Acute Stroke Care in Ireland – The Role of a National Audit in Improving Care

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Dr Paul McElwaine

Department of Medical Gerontology

School of Medicine

University of Dublin

Trinity College

DECLARATION

I declare that this thesis has not been submitted as an exercise for a degree at this or any other university and it is entirely my own work except where acknowledged.

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Dr Paul McElwaine, June 2020

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Thesis Summary

“A sound mind in a sound body is a short but full description of a happy state in this world”

– John Locke, Theory of Knowledge 1690

Stroke, a potentially catastrophic condition and worldwide the third largest contributor to disability. Stroke is often described as a disease of the elderly but can affect even the very young, and despite recent advances in care, outcomes between individuals is still challenging to predict. This knowledge gap is partly reflected in our current understanding of the complexity of the neurophysiology of the human brain.

Our approach to care has often been based on pragmatic and perhaps reliance on oversimplified models of explaining this heterogenous disease. However practical approaches such as developing clear organisation of care has reflected better outcomes for patients for example through the introduction of specialty wards in the form of stroke units.

Ireland has undergone significant changes to the organisation of its stroke services since 2010 and the introduction of the National Clinical Programme for Stroke. With reference to the previous national audit of stroke (INASC), an analysis of both the organisation of care and clinical outcomes through a new cycle of national audit, the aim of this thesis is to better understand the strengths and limitations of the approach to stroke care, in the Irish context.

In chapter 1, historical context is discussed in the development of acute stroke care globally and particularly in Ireland. This chapter expands on the foundations which made the *Irish*

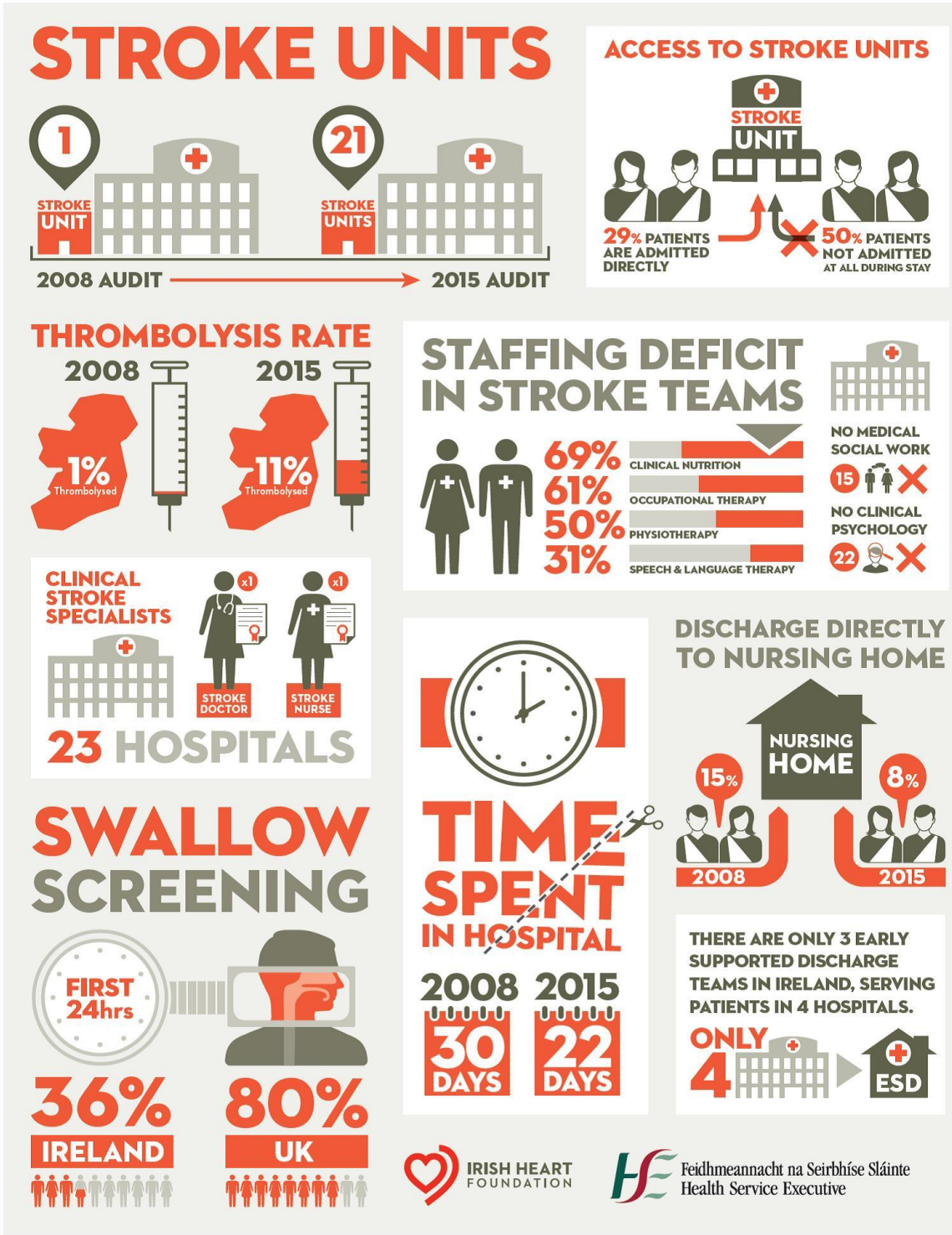
Heart Foundation/HSE National Stroke Audit 2015 feasible. The second chapter provides a shortened version of the methods, results, and conclusions of the published audit report.

