ireland. NOCA would like to thank all participating hospitals for their valuable contribution, in particular the Clinical Leads and all Irish National Audit of Stroke (INAS) Audit Coordinators and Early Supported Discharge (ESD) teams who completed the survey. NOCA would also like to acknowledge the work of the National Stroke Programme and the close collaborative relationship with the INAS in driving improvements in stroke care in Ireland.

ACKNOWLEDGING SIGNIFICANT CONTRIBUTIONS FROM THE FOLLOWING:

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ENDORSEMENT LETTER FROM DR BRIAN CREEDON

Prof. Joe Harbison
National Clinical Lead
Irish National Audit of Stroke
National Office of Clinical Audit
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15th March 2022

Dear Prof. Harbison

I wish to acknowledge receipt of the *Irish National Audit of Stroke Organisational Audit Report 2021*.

On behalf of the NOCA Governance Board, I wish to congratulate you, Audit Manager Joan McCormack and your governance committee in the development of this report which provides a detailed description of the current state of stroke services in Ireland.

Please accept this as formal endorsement from the NOCA Governance Board of the *Irish National Audit of Stroke Organisational Audit Report 2021* and we wish you every success in your ongoing commitment to improving the outcomes for stroke in Ireland.

Yours sincerely,

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Dr Brian Creedon
Clinical Director
National Office of Clinical Audit

PREFACE

I am delighted to welcome this first organisational audit of stroke services in Ireland by the Irish National Audit of Stroke in the National Office of Clinical Audit. This report is a comprehensive picture of the current state of stroke services and is hugely important as the National Stroke Programme seeks to implement its' *National Stroke Strategy 2021-2026*.

This report follows on from two previous organisational audits of stroke services carried out in 2008 and 2015. In 2008, stroke services in Ireland were poor and ineffective, with only one hospital having a stroke unit and only 1% of stroke patients receiving thrombolysis. In response to the publication of *Changing Cardiovascular Health: National Cardiovascular Strategy 2010-2019*, the National Stroke Programme was set up as one of the inaugural HSE clinical programmes in 2010. It drove improvements through supporting local organisation of stroke services, developing training and educational programmes for healthcare staff, setting KPIs for stroke care and beginning the collection of clinical process and outcome data in a national stroke registry.

The subsequent 2015 National Stroke Audit showed significant improvements in the provision of care to stroke patients resulting in improved outcomes such as; a reduction of in-hospital mortality, a reduction of admission to long term care facilities and an increased access to thrombolysis. The Irish National Audit of Stroke now reports annually on the clinical care received by patients and continues to see improvements in some aspects of care such as access to timely imaging and thrombectomy but also sees challenging stagnation in other key areas such as access to stroke units, provision of timely and adequate assessment and therapy time, access to clinical psychology and early supported discharge.

In this, a third audit of the organisation of Irish stroke services, it is evident that there has been some reorganisation of acute stroke services with twenty-four hospitals providing acute stroke care compared to twenty-seven in 2015, and an ambulance bypass pathway to the nearest hospital providing a 24/7 thrombolysis service in some areas. This indicates a possible trend for future hyperacute stroke care where case numbers and specialist staffing considerations may warrant further reduction in our absolute number of acute stroke centres. Only eleven hospitals currently have on-call stroke teams available 24/7 including our two comprehensive stroke centres, which provide stroke thrombectomy, Beaumont Hospital and Cork University Hospital. There will be challenging times ahead as we discuss and plan how best to deliver acute stroke care that meet modern medical standards while delivering stroke care services that meet local expectations across the country.

The number of stroke unit beds have increased from 150 to 239 since 2015, however, the majority of hospitals do not have enough stroke unit beds to meet the national standard that 90% of stroke patients are admitted to an acute stroke unit and one third of stroke patients do not get acute stroke unit care currently. This is a wholly unacceptable situation. Eighty-eight percent of stroke units operate below the recommended nurse staffing level and there are wide gaps in health and social care profession staffing levels from the internationally recommended numbers of staff needed.

Only five hospitals for example have access to clinical psychology as part of stroke unit care and many hospitals are unable to provide early swallow screening or adequate therapy time.

Early supported discharge teams have increased since 2015 from 3 to 10 teams though none have the recommended composition of staff as recommended by the National Stroke Programme to make them optimally effective for both patient and the health service.

This audit highlights many challenges for the National Stroke Programme in delivering better stroke care and indeed prevention, where for example only a minority of our hospitals have a rapid access stroke prevention / TIA service. The programme is confident that its' ***National Stroke Strategy 2021-2026*** can meet this challenge if fully implemented by the HSE and Department of Health as recommended by the country's leading clinical experts in the field.

I want to commend the INAS team at NOCA and all our dedicated stroke teams around the country for providing such an important report on our organisation of stroke services. This audit is an important clarion to health care commissioners and providers that stroke, as a leading cause of death and disability, needs more attention.

Prof Rónán Collins
Clinical Lead
National Stroke Programme

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TABLES AND FIGURES

GLOSSARY OF TERMS AND DEFINITIONS

AHA	American Heart Association
ANP	advanced nurse practitioner
ASA	American Stroke Association
Barthel	Barthel Index for Activities of Daily Living
carotid endarterectomy	Carotid endarterectomy is surgery that removes plaque build-up from inside a carotid artery in the neck.
carotid stenosis	Carotid stenosis is a narrowing of the carotid arteries, the two major arteries that carry oxygen-rich blood from the heart to the brain.
carotid stenting	Carotid stenting is a procedure in which ideally an interventional neuroradiologist or vascular surgeon inserts a stent which expands inside the carotid artery in order to increase blood flow in areas blocked by plaque.
CCU	coronary care unit
COVID-19	coronavirus disease 2019 – COVID-19 is the disease caused by SARS-CoV-2, the coronavirus that emerged in December 2019.
CNS	clinical nurse specialist
CT	computed tomography – a scanning technique that uses X-rays to take highly detailed images of the body/brain.
CTA	computed tomography angiography
CTP	computed tomography perfusion
DSA	digital subtraction angiography
ECG	electrocardiogram
echo	echocardiogram
ED	emergency department
ESD	Early Supported Discharge
ESO	European Stroke Organisation
EVT	endovascular thrombectomy

haemorrhagic stroke	Haemorrhagic stroke occurs when a blood vessel in the brain leaks or ruptures.
HCA	healthcare assistant
HDU	high dependency unit
HSCP	health and social care professional
HSE	Health Service Executive
ICU	intensive care unit
IHF	Irish Heart Foundation
INAS	Irish National Audit of Stroke
ischaemic stroke	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).
MDT	multidisciplinary team
median	The median is the middle number in a sorted (ascending or descending) list of numbers and can be more descriptive of that dataset than the mean.
MRA	magnetic resonance angiography
MRI	magnetic resonance imaging
mRS	modified Rankin Scale
N/A	not applicable
NCHD	non-consultant hospital doctor
NIHSS	National Institutes of Health Stroke Scale
NIMIS	National Integrated Medical Imaging System
NOCA	National Office of Clinical Audit
NSR	National Stroke Register
PFO	patent foramen ovale
Protocol 37	Emergency Inter-Hospital Transfer Policy
RCSI	Royal College of Surgeons in Ireland

RGN	registered general nurse
subarachnoid haemorrhage	Subarachnoid haemorrhage is a life-threatening type of stroke caused by bleeding into the space surrounding the brain.
SPSS	Statistical Package for the Social Sciences
SSNAP	Sentinel Stroke National Audit Programme
STARs	Stroke Training and Awareness Resources
stroke unit	A geographically discrete area in a ward where patients with a 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.
thrombectomy	The mechanical removal of a blood clot in the brain.
thrombolysis	The breakdown of blood clots formed in blood vessels using medication.
TIA	transient ischaemic attack
Time is Brain	'Time is Brain' is a phrase that simply means that the more time passes before a patient with a stroke receives treatment, the worse the outcome will be. It also means that if the stroke is treated immediately, brain damage will be minimised.
TCD	Transcranial Doppler
TOE	transoesophageal echocardiography
TTE	transthoracic echocardiography
UK	United Kingdom
WHO	World Health Organization
WTE	whole time equivalent

EXECUTIVE SUMMARY

This is the third national audit of the organisation of acute hospital stroke services in Ireland and the first under the governance of the National Office of Clinical Audit. The first audit examining the organisation of stroke care took place in 2006 and it found that only one hospital had a stroke unit, that access to acute treatments such as thrombolysis was very limited, and that the patient journey was fragmented and poorly organised.

Since 2008, there have been important changes in the organisation and delivery of stroke services in Ireland. In 2010, the National Stroke Programme (NSP) was developed with the aim of providing rapid access to best-quality stroke services. The results of the second audit of stroke care in 2015, published in the report titled *Irish Heart Foundation/HSE National Stroke Audit 2015* found a huge improvement in some key areas of stroke care, such as the increased number of stroke units (from 1 to 21) and an increase in the thrombolysis rate from to 1% to 11%. Since 2015, there have been many advances in the acute treatment of patients with a stroke and recommendations have been updated nationally and internationally. In addition, the European Stroke Organisation (ESO) now awards stroke unit accreditation to stroke units that meet specific criteria.

This report describes the organisation of acute hospital stroke services based on a self-reported questionnaire submitted by all hospitals providing acute stroke services in Ireland, and results are compared against national and international guidelines and against the ESO's recommendations to establish a stroke unit and stroke center. The findings show that the number of stroke units in Ireland increased from 21 in 2015 to 24 in 2021, and the number of stroke unit beds increased from 150 in 2015 to 239 in 2021. The 2021 Irish National Audit of Stroke Organisational Audit findings show that there are large staffing deficits across all healthcare professions in the 24 hospitals surveyed, and access to clinical psychologists is largely unavailable. Early Supported Discharge (ESD) teams are now operational in 10 hospitals, an increase from 3 in 2015, although no ESD team is fully resourced. An interesting finding is that there is an almost even split in how stroke is defined within the 24 hospitals, with 13 (54%) hospitals reporting that they use the American Heart Association (AHA)/American Stroke Association (ASA) definition of stroke (imaging-based diagnosis), and 11 (46%) reporting that they use the World Health Organization (WHO) definition (symptom-based diagnosis). This has an effect on activity and outcomes in hospitals, and consensus needs to be agreed nationally.

I would like to thank all hospital managers and clinical teams for their participation in this audit during a time of particular pressure due to the coronavirus disease 2019 (COVID-19) pandemic.

Prof. Joe Harbison
Clinical Lead, Irish National Audit of Stroke
Consultant Geriatrician and Stroke Physician, St James's Hospital

KEY FINDINGS

Organisation of emergency stroke services 	• In 2021, almost all hospitals (n=22, 92%) reported that they provide a thrombolysis service 24 hours a day, 7 days a week, with the remaining two hospitals providing an ambulance bypass service to the nearest hospital providing a thrombolysis service 24 hours a day, 7 days a week • There are two endovascular thrombectomy (EVT) stroke centres providing a thrombectomy service for acute stroke 24 hours a day, 7 days a week • Eleven (46%) out of 24 hospitals have availability of on-call stroke teams 24 hours a day, 7 days a week and 67% (n=16) of hospitals have on-site computed tomography (CT) radiographers • Fifteen (63%) out of 24 hospitals reported that following treatment in the emergency department (ED), patients who were thrombolysed are admitted to a coronary care unit (CCU)/high dependency unit (HDU)/intensive care unit (ICU) rather than a stroke unit.

Organisation of stroke units 	• All hospitals receiving patients with acute stroke reported that they have a stroke unit • The total number of designated stroke unit beds was reported as 239, a 59% increase from 150 in 2015 (McElwaine et al., 2015). However, on the day of survey completion, 16 (67%) out of 24 hospitals had more patients with a stroke in the hospital than designated stroke unit beds • Twenty (83%) hospitals reported that they have an in-house programme for continuing education in stroke management • All hospitals have weekly multidisciplinary team (MDT) stroke meetings. However, a psychologist is represented at these meetings in only four (17%) hospitals.

Organisation of human resources 	• Eighty-eight percent (n=21) of stroke units operate below the recommended nurse staffing level • In 2021, seven (29%) hospitals had an ANP in stroke, and 22 (92%) had one or more CNSs in stroke • Physiotherapy had 53% (n=30.5) of the recommended number of physiotherapists, this was 45% (n=25) in occupational therapy, 66% (n=18.0) in speech and language therapy, 57% (n=5.9) in dietetics and 20% (n=2.7) in clinical psychology • Only five (21%) hospitals have access to clinical psychologists as part of stroke unit care • The geriatric medicine specialty contributes to providing normal working hours stroke service cover in all hospitals, and in 15 (63%) hospitals this specialty also contributes to providing out-of-hours stroke service cover. Neurology contributes to providing both normal working hours and out-of-hours stroke service cover in five hospitals (21%).

Organisation of Early Supported Discharge services 	• There are 10 Early Supported Discharge (ESD) teams in operation, providing access to ESD for 11 out of 24 hospitals (46%), an increase from 4 hospitals in 2015 • In 2021, no hospital had a fully resourced ESD team • Eight (80%) ESD teams reported that a member of the ESD team attends the stroke MDT meetings in the hospital • Almost all ESD teams (n=9) have geographical parameters for access to ESD.

CHAPTER 1: INTRODUCTION

BACKGROUND

The first audit examining the organisation of stroke care in Ireland took place in 2006 (Horgan *et al*., 2008) and it found that only one hospital had a stroke unit, that access to acute treatments such as thrombolysis was very limited, and that the patient journey was fragmented and poorly organised.

Since 2008, there have been important changes in the organisation and delivery of healthcare in general within the Health Service Executive (HSE). In 2010, the National Stroke Programme (NSP) was developed with the key aims of:

- enabling national rapid access to best-quality stroke services
- preventing one stroke every day
- avoiding death and dependence in one patient every day.

These aims were targeted through the provision of funding to develop infrastructure and specialist posts within the stroke service nationally, and specifically the development of a national programme for thrombolysis therapy; the creation of designated stroke units in hospitals managing patients with acute stroke; and the recruitment of medical, nursing, and health and social care professionals (HSCPs) with specialist knowledge in stroke. In order to monitor the implementation of the Stroke Model of Care (HSE, 2012), the National Stroke Register (NSR) was established in partnership with the Health Research and Information Division of the Economic and Social Research Institute. Through collaboration with the Hospital In-Patient Enquiry's (HIPE's) existing information system and the addition of a stroke-specific data entry system, the NSR provided data for the planning and estimation of resource requirements for stroke services, for evaluation, and for clinical audits.

In 2015, McElwaine *et al*. (2015) completed the second Irish National Stroke Audit and found a huge improvement in some key areas of stroke care, such as the increased provision of stroke units (from 1 to 21) and an increase in the thrombolysis rate (from 1% to 11%) between 2008 and 2015. The impact of these improvements was demonstrated by the reduction in the in-hospital mortality rate from 19% in 2008 to 14% in 2015, and the fact that only 8% of patients were newly admitted to nursing homes in 2015, compared with 15% in 2008.

Since 2015, there have been many advances in the acute treatment of patients with a stroke, recommendations have been updated nationally and internationally, and there has been some significant reorganisation within the HSE hospital network. In addition, the NSR has evolved to include data collection on thrombectomy and on discipline-specific rehabilitation metrics.

In 2019, governance of the NSR was transferred to the National Office of Clinical Audit (NOCA). The same year, the Irish National Audit of Stroke Governance Committee (Appendix 1) was established and the NSR was renamed the Irish National Audit of Stroke (INAS). The aim of the INAS is to conduct audit of stroke care, including clinical care and service organisation (NOCA, 2020).

PURPOSE OF THIS REPORT

In 2020, NOCA published the first INAS report, the *Irish National Audit of Stroke National Report 2019* (NOCA, 2020). One of the recommendations was to complete an organisational audit of stroke units in order to review the availability and accessibility of stroke unit beds, the availability of the appropriate number of trained stroke staff, and the accessibility of diagnostic tests and investigations. Another recommendation was to complete an audit of Early Supported Discharge (ESD) services in order to assess the availability and accessibility of ESD services nationally, including the membership of each ESD team.

This report presents the findings from two surveys:

- INAS Organisational Audit Survey September 2021
- INAS Early Supported Discharge Survey November 2021.

The INAS Organisational Audit Survey September 2021 was completed during the month of September 2021 by all hospitals providing acute stroke care. The INAS Early Supported Discharge Survey November 2021 questionnaire was completed by each ESD team in November 2021. The findings from the INAS Organisational Audit Survey September 2021 are compared to two national guidelines and two European guidelines (Chapter 2). The INAS Early Supported Discharge Survey November 2021 findings are presented as a description of ESD services in Ireland in November 2021.

Recommendations based on this report will be made in the *Irish National Audit of Stroke National Report 2021*, aligned with clinical audit findings.

WHO IS THIS REPORT AIMED AT?

This report is intended for use by a wide range of individuals and organisations, including:

1. healthcare professionals, hospital managers, and Hospital Groups
2. policy-makers
3. patient advocacy groups
4. researchers.

CHAPTER 2: METHODOLOGY

INAS ORGANISATIONAL AUDIT SURVEY

An organisational audit survey was developed based on the 2015 organisational audit questionnaire (Appendix 2), with some modifications to include questions on thrombectomy and other technological and radiological developments since 2015. The questionnaire contained 131 questions under the following headings:

- ✓ Hospital Details
- ✓ Stroke Governance
- ✓ Hospital Information
- ✓ Stroke Unit Activity
- ✓ Acute presentation
- ✓ Thrombolysis, thrombectomy and advanced imaging
- ✓ Specialist investigations
- ✓ Transient ischaemic attack (TIA) and neurovascular services
- ✓ Carotid stenosis treatment
- ✓ Human resources
- ✓ Education and training
- ✓ Discharge planning
- ✓ Patient information
- ✓ Community rehabilitation.

The questionnaire was endorsed by the INAS Governance Committee. SurveyMonkey© was used as the platform to carry out the survey, and validations were built in, in order to minimise errors at the point of entry. The survey was piloted in two hospitals and the questionnaire was modified slightly following the pilot.

INAS Early Supported Discharge Survey November 2021

When the hospitals providing ESD services were identified in the organisational audit, a short ESD-specific survey was distributed to the ESD team leads in each hospital using the SurveyMonkey© platform to gather additional data on the composition of, and service provided by, each ESD team (Appendix 3). This survey was endorsed by the HSCP Lead on the INAS Governance Committee.

RECRUITMENT

In 2021, 24 hospitals from 6 Hospital Groups provided acute stroke services. Each hospital providing acute stroke services was asked to participate in the survey. In August 2021, a letter explaining the rationale for the audit and the processes involved in completing the survey was sent to the Chief Executive Officer/Hospital Manager, Clinical Director, Director of Nursing, Stroke

Clinical Lead, and Advanced Nurse Practitioner (ANP)/Clinical Nurse Specialist (CNS) in Stroke in each participating hospital (Appendix 4). A total of 24 hospitals participated in the audit.

DATA COLLECTION

On 31 August 2021, the survey link was disseminated via email to the stroke clinical leads and the ANPs/CNSs. Each hospital was asked to complete the survey within 1 month. Data were submitted using the SurveyMonkey© platform.

On 21 September 2021, a reminder to complete the survey was sent to any hospitals that had not completed the survey. All 24 hospitals completed the survey by 30 September 2021. Clarification on data related to HSCP WTE staffing allocation to stroke was requested in February 2022 (Appendix 2).

The INAS Early Supported Discharge Survey November 2021 was disseminated on 13 November 2021, with a 1-week turnaround. All 10 ESD teams returned the survey.

DATA ANALYSIS

Descriptive statistical analysis was completed by the NOCA Data Analyst. The analysis was conducted using Statistical Package for the Social Sciences (SPSS) V25.

This report compared the organisation of stroke care against the *Irish Heart Foundation/HSE National Stroke Audit 2015* (McElwaine *et al*., 2015) and against four stroke guidelines and recommendations:

1. the Irish Heart Foundation (IHF) Council for Stroke's *National Clinical Guidelines and Recommendations for the Care of People with Stroke and Transient Ischaemic Attack* (IHF, 2010)
2. the IHF Council for Stroke's *Stroke Thrombolysis Guidelines Version 2.0* (IHF, 2015)
3. the Royal College of Physicians' *National clinical guideline for stroke* (Royal College of Physicians, 2016)
4. the European Stroke Organisation's (ESO's) recommendations to establish a stroke unit and stroke center (Ringelstein *et al.*, 2013).

CHAPTER 3: DATA QUALITY

Tables 3.1, 3.2 and 3.4 provide an assessment of the quality of the INAS Organisational Audit Survey September 2021 and the INAS Early Supported Discharge Survey November 2021 data in this report using internationally agreed dimensions of data quality (Health Information and Quality Authority, 2018).

TABLE 3.1: CONTEXT OF DATA QUALITY STATEMENT

Scope	This data quality statement provides an assessment of the data released for this report. This statement solely focuses on the data quality dimension of accuracy and reliability, and specifically on the characteristics of: • coverage of data release • completeness of data release • accuracy of data release.
Purpose	This data quality statement will help the user decide whether the data are fit for the user's specific purpose.
Data source	Sources of data for this report are from the data submitted via the INAS Organisational Audit Survey September 2021 SurveyMonkey© link (Appendix 2) from 24 hospitals providing acute stroke care, and from the INAS Early Supported Discharge Survey November 2021 (Appendix 3) from the 10 operational ESD teams.
Time frame of data release	The data released in this report are based on data reported between 1 September 2021 and 30 September 2021 for the INAS Organisational Audit Survey September 2021. Data for the INAS Early Supported Discharge Survey November 2021 were submitted in November 2021. The results for each hospital are based on a defined period of time in 2021, thus limiting variation due to seasonal trends.
Type of data	The report is based on a self-reported survey completed by stroke teams in each hospital.

TABLE 3.2: CHARACTERISTICS OF DATA QUALITY

Coverage of data release	A hospital was considered eligible to participate if it provided acute stroke services. In 2021, 24 hospitals fulfilled this criterion and all 24 hospitals are reported on within this report. If a hospital provided ESD services, it was eligible to participate in the INAS Early Supported Discharge Survey November 2021, and all 10 ESD teams are represented.
Completeness of	The survey contained mandatory fields, which minimised the risk of missing or incomplete data. Overall, out of 140 questions (131 organisational audit questions,

data release	and 9 INAS Early Supported Discharge Survey November 2021 questions), there were 2 where data were incomplete, resulting in 99% completeness. One hospital did not respond to the request for additional data regarding HSCP resourcing and are excluded from that analysis.
Accuracy of data release	Each hospital's survey was reviewed by the INAS Audit Manager; any omissions or clarifications were directed back to the clinical teams and the Excel file was amended accordingly. Following review of the final draft of the report, it became apparent that the question related to HSCP WTE staffing allocation to stroke may have been misinterpreted in different hospitals. A follow-up email to clarify the question further was requested and all but one hospital responded. The data from this clarification replaces data from the original question 109 in the INAS Organisational Audit Survey September 2021 (Appendix 2). Hospitals were provided with a copy of the final draft of the report in April 2022 After reviewing their data seven hospitals requested amendments to the report, these amendments were made to ensure that the data reported were as accurate and precise as possible for all participating hospitals. The number of amendments ranged from one in two hospitals, three in three hospitals, nine in one hospital and eighteen in one hospital.

TABLE 3.3: ASSESSMENT

Strengths of data in this report	All 24 eligible hospitals participated in the survey. The survey was completed by stroke clinical specialists, with input from the multidisciplinary team and hospital management teams as necessary. Built-in validations minimised the risk of missing data at the point of data entry, resulting in 99% data completeness. All ESD services are represented in the results.
Limitations of data in this report	The INAS Organisational Audit Survey September 2021 questionnaire was long, with 131 questions. On average, it took 93 minutes to complete.[1] However, this excludes the time it took to access the information, particularly in relation to collating data on multidisciplinary staffing levels.

[1] SurveyMonkey© analysis of how long it took to complete the survey.

	Three questions required follow-up clarification. Two questions were resolved by email and the third question, as outlined above, was reworded and expanded upon. Only hospitals that currently provide acute stroke services were asked to complete the survey. It is possible that other acute hospitals provide some acute stroke care, e.g. if a patient has a stroke while an inpatient in a hospital that does not provide acute stroke care. This information is not known.

CHAPTER 4: ORGANISATION OF STROKE SERVICES

NATIONAL ACUTE STROKE SERVICE PROVISION

In 2021, the HSE provided acute care to patients in 47 hospitals, governed by 6 Hospital Groups. Table 4.1 lists all hospitals within each of the Hospital Groups, and identifies the hospitals that are designated to provide acute emergency stroke services. In total, 24 out of 47 hospitals provided an acute stroke service. In the *Irish Heart Foundation/HSE National Stroke Audit 2015* (McElwaine *et al*., 2015), this was reported as 27 hospitals, indicating a reorganisation of stroke services nationally.

TABLE 4.1: HOSPITALS AND HOSPITAL GROUPS WITH AN ACUTE STROKE SERVICE PROVISION

Hospital Group	Hospital (N=47)	Acute stroke service provision (N=24)
Dublin Midlands Hospital Group	Midland Regional Hospital Portlaoise	
	Midland Regional Hospital Tullamore	
	Naas General Hospital	✓
	St James's Hospital	✓
	Coombe Women and Infants University Hospital	
	Saint Luke's Radiation Oncology Network	
	Tallaght University Hospital	✓
Ireland East Hospital Group	Mater Misericordiae University Hospital	✓
	National Orthopaedic Hospital Cappagh	
	National Maternity Hospital	
	Our Lady's Hospital, Navan	
	Regional Hospital Mullingar	✓
	Royal Victoria Eye and Ear Hospital	
	St Luke's General Hospital, Carlow/Kilkenny	✓
	St Michael's Hospital, Dun Laoghaire	
	St Columcille's Hospital, Loughlinstown	
	St Vincent's University Hospital	✓
	Wexford General Hospital	✓
RCSI Hospital Group	Beaumont Hospital	✓
	Cavan General Hospital	✓
	Connolly Hospital	✓
	Louth County Hospital	
	Monaghan Hospital	
	Our Lady of Lourdes Hospital Drogheda	✓
	Rotunda Hospital	
Saolta University Health Care Group	Letterkenny University Hospital	✓
	Mayo University Hospital	✓
	Portiuncula University Hospital	✓
	Roscommon University Hospital	
	Sligo University Hospital	✓
	University Hospital Galway	✓
South/South West Hospital Group	Bantry General Hospital	✓
	Cork University Hospital	✓
	Kilcreene Regional Orthopaedic Hospital	
	Mallow General Hospital	
	Mercy University Hospital	✓
	South Infirmary Victoria University Hospital	
	Tipperary University Hospital	✓
	University Hospital Kerry	✓
	University Hospital Waterford	✓
University Limerick Hospitals Group	Croom Orthopaedic Hospital	
	Ennis Hospital	
	Nenagh Hospital	
	St John's Hospital	
	University Hospital Limerick	✓
	University Maternity Hospital Limerick	

HOSPITAL ORGANISATION OF STROKE SERVICES

All hospitals providing acute emergency stroke services completed the survey (N=24) and these are the hospitals that are referred to in this report. In total, there were 9,597 inpatient beds across the 24 hospitals. The average number of hospital beds per hospital was 400, and the median was 314 (interquartile range (IQR): 252–503 beds). All hospitals reported that they have a stroke unit, and two hospitals reported that they also provide an endovascular thrombectomy (EVT) service (Table 4.2).

TABLE 4.2: NUMBER OF BEDS, STROKE UNIT PROVISION, ENDOVASCULAR THROMBECTOMY PROVISION, AND DEFINITION OF STROKE, BY HOSPITAL

Hospital Group	Hospital (N=24)	Number of beds	Stroke unit provision (N=24)	EVT provision (n=2)	Definition of stroke	
					American Heart Association/American Stroke Association (n=13)	World Health Organization (n=11)
Dublin Midlands Hospital Group	Naas General Hospital	243	✓			✓
	St James's Hospital	950	✓			✓
	Tallaght University Hospital	652	✓		✓	
Ireland East Hospital Group	Mater Misericordiae University Hospital	721	✓		✓	
	Regional Hospital Mullingar	216	✓		✓	
	St Luke's General Hospital, Carlow/Kilkenny	217	✓		✓	
	St Vincent's University Hospital	484	✓		✓	
	Wexford General Hospital	260	✓		✓	
RCSI Hospital Group	Beaumont Hospital	738	✓	✓	✓	
	Cavan General Hospital	264	✓			✓
	Connolly Hospital	295	✓		✓	
	Our Lady of Lourdes Hospital Drogheda	479	✓		✓	
Saolta University Health Care Group	Letterkenny University Hospital	322	✓			✓
	Mayo University Hospital	313	✓		✓	
	Portiuncula University Hospital	170	✓			✓
	Sligo University Hospital	284	✓			✓
	University Hospital Galway	521	✓			✓
South/South West Hospital Group	Bantry General Hospital	118	✓			✓
	Cork University Hospital	651	✓	✓		✓
	Mercy University Hospital	314	✓			✓
	Tipperary University Hospital	206	✓		✓	
	University Hospital Kerry	300	✓		✓	
	University Hospital Waterford	429	✓			✓
University Limerick Hospitals Group	University Hospital Limerick	450	✓		✓	

DEFINING STROKE

Stroke can be defined according to two classifications:

- **World Health Organization (WHO)** definition – Rapidly developing clinical signs of focal (or global) disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin.
- **American Heart Association (AHA)/American Stroke Association (ASA)** definition – Infarction based on pathological, imaging or other objective evidence of infarction. In the absence of this evidence, the persistence of symptoms for at least 24 hours or until death remained a method to define ischaemic stroke.

How stroke is defined can impact on case mix, thus impacting on activity reports, audit results and outcomes. The AHA/ASA definition permits inclusion of patients with transient or even absent neurological deficits and would tend to result in the inclusion of a large number of milder strokes with short lengths of stay. It also means that hospitals with easier access to advanced imaging may diagnose more strokes, which may not fairly represent relative activity. However, such patients may also benefit from the organised care and evaluation that they would receive while being cared for in a stroke service. This report indicates that there is an almost even split in how stroke is defined within the 24 surveyed hospitals, with 13 (54%) hospitals reporting that they use the AHA/ASA definition of stroke, and 11 (46%) reporting that they use the WHO definition (Table 4.2). National agreement on how stroke should be classified will need to be prioritised.

STROKE SERVICE GOVERNANCE

Standard: The process of clinical governance should be embedded within all healthcare organisations. Stroke services should develop a culture of continuous quality improvement, and attention to good governance is mandatory. The process of quality improvement includes collecting appropriate data in a timely manner, analysing the data and acting upon the findings (Royal College of Physicians, 2016).

Twenty (83%) hospitals reported that they have a stroke governance committee. Of these hospitals, 2 (10%) meet monthly, 13 (65%) meet quarterly, 3 (15%) meet twice annually, and 2 (10%) meet annually. During these meetings, the INAS annual reports form part of the agenda in 11 out of 20 (55%) hospitals, and 13 (65%) hospitals use local INAS data to inform the discussion (Table 4.3).

TABLE 4.3: HOSPITAL STROKE GOVERNANCE COMMITTEES

Hospital Group	Hospital	Stroke governance committee (n=20)	Frequency of governance committee meetings	INAS reports form part of the agenda (n=11)	Local INAS data inform the discussion (n=13)
Dublin Midlands Hospital Group	Naas General Hospital	✓	Annually	✓	✓
	St James's Hospital	✓	Quarterly		✓
	Tallaght University Hospital	✓	Quarterly	✓	✓
Ireland East Hospital Group	Mater Misericordiae University Hospital	✓	Quarterly		
	Regional Hospital Mullingar	✓	Twice annually	✓	✓
	St Luke's General Hospital, Carlow/Kilkenny	✓	Monthly		✓
	St Vincent's University Hospital	✓	Quarterly	✓	✓
	Wexford General Hospital				
RCSI Hospital Group	Beaumont Hospital	✓	Quarterly		
	Cavan General Hospital	✓	Twice annually	✓	✓
	Connolly Hospital				
	Our Lady of Lourdes Hospital Drogheda	✓	Quarterly		
Saolta University Health Care Group	Letterkenny University Hospital	✓	Quarterly		
	Mayo University Hospital	✓	Twice annually	✓	✓
	Portiuncula University Hospital	✓	Quarterly		
	Sligo University Hospital	✓	Annually		✓
	University Hospital Galway	✓	Quarterly		
South/South West Hospital Group	Bantry General Hospital				
	Cork University Hospital	✓	Monthly	✓	
	Mercy University Hospital				
	Tipperary University Hospital	✓	Quarterly	✓	✓
	University Hospital Kerry	✓	Quarterly	✓	✓
	University Hospital Waterford	✓	Quarterly	✓	✓
University Limerick Hospitals Group	University Hospital Limerick	✓	Quarterly	✓	✓

MEMBERSHIP OF THE STROKE GOVERNANCE COMMITTEE

In hospitals that have a stroke governance committee, membership is multidisciplinary. Figure 4.1 shows the membership of the stroke governance committees. All of the hospitals have a stroke consultant represented. The majority have a senior nursing representative (n=17, 85%) and a senior HSCP representative (n=16, 80%). One-half of the hospitals have a senior accountable hospital manager represented on the stroke governance committee (n=10, 50%) and 6 (30%) out of 20 hospitals have a quality manager represented. Other committee members include a patient representative, an ANP or CNSs in stroke care, an emergency department consultant, a radiologist, a general practitioner (GP), a healthcare assistant (HCA), a portering representative, a non-consultant hospital doctor (NCHD), a nursing facilitator, an ambulance

service representative, a laboratory representative, and representatives from all HSCP disciplines.

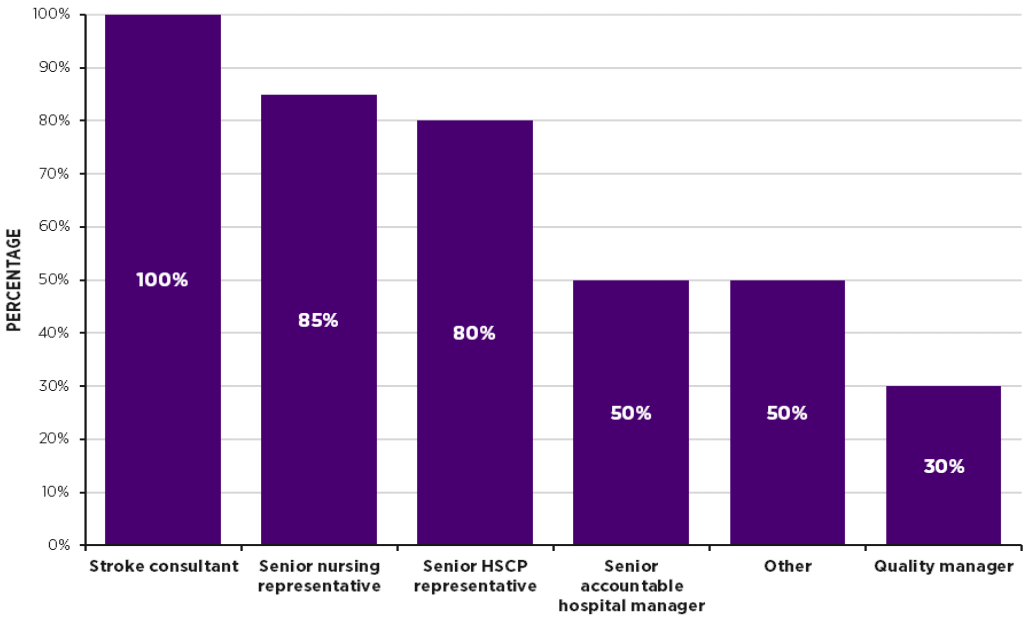

FIGURE 4.1: MEMBERSHIP OF THE STROKE GOVERNANCE COMMITTEE (n=20)

ORGANISATION OF STROKE UNIT BEDS

Guideline: People with stroke should be treated in a stroke unit throughout their hospital stay unless their stroke is not the predominant clinical problem (Royal College of Physicians, 2016; IHF, 2010).

The total number of designated stroke unit beds was reported as 239, a 59% increase from 150 in 2015 (McElwaine *et al*., 2015). The total number of patients with a stroke in the hospital was reported as 342, slightly less than the number in 2015, which was 384. This would indicate that 70% of patients with a stroke had access to a stroke unit bed, an increase from 39% in 2015 (McElwaine *et al*., 2015). Figure 4.2 shows the number of designated stroke unit beds in each hospital in comparison to the number of patients with a stroke in the hospital on the day of survey completion. The mean number of stroke unit beds available was 10 (median: 8 beds), in comparison to the mean number of 14 patients with a stroke (median: 12 patients) in the hospital on the day of survey completion. On the day of survey completion, 16 out of 24 hospitals had more patients with a stroke in the hospital than designated stroke unit beds.

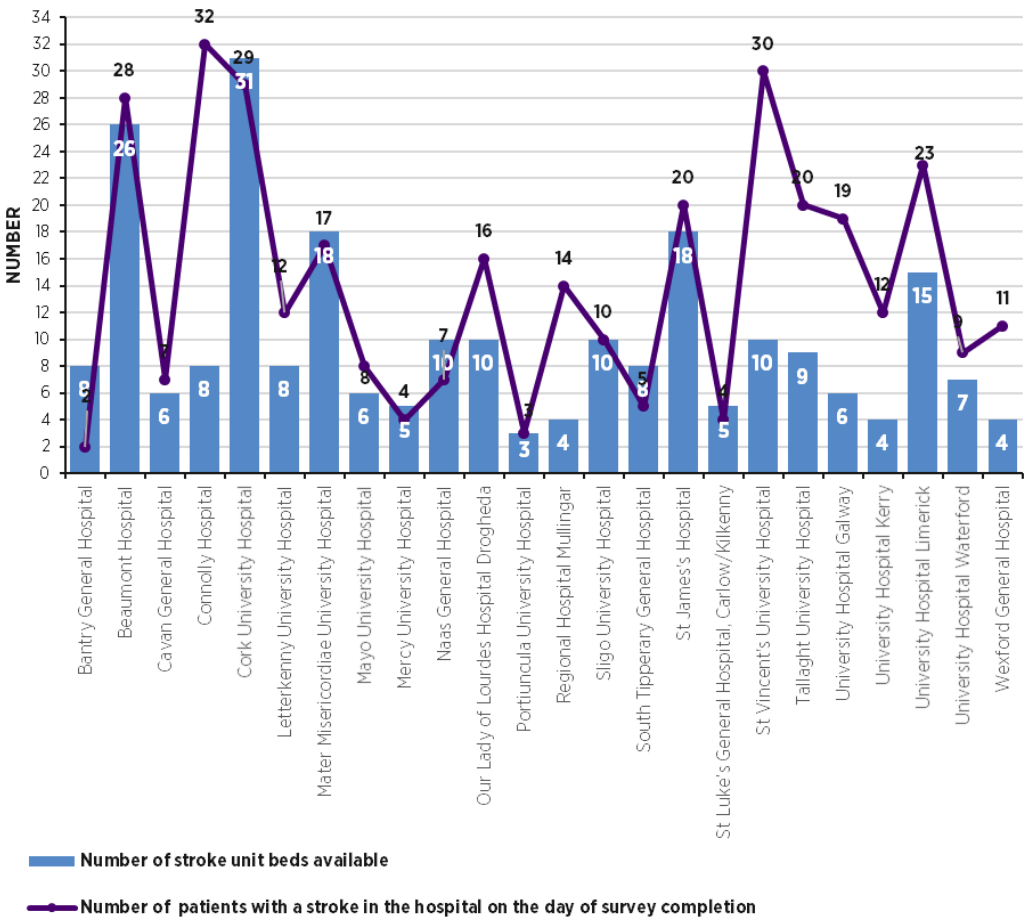

FIGURE 4.2: NUMBER OF STROKE UNIT BEDS (N=239) IN COMPARISON TO NUMBER OF PATIENTS WITH A STROKE (N=342), BY HOSPITAL

Stroke unit beds should be protected for patients with a stroke (HSE, 2012) and it is recommended that a bed should be kept vacant in order to facilitate timely access to the stroke unit. While the hospital may have designated stroke unit beds, on occasion the beds may be occupied by patients who did not have a stroke. In total, on the day of survey completion, bed occupancy in stroke units with patients with a stroke was 82% (n=197). Figure 4.3 shows the number of designated stroke unit beds in comparison to the number of patients with a stroke occupying a stroke unit bed. The mean number of designated stroke unit beds was 10 (median: 8 beds), in comparison to the mean number of 8 patients with a stroke (median: 7 patients) in a stroke unit bed. Comparative data from 2015 are unavailable.

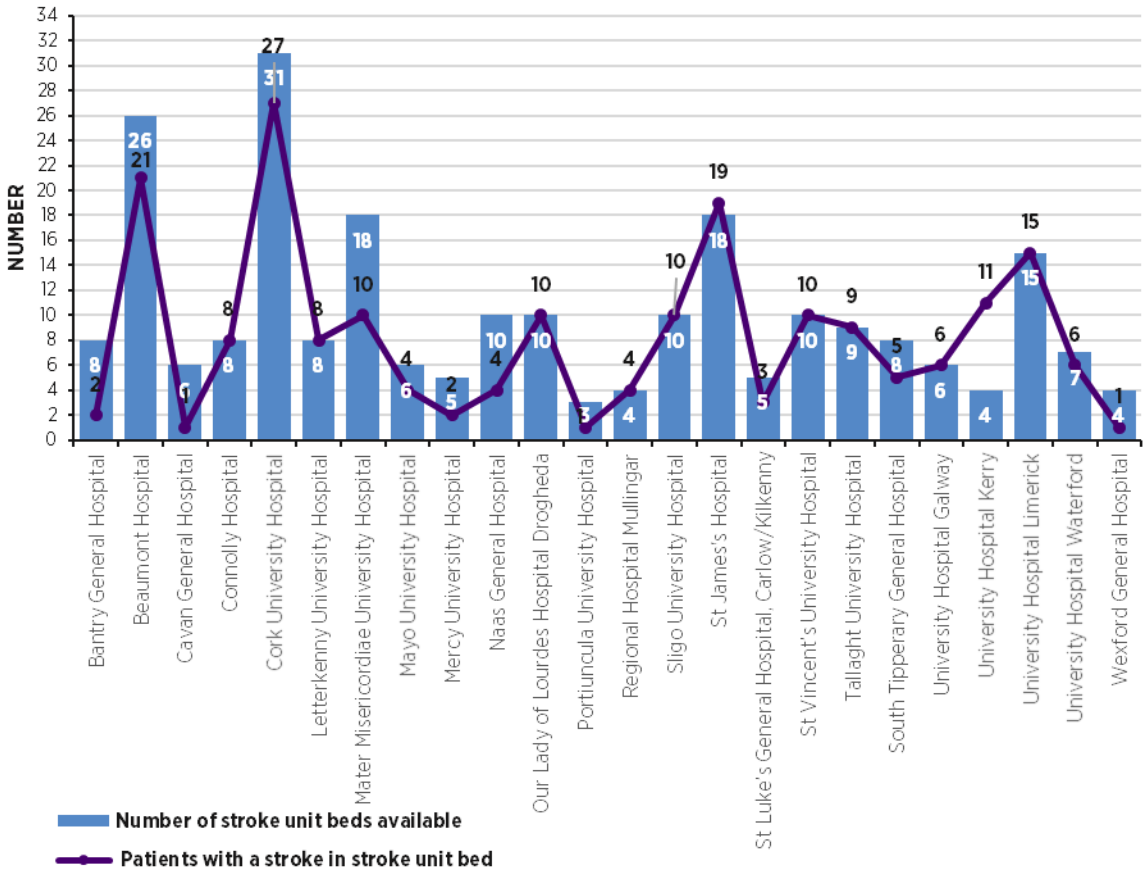

FIGURE 4.3: NUMBER OF STROKE UNIT BEDS (N=239) IN COMPARISON TO NUMBER OF PATIENTS WITH A STROKE IN A STROKE UNIT BED (n=197), BY HOSPITAL

KEY FINDINGS FROM CHAPTER 4

- All participating hospitals reported that they have a stroke unit, and two hospitals reported that they provide an EVT service (Table 4.2).
- This report indicates that there is an almost even split in how stroke is defined within the participating hospitals, with 13 (54%) hospitals reporting that they use the AHA/ASA definition of stroke, and 11 (46%) reporting that they use the WHO definition (Table 4.2).
- The total number of designated stroke unit beds was reported as 239, a 59% increase from 150 in 2015 (McElwaine *et al*., 2015).
- On the day of survey completion, 16 (67%) out of 24 hospitals had more patients with a stroke in the hospital than designated stroke unit beds.

CHAPTER 5: ORGANISATION OF STROKE SERVICES – ACUTE PRESENTATION

ON-CALL MEDICAL AVAILABILITY

Standard: There should be on-call availability of an acute stroke specialist 24 hours a day, 7 days a week (IHF, 2010).

Eleven (46%) out of 24 hospitals have availability of on-call stroke teams 24 hours a day, 7 days a week, an increase from 33% in 2015. Seven (29%) have 9.00am to 5.00pm Monday to Friday on-call stroke teams, and six (25%) do not have availability of on-call stroke teams (Table 5.1). This situation remains relatively unchanged from 2015 (McElwaine *et al*., 2015). Hospitals reported some local arrangements to support out-of-hours specialist stroke provision, including unofficial on-call rotas and out-of-hours ambulance bypass protocols.

TABLE 5.1: AVAILABILITY OF ON-CALL STROKE TEAMS, BY HOSPITAL (N=24)

Hospitals	Yes, 24 hours a day, 7 days a week (n=11)	Yes, Monday–Friday, 09.00–17.00 (n=7)	No (n=6)
Bantry General Hospital			✓
Beaumont Hospital	✓		
Cavan General Hospital			✓[2]
Connolly Hospital		✓	
Cork University Hospital	✓		
Letterkenny University Hospital			✓
Mater Misericordiae University Hospital	✓		
Mayo University Hospital		✓	
Mercy University Hospital	✓		
Naas General Hospital	✓		
Our Lady of Lourdes Hospital Drogheda		✓	
Portiuncula University Hospital			✓
Regional Hospital Mullingar		✓	
Sligo University Hospital			✓
St James's Hospital	✓		
St Luke's General Hospital, Carlow/Kilkenny		✓	
St Vincent's University Hospital		✓	
Tallaght University Hospital	✓		
Tipperary University Hospital	✓		
University Hospital Galway	✓		
University Hospital Kerry	✓		
University Hospital Limerick	✓		
University Hospital Waterford		✓	
Wexford General Hospital			✓

[2] There is 24/7 access to a stroke specialist from the Mater Misericordiae University Hospital for FAST positive patients.

AMBULANCE SERVICE PRE-ALERT

Guideline: Paramedical staff should pre-notify the receiving hospital emergency department (ED) of any incoming face, arm, speech, time (FAST) positive patient to facilitate early medical assessment and access to rapid neuroimaging (Royal College of Physicians, 2016; IHF, 2010).

Seventeen (74%) out of 24 hospitals reported that they get an ambulance service pre-alert for all FAST calls, higher than the 69% reported by the Sentinel Stroke National Audit Programme (Sentinel Stroke National Audit Programme on behalf of the Intercollegiate Stroke Working Party, 2019). Six reported that they sometimes get an alert.

The majority (n=21, 91%) of hospitals reported that the ED receives the ambulance service pre-alert. One hospital reported that the pre-alert is received by the stroke NCHD on call and one hospital reported that the call is received by the assistant director of nursing office. Sentinel Stroke National Audit Programme (SSNAP) results suggest that the pre-alert is received by different members of the stroke team (e.g. 44% are received by a stroke nurse specialist).

Twenty-one (88%) hospitals reported that patients with a suspected stroke who arrive by ambulance are taken to the ED for assessment, two reported that patients are brought directly to a computed tomography (CT) scanner, and one hospital reported that patients are brought to an acute medical admission ward.

Figure 5.1 shows the distribution of healthcare professionals that a patient with a stroke is first seen by. Ten (42%) out of 24 hospitals reported that the first healthcare professional who reviews the patient is an ED nurse.

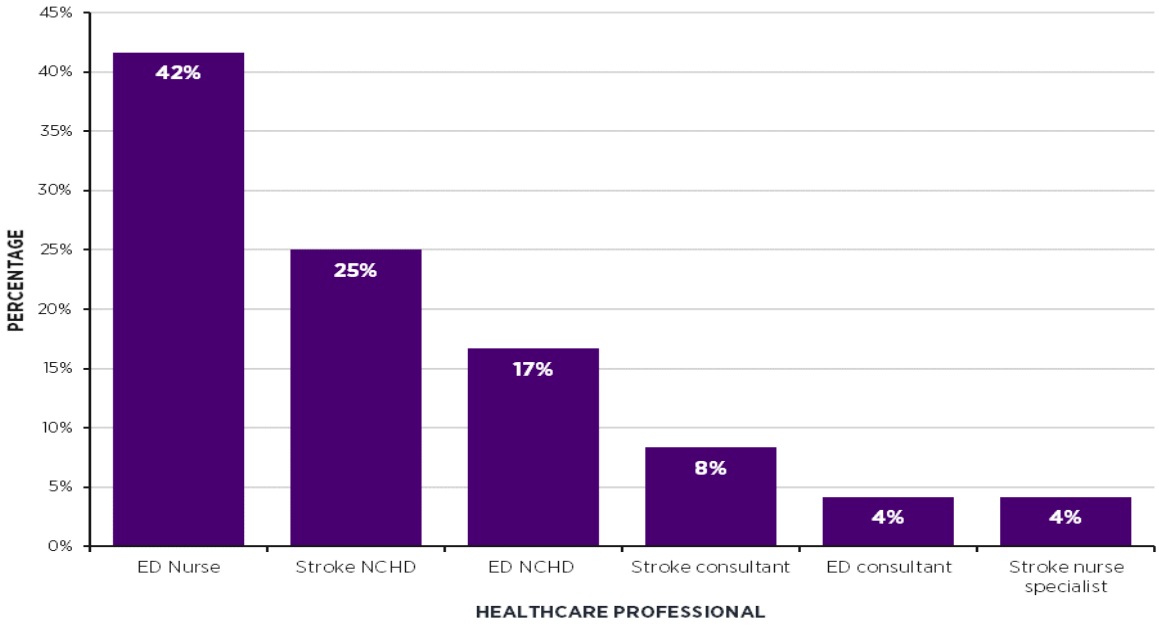

FIGURE 5.1: THE HEALTHCARE PROFESSIONAL A PATIENT WITH A STROKE IS FIRST SEEN BY (N=24)

BRAIN IMAGING

As in 2015, all hospitals reported that they have access to CT imaging for patients in the ED. Eighteen (75%) hospitals can routinely get a CT scan performed on all patients with a suspected stroke within 3 hours of admission, and one-half of the hospitals (n=12, 50%) have access to magnetic resonance imaging (MRI) for patients in the ED (Table 5.2); this is unchanged from 2015.

TABLE 5.2: ACCESS TO BRAIN IMAGING FOR PATIENTS IN THE EMERGENCY DEPARTMENT, BY HOSPITAL (N=24)

Hospitals	Access to CT imaging for patients in the ED (N=24)	Ability to routinely get a CT scan performed on all patients within 3 hours of admission (n=18)	Access to MRI for patients in the ED (n=12)
Bantry General Hospital	✓	✓	
Beaumont Hospital	✓	✓	✓
Cavan General Hospital	✓	✓	✓
Connolly Hospital	✓		
Cork University Hospital	✓	✓	✓
Letterkenny University Hospital	✓	✓	
Mater Misericordiae University Hospital	✓	✓	✓
Mayo University Hospital	✓	✓	✓
Mercy University Hospital	✓	✓	✓
Naas General Hospital	✓	✓	✓
Our Lady of Lourdes Hospital Drogheda	✓	✓	✓
Portiuncula University Hospital	✓	✓	✓
Regional Hospital Mullingar	✓	✓	
Sligo University Hospital	✓		
St James's Hospital	✓	✓	✓
St Luke's General Hospital, Carlow/Kilkenny	✓	✓	
St Vincent's University Hospital	✓	✓	
Tallaght University Hospital	✓	✓	
Tipperary University Hospital	✓		✓
University Hospital Galway	✓	✓	
University Hospital Kerry	✓		✓
University Hospital Limerick	✓		
University Hospital Waterford	✓	✓	
Wexford General Hospital	✓	✓	

One-half (n=12, 50%) of hospitals reported that they always have availability of access to a CT scan of the brain within 30 minutes of the request (Figure 5.2).

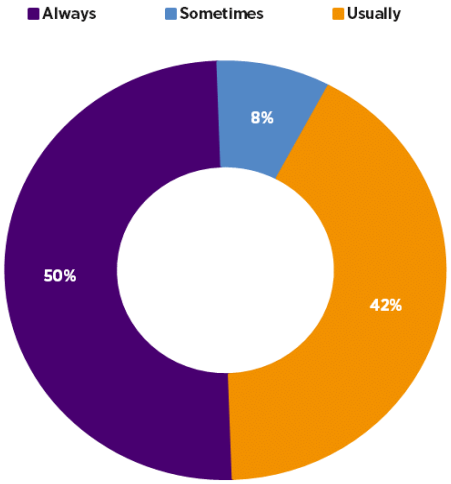

FIGURE 5.2: AVAILABILITY OF ACCESS TO A COMPUTED TOMOGRAPHY SCAN OF THE BRAIN WITHIN 30 MINUTES OF THE REQUEST (N=24)

ON-CALL RADIOLOGY AVAILABILITY

Standard: Patients with suspected acute stroke should receive brain imaging urgently and at most within 1 hour of arrival at hospital (Royal College of Physicians, 2016).

Access to timely imaging can be improved if hospitals provide an off-site on-call radiology service. Three (13%) out of 24 hospitals have an on-call radiologist on-site and 16 (67%) hospitals have an on-call radiographer on-site (Table 5.3).

TABLE 5.3: AVAILABILITY OF AN ON-CALL RADIOLOGIST AND RADIOGRAPHER TO PERFORM BRAIN IMAGING, BY HOSPITAL (N=24)

Hospitals	On-call radiologist		On-call radiographer	
	On-site (n=3)	Off-site (n=21)	On-site (n=16)	Off-site (n=8)
Bantry General Hospital		✓		✓
Beaumont Hospital		✓	✓	
Cavan General Hospital		✓		✓
Connolly Hospital		✓		✓
Cork University Hospital		✓	✓	
Letterkenny University Hospital		✓	✓	
Mater Misericordiae University Hospital	✓		✓	
Mayo University Hospital		✓	✓	
Mercy University Hospital		✓	✓	
Naas General Hospital		✓		✓
Our Lady of Lourdes Hospital Drogheda		✓	✓	
Portiuncula University Hospital		✓	✓	
Regional Hospital Mullingar		✓		✓
Sligo University Hospital		✓		✓
St James's Hospital		✓	✓	
St Luke's General Hospital, Carlow/Kilkenny		✓	✓	
St Vincent's University Hospital	✓		✓	
Tallaght University Hospital	✓		✓	
Tipperary University Hospital		✓	✓	
University Hospital Galway		✓		✓
University Hospital Kerry		✓	✓	
University Hospital Limerick		✓	✓	
University Hospital Waterford		✓		✓
Wexford General Hospital		✓	✓	

INITIAL BRAIN IMAGING

Standard: Acute stroke services should have continuous access to brain imaging, including computed tomography angiography, and should be capable of undertaking immediate brain imaging when clinically indicated (Royal College of Physicians, 2016).

Table 5.4 shows the initial acute brain imaging modality requested pertaining to the clinical presentation. Computed tomography (CT) was the most widely used brain imaging modality where there is a clinical suspicion of stroke amenable to thrombolysis (N=24), followed by computed tomography angiography (CTA) (n=20). Computed tomography perfusion (CTP) was used in five hospitals. Appendix 5 displays the initial acute brain imaging requested, by hospital.

TABLE 5.4: INITIAL ACUTE BRAIN IMAGING MODALITY (N=24)

	CT		CTA		CTP	
	N	%	N	%	N	%
Clinical suspicion of stroke amenable to thrombolysis	24	100%	20	83%	4	17%
Clinical suspicion of stroke amenable to thrombolysis and possible thrombectomy	24	100%	24	100%	6	25%
Clinical suspicion of stroke but over 4.5 hours since onset of symptoms	23	96%	24	100%	6	25%
Clinical suspicion of posterior circulation stroke but not a thrombolysis candidate	24	100%	23	96%	5	21%
Clinical suspicion of alternative neurological diagnosis	24	100%	4	17%	2	8%

IMAGING REVIEW

Almost one-half (n=10, 42%) of hospitals reported that the stroke consultant on-site is responsible for the initial review of brain imaging to inform decisions about thrombolysis/thrombectomy during normal working hours, and nine hospitals (38%) reported that it is the responsibility of a general radiologist. However, in the majority of hospitals (n=13, 54%), out-of-hours, a general radiologist is reported to be responsible for the initial review of brain imaging to inform decisions about thrombolysis/thrombectomy (Figure 5.3).

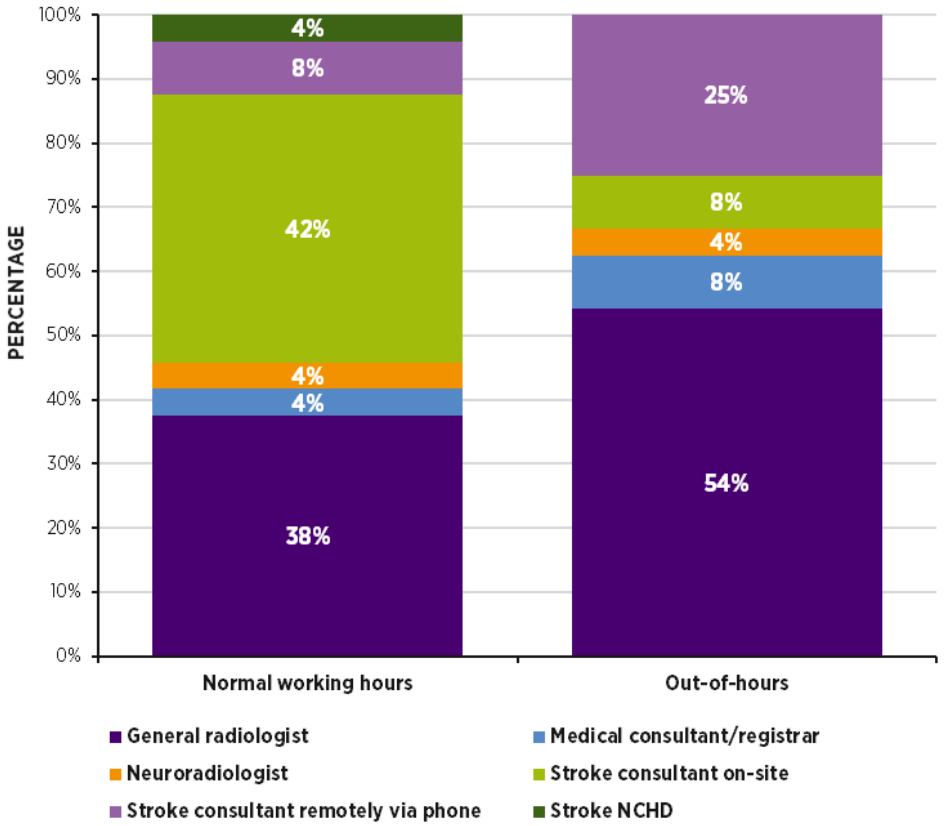

FIGURE 5.3: HEALTHCARE PROFESSIONAL RESPONSIBLE FOR THE INITIAL REVIEW OF BRAIN IMAGING TO INFORM DECISIONS ABOUT THROMBOLYSIS/THROMBECTOMY (N=24)

In the majority (63%) of hospitals, if the imaging was not reviewed by a radiologist initially, the imaging of patients with a large vessel occlusion stroke was subsequently reviewed by a radiologist with a specific competency in neurovascular imaging. However, subsequent review by a radiologist with a specific competency in neurovascular imaging occurred in less than one-third of all other stroke types (Figure 5.4).