In chapter 3, a comparison of two neighbouring health services is discussed with regard acute stroke care, namely the Republic of Ireland and Northern Ireland. The chapter discusses the strengths and weaknesses in assessing services based on compliance to guidelines and whether compliance equates to equitable care. Chapter 4 focuses on the delivery of a national thrombolysis service for acute ischaemic stroke and how clinical audit demonstrates the improvements in increasing access and maintaining safety despite challenges and limitations in resources.

Finally, in chapter 5 the overall implications of the findings of the *Irish Heart Foundation/HSE National Stroke Audit 2015* are discussed and how the report may inform policy at both a local and national level, while acknowledging barriers to change. The discussion highlights the need to keep the focus on improving care and patient outcomes, and that continued audit is an essential element of any national clinical programme. Ireland now provides acute stroke care comparable to most of our European counterparts. However cerebrovascular health and stroke management is a continuum from preventive strategies, acute care, secondary stroke prevention, rehabilitation, and re-enablement. Further work is needed to ensure that a person's journey of recovery to their full potential following a stroke is equitable and complete.

IRISH HEART FOUNDATION / HSE NATIONAL STROKE AUDIT 2015

The 2015 National Stroke Audit is the second audit of stroke services following the Irish National Audit of Stroke Care 2008. The 2015 audit took place in the twenty-seven hospitals which currently treat stroke patients during the acute phase of their care. The 2008 audit found that only one hospital had a stroke unit and just 1% of patients received clot-busting thrombolysis treatment. The results of the 2015 audit reveal huge progress has been made from that low base.



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Introduction to stroke and stroke care in Ireland

"The real voyage of discovery is not in seeking new landscapes, but in having new eyes”

Marcel Proust (1871-1922)

1.1 The brief history of acute stroke

Pieced together from scant references to the Hippocratic corpus around 400BC, apoplexy, the disorder of being "struck down by violence" was very poorly understood well into the second half of the last millennium. Hindered by the doctrine promoted by Galen circa 129AD that stroke is a consequence of an imbalance of the humours, it was not until the 1600s that theory surrounding cerebrovascular disease took significant steps forward.

The first notable work of the 17th Century advancing our understanding of stroke could be attributed to William Harvey (1578-1657). Building on his Lumleian lecture for the Royal College of Physicians in 1616, the published work Exercitatio Anatomica de Motu Cordis et Sanguinis in Animalibus (1628) outlined the physiological movement of blood through the circulation (1). This was revolutionary and not widely accepted, which is a common theme in medical history. However, it did inspire a conceptual change in how disease processes were perceived to occur.

Johann Jakob Wepfer (1620-1695), a Swiss physician, is widely accepted as proposing the theory of intracranial haemorrhage as a cause of stroke in his treatise Historiae Apoplecticom, coupled with suggestions that clot in blood vessels may also have a role in the disease (2). This theory was further supported by the work of Thomas Willis (1622-1675) who also proposed that apoplexy was due to intracranial extravasation of blood (3). Both men however were still limited in their theories as they held firm to Galenic principle of obstruction of "animal spirits" as the root cause of the condition, and as such was reflected in an absence of clear guidance on how to treat the condition.

Theophile Bonet's *Sepulchretum sive Anatomica Practica*, which contained 70 autopsy-based case reports of apoplexy added a large amount of practical anatomical knowledge to the area (4). Bonet also demonstrated an awareness of the therapeutic nihilism that affects sufferers of stroke still today, as quoted in Book IXX "Let him not give then over who are past hope" (5). As the 18th century progressed it was clear advances were being made in how physicians treated patients at the bedside. Although there was a slowness to accept new concepts, apoplexy was becoming more refined with a focus on the clinical presentation rather than treating it as a single disease entity. Extensive literature reviews, informed by clinical experience were being published, including *A Commentary on Apopletic and Paralytic Affections*, T Kirkland (1792) and *A treatise on nervous diseases,* J Cooke (1820) (6, 7).

Developments in vascular surgery, with the carotid artery, were occurring in parallel, primarily driven through experience in trauma and armed conflict related injuries. Sir Astley Cooper is credited with the first carotid ligation of an aneurysm in 1805 (8). However, progress was slowed, with apoplexy primarily viewed as an intracranial issue, with less appreciation of the embolic causes of the disease postulated for example by Gerard van Swieten in 1754 and refined by Hans Chiari in the early 20th century (9, 10) .

The terminology began to reflect developing expertise in the condition with cerebrovascular disease becoming more commonplace coupled with a declining use of apoplexy as a term into the early 20th century. A major leap forward in understanding of stroke as a disease can be attributed to the work of Egas Moniz and his new radiological tool *encéphalographie artérielle (11).* These cerebral arteriograms would be the mainstay of cerebral imaging until the second half of the 20th century. The modern era

of stroke care gathered pace from the 1950s, with clinical management of stroke broadly advancing in surgical, radiological, and medical disciplines.

1.2 Surgical approaches to acute stroke

Modern surgical approaches to management of stroke were intertwined with the advances in neuroimaging outlined below**.** Defining whether a stroke was haemorrhagic or ischaemic in origin produced new paradigms in approach to patient care.

With regards vascular approaches to carotid stenosis, through the 20th century and into the present day, the focus has been on refining the endartectomy procedure first performed by Michael DeBakey in 1953, identifying the patient cohort who safely benefit from the operation, and best postoperative care (12-14). Less invasive approaches now mean quicker recovery times and short length of stays in hospital.

Other surgical approaches utilized in ischaemic stroke include decompressive hemicraniectomy. The procedure was first described by Harvey Cushing in 1905 and was first reported utilized in severe cerebral infarction in 1951 (15, 16). This radical procedure is used in cases of malignant infarction of the middle cerebral artery (MCA) and can be indicated if CT evidence reveals greater than 50% infarction of the MCA territory. The procedure involves the removal of a large bone flap with the insertion of a dural patch. It aims to reduce intracranial pressure and reduce constriction on the infarcting brain tissue. Trials confirmed its benefit in reducing morbidity and mortality in a very select group of patients (17). The removal of emboli via mechanical means will be discussed in the next section, as in the Irish context, it is performed by interventional neuroradiologists.

A haemorrhagic stroke due to the spontaneous development of bleeding into the cranial vault, in the absence of trauma, and its management have been an area of strong debate for most of the second half of the 20th century into the new millennium. Although they account for a smaller proportion of strokes, intracerebral haemorrhage often has higher rates of morbidity and mortality. Most commonly caused by uncontrolled hypertension, intracerebral haemorrhage has a two-phase injury effect. Firstly, the haemorrhage itself leading to brain injury and neuronal loss and the secondary effects by the haematoma, including oedema and pressure effects.

With the momentum from McKissock's work through the 1950s and 60s, coupled with advances in neuroimaging, a few relatively small and underpowered trials attempted to show if there was a benefit in the invasive approach to haematoma management (18). Both the ISTICH and later STICH II trial failed to show a clear benefit to evacuation in supratentorial bleeds (19, 20) . There are however some optimism around more minimally invasive approaches. Intracerebellar bleeds are an indication for surgical intervention, prompted from the smaller cavity in which the bleed occurs. The placement of extraventricular drains is also a surgical treatment option in certain instances where intraventricular haemorrhage and/or hydrocephalus is present.

Clinical decisions on the need for intervention has been based on a deterioration in a patient's neurological status. With neurosurgical teams often not being available in most stroke centres, as is the case in Ireland, this presents significant challenges which may be evident within this thesis.

1.3 Radiological approaches to acute stroke

Radiological advances were major drivers of new approaches to the diagnosis and management of stroke. Firstly, ultrasound imaging was first adopted in a clinical setting by a Scottish gynaecologist, Ian Donald, who would publish his findings in 1958 (21). The development of ultrasound lead to a safe, non-invasive method for assessing the external carotid vessels. In 1967 Geoffrey Hounsfield, an engineer, developed the concept of a commercially viable form of computed tomography (CT) imaging, with the first clinical CT scan being performed on the 1st of October 1971 in Atkinson Morley Hospital in London (22). The CT scanner was a "game changer" for stroke care with the ability to differentiate ischaemic and haemorrhagic stroke in a relatively expeditious fashion. American chemist Paul Lauterber provided the first magnetic resonance image (MRI) of a test tube of water. His work was built upon by Peter Mansfield, who performed the first human scan in 1977. By the early 1980s the first MRI scanners were appearing in hospitals (23). In 2003 Lauterbur and Mansfield shared the Nobel prize in Physiology or Medicine for their work in the development of this revolutionary imaging technique.

1.4 Medical approaches to acute stroke

With the increased recognition of stroke as a clinical syndrome with the support of advances in imaging, and differentiation from other common neurological conditions such as epilepsy, specific acute management targets evolved. The focus being the limitation of the damage caused by the insult, whether it be haemorrhage or ischaemic in nature, reestablishment of homeostasis and recovery of function.

1.4.1 Medication and treatments

The work of Dr Henry Barnett in the 1970s supported the use of aspirin in the prevention of ischaemic stroke and was reinforced in the Chinese Acute Stroke Trial for reduction in recurrent stroke (24, 25). Various combinations of antiplatelet and anticoagulants have been used in acute stroke often straddling the risk/benefit margins with regard haemorrhage complications. Yet aspirin, in those tolerant of same, has persevered as the first line agent in acute ischaemic stroke in many parts of the world.

Antihypertensive agents have a role in primary and secondary prevention of stroke and a more nuanced role in the management of hyperacute and acute stroke. Acute and aggressive blood pressure responses within the first 24 hours of stroke onset should be avoided and antihypertensive therapy is recommended only for patients presenting with acute ischemic stroke and blood pressure > 220/120 mmHg or those with blood pressure > 185/110 mmHg who are eligible for therapy with thrombolysis as discussed below (26). By contrast, recent clinical trials showed that intensive blood pressure reduction to levels < 140 mmHg for systolic blood pressure is safe and lowers the risk of haematoma expansion in patients with acute intracerebral haemorrhage and this blood pressure target is recommended by current international guidelines (27).

Glycaemic and temperature control are important facets of care, with the aim to achieve a steady state in which the person can begin to recover and minimise tissue injury. Various neuroprotectant agents, for example magnesium sulphate, N-Methyl-D-Aspartate receptor antagonists and nimodipine, have been trialled in the acute setting, with disappointing translation of initial preclinical research to solid clinical outcomes

(28-30). The benefit of statins in acute ischaemic stroke is still not clear although meta-analysis would appear to support its use (31).

1.4.2 Overview of the use of thrombolytics in stroke

Early experience of the use of thrombolytic use came in the management of acute myocardial infarction. However building on the work of TG Brott, in 1996 the FDA approved the use of tissue plasminogen activator (tPA) in the treatment of acute ischaemic stroke following the NINDS tPA Study Group trial (32). This prompted a new wave of interest in stroke research with several randomised control trials. Success of the initial trials lay in no small part to the large numbers of patients who were treated early from symptom onset in the context of robust clinical trials, thus presenting a new challenge to clinicians in routine practice.