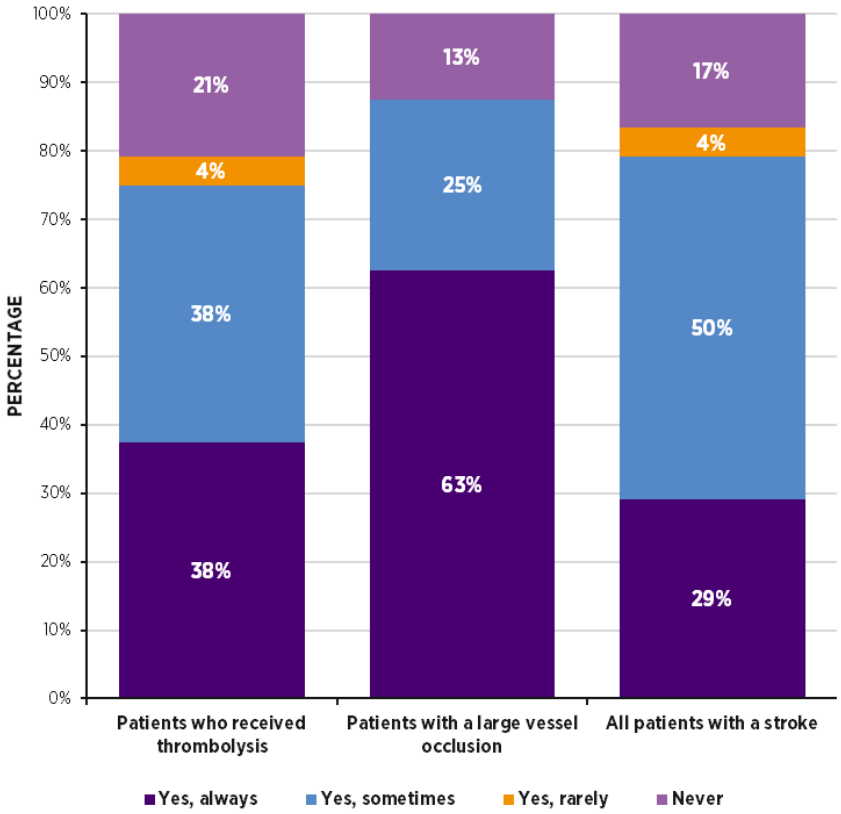

FIGURE 5.4: REVIEW OF BRAIN IMAGING BY A RADIOLOGIST WITH A SPECIFIC COMPETENCY IN NEUROVASCULAR IMAGING, BY PATIENT GROUP (N=24)

ORGANISATION OF THROMBOLYSIS SERVICES

Almost all hospitals (n=22, 92%) reported that they provide a thrombolysis service 24 hours a day, 7 days a week (Table 5.5), with an ambulance bypass to the nearest hospital providing a thrombolysis service 24 hours a day, 7 days a week in the remaining two hospitals. This is relatively unchanged from 2015 (McElwaine *et al*., 2015), when 82% of hospitals (n=22) had a thrombolysis service 24 hours a day, 7 days a week, 15% (n=4) had an ambulance bypass arrangement, and one provided an ad hoc thrombolysis, the difference mainly relating to the differing numbers of hospitals included in the audit.

TABLE 5.5: PROVISION OF THROMBOLYSIS, BY HOSPITAL (N=24)

	Yes, 24 hours a day, 7 days a week (n=22)	Yes, 09.00–17.00, Monday–Friday (n=1)	No (n=1)
Bantry General Hospital	✓		
Beaumont Hospital	✓		
Cavan General Hospital	✓		
Connolly Hospital		✓	
Cork University Hospital	✓		
Letterkenny University Hospital	✓		
Mater Misericordiae University Hospital	✓		
Mayo University Hospital	✓		
Mercy University Hospital	✓		
Naas General Hospital	✓		
Our Lady of Lourdes Hospital Drogheda	✓		
Portiuncula University Hospital			✓
Regional Hospital Mullingar	✓		
Sligo University Hospital	✓		
St James's Hospital	✓		
St Luke's General Hospital, Carlow/Kilkenny	✓		
St Vincent's University Hospital	✓		
Tallaght University Hospital	✓		
Tipperary University Hospital	✓		
University Hospital Galway	✓		
University Hospital Kerry	✓		
University Hospital Limerick	✓		
University Hospital Waterford	✓		
Wexford General Hospital	✓		

More than one-half (n=12, 52%) of hospitals reported that the stroke NCHD usually assesses the patient for thrombolysis, and in one-quarter (n=6, 26%) of hospitals, the patient is assessed by a stroke consultant. Seventy percent (n=16) of hospitals reported that the stroke consultant is the person who decides to proceed to thrombolysis, and in one-quarter (n=6) of hospitals a medical consultant makes this decision (Figure 5.5). In 2015, 63% of hospitals reported that a stroke consultant made the decision to proceed with thrombolysis (McElwaine *et al.*, 2015).

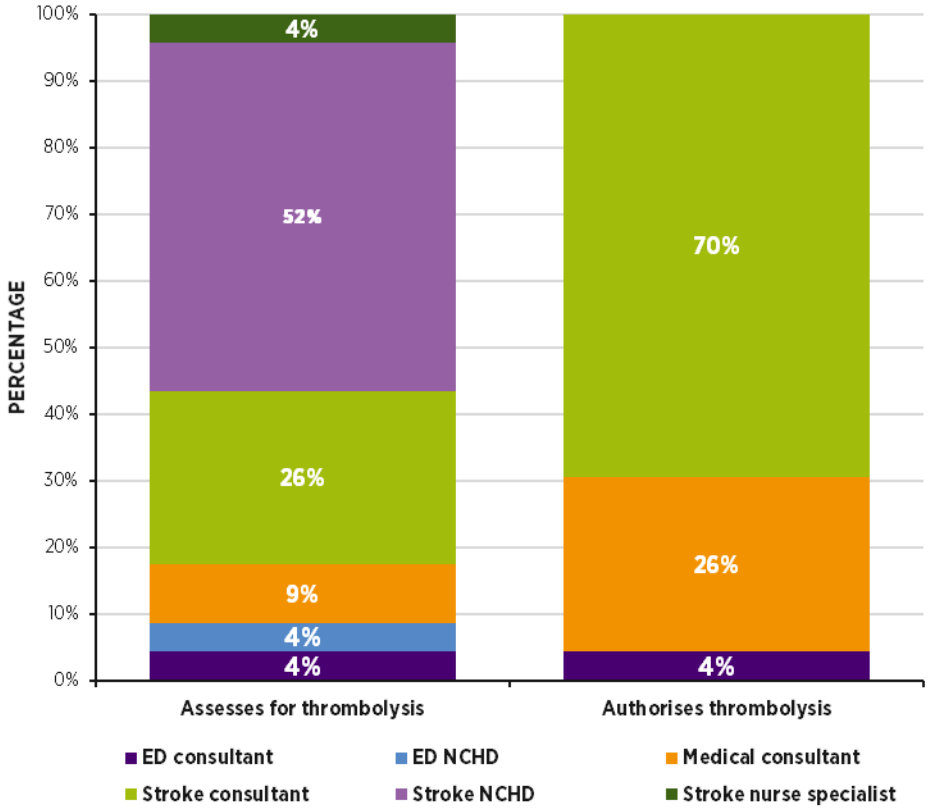

FIGURE 5.5: HEALTHCARE PROFESSIONAL WHO USUALLY ASSESSES THE PATIENT AND DECIDES TO PROCEED TO THROMBOLYSIS (n=23)[3]

[3] Figure 5.5 excludes Portiuncula University Hospital, because there is an ambulance bypass to University Hospital Galway.

Thrombolysis is delivered by the administration of an initial 10% of the total dose (bolus) followed by an infusion of the remaining 90%, which lasts for 1 hour. Fifteen (65%) out of 23 hospitals reported that the thrombolysis bolus dose is given in the ED, and 8 (35%) reported that it is given in a CT scanner. Twenty-five percent of hospitals in the United Kingdom (UK) reported that the thrombolysis bolus is given in the CT scanner (SSNAP on behalf of the Intercollegiate Stroke Working Party, 2019). Tenecteplase is another form of thrombolysis that can be given as one bolus dose, thereby not requiring an infusion.

Almost all of the reporting hospitals (n=21, 91%) give the infusion in the ED (Figure 5.6). One hospital gives the infusion in a CT scanner and one hospital reports that it is given in a coronary care unit (CCU), high dependency unit (HDU) or intensive care unit (ICU).

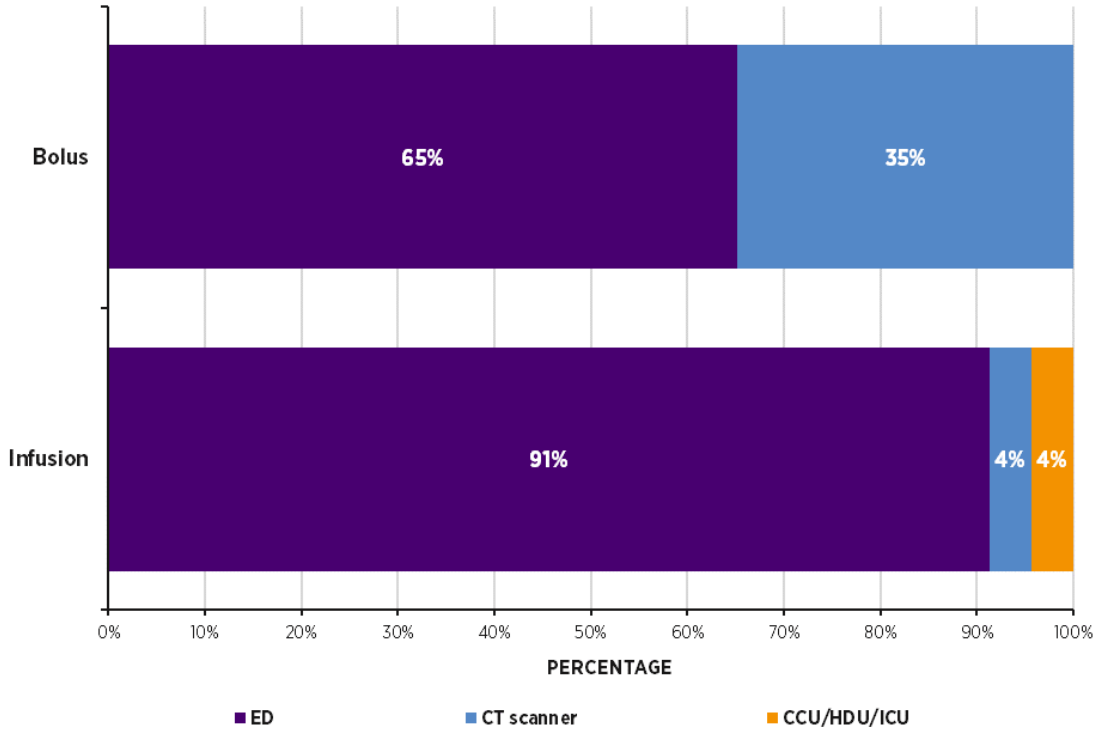

FIGURE 5.6: LOCATION OF THROMBOLYSIS FOR BOLUS AND INFUSION PROCEDURES (n=23)[4]

[4] Figure 5.6 excludes Portiuncula University Hospital because there is an ambulance bypass to University Hospital Galway.

ORGANISATION OF THROMBECTOMY SERVICES

In Ireland in 2021, there were two EVT stroke centres providing a thrombectomy service 24 hours a day, 7 days a week for patients with acute stroke. Sixteen (73%) out of the other 22 surveyed hospitals reported that they refer their patients to Beaumont Hospital and 6 (27%) refer their patients to Cork University Hospital for thrombectomy. Both hospitals reported that a consultant interventional neuroradiologist performs thrombectomy. Beaumont Hospital employs five consultants and Cork University Hospital employs three (Table 5.6).

TABLE 5.6: THROMBECTOMY CENTRES REFERRAL (n=2)

	Hours of operation	Number of consultant- level doctors	Specialty of consultant-level doctors
Beaumont Hospital	24 hours a day, 7 days a week	5	Interventional neuroradiology
Cork University Hospital	24 hours a day, 7 days a week	3	Interventional neuroradiology

Eight (36%) out of 22 hospitals reported that during normal working hours, a general radiologist makes the decision that there is a large vessel occlusion on CTA imaging, prior to transferring the patient for thrombectomy. Seven (32%) hospitals reported that the decision is made by a stroke consultant. In five (23%) hospitals the decision is made by a neuroradiologist at the EVT stroke centre. One (5%) hospital reported that a stroke NCHD makes the decision to refer the patient to a thrombectomy centre and one (5%) hospital reported that a neuroradiologist at the referring hospital makes this decision. During out-of-hours periods, almost one-half of hospitals (n=10, 45%) reported that a general radiologist makes the decision that there is a large vessel occlusion on CTA imaging, prior to transferring the patient for thrombectomy. One hospital (5%) has access to a remote teleradiology service off site, and one hospital (5%) does not provide this service during the out-of- hours period. (Figure 5.7).

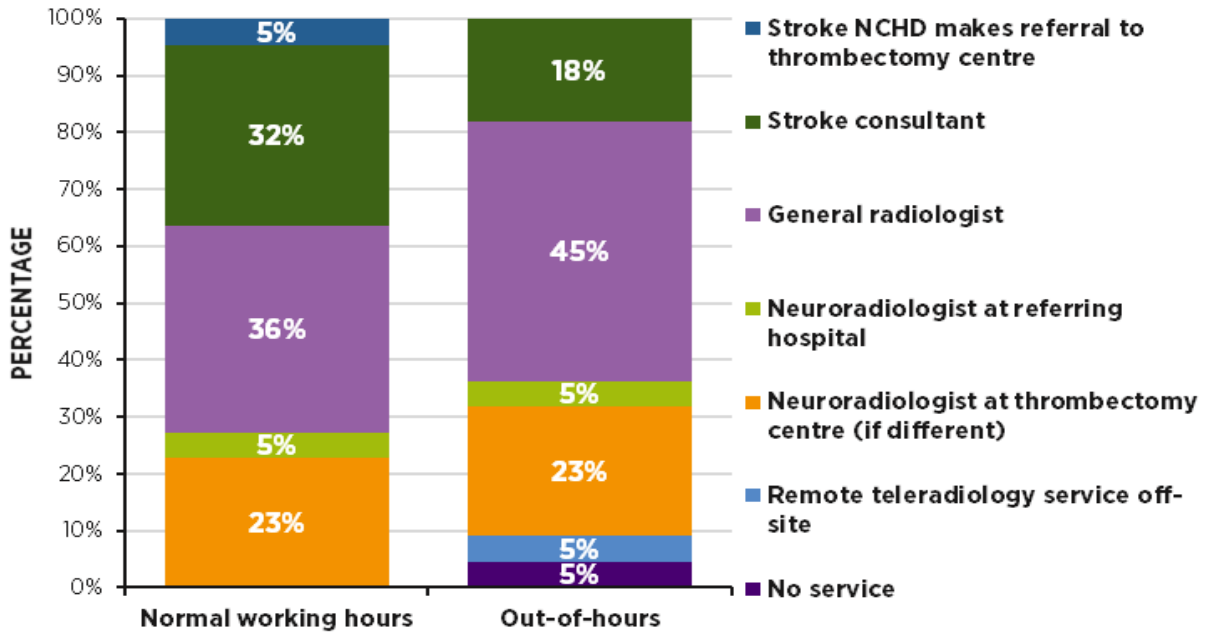

FIGURE 5.7: HEALTHCARE PROFESSIONAL WHO MAKES THE DECISION THAT THERE IS A LARGE VESSEL OCCLUSION ON COMPUTED TOMOGRAPHY ANGIOGRAPHY IMAGING PRIOR TO TRANSFERRING THE PATIENT FOR THROMBECTOMY (n=22)[5]

ORGANISATION OF INTER-HOSPITAL TRANSFER FOR THROMBECTOMY

When a patient requires transfer to the EVT centre, 18 (82%) out of 22 hospitals call the ambulance service when the patient has been accepted by the EVT centre. In the remaining four hospitals, the paramedic crew agree to stand by and do not release themselves from the initial call until a decision has been made regarding the need to transfer the patient to the EVT stroke centre for thrombectomy.

Prior to transfer for thrombectomy, one-half (n=11, 50%) of hospitals reported that they give the thrombolysis bolus and that the infusion is continued in the ambulance with the support of a doctor accompanying the patient during transfer. In four hospitals (18%), the infusion is continued in the ambulance with the support of an ED/other nurse accompanying the patient during transfer, and in three (14%) hospitals the infusion is continued in the ambulance with the support of a stroke trained nurse accompanying the patient during transfer (Figure 5.8). In the 'other' category (n=4, 18%), one hospital does not provide a thrombolysis service, and the other comments include "the bolus and infusion is generally completed before transfer of the patient is arranged" and "tenecteplase is used. Therefore, no infusion required".

[5] Figure 5.7 excludes thrombectomy centres (Beaumont Hospital and Cork University Hospital).

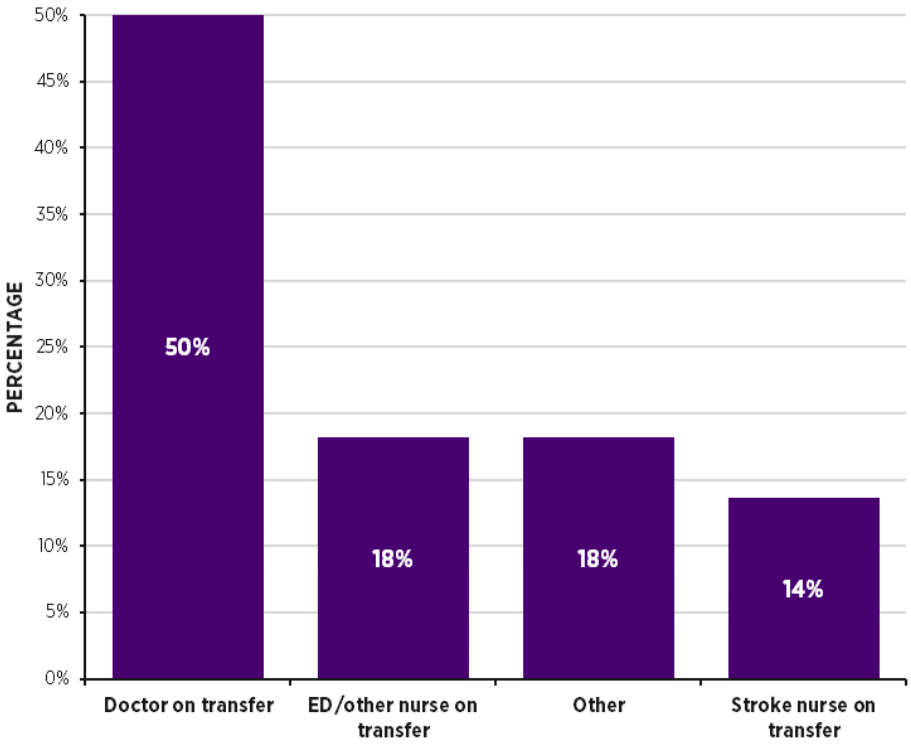

FIGURE 5.8: HEALTHCARE PROFESSIONAL WHO MANAGES THROMBOLYSIS INFUSION DURING TRANSFER TO THE ENDOVASCULAR THROMBECTOMY STROKE CENTRE (n=22)[6]

[6] Figure 5.8 excludes thrombectomy centres (Beaumont Hospital and Cork University Hospital).

All hospitals made use of the National Ambulance Service's Emergency Inter-Hospital Transfer Policy (Protocol 37) when transferring patients for thrombectomy. Twenty (91%) hospitals experienced delays of more than 30 minutes in awaiting a Protocol 37 ambulance on more than one occasion, and 7 (32%) hospitals reported that the stroke team used helicopter transfers for thrombectomy patients (Table 5.7).

TABLE 5.7: TRANSFER OF PATIENT TO THE THROMBECTOMY CENTRE, BY HOSPITAL (n=22)[7]

	Made use of Protocol 37 when transferring patients for thrombectomy (n=22)	Experienced delays >30 minutes in awaiting a Protocol 37 ambulance on more than one occasion (n=20)	Stroke team used helicopter transfers for thrombectomy patients (n=7)
Bantry General Hospital	✓	✓	✓
Cavan General Hospital	✓		
Connolly Hospital	✓	✓	
Letterkenny University Hospital	✓	✓	✓
Mater Misericordiae University Hospital	✓	✓	
Mayo University Hospital	✓	✓	✓
Mercy University Hospital	✓	✓	
Naas General Hospital	✓	✓	
Our Lady of Lourdes Hospital Drogheda	✓	✓	
Portiuncula University Hospital	✓	✓	
Regional Hospital Mullingar	✓	✓	
Sligo University Hospital	✓	✓	✓
St James's Hospital	✓	✓	
St Luke's General Hospital, Carlow/Kilkenny	✓		
St Vincent's University Hospital	✓	✓	
Tallaght University Hospital	✓	✓	
Tipperary University Hospital	✓	✓	
University Hospital Galway	✓	✓	✓
University Hospital Kerry	✓	✓	
University Hospital Limerick	✓	✓	✓
University Hospital Waterford	✓	✓	✓
Wexford General Hospital	✓	✓	

[7] Table 5.7 excludes thrombectomy centres (Beaumont Hospital and Cork University Hospital).

More than one-half (n=14, 58%) of hospitals reported that most patients referred for thrombectomy are reviewed locally as part of a multidisciplinary team (MDT) meeting. Beaumont Hospital has a monthly MDT meeting which can be accessed remotely by all hospitals referring patients, and each month all referred patients can be discussed if the referring team dials in. Eight (33%) out of 24 hospitals reported that most patients referred for thrombectomy are reviewed with the EVT stroke centre as part of a regional MDT meeting, and 2 (8%) hospitals have an informal feedback process (Table 5.8).

TABLE 5.8: POST-THROMBECTOMY MULTIDISCIPLINARY TEAM DISCUSSION, BY HOSPITAL (N=24)

	Most patients referred are reviewed with the thrombectomy centre as part of regional MDT meeting (n=8)	Most patients referred are reviewed locally as part of local MDT meeting (n=14)	Informal feedback (n=2)
Bantry General Hospital			✓
Beaumont Hospital	✓		
Cavan General Hospital		✓	
Connolly Hospital		✓	
Cork University Hospital			✓
Letterkenny University Hospital		✓	
Mater Misericordiae University Hospital	✓		
Mayo University Hospital		✓	
Mercy University Hospital		✓	
Naas General Hospital	✓		
Our Lady of Lourdes Hospital Drogheda		✓	
Portiuncula University Hospital		✓	
Regional Hospital Mullingar	✓		
Sligo University Hospital		✓	
St James's Hospital	✓		
St Luke's General Hospital, Carlow/Kilkenny		✓	
St Vincent's University Hospital	✓		
Tallaght University Hospital	✓		
Tipperary University Hospital		✓	
University Hospital Galway		✓	
University Hospital Kerry		✓	
University Hospital Limerick		✓	
University Hospital Waterford		✓	
Wexford General Hospital	✓		

STROKE SEVERITY SCORES

When a patient with a stroke is admitted, almost all hospitals reported that they record the National Institutes of Health Stroke Scale (NIHSS) score (n=23, 96%) and the modified Rankin Scale (mRS) score (n=22, 92%) as baseline scores of stroke severity. Ten (42%) hospitals reported that they record the Barthel Index of Daily Living (Barthel) score on admission. The majority (n=20, 83%) of hospitals reported that they record the mRS score on discharge as an outcome measure after stroke (Table 5.9). Appendix 6 shows stroke severity recorded on admission and discharge, by hospital. Only eight hospitals (33%) reported that they record a measure of stroke severity in the 3–6-month follow-up period.

TABLE 5.9: STROKE SEVERITY RECORDED ON ADMISSION AND DISCHARGE (N=24)

	Admission		Discharge		3–6 months	
	N	%	N	%	N	%
mRS	22	92%	20	83%	6	25%
NIHSS	23	96%	3	13%	1	4%
Barthel	10	42%	7	29%	1	4%

ADMISSION WARD AFTER TREATMENT IN THE ED

Fifteen (63%) out of 24 hospitals reported that following treatment in the ED, patients who are thrombolysed are admitted to a CCU, HDU or ICU. The other nine hospitals (38%) reported that patients who are thrombolysed are admitted to an acute stroke unit. In 20 (83%) hospitals, patients who are not thrombolysed are admitted to an acute stroke unit following treatment in the ED. Four (17%) hospitals reported that they admit patients who were not thrombolysed to a medical ward following treatment in the ED (Figure 5.9). Appendix 7 lists the admission ward for each hospital, both for patients who were thrombolysed and patients who were not thrombolysed. Stroke units should have the capacity to manage patients with a stroke following thrombolysis, unless there is another reason for admission to a CCU/HDU/ICU. Data in this report may reflect differing capacities of various stroke units to manage complex patients.

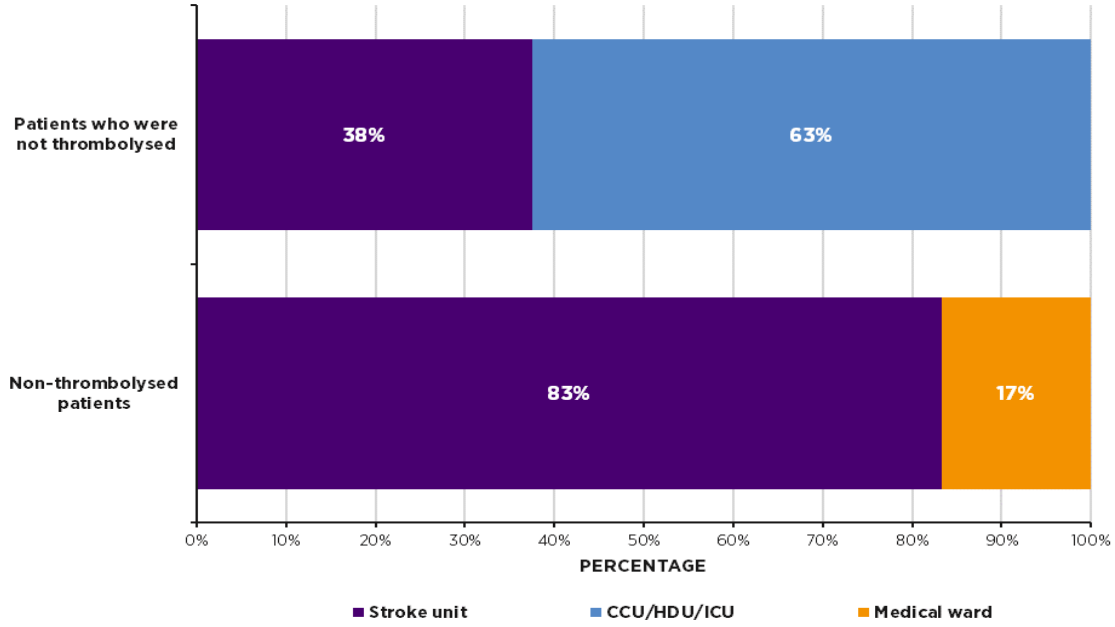

FIGURE 5.9: ADMISSION WARD FOR PATIENTS WHO WERE THROMBOLYSED AND PATIENTS WHO WERE NOT THROMBOLYSED FOLLOWING TREATMENT IN THE EMERGENCY DEPARTMENT (N=24)

KEY FINDINGS FROM CHAPTER 5

All hospitals (100%) reported that they have access to CT imaging in the ED.

Eleven (46%) out of 24 hospitals reported that they have availability of on-call stroke teams 24 hours a day, 7 days a week.

Sixty-seven percent (n=16) of hospitals reported that they have on-call CT radiographers.

Almost all hospitals (n=22, 92%) reported that they provide a thrombolysis service 24 hours a day, 7 days a week, with an ambulance bypass to the nearest hospital providing a thrombolysis service 24 hours a day, 7 days a week in the remaining two hospitals.

There are two EVT stroke centres providing a thrombectomy service 24 hours a day, 7 days a week for patients with acute stroke in Ireland.

Fifteen (63%) out of 24 hospitals reported that following treatment in the ED, patients who are thrombolysed are admitted to a CCU/HDU/ICU rather than an acute stroke unit.

CHAPTER 6: STROKE UNIT ORGANISATION

Guideline: People with suspected acute stroke should be admitted directly to a hyperacute stroke unit and be assessed for emergency stroke treatments by a specialist physician without delay (Ringelstein *et al*., 2013).

Organised inpatient (stroke unit) care is a form of care provided in hospital by nurses, doctors, and other HSCPs who specialise in looking after people with stroke (Langhorne *et al*., 2020). They aim to work as a coordinated team to provide the most appropriate care tailored to the needs of patients with a stroke.

NATIONAL COMPOSTION OF STROKE UNIT BEDS

All participating hospitals reported that they have a stroke unit (Table 4.2). Table 6.1 shows the composition of stroke units by bed type. Stroke unit bed types are defined as follows:

- Type 1: Acute stroke unit bed
- Type 2: Rehabilitation bed
- Type 3: Combined acute and rehabilitation bed.

In total, 126 type 1 beds were identified, and 67 (53%) of those are monitored beds. A further 79 type 3 beds were identified, with 7 (9%) of these reported to be monitored beds. Six hospitals reported that rehabilitation beds (type 2) form part of their stroke service (79 beds), with none of these beds being monitored. Follow-up emails confirmed that the other hospitals reported that they did have access to rehabilitation beds as part of the stroke service. Hospitals with smaller numbers of admissions may not be able to justify purely acute beds that may occasionally be left vacant. Combined beds may be used for both acute and non-acute patients and there are no data showing differences in patient outcomes between these modes of care delivery.