Further studies aimed to show the limits of benefit both from time of symptom onset and the degrees of severity, mild or severe, depending on the National Institute of Health Stroke Scale (NIHSS), a validated assessment tool, offset by minimising risk of spontaneous intracranial haemorrhage (sICH). Sometimes misappropriating Heisenberg's uncertainty principle, but more accurately a perceived observer effect, clinicians were slow to accept the clear benefits of tPA. Now with over 20 years' experience the benefits and safety are clear (33). What remains is the larger challenge of optimising the early delivery of the drug which is a fundamental observation of this thesis. The where, the when, and by who are important questions which apply to all aspects of stroke care but most apparent in hyperacute stroke, further underpinned by the recent expansion of mechanical thrombectomy services.

1.4.3 Stroke units and rehabilitation

The stroke unit has developed into a fundamental anchor of care for all types of acute stroke. The numbers needed to treat (NNT) to prevent one death or dependent outcome is 16 which compares favourably to thrombolysis of approximately 8. It can benefit all types of stroke as opposed to certain subtypes.

Although it is unclear what specific element brings the strongest weight to stroke unit care's benefit, the organisation of all processes and centralisation of skills and knowledge has led to better outcomes for stroke patients (34). Stroke physicians continue to push for need to protect specialist beds in acute hospitals in an increasingly demanding environment. This thesis will discuss that challenge in greater detail.

1.4.4 Mechanical Thrombectomy

At the time of undertaking of the thesis, mechanical thrombectomy became a more viable and clearly beneficial treatment modality for certain types of acute ischaemic stroke. A number of trials tested the efficacy of retrieval devices, and demonstrated impressive benefits with a NNT of between 3-7 in appropriately selected patients (35). This surge in need for a specialist stroke service further emphasised the challenges in delivering an equitable and timely service to the greatest number of people, again in the backdrop of a severe recession. Although the role of mechanical thrombectomy will not be discussed at length, the challenges have considerable overlap with general hyperacute stroke care i.e. thrombolysis and immediate access to specialist beds and staff will be explored further.

1.5 Epidemiology of stroke

Presenting a global perspective on stroke epidemiology has proven challenging due to a lack of readily accessible comparative data (36). Differences in prevalence, incidence and mortality vary considerably from region to region, or there is a complete gap in data. This is the consequence of several factors including but not limited to, environmental exposure, risk factors, lifestyle, genetics, stroke management practices and the methodology of statistical reporting.

Globally 56 million people died in 2012, 6.7 million was stroke related which is 1 million more people than it was in 2000 (37). Nationally each year, approximately 7,000-8,000 Irish people have a new stroke and around 2,000 people are reported to die as per CSO vital statistical data – more deaths than breast cancer, prostate cancer and bowel cancer combined with a further estimated 30,000 people are living in the community with disabilities as a result of a stroke.

Broadly speaking the global total crude incidence of stroke is approximately 100-200 per 100000. Stroke being characterised as either an ischaemic or haemorrhagic event, which is an oversimplification of a heterogenous condition. This incidence varies for several reasons as mentioned above but also on the impact of risk factors, both unmodifiable and modifiable factors.

1.5.1 Unmodifiable risk factors

The incidence of stroke doubles with every decade beyond the age of 55 years and is more common in women largely since women live longer (38). Ethnicity impacts on risk, with African Americans having double the risk of their Caucasian counterparts (39). A

positive family history increases the risk of stroke, with a trebling of risk seen in people with a positive paternal history (40).

1.5.2 Modifiable risk factors

Although stroke is common it is also caused by several readily treatable risk factors. Investigators identified that globally ten potentially modifiable risk factors accounted for 9 out of 10 strokes (41). Hypertension is the most common modifiable risk factor which increases the relative risk for stroke between three to five-fold, with a prevalence ranging between 25-40%.

Smoking, which has a prevalence of around 20-40%, increases risk by 50-150% and has worrying trend of increasing consumption in developing countries, where overall stroke incidence is on the increase.

Other risk factors include diabetes, dyslipidaemia, physical inactivity, alcohol excess, atrial fibrillation, carotid artery disease, and less commonly obstructive sleep apnoea, migraine, and elevated homocysteine levels.

1.5.3 Cost of stroke

With the total global health care spend in the region of $6 trillion, it is estimated $863 billion spent on CVD including stroke. Projections put the potential cost of global health care by 2030 to over $40 trillion dollars with CVD and mental health being two of the largest drivers of cost (42).

Through research by the Economic and Social Research Institute (ESRI) in Ireland, it was estimated the mean direct cost per stroke patient for incident cases in the first year of stroke was approximately €18,751 in 2007. Nationally the direct costs due to stroke account for an estimated 2-4% of the total health budget, greater than €1 billion euros. Within that 40% goes toward residential care costs, further underpinning the need to better resource the hyperacute and acute stroke services in order to improve the outcome of dependency poststroke (43).

1.6 Stroke organisation and organisations

Stroke care was often subsumed or under prioritised in comparison to cardiovascular disease or cancer. The development of stroke specific organisations helped advance research, guidelines, and patient advocacy.

1.6.1 International organisations

Bore out of a need to manage the complex neurological issues facing returning war veterans, the National Institute of Health in the US set up the National Institute of Neurological Disorders and Blindness (NINDB) in 1950, which was changed in 1960 to the National Institute of Neurological Disorders and Stroke. The change came after Joseph Kennedy, father of then President JFK, suffered a stroke. This event highlighting the tentative balance that political capital can play in the advancement of one agenda over another. The NINDS was responsible for the advancement of thrombolysis as a therapy and developed the NIHSS, the now ubiquitous tool for assessing acute stroke.

Stroke continued to strengthen its international position with the formation of the International Stroke Society in the 1980s and the World Stroke Federation in the 2000s. These two groups would merge to form the World Stroke Organisation (WSO) to promote stroke awareness, foster best standards of care, influence health policy, and drive prevention strategies.