TABLE 6.1: NUMBER OF STROKE UNIT BEDS, BY TYPE, BY HOSPITAL (N=24)

	Type 1: Acute stroke unit beds (n=21)		Type 2: Rehabilitation beds (n=6)		Type 3: Combined acute and rehabilitation beds (n=9)	
	Number of beds	Monitored beds	Number of beds	Monitored beds	Number of beds	Monitored beds
Bantry General Hospital	4	4	4	0	0	0
Beaumont Hospital	12	6	14	0	0	0
Cavan General Hospital	6	0	0	0	0	0
Connolly Hospital	8	8	0	0	0	0
Cork University Hospital	5	5	0	0	26	0
Letterkenny University Hospital	8	**	19*	0	0	0
Mater Misericordiae University Hospital	6	6	0	0	12	2
Mayo University Hospital	6	0	0	0	0	0
Mercy University Hospital	5	0	0	0	0	0
Naas General Hospital	2	2	0	0	8	0
Our Lady of Lourdes Hospital Drogheda	10	0	0	0	0	0
Portiuncula University Hospital	3	0	0	0	0	0
Regional Hospital Mullingar	0	0	0	0	4	4
Sligo University Hospital	5	**	0	0	5	0
St James's Hospital	6	6	12	0	0	0
St Luke's General Hospital, Carlow/Kilkenny	2	2	0	0	3	0
St Vincent's University Hospital	4	4	0	0	6	0
Tallaght University Hospital	9	9	17*	0	0	0
Tipperary University Hospital	8	0	0	0	0	0
University Hospital Galway	0	0	0	0	6	1
University Hospital Kerry	4	4	13*	0	0	0
University Hospital Limerick	6	6	0	0	9	0
University Hospital Waterford	7	5	0	0	0	0
Wexford General Hospital	0	0	0	0	4	**

*Access to rehabilitation beds as part of the stroke service.

** This hospital did not indicate the number of beds with continuous monitoring. However, it has indicated that it has access to continuous monitoring, as the results in Table 6.2 show.

Eighteen (75%) hospitals have access to continuous monitoring within the stroke unit. This is an increase from 2015, when 12 (57%) hospitals were reported to have access to continuous monitoring (McElwaine *et al*., 2015). Table 6.2 displays the type of continuous monitoring available in the stroke units. The majority (n=18, 75%) of stroke units were reported to have continuous electrocardiogram (ECG) monitoring.

TABLE 6.2: AVAILABILITY OF CONTINUOUS MONITORING IN A STROKE UNIT, BY HOSPITAL (N=24)

	ECG (n=18)	Breathing (n=16)	Blood pressure (n=17)	Pulse oximetry (n=17)	Blood glucose monitoring (n=13)	Temperature (n=14)
Bantry General Hospital	✓		✓	✓	✓	✓
Beaumont Hospital	✓	✓	✓	✓		
Cavan General Hospital	✓	✓	✓	✓	✓	✓
Connolly Hospital		✓	✓	✓	✓	✓
Cork University Hospital	✓	✓	✓	✓	✓	✓
Letterkenny University Hospital	✓	✓	✓	✓	✓	✓
Mater Misericordiae University Hospital	✓	✓	✓	✓		✓
Mayo University Hospital						
Mercy University Hospital						
Naas General Hospital	✓	✓	✓	✓	✓	✓
Our Lady of Lourdes Hospital Drogheda						
Portiuncula University Hospital						
Regional Hospital Mullingar	✓	✓	✓	✓	✓	✓
Sligo University Hospital	✓	✓	✓	✓	✓	✓
St James's Hospital	✓	✓	✓	✓	✓	✓
St Luke's General Hospital, Carlow/Kilkenny	✓	✓	✓	✓	✓	✓
St Vincent's University Hospital	✓	✓	✓	✓	✓	✓
Tallaght University Hospital	✓	✓	✓	✓	✓	✓
Tipperary University Hospital						
University Hospital Galway	✓					
University Hospital Kerry	✓	✓	✓	✓		
University Hospital Limerick	✓	✓	✓	✓	✓	✓
University Hospital Waterford	✓	✓	✓	✓		
Wexford General Hospital	✓					

STROKE UNIT ADMISSION CRITERIA

Eight (33%) hospitals reported that their stroke unit operates based on admission criteria or limitation. The admission criteria include age-related criteria (n=5, 63%), stroke severity (n=4, 50%), pre-existing dementia (n=1, 13%), and stroke type (n=1, 1%). Almost all (n=23, 96%) hospitals reported that they have a policy for direct admission to the stroke unit from the ED, and in ten (42%) hospitals, the stroke service has control of bed management for the stroke

unit. Five (21%) hospitals admit patients with subarachnoid haemorrhage to the stroke unit (Table 6.3).

TABLE 6.3: STROKE UNIT ADMISSION CRITERIA, BY HOSPITAL (N=24)

	Stroke unit operates based on admission criteria or limitation (n=8)	Policy for direct admission to the stroke unit from the ED (n=23)	Stroke service has control of bed management for the stroke unit (n=10)	Admits patients with subarachnoid haemorrhage to the stroke unit	Admits patients with subdural haematoma to the stroke unit	Number of stroke consultant-led ward rounds conducted per week
Bantry General Hospital		✓	✓	No	No	5
Beaumont Hospital		✓		No	No	10
Cavan General Hospital	✓	✓	✓	Yes	No	0
Connolly Hospital		✓		No	No	3
Cork University Hospital		✓		No	No	10
Letterkenny University Hospital		✓	✓	Yes	Sometimes	5
Mater Misericordiae University Hospital		✓	✓	Sometimes	Sometimes	5
Mayo University Hospital	✓	✓	✓	No	No	6
Mercy University Hospital		✓		Sometimes	Sometimes	4
Naas General Hospital		✓		No	No	3
Our Lady of Lourdes Hospital Drogheda		✓		Sometimes	Sometimes	3
Portiuncula University Hospital	✓	✓		No	No	3
Regional Hospital Mullingar	✓	✓		Sometimes	Sometimes	3
Sligo University Hospital		✓		Sometimes	Sometimes	5
St James's Hospital	✓	✓	✓	Sometimes	No	5
St Luke's General Hospital, Carlow/Kilkenny		✓		No	No	3
St Vincent's University Hospital		✓		No	No	5
Tallaght University Hospital		✓	✓	Sometimes	Sometimes	10
Tipperary University Hospital		✓	✓	Yes	No	3
University Hospital Galway		✓	✓	Yes	Sometimes	5
University Hospital Kerry	✓	✓	✓	Sometimes	Sometimes	5
University Hospital Limerick		✓		Yes	Sometimes	8
University Hospital Waterford	✓	✓		Sometimes	Sometimes	5
Wexford General Hospital	✓			No	Sometimes	0

STANDARD OPERATING PROTOCOLS AND PROCEDURES

Figure 6.1 shows the availability of written standard operating procedures or protocols in hospitals. Twenty-one (88%) hospitals reported that they have a written standard operating procedure or protocol for use in ED management, and three-quarters (n=18, 75%) reported that they have a written standard operating procedure or protocol for stroke nursing.

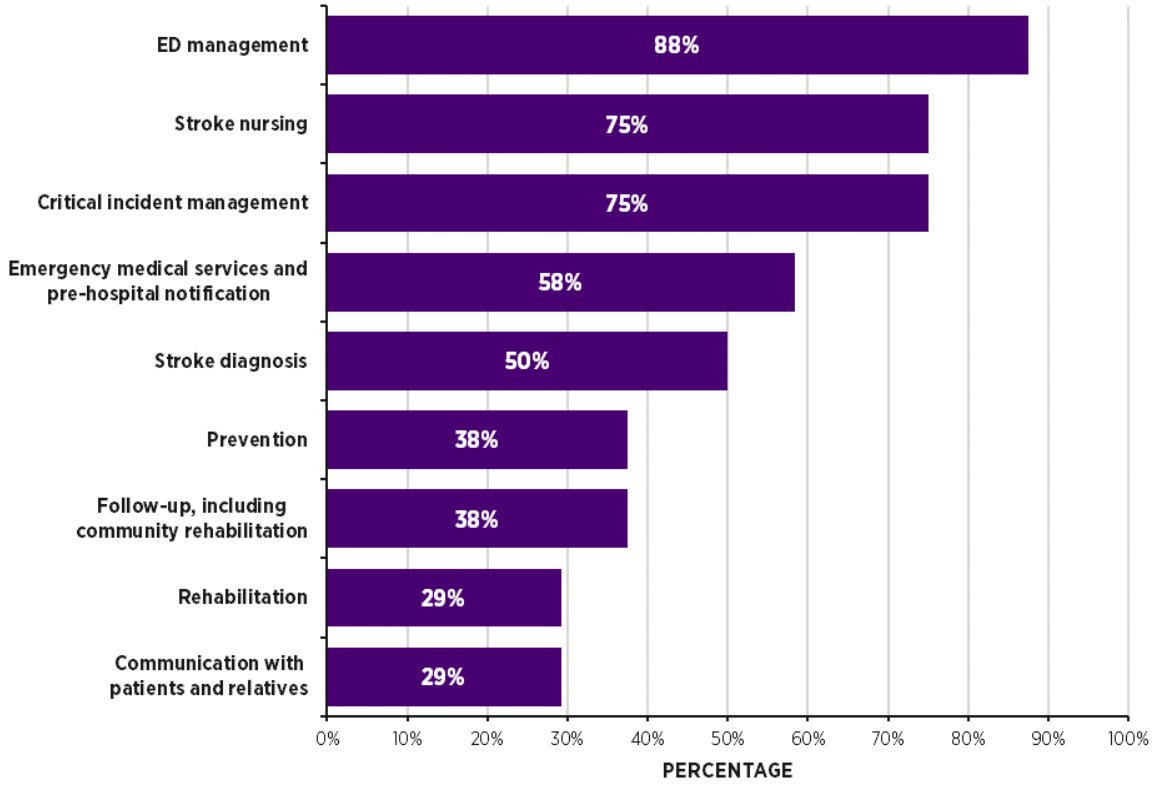

FIGURE 6.1: STANDARD OPERATING PROCEDURES IN STROKE UNITS (N=24)

STROKE-SPECIFIC NURSE EDUCATION

Guideline: Stroke units must be staffed with nurses with special interest, training, and expertise in stroke care (Royal College of Physicians, 2016; Ringelstein *et al*., 2013).

Table 6.4 displays the additional stroke-specific training and education available for nurses in stroke units. Twenty (83%) hospitals reported that they have an in-house programme for continuing education in stroke management, and 21 (88%) hospitals reported that they have a programme for swallow screen training.

TABLE 6.4: STROKE-SPECIFIC NURSE TRAINING AND EDUCATION, BY HOSPITAL

	In-house programme for continuing education in stroke management (n=20)	All staff should complete the 'STARS' programme policy (n=20)	Swallow screening programme available (n=21)	Funding available locally for staff education or conference attendance (n=18)
Bantry General Hospital	✓	✓	✓	✓
Beaumont Hospital			✓	✓
Cavan General Hospital	✓	✓	✓	✓
Connolly Hospital	✓	✓	✓	
Cork University Hospital	✓	✓	✓	
Letterkenny University Hospital	✓	✓		✓
Mater Misericordiae University Hospital	✓	✓	✓	✓
Mayo University Hospital	✓	✓		✓
Mercy University Hospital		✓		✓
Naas General Hospital	✓	✓	✓	✓
Our Lady of Lourdes Hospital Drogheda	✓	✓	✓	✓
Portiuncula University Hospital			✓	
Regional Hospital Mullingar	✓	✓	✓	✓
Sligo University Hospital	✓	✓	✓	
St James's Hospital	✓	✓	✓	✓
St Luke's General Hospital, Carlow/Kilkenny			✓	✓
St Vincent's University Hospital	✓		✓	
Tallaght University Hospital	✓	✓	✓	✓
Tipperary University Hospital	✓	✓	✓	✓
University Hospital Galway	✓	✓	✓	✓
University Hospital Kerry	✓	✓	✓	
University Hospital Limerick	✓	✓	✓	✓
University Hospital Waterford	✓	✓	✓	✓
Wexford General Hospital	✓	✓	✓	✓

The number of nurses trained in stroke assessment and management, and in swallow screening, is displayed in Table 6.5. In many hospitals, the stroke unit is located within a ward and all nurses require training as they rotate within the ward. As such, these numbers are specific to each unit and are difficult to compare.

TABLE 6.5: NUMBER OF NURSES TRAINED IN SWALLOW SCREENING AND STROKE MANAGEMENT, BY HOSPITAL

	Number of registered general nurses (RGNs) trained in swallow screening	Number of RGNs trained in stroke assessment and management
Bantry General Hospital	9	9
Beaumont Hospital	35	8
Cavan General Hospital	35	35
Connolly Hospital	14	14
Cork University Hospital	5	15
Letterkenny University Hospital	1	9
Mater Misericordiae University Hospital	31	28
Mayo University Hospital	1	16
Mercy University Hospital	1	3
Naas General Hospital	35	28
Our Lady of Lourdes Hospital Drogheda	1	10
Portiuncula University Hospital	5	**
Regional Hospital Mullingar	1	**
Sligo University Hospital	15	15
St James's Hospital	11	11
St Luke's General Hospital, Carlow/Kilkenny	5	8
St Vincent's University Hospital	22	13
Tallaght University Hospital	21	16
Tipperary University Hospital	4	30
University Hospital Galway	15	15
University Hospital Kerry	24	23
University Hospital Limerick	17	17
University Hospital Waterford	3	6
Wexford General Hospital	1	12

**0: high turnover of staff recently. Experienced staff have left the area.

MULTIDISCIPLINARY TEAM MEETINGS

Guideline: The MDT should meet at least weekly to discuss goal setting and individual progress of the stroke patient (Ringelstein *et al*, 2013).

Figure 6.2 displays the frequency of MDT meetings for the interchange of information about individual patients, for each of the stroke unit bed types. Daily MDT meetings are more common in units with acute stroke unit beds; the most common frequency of MDT meetings is weekly.

The average number of stroke consultant-led ward rounds per week was five (Table 6.3).

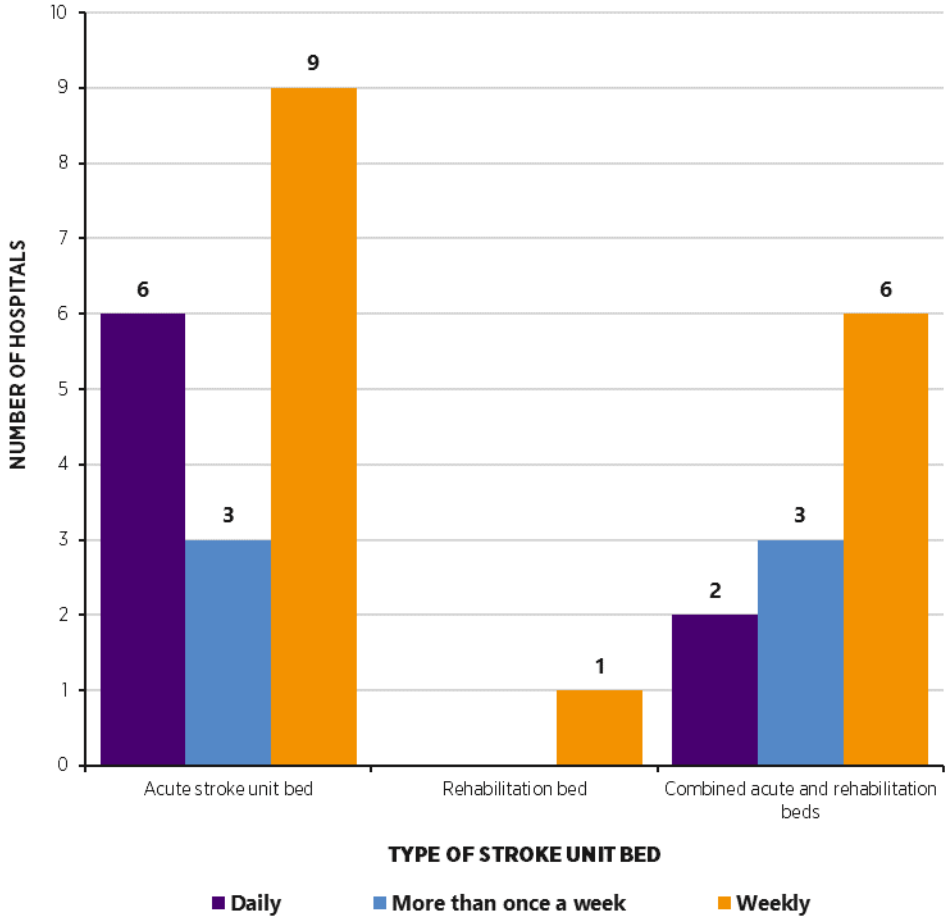

FIGURE 6.2: MULTIDISCIPLINARY TEAM MEETINGS, BY TYPE OF STROKE BED (N=24)

AVAILABILITY OF HEALTH AND SOCIAL CARE PROFESSIONALS

Almost all (n=23, 96%) hospitals reported that physiotherapists are represented at weekly MDT meetings. Speech and language therapists are represented at such meetings in 21 (88%) hospitals, and occupational therapists in 22 (92%) hospitals. Sixteen (67%) hospitals have dietitians represented at weekly MDT meetings, and one-half (n=12, 50%) of hospitals have a medical social worker represented at these meetings. Only 4 (17%) out of 24 hospitals have a clinical psychologist represented at weekly MDT meetings (Table 6.6). Other healthcare professionals who attend MDT meetings include a clinical pharmacist and discharge coordinator in some hospitals.

Weekend cover is available for occupational therapy and physiotherapy in two hospitals (8%). One hospital (4%) has weekend cover availability for dietetics and also for speech and language therapy.

TABLE 6.6: AVAILABILITY OF HEALTH AND SOCIAL CARE PROFESSIONALS

	Number of hospitals with HSCPs					
	Represented at weekly MDT meetings		Weekend cover available		Professional clinical specialist in stroke	
	N	%	N	%	N	%
Clinical psychologist	4	17%	0	0%	0	0%
Dietitian	16	67%	1	4%	1	4%
Medical social worker	12	50%	0	0%	0	0%
Occupational therapist	22	92%	2	8%	5	21%
Physiotherapist	23	96%	2	8%	5	21%
Speech and language therapist	21	88%	1	4%	6	25%

PATIENT AND CARER INFORMATION AND EDUCATION

Almost all (n=22, 92%) hospitals were reported to have patient/carer material easily available in the stroke unit, an increase from 81% in 2015. Five hospitals (21%) provide an educational programme for inpatients and carers, and four (17%) hospitals conduct stroke-specific patient satisfaction surveys. Information literature was available to be given to patients/carers in most hospitals (n=23, 96%). Seventeen (71%) hospitals have information on local voluntary agencies available for patients, and 14 (58%) have information available on community services. One-half of hospitals (n=12, 50%) have information on the carer's benefits/allowances available, an increase from 29% in 2015, and one-quarter (n=6, 25%) have patient versions of national or local guidelines or standards, a decrease from 48% in 2015. Seventeen hospitals (71%) provide information literature on how to complain, an increase from 57% in 2015 (Figure 6.3).

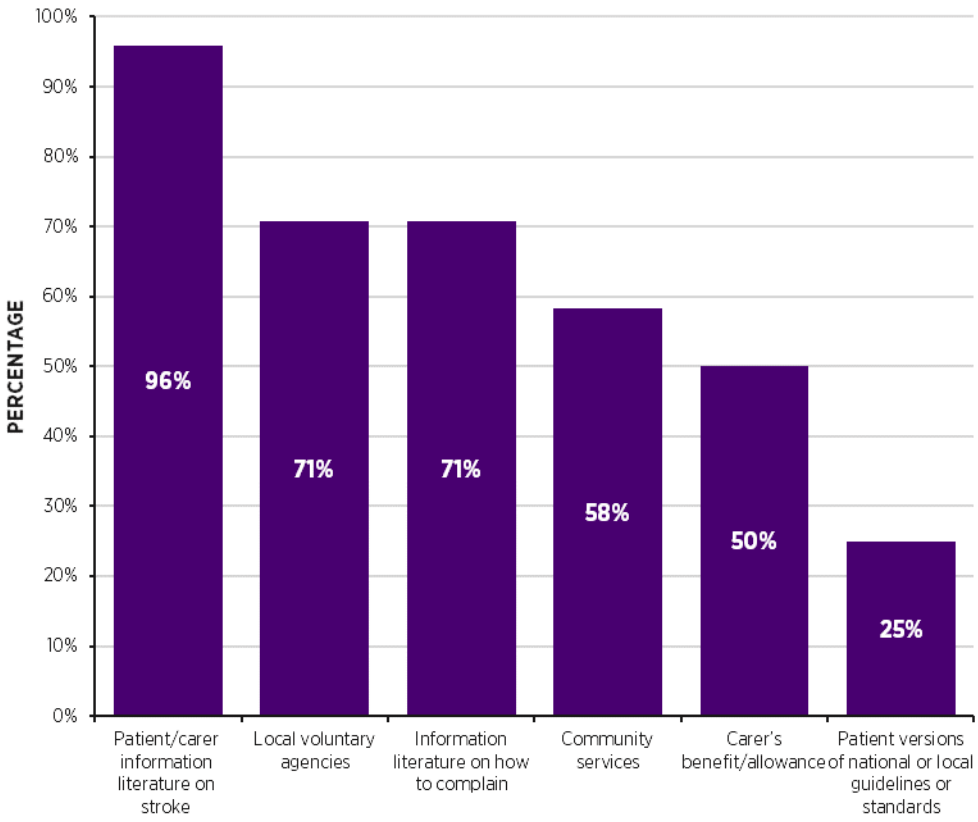

FIGURE 6.3: PATIENT INFORMATION ON DISCHARGE (N=24)

All hospitals made use of the Irish Heart Foundation's (IHF's) online support services for patients with a stroke. Twenty (83%) hospitals have a stroke support group that is available locally for patients. Thirteen (54%) hospitals have formal links with patients' and carers' organisations for communication on the service; in the UK, 83% of hospitals have such links (SSNAP on behalf of the Intercollegiate Stroke Working Party, 2019). Eight (33%) hospitals have a policy that includes giving patients a named contact on transfer from hospital to the community (Figure 6.4).

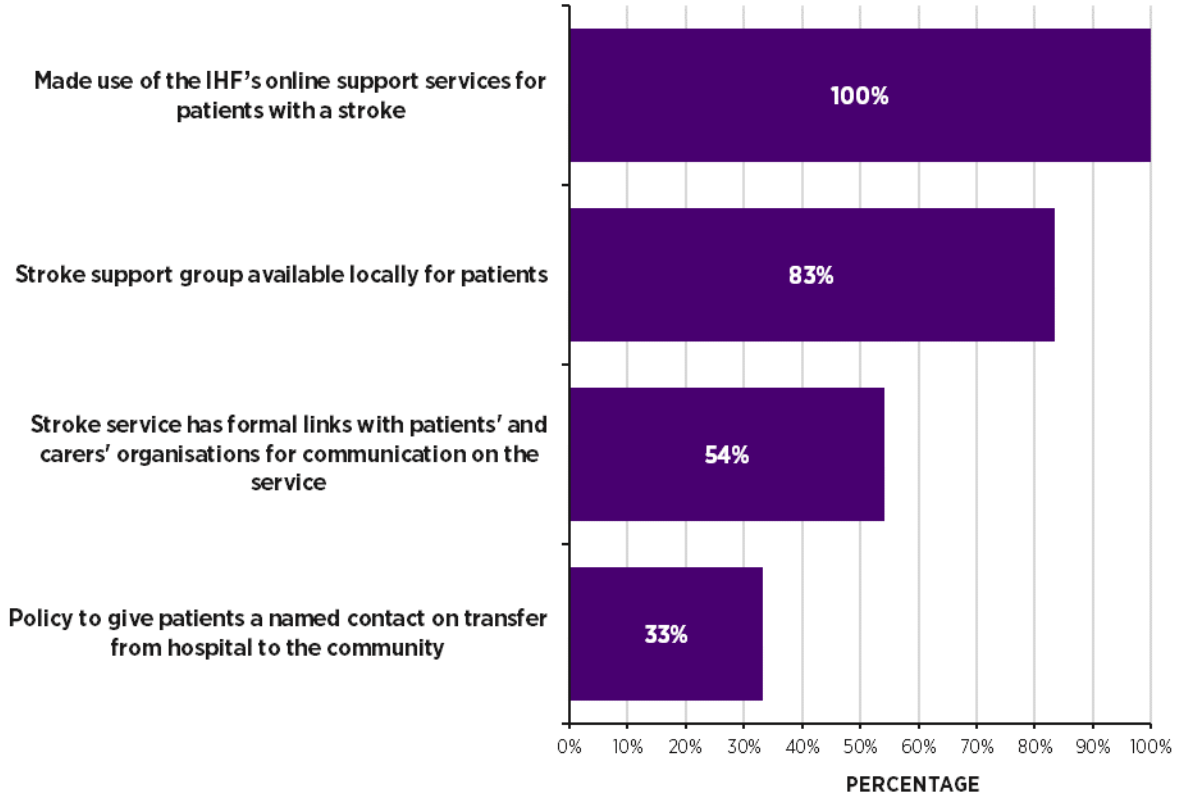

FIGURE 6.4: COMMUNITY SUPPORT ON DISCHARGE (N=24)

KEY FINDINGS FROM CHAPTER 6

Fifteen (63%) hospitals have access to continuous monitoring within the stroke unit.

Twenty (83%) hospitals reported that they have an in-house programme for continuing education in stroke management.

All hospitals have weekly MDT stroke meetings. However, a clinical psychologist is represented at these meetings in only four (17%) hospitals.

Twenty (83%) hospitals have a stroke support group that is available locally for patients.

CHAPTER 7: ORGANISATION OF SPECIALIST IMAGING AND INVESTIGATIONS

Imaging in acute stroke has evolved greatly since the IHF published the first national audit of stroke care in 2008 (Horgan *et al*., 2008), and even since the most recent audit was published in 2015 (McElwaine *et al*., 2015). Increased availability of interventions, such as thrombectomy and thrombolysis, and divergence of management pathways between acute ischaemic and haemorrhagic stroke has led to an increasing need for complex imaging. The need to discuss acute imaging results with colleagues outside the hospitals that carry out the imaging has increased the need for complex IT systems such as the National Integrated Medical Imaging System (NIMIS). Broadening time frames for intervention, as recommended in the European Stroke Organisation (ESO) guidelines on intravenous thrombolysis for acute ischaemic stroke (Berge *et al.,* 2021), has increased the need for technologies such as MRI scanning and computed tomography perfusion (CTP).

In 2021, almost all (n=21, 88%) hospitals had in-hospital access to NIMIS, and 13 hospitals (n=54%) had remote access.

SPECIALIST IMAGING IN STROKE

MRI scanning, in the acute setting, can help identify some patients who may be eligible for interventions such as thrombectomy or thrombolysis who fall outside conventional time frames. Use of acute MR or CTP scanning may increase time frames for intervention to 9 or 12 hours and help with the evaluation of patients whose time of onset of symptoms is unknown, e.g. 'wake-up' stroke.

Transcranial Doppler (TCD) can be useful to non-invasively monitor patients with arterial or venous occlusions in the brain, and such monitoring is important in conditions such as sickle cell disease that are common causes of stroke in younger affected patients. Positron emission tomography (PET) scanning, although primarily used in cancer, can be of use in identifying people with high-risk arteriosclerotic plaques resulting in significantly elevated risk of stroke. Digital subtraction angiography is the gold standard of cerebrovascular imaging and is necessary in the diagnosis and differentiation of conditions such as cerebral vasculitis and arterial spasm and in the identification of subtle vascular lesions such as small aneurysms.

Table 7.1 shows the availability of specialist imaging for each hospital. Twenty-two (92%) hospitals have access to magnetic resonance imaging (MRI), an increase from 85% in 2015. One hospital reported having access to MRI out-of-hours, which was a decrease from two hospitals in 2015. Five (21%) hospitals have TCD scanning, four (17%) have PET, and two hospitals (8%) have digital subtraction angiography (DSA).

TABLE 7.1: AVAILABILITY OF SPECIALIST IMAGING, BY HOSPITAL (N=24)

	Access to NIMIS		MRI available in the hospital (n=22)	MRI scanner availability out-of-hours			TCD (n=5)	PET (n=4)	DSA (n=2)
	In the hospital (n=21)	Remotely (n=13)		Yes (n=1)	Sometimes (n=5)	No (n=16)			
Bantry General Hospital				N/A	N/A	N/A			
Beaumont Hospital	✓	✓	✓	✓					✓
Cavan General Hospital	✓	✓	✓			✓			
Connolly Hospital	✓	✓	✓			✓	✓		
Cork University Hospital	✓		✓		✓			✓	✓
Letterkenny University Hospital	✓		✓			✓			
Mater Misericordiae University Hospital	✓	✓	✓		✓		✓	✓	
Mayo University Hospital	✓	✓	✓			✓	✓		
Mercy University Hospital			✓			✓			
Naas General Hospital	✓	✓	✓			✓			
Our Lady of Lourdes Hospital Drogheda	✓		✓			✓			
Portiuncula University Hospital	✓		✓			✓			
Regional Hospital Mullingar	✓			N/A	N/A	N/A			
Sligo University Hospital	✓		✓			✓			
St James's Hospital	✓	✓	✓		✓			✓	
St Luke's General Hospital, Carlow/Kilkenny	✓	✓	✓			✓			
St Vincent's University Hospital			✓		✓			✓	
Tallaght University Hospital	✓	✓	✓			✓	✓		
Tipperary University Hospital	✓	✓	✓			✓			
University Hospital Galway	✓		✓		✓				
University Hospital Kerry	✓		✓			✓			
University Hospital Limerick	✓	✓	✓			✓	✓		
University Hospital Waterford	✓	✓	✓			✓			
Wexford General Hospital	✓	✓	✓			✓			

Note: Not applicable, as those hospitals do not have MRI available in their hospital

The majority (75%) of hospitals reported that patients usually receive carotid imaging on the same day or the next weekday. One-quarter (n=6) of hospitals reported that patients receive carotid imaging within 1 week (Figure 7.1). This is an improvement from 2015, when 56% (n=16) of hospitals reported that they had access to carotid imaging within 48 hours.

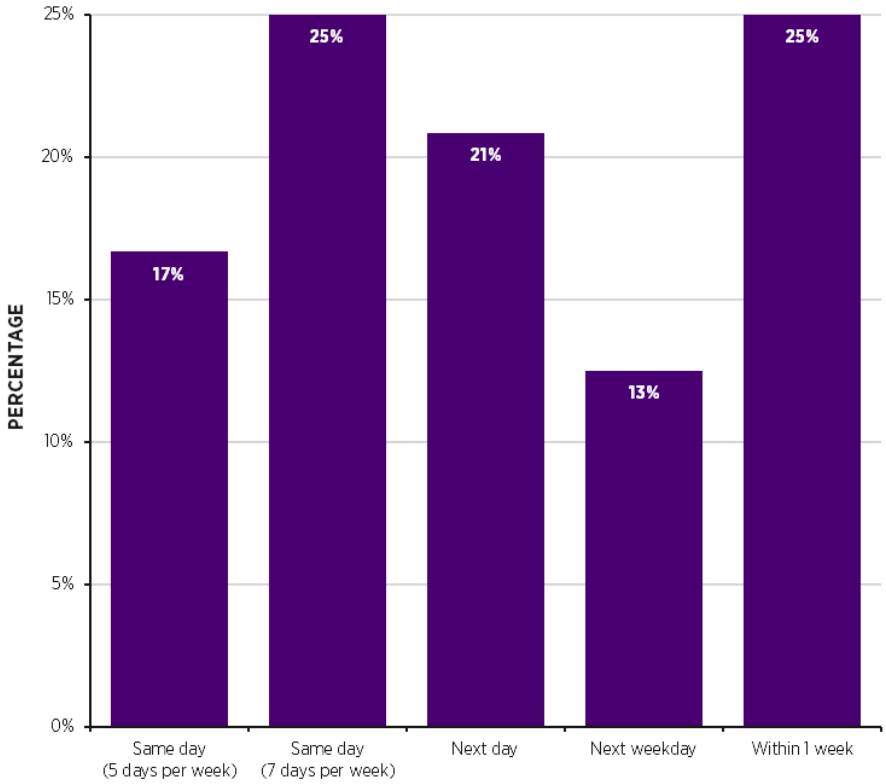

FIGURE 7.1: WAITING TIME FOR PATIENTS TO RECEIVE CAROTID IMAGING (N=24)

IMAGING OF INTRACRANIAL VESSELS

Imaging of intracranial vessels for patients with ischaemic stroke is performed in all hospitals. It is a routine investigation for all patients with a stroke in seven (29%) hospitals, and in 17 (71%) hospitals it is only performed for patients who would be amenable to specific treatment if an abnormality is detected.

All hospitals use computed tomography angiography (CTA) as the method of imaging intracranial vessels during normal working hours, and 92% of hospitals (n=22) also access CTA during out-of-hours periods. Management protocols for managing patients with large arterial occlusion in the brain now mandate the availability and application of angiography in a large proportion of patients with suspected stroke. Magnetic resonance angiography (MRA) is used as a method of imagining cranial vessels by seven (29%) hospitals during normal working hours, with no hospitals using this method during out-of-hours periods. One hospital reported that there was no service during out-of-hours periods (Table 7.2).

TABLE 7.2: IMAGING OF INTRACRANIAL VESSELS, BY HOSPITAL (N=24)

	Imaging of intracranial vessels for patients with ischaemic stroke (N=24)	Best describes practice for imaging of intracranial vessels		CTA		MRA		No service	
		A routine investigation for all patients with a stroke (n=7)	Only for patients that would be amenable to specific treatment if abnormality detected (n=17)	Normal working hours (N=24)	Out-of-hours (n=22)	In hours (n=7)	Out-of-hours (n=0)	Normal working hours (n=0)	Out-of-hours (n=1)
Bantry General Hospital	✓		✓	✓	✓				
Beaumont Hospital	✓	✓		✓	✓				
Cavan General Hospital	✓		✓	✓	✓	✓			
Connolly Hospital	✓		✓	✓	✓				
Cork University Hospital	✓		✓	✓		✓			
Letterkenny University Hospital	✓		✓	✓	✓				
Mater Misericordiae University Hospital	✓	✓		✓	✓				
Mayo University Hospital	✓	✓		✓	✓				
Mercy University Hospital	✓		✓	✓	✓	✓			
Naas General Hospital	✓	✓		✓	✓				
Our Lady of Lourdes Hospital Drogheda	✓		✓	✓	✓				
Portiuncula University Hospital	✓		✓	✓		✓			✓
Regional Hospital Mullingar	✓	✓		✓	✓				
Sligo University Hospital	✓		✓	✓	✓				
St James's Hospital	✓	✓		✓	✓				
St Luke's General Hospital, Carlow/Kilkenny	✓		✓	✓	✓				
St Vincent's University Hospital	✓		✓	✓	✓				
Tallaght University Hospital	✓		✓	✓	✓	✓			
Tipperary University Hospital	✓		✓	✓	✓				
University Hospital Galway	✓		✓	✓	✓				
University Hospital Kerry	✓	✓		✓	✓	✓			
University Hospital Limerick	✓		✓	✓	✓	✓			
University Hospital Waterford	✓		✓	✓	✓				
Wexford General Hospital	✓		✓	✓	✓				

IMAGING OF EXTRACRANIAL VESSELS

All hospitals reported that they perform extracranial vessel imaging for patients with ischaemic stroke, and in 16 (67%) hospitals it was reported as a routine investigation for all patients with a stroke. The remaining eight (33%) hospitals perform extracranial vessel imaging only for patients who would be amenable to specific treatment if an abnormality was detected.

Fourteen (58%) hospitals use Doppler ultrasound as a method of imaging extracranial vessels during normal working hours, and one hospital uses this method out-of-hours. Fifteen (63%) hospitals use CTA during normal working hours, and the majority (n=22, 92%) use this method during out-of-hours periods. This is an evolution from previous years, where services largely used Doppler ultrasound. Modern acute stroke protocols mandate the performance of CTA for many patients on admission and this removes the need, in most cases, of performing a later ultrasound.

Only two hospitals (8%) use MRA during normal working hours, and no hospitals use MRA out-of-hours. Two hospitals reported no service out-of-hours (Table 7.3).

TABLE 7.3: IMAGING OF EXTRACRANIAL VESSELS, BY HOSPITAL (N=24)

	Imaging of extracranial vessels for patients with ischaemic stroke (N=24)	Best describes practice for imaging of extracranial vessels		Doppler ultrasound		CTA		MRA		No service	
		A routine investigation for all patients with a stroke (n=16)	Only for patients who would be amenable to specific treatment if abnormality detected (n=8)	Normal working hours (n=14)	Out-of-hours (n=1)	Normal working hours (n=15)	Out-of-hours (n=22)	Normal working hours (n=2)	Out-of-hours (n=0)	Normal working hours (n=0)	Out-of-hours (n=2)
Bantry General Hospital	✓		✓	✓		✓	✓				
Beaumont Hospital	✓	✓				✓	✓				
Cavan General Hospital	✓	✓		✓			✓				
Connolly Hospital	✓	✓		✓							✓
Cork University Hospital	✓		✓	✓		✓	✓				
Letterkenny University Hospital	✓		✓			✓	✓				
Mater Misericordiae University Hospital	✓	✓				✓	✓				
Mayo University Hospital	✓		✓			✓	✓				
Mercy University Hospital	✓	✓		✓	✓	✓	✓	✓			
Naas General Hospital	✓	✓				✓	✓				
Our Lady of Lourdes Hospital Drogheda	✓	✓				✓	✓				
Portiuncula University Hospital	✓	✓		✓		✓		✓			✓
Regional Hospital Mullingar	✓	✓				✓	✓				
Sligo University Hospital	✓		✓	✓			✓				
St James's Hospital	✓	✓				✓	✓				
St Luke's General Hospital, Carlow/Kilkenny	✓	✓		✓			✓				
St Vincent's University Hospital	✓		✓	✓			✓				
Tallaght University Hospital	✓	✓				✓	✓				
Tipperary University Hospital	✓	✓		✓			✓				
University Hospital Galway	✓	✓		✓		✓	✓				
University Hospital Kerry	✓	✓				✓	✓				
University Hospital Limerick	✓		✓	✓			✓				
University Hospital Waterford	✓	✓		✓			✓				
Wexford General Hospital	✓		✓	✓			✓				

CARDIAC INVESTIGATIONS

DIAGNOSING ATRIAL FIBRILLATION AFTER STROKE

Standard: Patients with suspected stroke or transient ischaemic attack (TIA) should be monitored for atrial fibrillation and other arrhythmias (Royal College of Physicians, 2016).

Each hospital was asked to identify the investigative pathway used to detect paroxysmal atrial fibrillation in its stroke service. Fourteen (58%) hospitals reported that bedside telemetry monitoring in an acute stroke unit is the first step in detecting paroxysmal atrial fibrillation. Use of a 24-hour monitor for an inpatient or an outpatient follows as the second line of investigation. Fifteen (63%) hospitals reported using extended 5–7-day cardiac recording. Sixteen (67%) hospitals access an implantable loop recorder as the final line of investigation, with a further two hospitals accessing a transdermal patch as the final line of investigation (Table 7.4).

TABLE 7.4: PATHWAY FOR DETECTING PAROXYSMAL ATRIAL FIBRILLATION (N=24)

	Stroke unit telemetry monitoring	Inpatient 24-hour tape	Outpatient 24-hour tape	Extended cardiac recording: 48 hours	Extended cardiac recording: 5–7 days	Reveal/ implantable loop recorder	Transdermal patch (e.g. Ziopatch)
Bantry General Hospital	1st				2nd		
Beaumont Hospital	1st	2nd			3rd	4th	
Cavan General Hospital		2nd		3rd	1st		
Connolly Hospital					1st	2nd	
Cork University Hospital	1st	2nd	3rd				
Letterkenny University Hospital	1st			2nd	3rd	4th	
Mater Misericordiae University Hospital	1st	2nd				3rd	
Mayo University Hospital		1st		2nd	3rd		
Mercy University Hospital		1st	3rd	2nd			
Naas General Hospital	2nd	4th	5th	3rd	1st	6th	7th
Our Lady of Lourdes Hospital Drogheda	6th	1st	3rd	2nd	4th	5th	7th
Portiuncula University Hospital		1st	2nd			3rd	
Regional Hospital Mullingar		1st	2nd	3rd		4th	
Sligo University Hospital	1st			2nd	3rd	4th	
St James's Hospital	1st				2nd		
St Luke's General Hospital, Carlow/Kilkenny	1st		2nd			3rd	
St Vincent's University Hospital	1st	2nd		3rd		4th	
Tallaght University Hospital	1st		2nd	3rd		4th	
Tipperary University Hospital	1st			2nd		3rd	
University Hospital Galway				1st	2nd	3rd	
University Hospital Kerry	1st	2nd			3rd	4th	
University Hospital Limerick		1st		2nd	3rd	4th	
University Hospital Waterford	1st			2nd	3rd	4th	
Wexford General Hospital	1st		2nd		3rd	4th	

DIAGNOSING OTHER CARDIOEMBOLIC SOURCES

Nineteen (79%) hospitals reported that they perform an echocardiogram (echo) in the majority of patients post-stroke. This was reported as 32% in the UK (SSNAP on behalf of the Intercollegiate Stroke Working Party, 2019), where there appears to be a more selective approach to performing echo; for example, for patients suggestive of a cardioembolic source on brain imaging, an echo is performed in 79% of cases. Nine hospitals (38%) reported that they perform echo in patients with suspected valvular lesions, and a similar number of hospitals (n=8, 33%) reported that they perform echo in patients suggestive of a cardioembolic source on brain imaging, in young patients with suspected patent foramen ovale (PFO), and in patients with new heart failure (Figure 7.2).

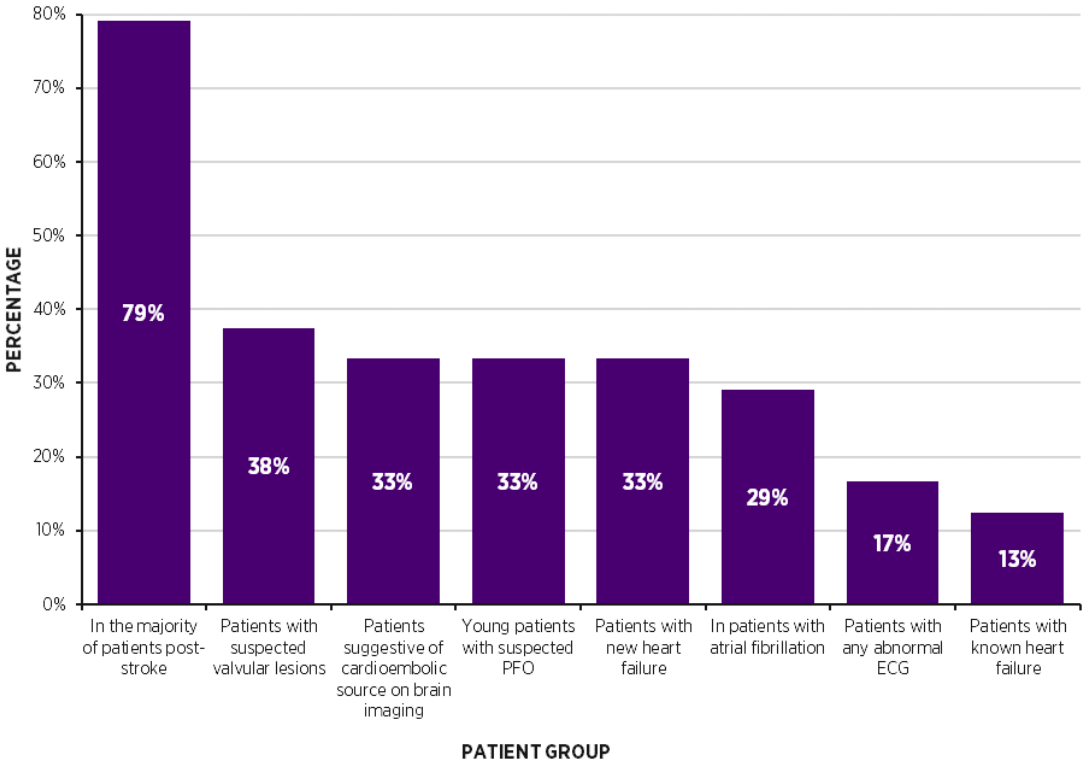

FIGURE 7.2: PATIENT GROUPS WHO RECEIVE ECHOCARDIOGRAPHY (N=24)[8]

Eleven (46%) hospitals reported that they request a bubble contrast echo in young patients with suspected PFO (Figure 7.3). The 'other' category includes four hospitals, with the following comments: "not typically requested"; "transthoracic echocardiography (TTE) done routinely or transoesophageal echocardiography (TOE) if indicated in certain patients"; "patients with ischaemic stroke under age 60"; "rarely as can perform TOE with bubble"; and "young stroke patient younger than 60 years, cardioembolic stroke with normal ECG monitoring and TTE".

[8] Please note: percentages do not sum to 100%, as Figure 7.2 refers to the number of patient groups, i.e. a hospital may have selected more than one patient group.

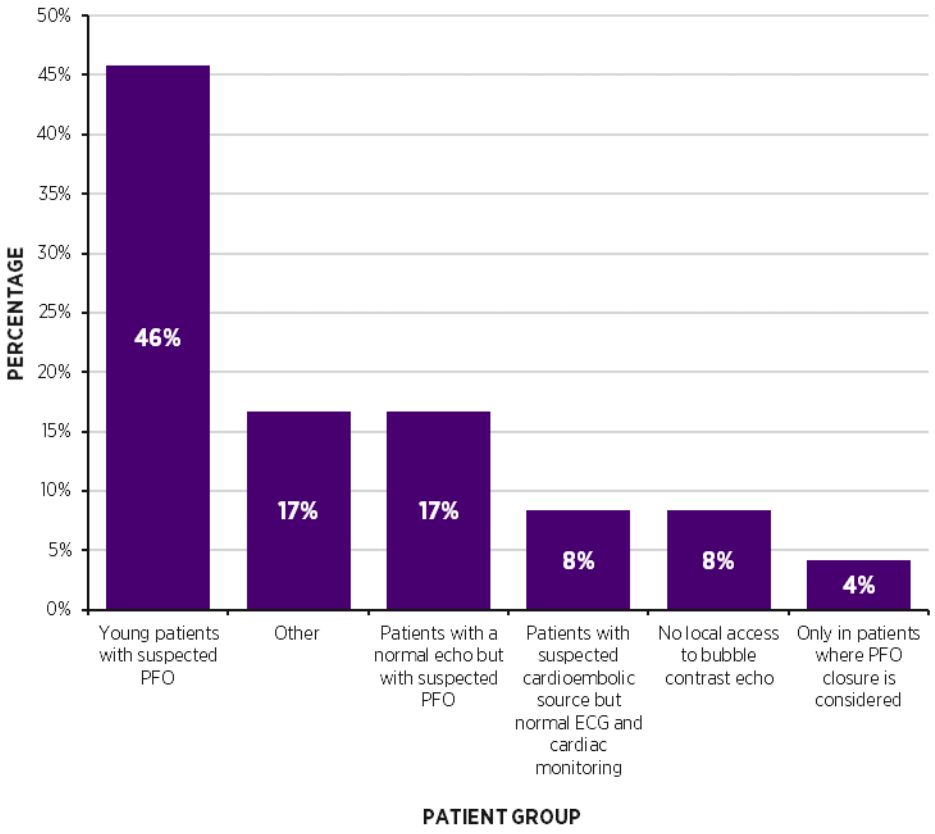

FIGURE 7.3: PATIENT GROUPS WHO RECEIVE BUBBLE CONTRAST ECHOCARDIOGRAPHY (N=24)

Nine (38%) hospitals reported that they perform a TOE if a patient has had a positive bubble contrast echo. Three hospitals (13%) reported that a TOE is performed in all patients with a suspected cardioembolic source on brain imaging and three hospitals (13%) reported that there is no local access to TOE (Figure 7.4). The majority of hospitals that selected 'other' on the survey questionnaire have commented that they perform TOE in young patients with a suspected cardioembolic source.

Seven (29%) hospitals reported that PFO closure is available locally. Of those seven hospitals, six discuss all patients with a stroke at a specialist stroke/cardiology MDT meeting before PFO closure is offered.

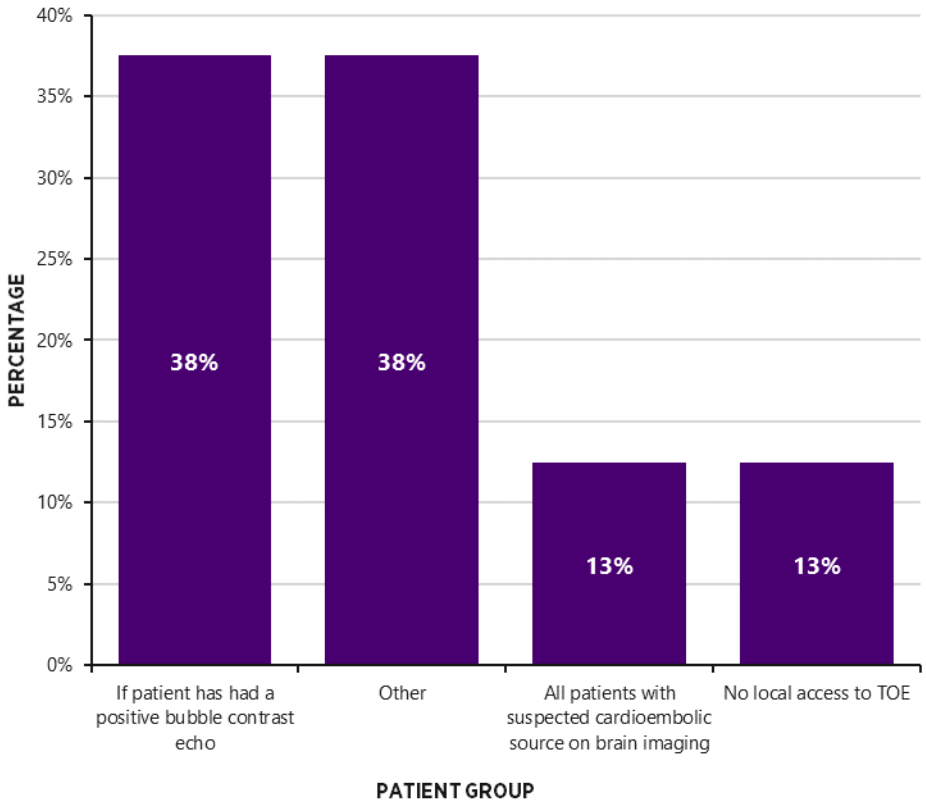

FIGURE 7.4: PATIENT GROUPS WHO RECEIVE BUBBLE TRANSOESOPHAGEAL ECHOCARDIOGRAPHY (N=24)

Almost all (n=22, 92%) hospitals reported that they only request thrombophilia screening in patients under a specific age. The remaining two hospitals only request the screening in patients with a previous history of deep vein thrombosis (DVT)/pulmonary embolism (PE)/miscarriage.

TIA AND NEUROVASCULAR SERVICES

Standard: People with stroke or TIA for whom secondary prevention is appropriate should be investigated for risk factors as soon as possible within 1 week of onset (Royal College of Physicians, 2016).

Four (17%) hospitals reported that they operate a TIA clinic, and five (21%) hospitals have agreed TIA protocols with primary care services. However, almost all hospitals (n=21, 88%) routinely admit patients with TIA for investigation (Table 7.5).

TABLE 7.5: TRANSIENT ISCHAEMIC ATTACK SERVICES, BY HOSPITAL (N=24)

	TIA clinic (n=4)	Agreed TIA protocols with primary care services (n=5)	Routinely admit patients with TIA for investigation (n=21)
Bantry General Hospital			✓
Beaumont Hospital			✓
Cavan General Hospital			✓
Connolly Hospital			✓
Cork University Hospital	✓	✓	
Letterkenny University Hospital			✓
Mater Misericordiae University Hospital	✓	✓	
Mayo University Hospital			✓
Mercy University Hospital			✓
Naas General Hospital			✓
Our Lady of Lourdes Hospital Drogheda			✓
Portiuncula University Hospital			✓
Regional Hospital Mullingar		✓	✓
Sligo University Hospital			✓
St James's Hospital	✓	✓	✓
St Luke's General Hospital, Carlow/Kilkenny			✓
St Vincent's University Hospital			✓
Tallaght University Hospital	✓	✓	
Tipperary University Hospital			✓
University Hospital Galway			✓
University Hospital Kerry			✓
University Hospital Limerick			✓
University Hospital Waterford			✓
Wexford General Hospital			✓

Almost all hospitals (n=23, 96%) reported that CT is the first-line brain imaging modality most frequently used for suspected TIAs, and one hospital reported using MRI as the most frequently used first-line brain imaging modality for suspected TIAs. Carotid Doppler is the first-line carotid imaging modality most frequently used for suspected TIAs in 19 (79%) hospitals, and CTA is the first-line brain imaging modality most frequently used in the remaining 5 (21%) hospitals. Twenty-two hospitals (92%) reported that they frequently (>70% of the time) use their first-line brain imaging modality for suspected TIAs (Table 7.6).

TABLE 7.6: IMAGING IN TRANSIENT ISCHAEMIC ATTACK, BY HOSPITAL (N=24)

	First-line brain imaging modality most frequently used for suspected TIAs		First-line carotid imaging modality most frequently used for suspected TIAs		Frequency of first-line brain imaging modality for suspected TIAs	
	CT (n=23)	MRI (n=1)	Carotid Doppler (n=19)	CTA (n=5)	Frequently (>70%) (n=22)	Sometimes (30–70%) (n=2)
Bantry General Hospital	✓		✓		✓	
Beaumont Hospital	✓			✓	✓	
Cavan General Hospital	✓		✓		✓	
Connolly Hospital	✓		✓		✓	
Cork University Hospital		✓	✓		✓	
Letterkenny University Hospital	✓		✓		✓	
Mater Misericordiae University Hospital	✓		✓		✓	
Mayo University Hospital	✓		✓		✓	
Mercy University Hospital	✓		✓		✓	
Naas General Hospital	✓			✓	✓	
Our Lady of Lourdes Hospital Drogheda	✓			✓	✓	
Portiuncula University Hospital	✓		✓		✓	
Regional Hospital Mullingar	✓			✓	✓	
Sligo University Hospital	✓		✓		✓	
St James's Hospital	✓		✓			✓
St Luke's General Hospital, Carlow/Kilkenny	✓		✓		✓	
St Vincent's University Hospital	✓		✓		✓	
Tallaght University Hospital	✓		✓		✓	
Tipperary University Hospital	✓		✓		✓	
University Hospital Galway	✓		✓		✓	
University Hospital Kerry	✓			✓	✓	
University Hospital Limerick	✓		✓		✓	
University Hospital Waterford	✓		✓			✓
Wexford General Hospital	✓		✓		✓	

CAROTID STENOSIS TREATMENT

Ten (42%) hospitals provide a carotid endarterectomy service in their hospital. Eight out of the remaining 14 (57%) hospitals have a formal arrangement in place with a hospital that provides a carotid endarterectomy service for transfer of patients (Table 7.7).

TABLE 7.7: CAROTID ENDARTERECTOMY SERVICE, BY HOSPITAL (N=24)

Hospital that provides a carotid endarterectomy service (n=10)	Hospitals that refer to a carotid endarterectomy service (n=14)	Formal arrangement in place with an endovascular service (n=8)[9]
Beaumont Hospital	Cavan General Hospital	✓
	Connolly Hospital	✓
	Our Lady of Lourdes Hospital Drogheda	
	Wexford General Hospital	✓
Cork University Hospital	Bantry General Hospital	
	Tipperary University Hospital	
	University Hospital Kerry	
Mater Misericordiae University Hospital	Regional Hospital Mullingar	✓
	Sligo University Hospital	
Mercy University Hospital	Bantry General Hospital	
	Tipperary University Hospital	
	University Hospital Kerry	
St James's Hospital	St Luke's General Hospital, Carlow/Kilkenny	✓
St Vincent's University Hospital	Wexford General Hospital	✓
Tallaght University Hospital	Naas General Hospital	✓
University Hospital Galway	Letterkenny University Hospital	
	Mayo University Hospital	✓
	Portiuncula University Hospital	✓
University Hospital Limerick		
University Hospital Waterford	Tipperary University Hospital	
	Wexford General Hospital	✓

[9] Based on the number of hospitals. One hospital may appear more than once as they could refer to more than one carotid endarterectomy service.

Four hospitals provide a carotid stenting service and 16 hospitals had referred patients for carotid stenting in the last 12 months (Table 7.8).

TABLE 7.8: CAROTID STENTING IN THE LAST 12 MONTHS, BY HOSPITAL (n=16)

Hospitals that provided carotid stenting in the last 12 months (n=4)	Hospitals that referred patients for carotid stenting in the last 12 months (n=16)
Beaumont Hospital	Cavan General Hospital
	Connolly Hospital
	Mater Misericordiae University Hospital
	Naas General Hospital
	Our Lady of Lourdes Hospital Drogheda
	Regional Hospital Mullingar
	Sligo University Hospital
	St James's Hospital
	St Vincent's University Hospital
	Tallaght University Hospital
	Wexford General Hospital
Cork University Hospital	In hospital
	University Hospital Kerry
	University Hospital Limerick
Mercy University Hospital	In hospital
University Hospital Galway	Mayo University Hospital

KEY FINDINGS FROM CHAPTER 7

In 2021, almost all (n=21, 88%) hospitals had in-hospital access to NIMIS, and 13 hospitals (n=54%) had remote access.

Twenty-two (92%) hospitals have access to MRI, an increase from 85% in 2015.

Nineteen (79%) hospitals reported that they perform echo in the majority of patients post-stroke.

The majority (n=18, 75%) of hospitals reported that patients usually receive carotid imaging on the same day or the next weekday.

Four (17%) hospitals run a TIA clinic, and 21 (88%) hospitals routinely admit patients with TIA for investigation.

CHAPTER 8: HUMAN RESOURCES

NURSING RESOURCES

Recommending nurse staffing ratios in stroke units is challenging, particularly in Ireland, due to the small size of some stroke units. In 2018, the Department of Health published the *Framework for Safe Nurse Staffing and Skill Mix in General and Specialist Medical and Surgical Care Settings in Adult Hospitals in Ireland 2018* (Department of Health, 2018), which takes an evidence-based approach to determining safe nurse staffing based on nursing hours per patient day. The piloting of this approach is ongoing and we look forward to full implementation in all hospitals. In 2015, nurse staffing was measured at 1.2 whole time equivalent (WTE) nurses per bed. This did not consider the higher dependency care needs of patients with a stroke in the first 72 hours. In addition, since 2015, there has been a reorganisation of stroke units, and therefore comparison between 2015 and 2021 is not useful. This report benchmarks against the European Stroke Organisation (ESO) stroke unit recommendations (Ringelstein *et al*., 2013). The ESO has recommended that there should be one monitored or hyper-acute stroke unit (HASU) bed for every 100 stroke admissions annually, as the average stay on monitoring has been calculated to be 72 hours. Because patients with a stroke have high nursing requirements, the ESO recommends 1.5 WTE nurses per monitored bed per 24 hours and 0.5 WTE nurses, (both registered general nurses (RGNs) and healthcare assistants (HCAs)), per non-monitored bed per 24 hours (Ringelstein *et al*., 2013). To calculate the recommended nurse WTEs, we identified how many monitored beds are recommended for each stroke unit based on the annual stroke admissions by hospital (NOCA, 2022) and multiplied that number by 1.5 (1.5 WTE per monitored bed). The remaining beds in the stroke unit are calculated at the lower recommendation of 0.5 (0.5 WTE per non-monitored bed). Figure 8.1 compares the total nurse staffing, both RGNs and HCAs, and the recommended ESO staffing per 24 hours, by hospital.