Groups such as the American Heart Association and the European Stroke Organisation continue to drive innovation, guidelines for care, and dissemination of research.

1.6.2 National organisation

Closely following the formation of the British Heart Foundation (1961), the Irish Heart Foundation (1966), has nationally helped advocate for better care for stroke patients and inform the policies of health care with an emphasis on prevention.

The Irish Heart Foundation (IHF) advocates for better stroke services and care in both hospitals and the community. The IHF developed the Stroke Council, an expert group that provides comprehensive advice and information to the IHF on issues surrounding stroke. The IHF also funded the first ever audit of stroke services in Ireland in 2008.

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

- National rapid access to best-quality stroke services
- Prevent 1 stroke every day
- Avoid death and dependence in 1 patient every day

These aims were targeted through the provision of funding, to develop infrastructure and specialist posts within the stroke service nationally, specifically the development of a national programme for thrombolysis therapy, the creation of designated stroke units on sites managing acute stroke patients and the recruitment of medical, nursing and health and social care professionals (HSCP) with specialist knowledge in stroke (44, 45). In 2011, €4.2m reconfigured funding, from the Acute Hospital Division budget, was provided to support the implementation of the programme objectives.

From the outset the NSP established baselines from which the implementation of the programme can be evaluated. A baseline Hospital Emergency Stroke Services Survey was carried out in 2010 along with a review of workforce. With the changes and progress that have been made in recent years, it was vital that the stroke service underwent a repeat clinical audit to establish the current situation.

- The establishment of acute hospitals into a small number of groups each with its own planned governance and management structure, aims to provide an optimum configuration for hospital services to deliver high quality, safe patient care in a cost-effective manner (table 1.1).

Ireland East	Dublin Midlands	RCSI Hospitals	University of Limerick	South/ Southwest	SAOLTA
Mater Misercordiae University Hospital	St James's Hospital	Beaumont Hospital	University Hospital Limerick	University Hospital Waterford	University College Hospital Galway
St Vincent's University Hospital	Adelaide, Meath, National Children's Hospital	Our Lady's of Lourdes Hospital Drogheda	Ennis General Hospital	South Tipperary General Hospital	Portiuncula Hospital
Midland Regional Hospital Mullingar	Naas General Hospital	Cavan General Hospital	Nenagh General Hospital	Cork University Hospital	Mayo General Hospital
Wexford General Hospital	Midland Regional Hospital Tullamore	Connolly Hospital Blanchardstown	St John's Hospital	Kerry General Hospital	Sligo General Hospital
St Luke's Hospital, Carlow Kilkenny	Midland Regional Hospital Portlaoise	Louth County Hospital		Mercy University Hospital	Letterkenny General Hospital
Our Lady's Hospital Navan				Bantry General Hospital	Roscommon General Hospital
St Colmcille's Hospital				Mallow General Hospital	

Table 1.1: Hospital Groups 2015

1.6.3 National Stroke Audits

NICE guidelines define clinical audit as a process of quality improvement that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the implementation of change (46). Clinical audit developed through a combination of recognition of deficiencies and variability in quality of care, and healthcare professionals identifying the need to assess their own practice against evidence-based best practice. Initial criticism of clinical audit, such as perceived weakness in methodological processes and onerous data collection on staff, rescinded with the clear benefits to clinical care that robust audit brought to patients and healthcare professionals (47).

In recent decades stroke audit has been a frontrunner in the use of both organisational and clinical audit. The UK experience, starting with the National Sentinel Stroke Audit (NSSA) in 1998 to the development of the Sentinel Stroke National Audit Programme (SSNAP), showed that by developing a national audit, improvement in care could be stimulated by the process itself (48). It is also inspired other jurisdictions to attempt similar national stroke audits including Australia and Ireland as outlined below (49, 50).

Clinical audit has complimented national stroke registries, which are in operation in varying forms in several countries. In a systematic review of these registries, the majority of which were established in the early to mid-2000s, the primary aim was to monitor acute stroke care. Through reporting of the data collected, they have led to improvement in quality of care, patient outcomes, and health policy.

Starting with the RIkkstroke in Sweden in 1994, which had full coverage of hospitals by 1997, the registries have developed using differing methods. The Finnish registry,

PERFECT Stroke, avoided the challenge of cumbersome data collection due to the advantage of every patient having a unique identifier leading to ease of database linkage. In Ontario, Canada, a waiver of consent was approved to its population to avoid any biases within the data for public interest. National stroke registries were felt to be complimentary to active improvement programmes in the respective country and also offered a suitable proxy for important epidemiological measures in areas where stroke incidence and mortality was limited (51).

1.6.4 INASC

The Irish National Audit of Stroke Care (INASC) which was published in 2008 demonstrated severe limitations in stroke care in Ireland. The audit consisted of six parts: an organisational study; a clinical audit; general practitioner (GP) survey; public health nurse (PHN) and allied health professional (AHP) survey; nursing home survey; patient/carer survey. It was a wide ranging in its review of stroke services in Ireland, but some key findings were highlighted within the report.

Most starkly it was determined that only one hospital had a stroke unit. The audit highlighted limited access to acute interventions such as thrombolysis. Acute rehabilitation was only available to one in four patients with noted delays in access which reduce the interventions effectiveness. Continuing care and long-term recovery programmes were poorly organised or did not exist.

The patient journey was not coordinated in a way that would provide best clinical outcomes and was described as haphazard. Ultimately the report concluded that people were dying and being left disabled due to stroke in Ireland unnecessarily.