Eighty-eight percent (n=21) of stroke units operate below the recommended nurse staffing level. Figure 5.9 shows that 15 hospitals (63%) admit patients post-thrombolysis to an intensive care unit (ICU)/coronary care unit (CCU)/high dependency unit (HDU) setting and not to a stroke unit. It is likely that this is due to the low nurse staffing levels in some stroke units.

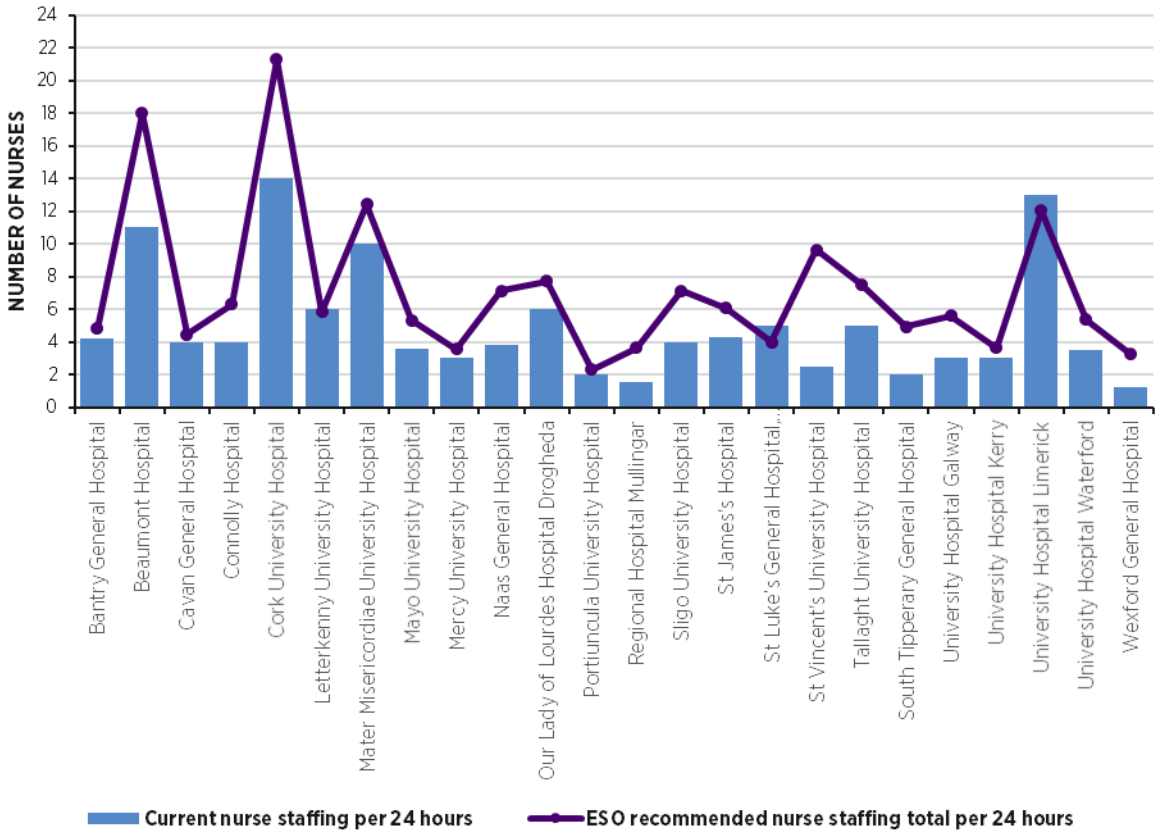

FIGURE 8.1: CURRENT NURSE STAFFING PER 24 HOURS COMPARED TO THE RECOMMENDED EUROPEAN STROKE ORGANISATION NURSE STAFFING TOTAL PER 24 HOURS, BY HOSPITAL (N=24)

NURSING GRADE MIX

The average grade mix between RGNs to HCAs varies depending on stroke unit bed type. The *Framework for Safe Nurse Staffing and Skill Mix in General and Specialist Medical and Surgical Care Settings in Adult Hospitals in Ireland 2018* (Department of Health, 2018) recommends the consideration of the evolving role of the nurse and the HCA when assessing grade mix. The 2016 *National clinical guideline for stroke* (Royal College of Physicians, 2016) recommends an 80:20 ratio for HASU beds and a 65:35 ratio for acute stroke unit beds. However, there is no recommendation in relation to this from the ESO. Figure 8.2 indicates the current RGN and HCA ratio by hospital.

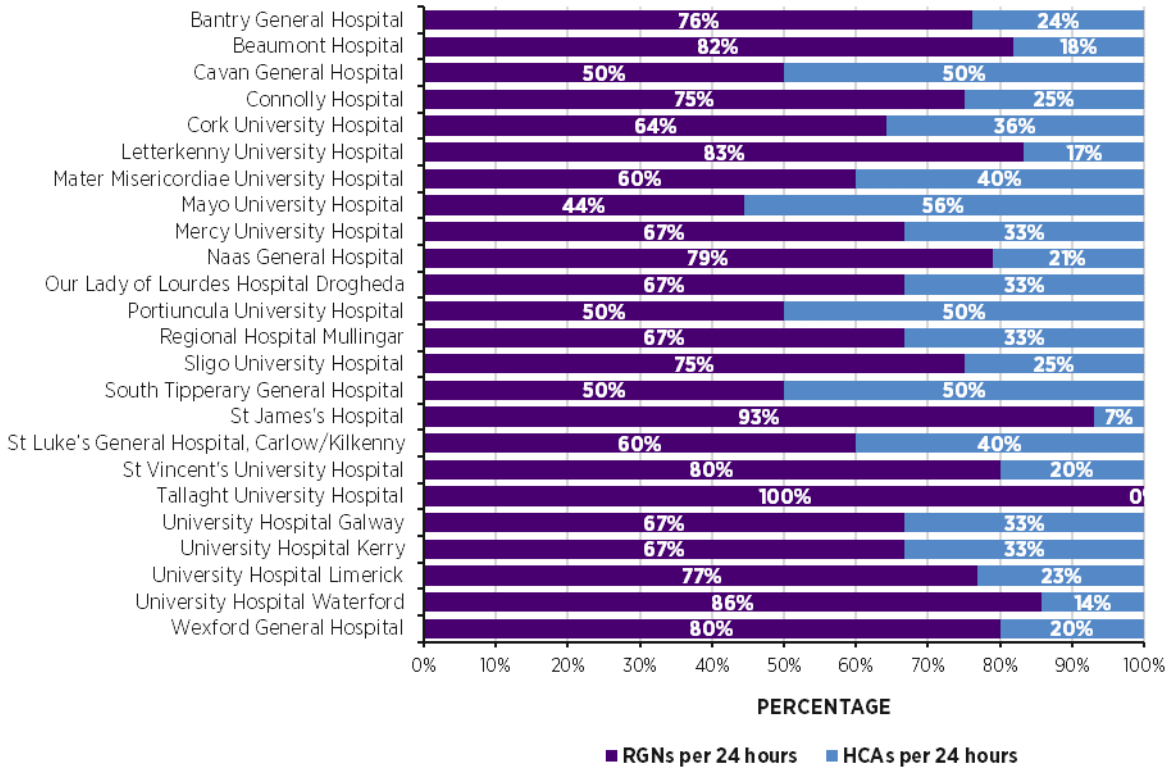

FIGURE 8.2: REGISTERED GENERAL NURSE AND HEALTHCARE ASSISTANT STAFFING RATIO, BY HOSPITAL (N=24)

SPECIALIST NURSING SERVICE

In 2021, seven (29%) hospitals had an advanced nurse practitioner (ANP) in stroke, and 22 (92%) had one or more clinical nurse specialists (CNSs) in stroke (Table 8.1).

TABLE 8.1: SPECIALIST NURSING, BY HOSPITAL (N=24)

	ANP		CNS	
	Yes (n=7)	Number of ANPs	Yes (n=22)	Number of CNSs
Bantry General Hospital			✓	0.5
Beaumont Hospital			✓	4
Cavan General Hospital			✓	1
Connolly Hospital			✓	1
Cork University Hospital			✓	2
Letterkenny University Hospital			✓	1
Mater Misericordiae University Hospital			✓	3
Mayo University Hospital	✓	1	✓	1
Mercy University Hospital			✓	1
Naas General Hospital	✓	1		
Our Lady of Lourdes Hospital Drogheda			✓	1
Portiuncula University Hospital			✓	1
Regional Hospital Mullingar			✓	1
Sligo University Hospital	✓	1		
St James's Hospital			✓	2
St Luke's General Hospital, Carlow/Kilkenny			✓	1
St Vincent's University Hospital	✓	1	✓	1
Tallaght University Hospital	✓	1	✓	2
Tipperary University Hospital			✓	1
University Hospital Galway	✓	1	✓	1
University Hospital Kerry			✓	1
University Hospital Limerick	✓	1	✓	2
University Hospital Waterford			✓	1
Wexford General Hospital			✓	1

Table 8.2 displays the services offered by ANPs (n=7) and CNSs (n=22) for inpatients, outpatients and in the community. On average, a CNS spends more time on inpatient services (average 83%) when compared to an ANP (average 69%). All hospitals reported that both CNSs and ANPs provide input into service development for inpatient care. The specialist nurse service is largely hospital based, with an average of 10% of ANPs' and 5% of CNSs' time spent on community care.

TABLE 8.2: SPECIALIST NURSING SERVICES PERFORMED BY ADVANCED NURSE PRACTITIONERS AND CLINICAL NURSE SPECIALISTS, FOR INPATIENTS, OUTPATIENTS AND IN THE COMMUNITY

		Inpatient		Outpatient		Community	
		N	%	N	%	N	%
Direct patient care/emergency response	ANPs (n=7)	6	86%	2	29%	0	0%
	CNSs (n=22)	21	95%	3	14%	0	0%
Patient education	ANPs (n=7)	6	86%	6	86%	1	14%
	CNSs (n=22)	22	100%	9	41%	1	5%
Staff education	ANPs (n=7)	7	100%	1	14%	1	14%
	CNSs (n=22)	21	95%	5	23%	2	9%
Clinics	ANPs (n=7)	1	14%	6	86%	0	0%
	CNSs (n=22)	9	41%	9	41%	0	0%
Service development	ANPs (n=7)	7	100%	4	57%	1	14%
	CNSs (n=22)	22	100%	6	27%	0	0%
Therapy planning	ANPs (n=7)	5	71%	3	43%	0	0%
	CNSs (n=22)	17	77%	3	14%	2	9%
Long-term patient support	ANPs (n=7)	2	29%	7	100%	2	29%
	CNSs (n=22)	16	73%	11	50%	3	14%

HEALTH AND SOCIAL CARE PROFESSIONAL RESOURCES

Guideline: In order to provide multidisciplinary stroke unit care, stroke units must be staffed with physiotherapists, occupational therapists, speech and language therapists, psychologists and dietitians with special interest, training, and expertise in stroke care (Royal College of Physicians, 2016; Ringelstein *et al*., 2013).

Recommendations regarding the appropriate HSCP staffing ratios in stroke units are documented (Royal College of Physicians, 2016). However, due to the shortage of stroke unit beds nationally (Figure 4.2), the care provided by many HSCPs often includes patients with a stroke both in and out of the stroke unit. In addition, a HSCP may provide care both for patients with a stroke and for other patients as part of general service provision. They may not be specifically allocated to the stroke service and therefore may not have the special interest, training or expertise in stroke care. In order to clarify this situation, all hospitals were asked to specify the allocation of each member of the MDT to the stroke service. Nineteen (83%) hospitals reported that there is an allocated physiotherapy provision to the stroke service, this was reported as 78% (n=18) for occupational therapy, 70% (n= 16) for speech and language therapy, 44% (n=10) for dietetics, 52% (n=12) for medical social work and 22% (n=5) for clinical psychology.

When completing the survey questionnaire, hospitals often found it difficult to assess the ratio of WTE time per profession spent on caring for patients with a stroke in a stroke unit. In this report, when calculating the recommended number of each HSCP, the data are based on the number of patients with a stroke in the hospital on the day of the survey and the total

stroke service WTE provision of each HSCP. The numbers of patients with a stroke can vary by the day so caution should be applied when interpreting the results.

Figures 8.3, 8.4, 8.5, 8.6, and 8.7 illustrate the comparison of the current staffing level of each HSCP against the recommended guidance (Royal College of Physicians, 2016). The figures include hospitals that have reported that there is no specific stroke allocation in order to indicate the recommended WTE for that particular service. It is important to note that when a hospital has missing data in relation to a particular HSCP, the hospital's stroke service may be able to access some HSCP services, but not necessarily a specialist stroke service.[10] Conversely, if a hospital appears to have more than the recommended number of HSCP WTEs, it is possible that the HSCP also provides care to patients other than patients with a stroke. There is no recommendation on the number of medical social workers in *National clinical guideline for stroke* (RCP, 2016) though the ESO recommendations do state that there should be access to medical social workers (Ringelstein *et al*., 2013).

In total, the recommended number of physiotherapists is 57.5 WTE and the reported total is 30.5 WTE, which represents 53% of the recommended number.

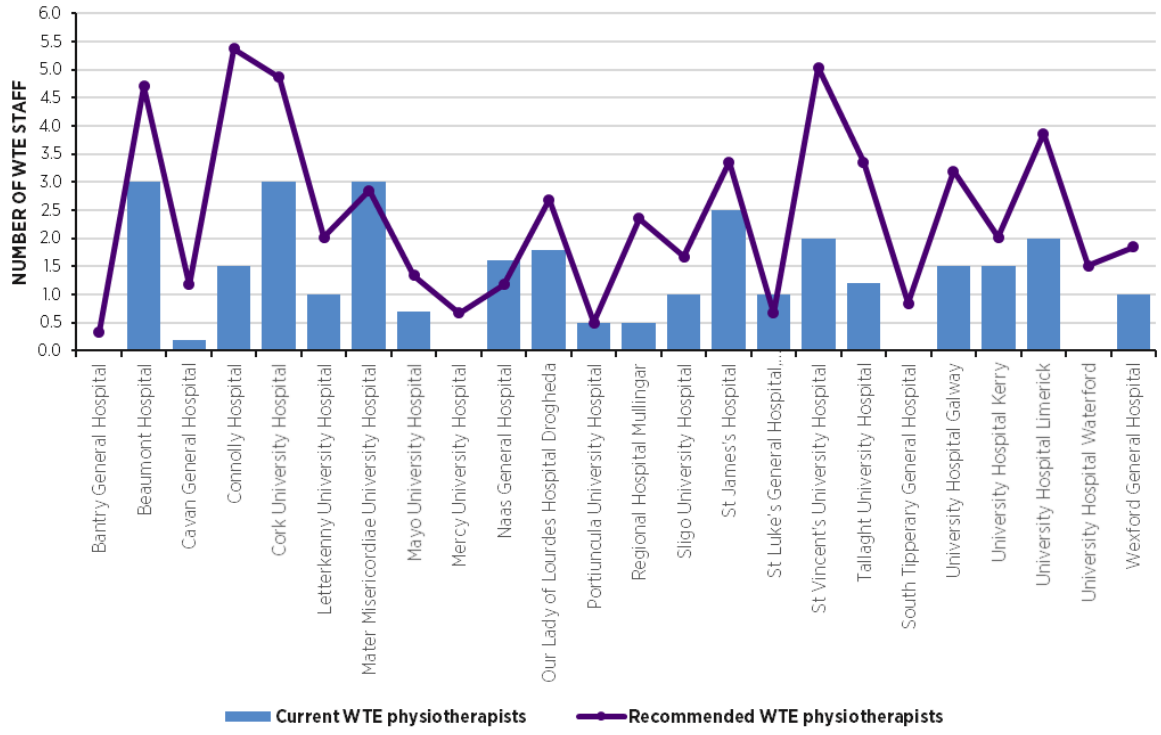

FIGURE 8.3: TOTAL CURRENT PHYSIOTHERAPIST STAFFING COMPARED TO THE RECOMMENDED PHYSIOTHERAPIST STAFFING, BY HOSPITAL (n=24)

[10] This excludes the provision of psychology services, as only five hospitals have access to clinical psychologists.

In total, the recommended number of occupational therapists is 55.5 WTE and the reported total is 25 WTE, which represents 45% of the recommended number.

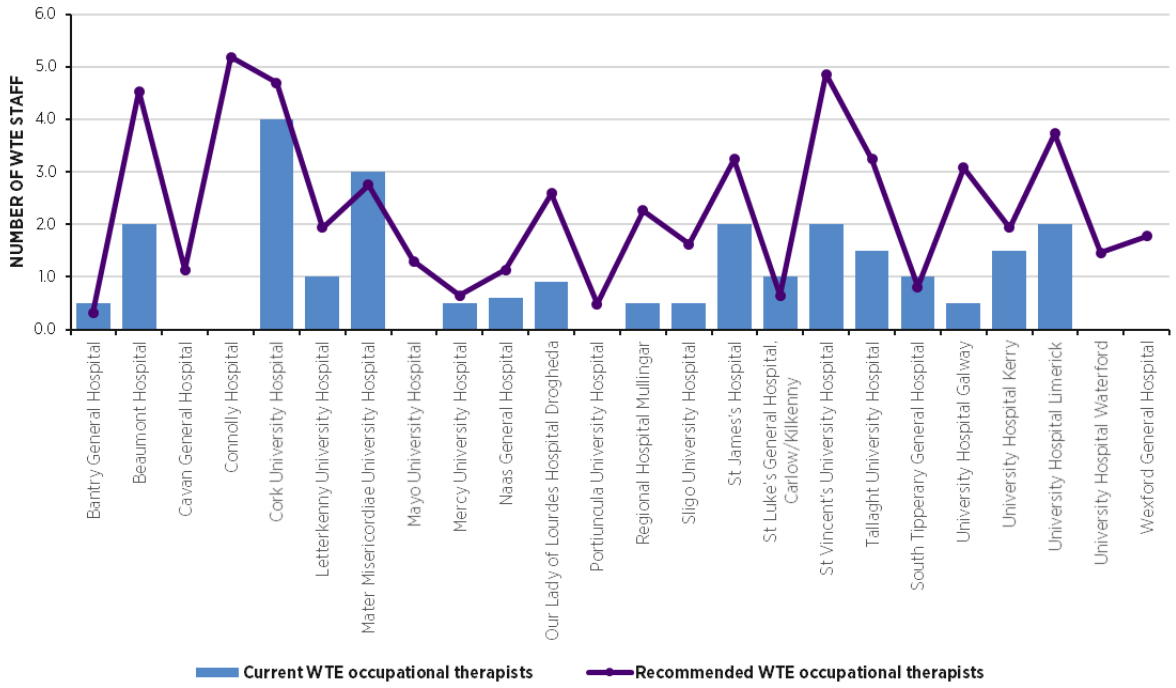

FIGURE 8.4: TOTAL CURRENT OCCUPATIONAL THERAPIST STAFFING COMPARED TO THE RECOMMENDED OCCUPATIONAL THERAPIST STAFFING, BY HOSPITAL (n=24)

In total, the recommended number of speech and language therapists is 27.4 WTE and the reported total is 18 WTE which represents 66% of the recommended number.

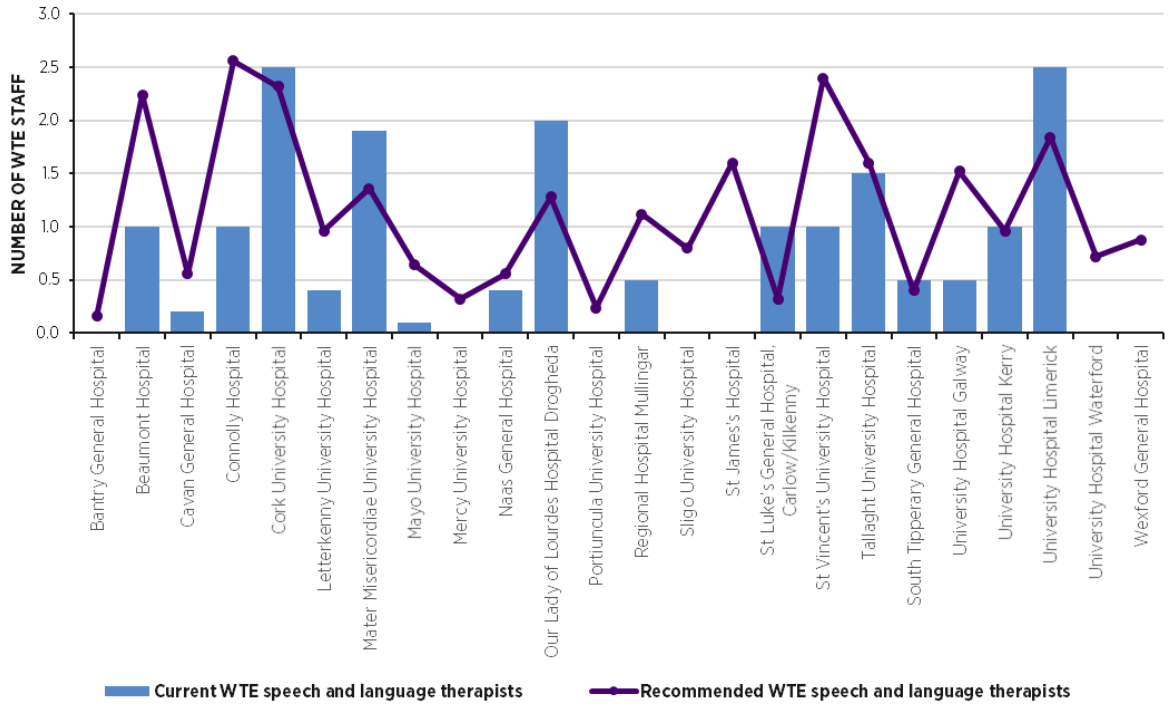

FIGURE 8.5: TOTAL CURRENT SPEECH AND LANGUAGE THERAPIST STAFFING COMPARED TO THE RECOMMENDED SPEECH AND LANGUAGE THERAPIST STAFFING, BY HOSPITAL (n=23)[11]

In total, the recommended number of dieticians is 10.3 WTE and the reported total is 5.9 WTE which represents 57% of the recommended number.

[11] Mayo University Hospital: 0.5WTE of a Senior SLT post was funded by the NSP in 2012. Unfortunately, this is not protected time due to staffing levels and is at times a basic grade level service. There are 0 nurses trained up in swallow screening as no training/education could be rolled out due to staffing levels in the SLT department.

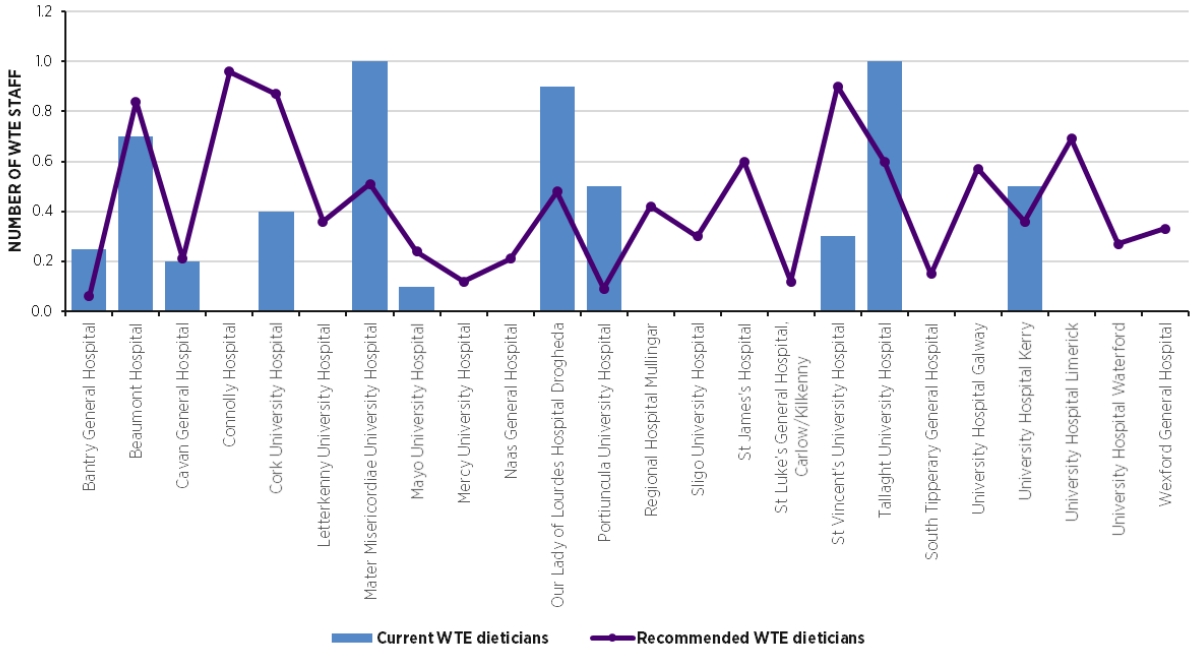

FIGURE 8.6: TOTAL CURRENT DIETITIAN STAFFING COMPARED TO THE RECOMMENDED DIETITIAN STAFFING, BY HOSPITAL (n=24)

In total, the recommended number of clinical psychologists is 13.7 WTE and the reported total is 2.7 WTE, which represents 20% of the recommended number.

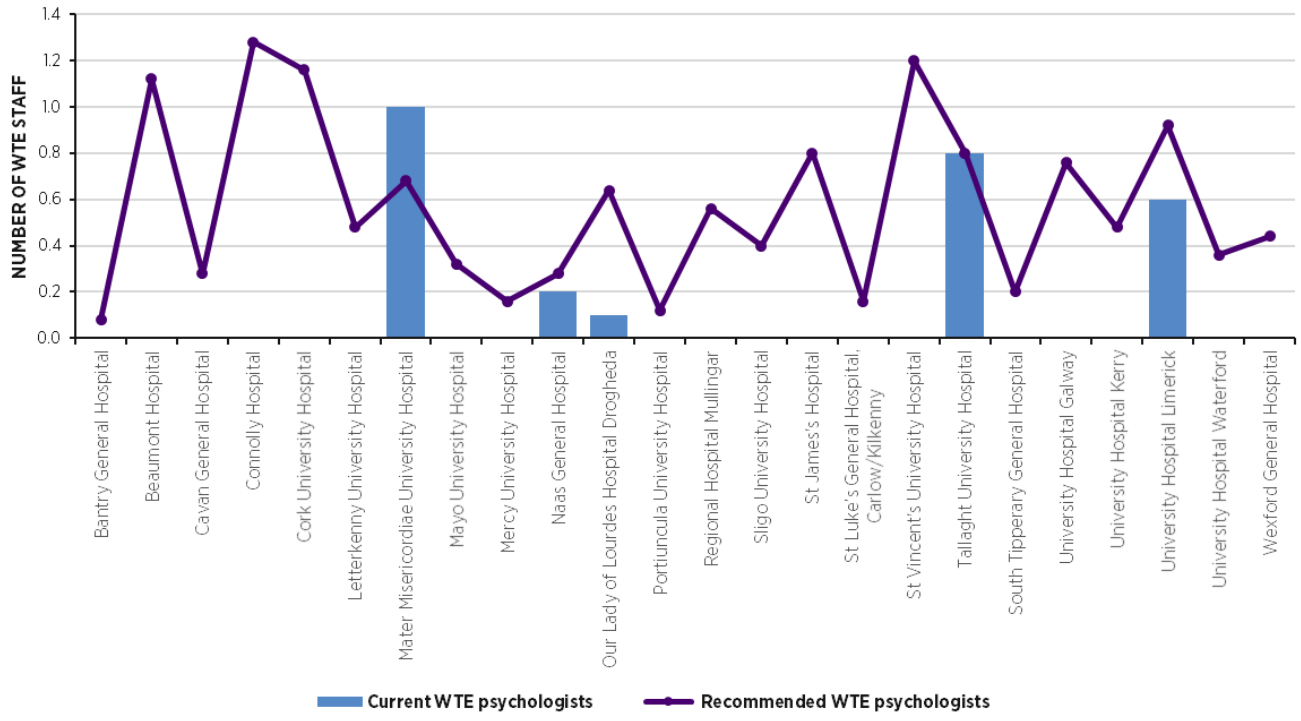

FIGURE 8.7: TOTAL CURRENT PSYCHOLOGIST STAFFING COMPARED TO THE RECOMMENDED PSYCHOLOGIST STAFFING, BY HOSPITAL (n=23)

HSCP GRADE MIX

CLINICAL SPECIALISTS

One-quarter (n=6, 25%) of hospitals have a clinical specialist speech and language therapist in stroke. Five hospitals (21%) have clinical specialist occupational therapists in stroke and clinical specialist physiotherapists in stroke. One hospital reported that it has a clinical specialist dietitian in stroke (Table 6.6). While this number of clinical specialists is low, it has increased from 4% in 2015, when only one hospital was reported to have one clinical specialist occupational therapist in stroke.

THERAPY ASSISTANTS

In 2021, therapy assistants were employed in 12 (50%) hospitals to provide assistance with stroke rehabilitation. Eleven (46%) hospitals reported that they had access to a physiotherapy assistant, four (17%) had access to an occupational therapy assistant and two (8%) had access to a speech and language therapy assistant.

CLINICAL PSYCHOLOGISTS

Only five (21%) hospitals have access to clinical psychologists as part of stroke unit care, unchanged from 2015.

One-quarter (n=6, 25%) of hospitals reported performing mood assessment and mood treatment. Three hospitals (13%) provide higher cognitive function assessment and treatment (Figure 8.8).