1.7 Conclusion

Stroke is a complex heterogenous disease that requires many facets in order to provide quality care, not least of which is organisation of care. INASC stimulated change as highlighted above, but it is essential in the clinical audit cycle to reaudit. The repeat audit, the Irish Heart Foundation/HSE National Stroke Audit 2015, forms the backbone of this thesis. Through organisation of services and collaborative practice, Ireland has developed a stroke service comparable internationally. The following chapters aim to provide evidence to support this observation.

2 Chapter Two

National Stroke Audit of Acute Stroke Care

Findings of this chapter are a shortened summary and were originally published in the full report *Irish Heart Foundation/HSE National Stroke Audit 2015 ISSN 978-1-78602-006-2*

Appendix A

"Start by doing what is necessary; then do what is possible;

and suddenly you are doing the impossible”

– St. Francis of Assisi

2.1 Abstract

2.1.1 Background

The 2008 Irish national audit of stroke service (INASC) showed large deficits in service provision and access. A national stroke programme emerged to develop services and address these deficits. The country suffered a severe economic recession with a 23% reduction in health funding between 2008-2014**.** We undertook a second national audit to reassess the impact of the national stroke programme.

2.1.2 Methodology

Twenty-seven sites participated with each of the participating sites managing at least 20 new patients with stroke per annum.

Two components:

1) An audit of the organisational aspects of stroke care in acute hospitals, involved the completion of a proforma detailing the structure of the stroke service on site in advance of a site visit by the audit team.

2) A clinical audit of stroke care involved the review of clinical case notes for a selected national sample of patients with stroke. The cases were reflective of the care provided to patients discharged during periods in 2014. In total 874 cases were included in this audit.

The results were compared against the findings of INASC 2008 and the Sentinel Stroke National Audit Programme (SSNAP) UK 2014.

2.1.3 Results

In the 2015 audit 27 hospitals admitted acute stroke patients compared with 37 hospitals in 2008. 21 sites (78%) provided stroke unit care, compared with 1 unit (3%) in 2008 ($p<0.001$, Chi square). Only 29% of patients were admitted directly to a stroke unit and 54% spent some time in a unit during their admission.

The number of stroke unit beds available nationally at the time of the audit was 150. However, 61% of inpatients with a stroke at the time of the audit were being managed on a ward other than a stroke unit.

24/7 access to CT was available in all hospitals (78%, 2008 $p<0.05$). Specialist physicians and nurses in 23 sites (85%) increased from 14% in 2008 ($p<0.001$). 11% of nonhaemorrhagic strokes were thrombolysed compared with 1% in 2008 ($p<0.001$).

Average length of stay reduced from 30 days to 22 days, with a reduction in newly institutionalised patients to residential care down from 15% to 8% ($p<0.001$). Inpatient mortality rate dropped from 19% to 14% ($p<0.01$).

A deficit in the availability of rehabilitative therapists exists, with deficits of 61%, 50%, and 31% for OT, physiotherapy and SLT respectively when compared to recent guidelines.

2.1.4 Conclusions

The National Stroke Audit 2015 provided a snapshot of the acute service available in Ireland. It provides vital information for planning and development both at local and national level. Overall, the audit found reorganisation of services, and recruitment and training of specialist staff improved service provision and outcomes for stroke patients in Ireland.

2.2 Background

Stroke is a leading cause of death and disability worldwide. It is estimated that cerebrovascular diseases account for up to five percent of total global healthcare costs (52, 53). 7,000 people in Ireland are hospitalized following stroke each year, of whom approximately about 20% die as in-patients per year (54). Evidence based stroke care reduces death and disability cost effectively (34). However, effective stroke care will only occur if the organisational structure allows and facilitates the delivery of the best treatments at the optimal time (55). Improved outcomes for stroke patients have been a policy priority for the HSE as evidenced by the implementation of the national stroke programme since 2010.

There have been important changes in the organisation and delivery of healthcare in general within the HSE since 2008 as outlined in the previous chapter. This chapter will outline key findings of the National Stroke Audit 2015. An emphasis on findings pertinent to hyperacute stroke, the early hours, and days, will be explored in more detail in further chapters.

2.3 Methodology

2.3.1 Overview of audit

The objective of the audit of acute stroke services was to establish the current level and functioning of services for the care of stroke patients in acute hospitals in the Republic of Ireland. The audit of acute hospital services had two components:

i. An audit of the organisational aspects of stroke care in acute hospitals regarding their resources for organised stroke care

ii. A clinical audit of stroke care involving the review of clinical case notes for a selected national sample of consecutive patients with stroke during a defined period.

The audit followed a very similar method and structure to INASC 2008 in order to allow for comparison(50). The organisational audit assessed the organisational structures within Irish hospitals using self-reported survey and site visit data collection. The clinical audit encompassed a large national survey of almost 900 clinical cases involving all hospitals managing acute stroke patients. Where appropriate the results are compared with INASC 2008 and the Sentinel Stroke National Audit Programme (SSNAP) UK 2014 audit of stroke care(56).

2.3.2 Evidence on best practice in acute stroke care

Acute stroke service performance was measured against recognised standards and guidelines. For the most part the findings were measured against the Irish national guidelines, *Irish Heart Foundation: Council for Stroke, National Clinical Guidelines and Recommendations for the Care of People with Stroke and Transient Ischaemic Attack March 2010*. However where the standard or guideline had changed significantly or where Irish guidelines were not available other sources were referenced from the UK and internationally including *National clinical guideline for stroke, Royal College of Physicians, Fourth Edition 2012, British Association of Stroke Physicians (BASP), Stroke Service Standards, Clinical Standards Committee, June 2014* and the *European Stroke*

Organisation (ESO) Recommendations to Establish a Stroke Unit and Stroke Center 2013;44:828-840 (55, 57, 58).