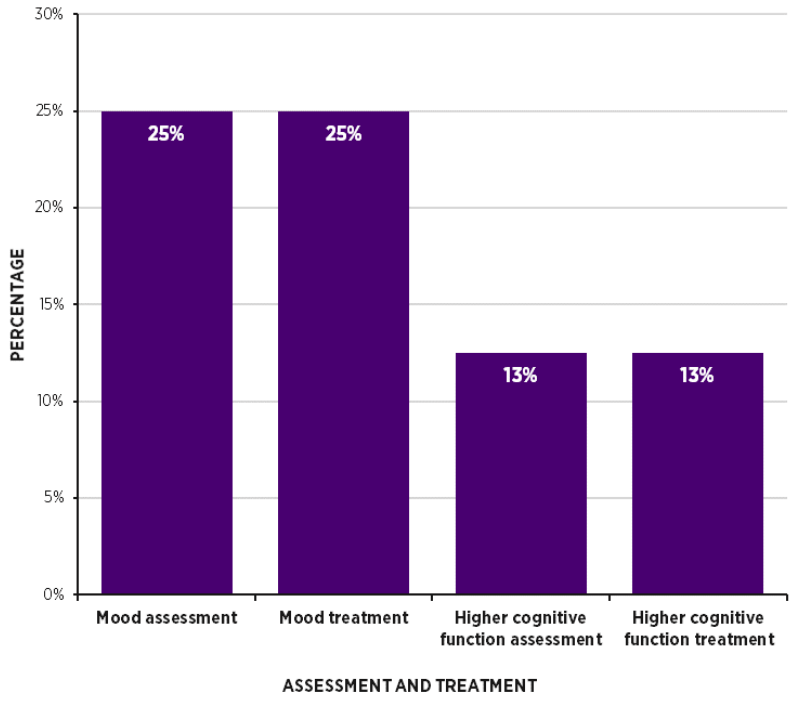

FIGURE 8.8: MOOD AND COGNITION ASSESSMENT AND TREATMENT (N=24)

MEDICAL RESOURCES

Guideline: There should be availability of a consultant stroke physician 24 hours a day, 7 days a week, with a minimum of six thrombolysis trained physicians on rota and consultant-led ward rounds 5 days per week (Royal College of Physicians, 2016).

MEDICAL SPECIALTIES CONTRIBUTING TO PROVIDING STROKE SERVICE COVER

A number of medical specialties, including geriatric medicine, neurology, general medicine and clinical pharmacology, contribute to providing stroke service cover in the hospitals surveyed. Geriatric medicine contributes to providing normal working hours stroke service cover in all hospitals, and in 15 (63%) hospitals this specialty also contributes to providing out-of-hours stroke service cover. Neurology contributes to providing both normal working hours and out-of-hours stroke service cover in five hospitals (21%).

One-half (n=12, 50%) of hospitals reported that general medicine contributes to providing out-of-hours stroke service cover, and seven hospitals (29%) reported that general medicine contributes to providing such cover during normal working hours. Two hospitals reported that clinical pharmacology contributes to providing stroke cover during normal working hours, and one hospital reported that this specialty contributes to providing stroke cover out-of-hours (Figure 8.9).

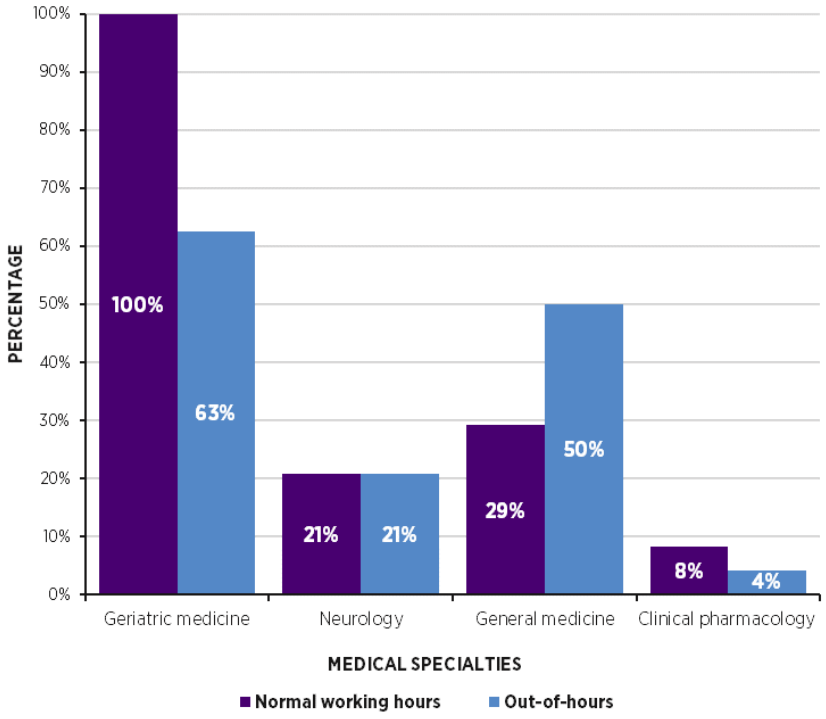

FIGURE 8.9: MEDICAL SPECIALTIES CONTRIBUTING TO PROVIDING STROKE SERVICE COVER (N=24)

STROKE SERVICE MEDICAL TEAM STAFFING

Table 8.3 shows the numbers of different members of the hospital medical team contributing to the stroke service and the approximate proportion of each members' WTE time spent on this service. Out of all hospitals, the average proportion of WTE time spent on the stroke service by the specialist registrar was 76%, for the intern it was 67%, for the senior house officer it was 62% and for the registrar it was 51%. For the stroke consultants providing daytime cover they spent 58% of their WTE time on the stroke service and other consultants contributing to the stroke service spent 25% of their WTE time on the stroke service.

	Stroke consultant providing normal working hours stroke service cover		Specialist registrar		Registrar		Senior house officer		Intern		Other consultant contributing to the stroke service (e.g. on call)	
	N	WTE time spent on stroke service (%)	N	WTE time spent on stroke service (%)	N	WTE time spent on stroke service (%)	N	WTE time spent on stroke service (%)	N	WTE time spent on stroke service (%)	N	WTE time spent on stroke service (%)
Bantry General Hospital	1	40%	0	0	0	0	0	0	0	0	0	0
Beaumont Hospital	3	83%	2	*	2	*	3	*	2	*	6	*
Cavan General Hospital	1	100%	0	0	1	*	1	*	0	0	9	*
Connolly Hospital	1	100%	1	100%	0	0	1	100%	0	0	0	0
Cork University Hospital	2	100%	2	*	1	*	1	*	1	*	13	*
Letterkenny University Hospital	1	50%	0	0	1	50%	1	50%	1	50%	11	*
Mater Misericordiae University Hospital	3	83%	2	100%	0	0	2	100%	1	100%	4	*
Mayo University Hospital	2	25%	0		3	33%	7	14%	2	50%	10	*
Mercy University Hospital	1	50%	1	50%	1	50%	1	50%	1	50%	1	50%
Naas General Hospital	1	100%	0	0	0	0	1	100%	0	0	2	50%
Our Lady of Lourdes Hospital Drogheda	1	50%	1	60%	2	75%	2	50%	1	60%	0	0
Portiuncula University Hospital	1	20%	0	0	0	0	0	0	0	0	0	0
Regional Hospital Mullingar	1	25%	0	0	0	0	0	0	0	0	7	10%
Sligo University Hospital	1	60%	1	60%	0	0	2	50%	1	50%	0	0
St James's Hospital	1	30%	1	30%	0	0	1	30%	1	30%	7	3%

St Luke's General Hospital, Carlow/Kilkenny	2	25%	1	20%	1	20%	2	10%	1	20%	1	10%
St Vincent's University Hospital	1	80%	1	90%	0	0	1	90%	1	100%	0	0
Tallaght University Hospital	2	60%	1	100%	0	0	1	100%	1	100%	10	12%
Tipperary University Hospital	1	30%	0		1	30%	1	30%	1	30%	1	10%
University Hospital Galway	1	100%	1	100%	0	0	2	100%	1	100%	1	20%
University Hospital Kerry	1	50%	1	100%	1	50%	1	10%	1	100%	4	13%
University Hospital Limerick	9	12%	0	0	1	*	0	0	0	0	0	0
University Hospital Waterford	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%
Wexford General Hospital	1	10%	0	0	0	0	0	0	0	0	8	1%

TABLE 8.3: STROKE SERVICE MEDICAL TEAM STAFFING

*WTE time spent on stroke care not reported.

KEY FINDINGS FROM CHAPTER 8

Eighty-eight percent (n=21) of stroke units operate below the recommended nurse staffing level.

In 2021, seven (29%) hospitals had an ANP in stroke, and 22 (92%) had one or more CNSs in stroke (Table 8.1).

Physiotherapy had 53% (n=30.5) of the recommended number of physiotherapists, this was 45% (n=25) in occupational therapy, 66% (n=18) in speech and language therapy, 57% (n=5.9) in dietetics and 20% (n=2.7) in clinical psychology.

Only five (21%) hospitals have access to clinical psychologists as part of stroke unit care.

The geriatric medicine specialty contributes to providing normal working hours stroke service cover in all hospitals, and in 15 (63%) hospitals this specialty also contributes to providing out-of-hours stroke service cover. Neurology contributes to providing both normal working hours and out-of-hours stroke service cover in five hospitals (21%).

CHAPTER 9: ORGANISATION OF EARLY SUPPORTED DISCHARGE

Early Supported Discharge (ESD) is international best practice in providing care for patients with a stroke as it improves patient outcomes while facilitating a reduced length of stay in hospital through the provision of stroke-specific rehabilitation in the home setting. Implementation of ESD is a fundamental aspect of the Stroke Model of Care (HSE, 2012). There are 10 ESD teams in operation, providing access to ESD in 11 out of 24 participating hospitals (46%), an increase from 4 hospitals in 2015 (McElwaine *et al*., 2015). Mercy University Hospital and Cork University Hospital share an ESD team. Nine out of the 13 hospitals that do not have access to an ESD team have access to other generic supported discharge teams that provide rehabilitation services to patients with a stroke on discharge from hospital (Table 9.1).

TABLE 9.1: EARLY SUPPORTED DISCHARGE AND COMMUNITY REHABILITATION, BY HOSPITAL (N=24)

	Access to ESD team (n=11)	ESD team attached to hospital (n=10)	Access to other generic supported discharge teams for patients with a stroke (n=9)
Bantry General Hospital			✓
Beaumont Hospital	✓	✓	
Cavan General Hospital			✓
Connolly Hospital			✓
Cork University Hospital	✓	✓	
Letterkenny University Hospital			✓
Mater Misericordiae University Hospital	✓	✓	
Mayo University Hospital			
Mercy University Hospital	✓		
Naas General Hospital			
Our Lady of Lourdes Hospital Drogheda			✓
Portiuncula University Hospital			
Regional Hospital Mullingar			✓
Sligo University Hospital	✓	✓	
St James's Hospital	✓	✓	
St Luke's General Hospital, Carlow/Kilkenny			
St Vincent's University Hospital	✓	✓	
Tallaght University Hospital	✓	✓	
Tipperary University Hospital			✓
University Hospital Galway	✓	✓	
University Hospital Kerry	✓	✓	
University Hospital Limerick	✓	✓	
University Hospital Waterford			✓
Wexford General Hospital			✓

The remainder of this chapter is only relevant to the 10 hospitals that have an ESD team attached to the hospital (Mercy University Hospital and Cork University Hospital share an ESD team and are counted as one hospital) (Table 9.1). Six ESD teams have been operational for 3 years or more and the other four teams have been operational for 13 months or less, at the time of the survey completion (Table 9.2).

TABLE 9.2: HOW LONG THE EARLY SUPPORTED DISCHARGE TEAM HAS BEEN IN OPERATION, BY HOSPITAL (n=10)[12]

	How long the ESD has been in operation
Beaumont Hospital	4 years and 8 months
Cork University Hospital/Mercy University Hospital	3 years and 9 months
Mater Misericordiae University Hospital	10 years
Sligo University Hospital	9 months
St James's Hospital	7 months
St Vincent's University Hospital	1 year and 1 month
Tallaght University Hospital	8 years and 11 months
University Hospital Galway	8 years and 2 months
University Hospital Kerry	8 months
University Hospital Limerick	4 years and 1 month

The National Clinical Programme for Stroke has defined the composition of a fully resourced ESD team. Table 9.3 shows the reported and recommended number of WTEs for each healthcare professional in the ESD team, by hospital. In 2021, no hospital had a fully resourced ESD team. All hospitals had the recommended number of WTEs for occupational therapists and physiotherapists. Two hospitals had more than the recommended number of WTEs for CNSs. Four hospitals had the recommended number of WTEs for therapy assistants, and five had the recommended number of WTEs for speech and language therapists and medical social worker.

[12] Calculated based on the month and year of survey completion, November 2021.

TABLE 9.3: HEALTHCARE PROFESSIONALS WHO MAKE UP THE EARLY SUPORTED DISCHARGE TEAM, BY HOSPITAL (n=10)

Healthcare professionals	CNS	Therapy assistant	Medical social worker	Occupational therapist	Physiotherapist	Speech and language therapist
Recommended WTE	0.5	**1.0**	0.5	**1.0**	**1.0**	**1.0**
Beaumont Hospital	1.0	0.0	1.0	1.0	1.0	1.0
Cork University Hospital/Mercy University Hospital	0.0	0.0	0.0	1.0	1.0	0.5
Mater Misericordiae University Hospital	0.0	1.0	0.5	1.0	1.0	0.5
Sligo University Hospital	0.0	0.0	0.5	1.0	1.0	0.5
St James's Hospital	0.0	1.0	0.5	1.0	1.0	1.0
St Vincent's University Hospital	0.0	0.0	0.5	1.0	1.0	1.0
Tallaght University Hospital	0.0	0.0	0.5	1.0	1.0	0.5
University Hospital Galway	0.0	1.0	0.2	1.0	1.0	1.0
University Hospital Kerry	1.0	1.0	0.0	1.0	1.0	1.0
University Hospital Limerick	0.5	0.0	0.0	1.0	1.0	0.5

Eight (80%) ESD teams reported that a member of the team attends the stroke MDT meetings in the hospital (Figure 9.1).

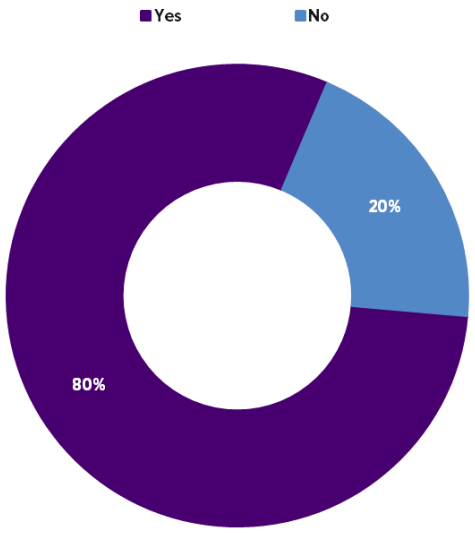

FIGURE 9.1: PERCENTAGE OF MEMBERS OF THE EARLY SUPORTED DISCHARGE TEAM WHO ATTEND THE STROKE MULTIDISCIPLINARY TEAM MEETINGS IN THE HOSPITAL (n=10)[13]

[13] 'Yes': Beaumont Hospital, Cork University Hospital/Mercy University Hospital, Mater Misericordiae University Hospital, Sligo University Hospital, St James's Hospital, St Vincent's University Hospital, Tallaght University Hospital, and University Hospital Galway. 'No': Tallaght University Hospital and University Hospital Kerry.

Five teams provide ESD in the home, and another five hospitals provide a combination of ESD in the home and via videoconferencing. The duration of ESD is dependent on patients' needs and preferences. Three teams provide ESD for up to 6 weeks, another two teams for 6–8 weeks, and five teams provide ESD for up to 8 weeks (Table 9.4).

TABLE 9.4: TYPE AND DURATION OF EARLY SUPPORTED DISCHARGE, AND PROPORTION OF EARLY SUPPORTED DISCHARGE ACTIVITY PROVIDED FACE TO FACE, BY HOSPITAL (n=10)

	Type of ESD model	Duration of ESD	Proportion of ESD activity provided face to face
Cork University Hospital/Mercy University Hospital	Combination of ESD in the home and via videoconferencing	Up to 8 weeks, average of 4 weeks	65%
Mater Misericordiae University Hospital	Combination of ESD in the home and via videoconferencing	Up to 8 weeks	60% (when a blended model is being employed), 100% otherwise
Tallaght University Hospital	ESD in the home	Up to 8 weeks, average of 4 weeks	Physiotherapy and occupational therapy 100%; speech and language therapy 80%
University Hospital Kerry	ESD in the home	Up to 6 weeks	100%
University Hospital Galway	ESD in the home	Up to 8 weeks	98%
Beaumont Hospital	Combination of ESD	6–8 weeks	98%
St Vincent's University Hospital	Combination of ESD in the home and via videoconferencing	Up to 8 weeks	64%*
St James's Hospital	ESD in the home	6–8 weeks	95% (some medical social worker phone support)
Sligo University Hospital	ESD in the home	Up to 6 weeks	95%
University Hospital Limerick	Combination of ESD in the home and via videoconferencing	6 weeks	80%

*64% of activity was face to face during the 6-month period from September 2020 to February 2021.

Almost all ESD teams (n=9) have geographical parameters for access to ESD. These parameters are described in Table 9.5.

TABLE 9.5: GEOGRAPHICAL PARAMETERS FOR ACCESS TO EARLY SUPPORTED DISCHARGE, BY HOSPITAL (n=10)

	Geographical parameters for access to ESD (n=9)	Geographical parameter comments
Beaumont Hospital	Yes	Beaumont Hospital catchment area
Cork University Hospital/Mercy University Hospital	Yes	Within a 30-minutes commute from Cork University Hospital
Mater Misericordiae University Hospital	Yes	The Mater Misericordiae University Hospital catchment area that covers Dublin North Central and Dublin North West Primary Community and Continuing Care areas
Sligo University Hospital	Yes	A 30-minute commute from Sligo University Hospital
St James's Hospital	No	
St Vincent's University Hospital	Yes	Provided to patients living in areas 1 and 2, and North Wicklow on a case-by-case basis. A travel time up to 30 minutes appears to be the most feasible means of ensuring service provision.
Tallaght University Hospital	Yes	The catchment area is 15 km for face-to-face visits. However, this catchment area can be greater if rehabilitation is via teleconferencing, or if patients can attend the hospital for a face-to-face session.
University Hospital Galway	Yes	Zone 1: 0–10 km from hospital. Zone 2: 10–25 km from the hospital and to the towns of Tuam and Loughrea.
University Hospital Kerry	Yes	Within a 30 km radius of University Hospital Kerry.
University Hospital Limerick	Yes	Within a 30-minute commute from hospital grounds.

KEY FINDINGS FROM CHAPTER 9

There are 10 ESD teams in operation, providing access to ESD in 11 out of 24 participating hospitals (46%), an increase from 4 hospitals in 2015.

In 2021, no hospital had a fully resourced ESD team. All hospitals had the recommended number of WTEs for occupational therapists and physiotherapists.

Eight (80%) ESD teams reported that a member of the ESD team attends the stroke MDT meetings in the hospital (Figure 9.1).

Five teams provide a combination of ESD in the home and via videoconferencing.

Almost all ESD teams (n=9) have geographical parameters for access to ESD for patients with a stroke.

CHAPTER 10: STANDARDISED QUALITY INDICATORS OF STROKE SERVICES

The definition of what constitutes a stroke unit and stroke service has evolved since the early 2000s from a simple 'ward for looking after patients with a stroke' to more complex definitions and set criteria. There are a number of published standards and as part of this organisational audit, data items were collected that would allow us to compare our data to two other sets of quality criteria: the UK 2014 stroke service standards (British Association of Stroke Physicians, 2014) and the European Stroke Organisation (ESO) Stroke Unit Certification Criteria (Ringelstein *et al*., 2013).

In the 2015 National Stroke Audit (McElwaine *et al*., 2015), the eight UK Sentinel Stroke National Audit Programme (SSNAP) Stroke Unit Quality Indicators from 2014 were applied in order to allow comparison with the UK and Northern Ireland stroke services. Although these criteria may not be current (the criteria have since been modified and expanded by the UK SSNAP (SSNAP on behalf of the Intercollegiate Stroke Working Party, 2019)), they were reapplied in the 2021 INAS Organisational Audit in order to allow comparability with 2015 audit data.

Subsequent to the 2015 audit, the ESO, which had published a consensus document on stroke unit certification in 2013 (Ringelstein *et al*., 2013), released criteria for an accreditation process for stroke units in Europe. These were divided into 'Must' and 'Additional' criteria. The 'Must' criteria are required to be adhered to in full in order to obtain accreditation, whereas the 'Additional' criteria can be partially adhered to. These are used in a formal accreditation process by the ESO to certify European stroke units. These are the most current and applicable standards for Ireland, since specific Irish guidelines have not been updated since 2009 and a consensus has been reached that Ireland should follow appropriate international standards.

In this chapter, both quality standards were applied to each stroke service in Ireland in order to determine conformity with European consensus recommendations and previously used UK standards. For the purposes of presentation of all data in this chapter, a score of 1 means the standard was met and a score of 0 means that it was not. Caution was applied when comparing the questions asked in the 2021 INAS Organisational Audit Survey to the ESO criteria. If a question was not specifically asked within the 2021 survey, the column for that criterion was left blank. However, where possible, an alternative was provided within the text.

UK SSNAP STROKE UNIT QUALITY INDICATORS FROM 2014

Table 10.1 shows the eight quality indicators used in the 2015 audit and compares them with the 2021 audit results. While there were evident improvements in some criteria, there were others where there was no improvement or even decline from 2015. Some of this may be due to how data were interpreted, e.g. 'Acute Stroke Protocols' is now reported as 'Emergency Department Protocols' in 2021, which is likely more specific than the prior analysis. Furthermore, in 2021, there were four fewer hospitals providing acute stroke services, which will have altered the findings. However, it is evident that limited ground has been gained in

meeting these standards. It should also be noted that while improvements were seen in both 'Nurses trained in swallow screening' (Criterion 6, with 100%) and 'Nurses trained in stroke assessment and management (Criterion 8, with 92% compliance) (Table 10.1), the actual number of nurses who had been trained was very low in some units. Indeed, in some cases, the number was just one (Table 6.5), which would have resulted in no specifically stroke or swallow screening trained nurses being available on many shifts.

Criterion 3 and Criterion 7 have been left blank in Table 10.1, as the UK Quality Indicator question does not match the exact question asked in the 2021 INAS Organisational Audit Survey. The question for Criterion 3 (a policy for direct admission to the emergency department (ED)) was not asked specifically. However, in Chapter 6, Figure 6.1 shows that 21 (88%) hospitals have a written standard operating procedure or protocol for use in ED management. Similarly, the 2021 INAS Organisational Audit Survey did not ask specifically whether the hospital had access to 24-hour brain scanning (Criterion 7). However, Table 5.2 shows that all hospitals have access to computed tomography (CT) scan in the ED and 18 (75%) reported that they perform a CT scan for a suspected stroke within 3 hours of admission (Table 5.2).

UK STROKE UNIT STANDARDS

1. continuous physiological monitoring (electrocardiogram (ECG), oximetry blood pressure)
2. access to scanning within 3 hours of admission
3. a policy for direct admission to the ED
4. specialist ward rounds at least five times a week
5. acute stroke protocols and guidelines
6. nurses trained in swallow screening
7. access to 24-hour brain scanning
8. nurses trained in stroke assessment and management.

TABLE 10.1: HOSPITALS THAT MET UNITED KINGDOM STROKE UNIT STANDARDS

Hospital	Criterion[14]							
	1[15]	2	3	4	5	6	7	8
Bantry General Hospital	1	1	N/A	1	1	1	N/A	1
Beaumont Hospital	1	1	N/A	1	1	1	N/A	1
Cavan General Hospital	1	1	N/A	0	1	1	N/A	1
Connolly Hospital	0	0	N/A	0	1	1	N/A	1
Cork University Hospital	1	1	N/A	1	1	1	N/A	1
Letterkenny University Hospital	1	1	N/A	1	1	1	N/A	1
Mater Misericordiae University Hospital	1	1	N/A	1	1	1	N/A	1
Mayo University Hospital	0	1	N/A	1	1	1	N/A	1
Mercy University Hospital	0	1	N/A	0	1	1	N/A	1
Naas General Hospital	1	1	N/A	0	1	1	N/A	1
Our Lady of Lourdes Hospital Drogheda	0	1	N/A	0	1	1	N/A	1
Portiuncula University Hospital	0	1	N/A	0	1	1	N/A	0
Regional Hospital Mullingar	1	1	N/A	0	1	1	N/A	0
Sligo University Hospital	1	0	N/A	1	1	1	N/A	1
St James's Hospital	1	1	N/A	1	1	1	N/A	1
St Luke's General Hospital, Carlow/Kilkenny	1	1	N/A	0	1	1	N/A	1
St Vincent's University Hospital	1	1	N/A	1	1	1	N/A	1
Tallaght University Hospital	1	1	N/A	1	1	1	N/A	1
Tipperary University Hospital	0	0	N/A	0	1	1	N/A	1
University Hospital Galway	0	1	N/A	1	1	1	N/A	1
University Hospital Kerry	1	0	N/A	1	1	1	N/A	1
University Hospital Limerick	1	0	N/A	1	1	1	N/A	1
University Hospital Waterford	1	1	N/A	1	1	1	N/A	1
Wexford General Hospital	0	1	N/A	0	1	1	N/A	1
Total percentage meeting standard in 2021	**67 %**	**79%**	N/A	**58%**	**100 %**	**100%**	N/A	**92 %**
Total percentage meeting standard in 2015	**57 %**	**86%**	**86 %**	**71%**	**95%**	**52%**	**100%**	**N/A**

Note: N/A - UK Quality Indicator question does not match the exact question asked in the 2021 INAS Organisational Audit Survey

[14] Questions for Criterion 3 and Criterion 7 were not specifically asked in the 2021 INAS Organisational Audit Survey. However, commentary on both is noted within this report.

[15] Criterion 1: if the infrastructure of the stroke unit allows for continuous monitoring of ECG, blood pressure, and pulse oximetry.

ESO STROKE UNIT ACCREDITATION CRITERIA

There are 44 ESO criteria included in the process of stroke unit accreditation, and these are divided into the following 6 subgroups:

1. Leadership
2. Personnel
3. General infrastructure
4. Investigations
5. Interventions and monitoring
6. Teaching, meetings and research.

These are further subdivided into 'Must' and 'Additional' criteria. The 'Must' criteria are highlighted in blue in the following tables: Table 10.2, Table 10.3, Table 10.4, Table 10.5, Table 10.6, and Table 10.8.

CRITERION A: LEADERSHIP

Table 10. 2 shows hospitals that met the Criterion A standard: Leadership. Almost all hospitals (n=23, 96%) complied with the 'Must' criteria in this classification. Disposition of beds means that the stroke service has control of bed management for the stroke unit. Ten out of 24 hospitals (42%) met Criterion A3 for disposition of beds, which may be achievable with reorganisation within hospitals (Table 10.2).

There are no data on Criterion A4 ('A stroke neurologist or a neurology experienced stroke physician leads an outpatient clinic dedicated to patients with a stroke'), as a specific question in relation to this issue was not asked in the 2021 INAS Organisational Audit Survey. The survey specifically asked if the stroke service operated a transient ischaemic attack (TIA) clinic, and while Table 7.5 shows that four (17%) hospitals operate a TIA clinic, it is known that many other hospitals operate other stroke-specific outpatient clinics.

CRITERION A STANDARDS

A1. Medical care is led and provided by a stroke neurologist or a neurology experienced senior stroke physician.

A2. The leading stroke neurologist or stroke physician is actively involved in stroke unit service coordination, development and audit.

A3. Acute evaluation of patients and disposition of stroke unit beds is held by the attending junior stroke physician or the stroke neurologist/senior stroke physician.

A4. A stroke neurologist or a neurology experienced stroke physician leads an outpatient clinic dedicated to patients with a stroke.

TABLE 10.2: HOSPITALS THAT MET CRITERION A STANDARDS

Hospital	Criterion[16]			
	A1	A2	A3	A4[17]
Bantry General Hospital	1	1	1	N/A
Beaumont Hospital	1	1	1	N/A
Cavan General Hospital	1	1	1	N/A
Connolly Hospital	1	1	0	N/A
Cork University Hospital	1	1	0	N/A
Letterkenny University Hospital	1	1	1	N/A
Mater Misericordiae University Hospital	1	1	1	N/A
Mayo University Hospital	1	1	1	N/A
Mercy University Hospital	0	0	0	N/A
Naas General Hospital	1	1	0	N/A
Our Lady of Lourdes Hospital Drogheda	1	1	0	N/A
Portiuncula University Hospital	1	1	0	N/A
Regional Hospital Mullingar	1	1	0	N/A
Sligo University Hospital	1	1	0	N/A
St James's Hospital	1	1	1	N/A
St Luke's General Hospital, Carlow/Kilkenny	1	1	0	N/A
St Vincent's University Hospital	1	1	0	N/A
Tallaght University Hospital	1	1	1	N/A
Tipperary University Hospital	1	1	1	N/A
University Hospital Galway	1	1	1	N/A
University Hospital Kerry	1	1	1	N/A
University Hospital Limerick	1	1	0	N/A
University Hospital Waterford	1	1	0	N/A
Wexford General Hospital	1	1	0	N/A
Total percentage meeting standard	**96%**	**96%**	**42%**	N/A

Note: N/A - UK Quality Indicator question does not match the exact question asked in the 2021 INAS Organisational Audit Survey

CRITERION B: PERSONNEL

Criterion B: Personnel relates mainly to the presence or absence of specific professions and, to a lesser degree, the nature of their specialist training. It does not take into account staff-to-patient ratios, which would also be an important indicator of level and quality of care provided.