2.3.3 Organisational audit proforma

The organisational audit proforma (appendix) was adapted from the INASC 2008 validated proforma, the Royal College of Physicians London (RCPUK) National Sentinel Stroke Audit 2004 Organisational Audit Proforma, and with minor modifications for the Irish setting and incorporating recent changes in guidelines. Expert opinion on the content of the questionnaire was provided by the National Stroke Audit Steering Group (Appendix A). The tool was piloted in August 2014 with good geographic representation.

2.3.4 Clinical Audit Proforma

The clinical audit tool proforma was an adapted version of the validated tool of the Royal College of Physicians London (United Kingdom) (RCPUK) National Sentinel Stroke Audit 2006 Clinical Audit Proforma (Appendix A). The tool had modifications to reflect the Irish setting and recent changes in guidelines and was reviewed by the National Stroke Programme Specialist Working Group.

2.3.5 Recruitment and Eligibility

Each hospital group (table 1.1) comprises between four and seven hospitals, each including at least one major academic teaching hospital. The National Stroke Audit aimed to recruit all hospitals admitting over 20 acute stroke patients per year. The identification of eligible hospitals was based on data from the National HIPE Office. Communication of the National Stroke Audit commenced in December 2014 with letters sent to each Clinical Director, Director of Nursing, Clinical Stroke Lead and Hospital Manager/CEO, inviting them to participate in the audit.

2.3.6 Data collection

Health care professionals responsible for stroke services at each site completed the organisational proforma between December 2014 and January 2015. Each hospital was assigned an individual site code to ensure confidentiality. The completed proforma was returned to the project team.

On return of the proforma a date was arranged for a visit to the site. Teams of three people performed the site visits (Appendix). The teams comprising of a national stroke programme clinical lead, a member of the project team; and a senior nurse or senior HSCP from the national stroke audit steering group. Representation from hospital management, clinical teams and multidisciplinary teams were invited to attend the meeting. The visits took place 5th February to the 31st March 2015 and involved a review of the completed organisational proforma and a visit to the stroke unit if present and to the emergency department.

For the clinical audit local chart auditors were identified through the stroke physician/clinical lead or stroke clinical nurse specialist at each hospital and by means of contact with relevant hospital departments. The chart auditors were provided with written and digital resources for training in use of the audit tool. A helpline was available to support auditors.

The clinical audit sample included consecutive cases discharged with a primary diagnosis of stroke (ICD 10 codes: I61, I63 and I64, including subcategories) during the specified six-month period: ***1 January 2014 – 31 March 2014 and 1 July 2014- 30 September 2014***.

Inclusion criteria were as follows: Admitted with a primary diagnosis *of* Intracerebral Haemorrhage (I61), Cerebral Infarction (I63), Stroke, not specified as haemorrhage or infarction (I64).

Exclusion criteria were as follows: Cases with subarachnoid haemorrhage (I60); subdural and extradural haematoma (I62); cases related to readmission of a previous event or complications of a previous stroke.

The chart numbers overall allowed for a national representative sample including thrombolysis of ischaemic stroke. Total cases per hospital are decided based on volume of stroke admissions (Table 2.1)

Data was comparable with INASC 2008 and the UK Sentinel Stroke audit. Completed data tools were collected by the project team for analysis. The project team performed reliability testing on a proportion of charts from randomly selected hospitals in each group in the form of a reaudit of a sample of 6% of total charts.

2.3.7 Data management and analysis

The project used clinical audit protocol, approved by National Stroke Audit Steering Group. There was no impact with patient care. As advised by National Hospitals' Office from previous INASC 2008, review for all protocols was provided by the expert steering group, with individual hospitals having option to address any local issues with its ethics committee if necessary. Ethical issues relating to data management and protection were discussed with the AMNCH/ St James' Hospital Research Ethics Committee. In advance of the audit, the National Hospitals Office of the Health Service Executive and the Chief Executive Officers of the relevant hospital's permission was obtained.

Security and confidentiality were maintained using passwords. All data were fully anonymised after quality assurance/ reliability testing had taken place. Individual hospital data were confidential to the researcher and the submitting hospital. The data from the proforma were transferred from hardcopy to digital format. Data management and processing was assisted by an ISO accredited data management company. Access to data was restricted to members of the project team. All files both digital and hardcopy were securely stored in a swipe access office with locked filing cabinets and password protected PCs. All sites contributing to this phase of the audit were provided with an interim report of the provisional findings.

2.3.8 Limitations

This was an audit of acute stroke care and as such did not evaluate the patient journey once discharged. However, a follow up audit on rehabilitation following an acute stroke was undertaken which highlighted deficits and heterogeneity in care in the post-acute stroke rehabilitation period (59).

With an audit dependent on medical records for evidence it must be acknowledged that the clinical notes may not fully reflect the care received. The absence of evidence of care meeting guidelines may not always mean that care was suboptimal but may reflect how data is recorded. Equally the meeting of certain criteria may not reflect quality of care but only acknowledges the occurrence of an event.