Table 10.3 shows hospitals that met the criteria for standards related to the subgroup 'Personnel'. In the 2021 INAS Organisational Audit Survey, a question in relation to Criterion B1 was not specifically asked. However, Table 5.1 shows that 11 hospitals provide an on-call stroke service 24 hours a day, 7 days a week. Almost all hospitals (n=23, 96%) reported availability of physiotherapists (Criterion B7). On-call radiography was not available in eight (33%) hospitals (Criterion B3), and two hospitals reported not having stroke-trained nursing staff (Criterion B6), due to a high turnover of experienced nursing staff. One hospital reported

[16] The 'Must' criteria are highlighted in blue.

[17] This question was not specifically asked. However, commentary is noted within this report.

non-availability of a speech and language therapist (Criterion B9), which represents a serious deficiency in the context of stroke care. Medical social workers (Criterion B10) were unavailable in 58% (n=14) of hospitals.

No data were available for Criterion B5, a specialist for neurorehabilitation. However, it is known that consultants such as geriatricians have some training in rehabilitation of patients with a stroke and could meet the criterion in a formal ESO appraisal. Specifically trained neurorehabilitationists, as would be typical in most European stroke services, are very uncommon in Ireland and are limited predominantly to Level 4 hospitals.

There were no data on Criterion B2 ('A neurosonologist is available during regular working hours'), as this specific question was not asked in the 2021 INAS Organisational Audit Survey. Transcranial Doppler (TCD) ultrasound, performed by neurosonologists, can be a useful adjunct in managing patients with a stroke, and it also has uses in intensive care units (ICUs). However, its use is not mandated by any current set of guidelines and it is not part of standard practice in many European countries. Additionally, most sites would not have sufficient activity to support a full-time neurosonologist. The ESO in application of this standard accepts the availability of alternate means of intracranial vascular imaging, such as CT or MRI, that are available in all hospitals (Table 5.2). Additionally, Table 7.1 shows that five (21%) hospitals have TCD scanning.

There were no data on Criterion B4 ('Cardiology expertise and internist expertise are available 24 hours a day, 7 days a week or assistance by immediate dialogue is available 24 hours a day, 7 days a week at the nearest stroke centre'), as a specific question in relation to this issue was not asked in the 2021 INAS Organisational Audit Survey. However, it is known that all acute hospitals have access to cardiology expertise.

CRITERION B STANDARDS

B1. A stroke physician (at least a junior) is present at the institution 24 hours a day, 7 days a week. A stroke neurologist is available 24 hours a day, 7 days a week.
B2. A neurosonologist is available during regular working hours.
B3. A radiology technician is present at the hospital around the clock, 24 hours a day, 7 days a week. A radiologist is present during regular working hours and available 24 hours a day, 7 days a week. Neuroradiological or neurointerventional assistance by immediate dialogue (telestroke) is available 24 hours a day, 7 days a week at the nearest stroke centre.
B4. Cardiology expertise and internist expertise are available 24 hours a day, 7 days a week or assistance by immediate dialogue is available 24 hours a day, 7 days a week at the nearest stroke centre.
B5. A specialist for neurorehabilitation is collaborating with the team.
B6. Patients are cared for by dedicated stroke-trained nursing staff.
B7. Stroke-trained physiotherapists are part of the stroke team.
B8. Stroke-trained occupational therapists are part of the stroke team.
B9. Stroke-trained speech and language therapists are part of the stroke team.
B10. Support by a medical social worker is available at the institution.
B11. Patients get access to neuropsychologists.

TABLE 10.3: HOSPITALS THAT MET CRITERION B STANDARDS

Hospital	Criterion[18, 19]										
	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
Bantry General Hospital	N/A	N/A	0	N/A	N/A	1	1	1	1	0	0
Beaumont Hospital	N/A	N/A	1	N/A	N/A	1	1	1	1	1	0
Cavan General Hospital	N/A	N/A	0	N/A	N/A	1	1	0	1	0[20]	0
Connolly Hospital	N/A	N/A	0	N/A	N/A	1	1	1	1	1	0
Cork University Hospital	N/A	N/A	1	N/A	N/A	1	1	1	1	1	0
Letterkenny University Hospital	N/A	N/A	1	N/A	N/A	1	1	1	1	1	0
Mater Misericordiae University Hospital	N/A	N/A	1	N/A	N/A	1	1	1	1	1	1
Mayo University Hospital	N/A	N/A	1	N/A	N/A	1	1	1	1	0	0
Mercy University Hospital	N/A	N/A	1	N/A	N/A	1	1	1	1	1	0
Naas General Hospital	N/A	N/A	0	N/A	N/A	1	1	1	1	1	1
Our Lady of Lourdes Hospital Drogheda	N/A	N/A	1	N/A	N/A	1	1	1	1	1	1
Portiuncula University Hospital	N/A	N/A	1	N/A	N/A	0	1	1	0	1	0
Regional Hospital Mullingar	N/A	N/A	0	N/A	N/A	0	1	1	1	0	0
Sligo University Hospital	N/A	N/A	0	N/A	N/A	1	1	1	1	1	0
St James's Hospital	N/A	N/A	1	N/A	N/A	1	1	1	1	0	0
St Luke's General Hospital, Carlow/Kilkenny	N/A	N/A	1	N/A	N/A	1	1	1	1	0	0
St Vincent's University Hospital	N/A	N/A	1	N/A	N/A	1	1	1	1	1	0
Tallaght University Hospital	N/A	N/A	1	N/A	N/A	1	1	1	1	1	1
Tipperary University Hospital	N/A	N/A	1	N/A	N/A	1	0	1	1	0	0
University Hospital Galway	N/A	N/A	0	N/A	N/A	1	1	1	1	1	0
University Hospital Kerry	N/A	N/A	1	N/A	N/A	1	1	1	1	0	0
University Hospital Limerick	N/A	N/A	1	N/A	N/A	1	1	1	1	1	1
University Hospital Waterford	N/A	N/A	0	N/A	N/A	1	1	1	1	0	0
Wexford General Hospital	N/A	N/A	1	N/A	N/A	1	1	1	1	0	0
Total percentage meeting standard	**N/A**	**N/A**	**67%**	**N/A**	**N/A**	**92%**	**96%**	**96%**	**96%**	**58%**	**21%**

Note: N/A - UK Quality Indicator question does not match the exact question asked in the 2021 INAS Organisational Audit Survey

[18] Questions for criteria B1, B2, B4, and B5 were not specifically asked in the 2021 INAS Organisational Audit Survey. However, commentary is noted within this report.
[19] The 'Must' criteria are highlighted in blue.
[20] Medical social worker is available for complex cases or safeguarding concerns.

CRITERION C: GENERAL INFRASTRUCTURE

Table 10.4 shows hospitals that met the criteria for standards related to the subgroup C: General infrastructure. In the 'Must' criteria (highlighted in blue), all hospitals reported a stroke unit as characterised by the now internationally accepted definition of a stroke unit (Langhorne *et al*., 2020) (Criterion C1). One hospital with no ED did provide acute stroke services (Criterion C2). However, this hospital serves a relatively large, sparsely populated area where timely access to neighbouring stroke services is challenging. All hospitals apart from one had local access to ICU support (Criterion C3). Criterion C4 ('The stroke unit runs an outpatient clinic for patients with a stroke as well as patients who have experienced a TIA. In cases where a patient misses an outpatient clinic at your hospital, specify the follow-up stroke care provided') is similar to Criterion A4 (Table 10.2). There were no data on Criterion A4, as a specific question in relation to this issue was not asked in the 2021 INAS Organisational Audit Survey.

CRITERION C STANDARDS

C1. Stroke patient care in a discrete area in the hospital, staffed by a specialist stroke MDT with regular MDT meetings for planning care. For this purpose, the stroke unit operates a geographically defined stroke ward admitting patients with a stroke as well as patients who have experienced a TIA.
C2. The stroke unit is located in an institution that runs an ED (according to international standards, such as trauma level 1 or higher).
C3. The stroke unit is located in an institution that runs an ICU.
C4. The stroke unit runs an outpatient clinic for patients with a stroke as well as patients who have experienced a TIA. In cases where a patient misses an outpatient clinic at your hospital, specify the follow-up stroke care provided.

TABLE 10.4: HOSPITALS THAT MET CRITERION C STANDARDS

Hospital	Criterion[21]			
	C1	C2	C3	C4[22]
Bantry General Hospital	1	0[23]	0	N/A
Beaumont Hospital	1	1	1	N/A
Cavan General Hospital	1	1	1	N/A
Connolly Hospital	1	1	1	N/A
Cork University Hospital	1	1	1	N/A
Letterkenny University Hospital	1	1	1	N/A
Mater Misericordiae University Hospital	1	1	1	N/A

[21] The 'Must' criteria are highlighted in blue.
[22] A question for C4 was not specifically asked in the 2021 INAS Organisational Audit Survey. However, commentary is noted within this report.
[23] The AMAU accepts all medical emergencies, including suspected stroke patients, 24/7, 7 days per week.

Mayo University Hospital	1	1	1	N/A
Mercy University Hospital	1	1	1	N/A
Naas General Hospital	1	1	1	N/A
Our Lady of Lourdes Hospital Drogheda	1	1	1	N/A
Portiuncula University Hospital	1	1	1	N/A
Regional Hospital Mullingar	1	1	1	N/A
Sligo University Hospital	1	1	1	N/A
St James's Hospital	1	1	1	N/A
St Luke's General Hospital, Carlow/Kilkenny	1	1	1	N/A
St Vincent's University Hospital	1	1	1	N/A
Tallaght University Hospital	1	1	1	N/A
Tipperary University Hospital	1	1	1	N/A
University Hospital Galway	1	1	1	N/A
University Hospital Kerry	1	1	1	N/A
University Hospital Limerick	1	1	1	N/A
University Hospital Waterford	1	1	1	N/A
Wexford General Hospital	1	1	1	N/A
Total percentage meeting standard	**100%**	**96%**	**96%**	N/A

Note: N/A - UK Quality Indicator question does not match the exact question asked in the 2021 INAS Organisational Audit Survey

CRITERION D: INVESTIGATIONS

Table 10.5 shows hospitals that met the criteria for subgroup 5: Investigations. All 'Investigations' criteria are categorised as 'Must' criteria. Emergency CT imaging was available in all hospitals (Criterion D1). The 2021 INAS Organisational Audit Survey included a question on whether digital subtraction angiography (DSA) is performed in the hospital (Question 56). However, the question did not extend to availability of DSA within a nearby stroke centre. Therefore, Criterion D2 was left blank. Table 7.1 shows that Beaumont Hospital and Cork University Hospital both have DSA in their hospitals. In addition, the survey did not assess the availability of swallowing assessment 24 hours a day, 7 days a week as, however, all hospitals did provide some level of swallow screening (Table 10.6 criterion 6), therefore Criterion D3 was left blank. Provision of this service has been identified as a key quality indicator for stroke services, as the absence of swallow screening can increase the risk of patients developing post-stroke pneumonia if they are inappropriately allowed to eat or swallow medications. The availability of neurosonology in this context is a 'Must' criterion and may limit formal accreditation of some Irish stroke centres. The issues associated with providing this service are described in the text related to criterion B above. All stroke centres could appropriately offer other described investigations in their own centre or through arrangements with other sites (Criterion D5).

CRITERION D STANDARDS

D1. Emergency CT or MRI are available 24 hours a day, 7 days a week, including imaging of cervical/intracranial vessels, and there is access within 30 minutes for candidates for acute interventional therapy

D2. DSA is available either in the hospital's stroke unit or in a nearby stroke centre.
D3. Swallowing assessment is available 24 hours a day, 7 days a week, following a written procedure.
D4. Neurosonology assessment is available within 24 hours.
D5. Investigations for establishing the aetiopathogenic diagnosis are available at the institution (Holter monitoring for at least 24 hours, as well as transthoracic echocardiography (TTE), transoesophageal echocardiography (TEE), laboratory analysis, and electroencephalogram (EEG)).

TABLE 10.5: HOSPITALS THAT MET CRITERION D STANDARDS

Hospital	Criterion[24, 25]				
	D1	D2	D3	D4	D5
Bantry General Hospital	1	N/A	N/A	N/A	1
Beaumont Hospital	1	N/A	N/A	N/A	1
Cavan General Hospital	1	N/A	N/A	N/A	1
Connolly Hospital	1	N/A	N/A	N/A	1
Cork University Hospital	1	N/A	N/A	N/A	1
Letterkenny University Hospital	1	N/A	N/A	N/A	1
Mater Misericordiae University Hospital	1	N/A	N/A	N/A	1
Mayo University Hospital	1	N/A	N/A	N/A	1
Mercy University Hospital	1	N/A	N/A	N/A	1
Naas General Hospital	1	N/A	N/A	N/A	1
Our Lady of Lourdes Hospital Drogheda	1	N/A	N/A	N/A	1
Portiuncula University Hospital	1	N/A	N/A	N/A	1
Regional Hospital Mullingar	1	N/A	N/A	N/A	1
Sligo University Hospital	1	N/A	N/A	N/A	1
St James's Hospital	1	N/A	N/A	N/A	1
St Luke's General Hospital, Carlow/Kilkenny	1	N/A	N/A	N/A	1
St Vincent's University Hospital	1	N/A	N/A	N/A	1
Tallaght University Hospital	1	N/A	N/A	N/A	1
Tipperary University Hospital	1	N/A	N/A	N/A	1
University Hospital Galway	1	N/A	N/A	N/A	1
University Hospital Kerry	1	N/A	N/A	N/A	1
University Hospital Limerick	1	N/A	N/A	N/A	1
University Hospital Waterford	1	N/A	N/A	N/A	1
Wexford General Hospital	1	N/A	N/A	N/A	1
Total percentage meeting standard	**100%**	N/A	N/A	N/A	**100%**

Note: N/A - UK Quality Indicator question does not match the exact question asked in the 2021 INAS Organisational Audit Survey

[24] The 'Must' criteria are highlighted in blue.
[25] Questions for D2, D3 and D4 were not specifically asked in the 2021 INAS Organisational Audit Survey. However, commentary is noted within this report.

CRITERION E: INTERVENTIONS AND MONITORING

Table 10.6 shows hospitals that met the criteria for subgroup E: Interventions and monitoring. In order to meet the 'Must' criteria, good access to neurointerventional therapies must be available. Two hospitals operate bypass services for thrombolysis (Criterion E5). The ESO criteria specify availability of continuous physiological monitoring using bedside monitors, as would be seen in an ED or coronary care unit (CCU). Continuous monitoring was assessed by the availability of ECG, blood pressure, and pulse oximetry monitoring at the bed side. Blood glucose monitoring and temperature are available, but they are not generally considered continuous monitoring (Criterion E8). Table 6.2 displays the detail of continuous monitoring in each hospital. Criterion E6 ('Neurosurgical and neurointerventional procedures are available 24 hours a day, 7 days a week in collaboration with the nearest stroke centre) refers to neurointerventional procedures only. The 2021 INAS Organisational Audit Survey did not seek information about neurosurgical procedures.

Many of the 'Additional' criteria relate to availability of written protocols or written standard operating procedures for a range of areas (Criterion E1). Only three hospitals (13%) reported having all of these documents for all areas. However, examples of these documents are available in many hospitals and could potentially be stored centrally and shared in order to allow development of locally specific protocols.

CRITERION E STANDARDS

E1. The stroke team establishes and follows written standard operating procedures (stroke pathways, or written protocols, which should be revised regularly) for diagnosis, nursing, rehabilitation, prevention, follow-up, and management of critical incidents.
E2. There are conceptual written protocols in relation to the Emergency Medical Service (EMS), ED, and referring institutions. The concepts are revised regularly.
E3. There are conceptual written protocols for all rehabilitation needs.
E4. The stroke team establishes and works following a defined concept for swallowing disorders.
E5. Intravenous thrombolysis is available 24 hours a day, 7 days a week. Time from ED arrival to thrombolysis (e.g. 'door to needle' time, complication rate) is assessed and documented.
E6. Neurosurgical and neurointerventional procedures are available 24 hours a day, 7 days a week in collaboration with the nearest stroke centre.
E7. Revascularisation of the carotid artery with carotid endarterectomy or stenting is available 24 hours a day, 7 days a week in collaboration with a nearby stroke centre.
E8. The infrastructure of the stroke unit allows continuous monitoring of ECG, breathing, blood pressure, pulse oximetry, and monitoring of glucose and temperature.

TABLE 10.6: HOSPITALS THAT MET CRITERION E STANDARDS

Hospital	Criterion[26]							
	E1	E2	E3	E4	E5	E6	E7	E8[27]
Bantry General Hospital	0	0	0	1	1	1	1	1
Beaumont Hospital	0	0	0	1	1	1	1	1
Cavan General Hospital	1	1	1	1	1	1	1	1
Connolly Hospital	0	0	0	1	0	0	1	0
Cork University Hospital	0	1	0	1	1	1	1	1
Letterkenny University Hospital	0	0	0	0	1	1	1	1
Mater Misericordiae University Hospital	0	1	0	1	1	1	1	1
Mayo University Hospital	0	0	0	0	1	1	1	0
Mercy University Hospital	0	0	0	0	1	1	1	0
Naas General Hospital	1	1	1	1	1	1	1	1
Our Lady of Lourdes Hospital Drogheda	0	0	1	1	1	1	1	0
Portiuncula University Hospital	0	0	0	1	0	0	1	0
Regional Hospital Mullingar	1	1	1	1	1	1	1	1
Sligo University Hospital	0	1	0	1	1	1	1	1
St James's Hospital	0	1	0	1	1	1	1	1
St Luke's General Hospital, Carlow/Kilkenny	0	1	0	1	1	1	1	1
St Vincent's University Hospital	0	0	0	1	1	1	1	1
Tallaght University Hospital	0	1	1	1	1	1	1	1
Tipperary University Hospital	0	1	0	1	1	1	1	0
University Hospital Galway	0	0	0	1	1	1	1	0
University Hospital Kerry	0	1	0	1	1	1	1	1
University Hospital Limerick	0	0	1	1	1	1	1	1
University Hospital Waterford	1	1	1	1	1	1	1	1
Wexford General Hospital	0	1	0	1	1	1	1	0
Total percentage meeting standard	**17%**	**54%**	**29%**	**88%**	**92%**	**92%**	**100%**	67%

CRITERION F: TEACHING, MEETINGS, AND RESEARCH

Table 10.7 shows hospitals that met the criteria for subgroup F: Teaching meetings, and research. None of these criteria are categorised as 'Must'. All services run MDT meetings at least weekly (Criterion F1). These meetings are considered an important element in coordinating patient care and in maintaining team communication and cohesion. Four hospitals (17%) reported not providing teaching courses and education for the team, which would be of concern in maintaining quality of care (Criterion F2). Seven hospitals (29%) were reported to have protocols and procedures on communication with patients and relatives (Criterion F3).

[26] The 'Must' criteria are highlighted in blue.

[27] Criterion E8: if the infrastructure of the stroke unit allows for continuous monitoring of ECG, blood pressure, and pulse oximetry.

CRITERION F STANDARDS

F1. Runs MDT meetings at least once a week and documents in the chart that the case was discussed by the MDT.

F2. Organises ongoing teaching courses, and professional education for all of the stroke team is warranted and documented.

F3. Patients and their families should be regularly updated about treatment and prognosis.

TABLE 10.7: HOSPITALS THAT MET CRITERION F STANDARDS

Hospital	Criterion		
	F1	F2	F3[28]
Bantry General Hospital	1	1	0
Beaumont Hospital	1	0	1
Cavan General Hospital	1	1	1
Connolly Hospital	1	1	0
Cork University Hospital	1	1	0
Letterkenny University Hospital	1	1	0
Mater Misericordiae University Hospital	1	1	0
Mayo University Hospital	1	1	0
Mercy University Hospital	1	0	0
Naas General Hospital	1	1	1
Our Lady of Lourdes Hospital Drogheda	1	1	0
Portiuncula University Hospital	1	0	0
Regional Hospital Mullingar	1	1	1
Sligo University Hospital	1	1	0
St James's Hospital	1	1	0
St Luke's General Hospital, Carlow/Kilkenny	1	0	0
St Vincent's University Hospital	1	1	0
Tallaght University Hospital	1	1	0
Tipperary University Hospital	1	1	1
University Hospital Galway	1	1	0
University Hospital Kerry	1	1	0
University Hospital Limerick	1	1	0
University Hospital Waterford	1	1	1
Wexford General Hospital	1	1	1
Total percentage meeting standard	**100%**	**83%**	**29%**

[28] Criterion F3: is based on hospitals that have a documented Standard Operating Procedure or Protocol related to communication and does not suggest that there is no communication with patient and families.

CRITERION G: NUMBERS AND QUALITY INDICATORS

Table 10.8 shows hospitals that met the criteria for subgroup G: Numbers and quality indicators. The single greatest factor in Irish stroke services failing to meet 'Must' criteria in this section are the requirements to have a minimum level of activity included in the standards. For reasons related to geography, demography and health service organisation, many Irish stroke services are not, and will probably never be, large enough to fulfil criteria on admissions (Criterion G4) and therapeutic interventions such as delivery of thrombolysis (Criterion G5). Delay to admission will always be a factor in delivering interventions, and while advanced imaging may increase the number of patients with a stroke for whom interventions are available outside the long-standing 3.0- or 4.5-hour windows, they cannot influence the natural progression of cerebral infarction or oedema.

There is evidence from international studies that increasing service size is associated with improved outcomes, but arguably these studies do not take adequate note of covariates such as unavoidable delays to admission and reduced presentation of more minor strokes to smaller, more rural services.

With regard to 'Additional' criteria, all services in Ireland can be accredited as having access to a database through their involvement in the INAS and access to the Hospital In-Patient Enquiry (HIPE) stroke audit portal (Criterion G1). Research is ongoing to review the data elements collected by the INAS while balancing the priorities of service provision and data collection; this is because the same staff members, usually clinical nurse specialists, are responsible for both. These considerations also relate to the mixed data on documentation of data elements that are not currently included on the HIPE stroke audit portal, e.g. stroke severity and National Institutes of Health Stroke Scale (NIHSS). Some data elements may be recorded outside the INAS, but this is variable where not mandated as a requirement for certification. While other countries with larger services can justify appointment of specific data collection staff for their stroke audits, issues of small service size and activity may militate against this in Ireland; the exception to this is larger services or those, like thrombectomy centres, where collection of multiple extra data items is necessary. The current dataset is currently under review as part of a research study conducted in association with the Royal College of Surgeons in Ireland (RCSI) and funded by the Health Research Board.

CRITERION G STANDARDS

G1. The stroke unit has a stroke database for quality control.
G2. Minimal overall number (n=6) of dedicated beds for patients with a stroke.
G3. Minimal number (n=4) of beds with automated monitoring.
G4. Minimal number of patients (n=200) with acute stroke treated per year.
G5. Numbers of acute treatment (intravenous thrombolysis), 'door to needle' time, type and rate of complications and number of referrals to acute intra-arterial interventions per year.
G6. Documentation of age, sex, admission stroke severity, case fatality, NIHSS score, and discharge modified Rankin Scale (mRS) score.
G7. Documentation of quality of stroke care: percentage of documented swallowing test, early mobilisation, and prevention of deep vein thrombosis (DVT).
G8. Access to a local stroke support organisation.

G9. Number of the relevant diagnostics (i.e. number of TTE/transoesophageal echocardiography (TOE) sessions, number of neurovascular ultrasound sessions, number of brain CT/MRI and computed tomography angiography (CTA)/magnetic resonance angiography (MRA) sessions).

TABLE 10.8: HOSPITALS THAT MET CRITERION G STANDARDS

Hospital	Criterion[29, 30]								
	G1	G2	G3	G4[31]	G5[32]	G6[33]	G7	G8	G9
Bantry General Hospital	1	1	1	0	1	1	N/A	1	N/A
Beaumont Hospital	1	1	1	1	1	1	N/A	1	N/A
Cavan General Hospital	1	1	0	0	1	1	N/A	1	N/A
Connolly Hospital	1	1	1	1	1	1	N/A	0	N/A
Cork University Hospital	1	1	1	1	1	1	N/A	1	N/A
Letterkenny University Hospital	1	1	0	0	1	0	N/A	1	N/A
Mater Misericordiae University Hospital	1	1	1	1	1	1	N/A	1	N/A
Mayo University Hospital	1	1	0	1	1	0	N/A	1	N/A
Mercy University Hospital	1	0	0	0	1	1	N/A	1	N/A
Naas General Hospital	1	1	0	1	1	1	N/A	1	N/A
Our Lady of Lourdes Hospital Drogheda	1	1	0	1	1	1	N/A	1	N/A
Portiuncula University Hospital	1	0	0	0	1	1	N/A	1	N/A
Regional Hospital Mullingar	1	0	1	0	1	0	N/A	1	N/A
Sligo University Hospital	1	1	0	1	1	1	N/A	1	N/A
St James's Hospital	1	1	1	1	1	0	N/A	1	N/A
St Luke's General Hospital, Carlow/Kilkenny	1	0	0	0	1	1	N/A	0	N/A
St Vincent's University Hospital	1	1	1	1	1	1	N/A	1	N/A
Tallaght University Hospital	1	1	1	1	1	1	N/A	1	N/A
Tipperary University Hospital	1	1	0	0	1	1	N/A	0	N/A
University Hospital Galway	1	1	0	1	1	1	N/A	1	N/A
University Hospital Kerry	1	0	1	0	1	1	N/A	1	N/A
University Hospital Limerick	1	1	1	1	1	1	N/A	1	N/A
University Hospital Waterford	1	1	1	0	1	1	N/A	1	N/A
Wexford General Hospital	1	0	0	0	1	0	N/A	0	N/A
Total percentage meeting standard	**100%**	**75%**	**50%**	**54%**	**100%**	**79%**	**N/A**	**83%**	N/A

[29] The 'Must' criteria are highlighted in blue.
[30] Questions for G7 and G9 were not specifically asked in the 2021 INAS Organisational Audit Survey. However, commentary is noted within this report.
[31] Results for Criterion G4 are based on the *Irish National Audit of Stroke National Report 2020*, Table 3.2: data coverage.
[32] Results for Criterion G5 are based on if a hospital collects information on thrombolysis.
[33] Results for Criterion G6 are based on if a hospital collects information on: age, sex, admission NIHSS, and discharge mRS.

SUMMARY

Despite the failure of any service to receive full marks according to a strict interpretation of the data, three Irish stroke services have obtained accreditation according to the ESO criteria. Engagement with the ESO on how standards may be interpreted or applied in the context of the Irish health service has been fruitful and has allowed some flexibility as to the application of definitions. For example, the ESO accreditation committee acknowledged specific stroke training of on-call junior doctors in medicine as an adequate alternative to a separate on-call rota. However, it is clear that criteria within the guidelines that require a minimum size of services or levels of activity can never be achieved by some units, and therefore other guidelines or accreditation criteria are needed in order to address this.

The National Stroke Programme is currently engaged with the UK's Royal College of Physicians and the UK SSNAP in the revision of the 2016 UK *National clinical guideline for stroke* (RCP, 2016) which it is hoped will become joint guidelines for the UK and Ireland. Notwithstanding issues related to Brexit and European Union membership, Ireland's stroke services remain more similar to the structure and organisation of UK stroke services than they do to most European Union member states. Moreover, the UK offers the most appropriate location for comparison of services at the current time.

The INAS Governance Committee and its partners will review these data in order to develop recommendations that will be included in the *Irish National Audit of Stroke National Report 2021*.

CONCLUSION

This is the third national audit of the organisation of stroke services in Ireland. The findings suggest that the delivery of acute stroke care has undergone significant reorganisation since the early 2000s and is continuing to evolve.

All hospitals that provide acute stroke services now have a stroke unit, which is arguably the most important intervention that can be provided to patients with a stroke (Langhorne *et al*., 2020). However, the capacity for these stroke units to provide care for all patients with a stroke for the duration of their hospital stay is limited in the majority (63%) of hospitals. Imaging modalities have increased, and in 2021 the majority (n=21, 88%) of hospitals had access to the National Integrated Medical Imaging System (NIMIS), with 54% (n=13) having access to NIMIS remotely. In 2021, there were two endovascular thrombectomy (EVT) stroke centres providing a service 24 hours a day, 7 days a week, resulting in high rates of thrombectomy in 2020, 8.6%, (NOCA, 2022). Ten Early Supported Discharge (ESD) teams are now providing rehabilitation in the home for patients with a stroke, an increase from four in 2015.

In all healthcare professions in the 24 hospitals surveyed, the number of available stroke-trained healthcare professionals continues to fall below the recommended guidelines. In 2021, 88% of hospitals had less than the recommended number of nurses per 24 hours. Furthermore, in 2021 only 11 hospitals were providing an on-call stroke team, 24 hours a day, 7 days a week and only five (21%) hospitals had access to clinical psychologists as part of stroke unit care.

In 2021, three hospitals in Ireland had ESO stroke unit certification. This report applied the criteria for accreditation to all stroke services in order to determine conformity with ESO consensus recommendations. Overall, Irish stroke services performed well against 'Must' ESO criteria, but not as well against 'Additional' criteria. It is important to note that criteria within the guidelines that require a minimum size of service or levels of activity can likely never be achieved by some hospitals due to geography, demography and health service organisation. Engagement with the ESO in how standards may be interpreted or applied in the context of the Irish health service is ongoing.

Another important finding is how stroke is defined in stroke services. There is an almost even split in terms of how stroke is defined within the participating hospitals, with 13 (54%) hospitals reporting that they use the American Heart Association/American Stroke Association definition of stroke, and 11 hospitals (46%) reporting that they use the World Health Organization definition (Table 4.2). How stroke is defined can impact on case mix, thus impacting on activity reports, audit results and outcomes. National agreement on how stroke should be classified will need to be prioritised.

The INAS Governance Committee and its partners will review these data to develop recommendations that will be included in the *Irish National Audit of Stroke National Report 2021*.

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APPENDICES

Accessing Report Appendices

National Office of Clinical Audit (2022) *Irish National Audit of Stroke Organisational Audit Report 2021* - Appendices. Dublin: National Office of Clinical Audit.

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