Patient Numbers	Stroke Admissions <100/yr.	Stroke Admissions 100-150/yr.	Stroke Admissions 150-200/yr.	Stroke Admissions >200/yr.
Minimum Charts to be audited	25	30	35	40

Table 2.1: Suggested chart numbers reviewed as per annual stroke admission

2.4 Summary of key results of audits

2.4.1 Hospital participation in audit process

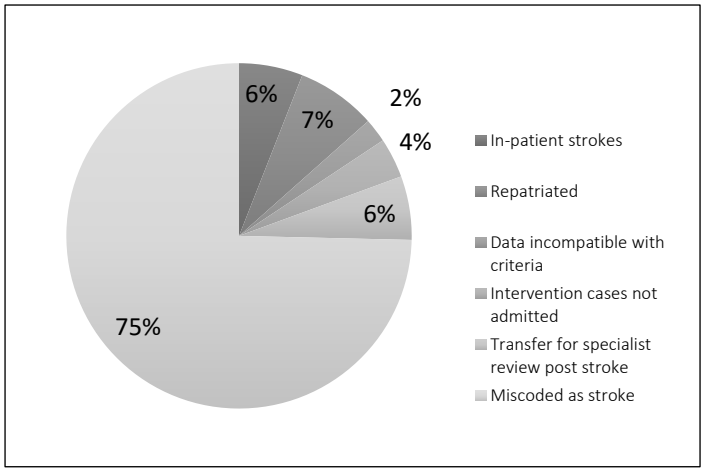
All hospital groups were represented and 100% (34/34) of hospitals responded resulting in a total of 79% (27/34) being eligible to participate. It was noteworthy that only one of the hospitals in the University of Limerick group was eligible to participate due to reconfiguration of services (Table 2.2). The total number of acute hospital beds reported from responses to survey at the audit time period was 10,005.

The completion of the organisational audit proforma was the responsibility of the clinical lead for stroke, if present, with contributions from the clinical nurse specialist, the multidisciplinary team and hospital management. In addition, the site visit from the national stroke audit team facilitated a review and clarification of any data points.

Hospitals accepting the care of at least 20 acute stroke patients per year were invited to participate in the clinical audit. The number of clinical charts each hospital was asked to review was based on the annual stroke admissions for that hospital as documented in the HIPE report 2014.

The auditors reviewed charts from a list created by the HIPE coding office. A proportion of charts were outside the inclusion criteria as set out in the methodology. These cases were excluded, and further charts requested for review (Fig. 2.1). In total 1010 cases were reviewed by auditors, 13% (136) were excluded. Miscoding of cases, inpatient strokes and patients admitted as repatriation admissions made up most excluded cases (Table 2.3).

Figure 2.1: Charts reviewed but not used



All members of the multidisciplinary team were invited to participate, and the numbers of auditor disciplines reflect a good mix of participants. Each hospital was requested to designate a lead auditor responsible for the execution of the chart review. The clinical nurse specialists fulfilled this role in 19 of the 27 sites. In the remaining 8 hospitals, 3 clinical leads for stroke led out, 1 clinical director, 1 medical registrar, 1 occupational therapist, 1 director of nursing. One hospital had no staff participation and the project team completed the chart review. In total 89 clinical professionals took part in the clinical audit. (Appendix A)

Table 2.2: Hospital groups' participation and bed numbers

	Number of hospitals in group N	Number of hospitals eligible to participate n (%)	Number of acute hospital beds reported n
Ireland East	7	6 (86)	1736
Dublin Midlands	5	5 (100)	2145
RCSI Hospitals	5	4 (80)	1844
University of Limerick	4	1 (25)	437
South/Southwest	7	6 (86)	2073
Saolta	6	5 (83)	1770
Total	34	27 (79)	10005

Table 2.3: Hospital participation

Group name	Hospital name	Synonym	Cases = n
Ireland East	Mater Misercordiae University Hospital	MMUH	40
	St Vincent's University Hospital	SVUH	40
	Midland Regional Hospital Mullingar	MRHM	34
	Wexford General Hospital	WGH	30
	St Luke's Hospital, Carlow Kilkenny	SLHK	30
	Our Lady's Hospital Navan	OLHN	21
Dublin Midlands	St James Hospital	SJH	37
	Adelaide Meath National Children's Hospital	AMNCH	36
	Naas General Hospital	NGH	35
	Midland Regional Hospital Tullamore	MRHT	24
	Midland Regional Hospital Portlaoise	MRHP	22
RCSI Hospitals	Our Lady of Lourdes Hospital	OLOL	41
	Cavan General Hospital	CGH	28
	Beaumont Hospital	BH	41
	Connolly Hospital	CH	25
University of Limerick	University Hospital Limerick	UHL	40
South Southwest	University Hospital Waterford	UHW	35
	South Tipperary General Hospital Clonmel	STGH	37
	Cork University Hospital	CUH	35
	Kerry General Hospital	KGH	30
	Mercy University Hospital	MUH	30
	Bantry Hospital	BGH	25
Saolta	University College Hospital Galway	UCHG	28
	Portiuncula Hospital	PH	26
	Mayo General Hospital	MGH	35
	Sligo General Hospital	SGH	35
	Letterkenny General Hospital	LGH	34
			Total= 874

2.4.2 Demographics

With the projected increases in the age profile of the nation and the age divide with regard access to services for the younger person with disability, the age and gender profile of the current audit is compared with INASC in 2008 and also with the SSNAP UK in 2014 (Table 2.4).

Of the 874 cases audited, 57% (n=499) were male and 41% (n=360) female. The mean age was 73.3 years and the median were 76 (range 22 - 102 years). Almost a quarter (24%) of cases were under 65 years of age, which is a rise from 19% in INASC 2008 and 37% were over 80 years. Females with stroke were older than males with a mean age of 77 versus 71. Age related data was missing in 2% (15) of cases.

Table 2.4: Age profile-National Stroke Audit 2015 and SSNAP 2014

National Stroke Audit 2015					
	<60	**60-69 years**	**70-79 years**	**80-89 years**	**90+**
Male n=499	19.2% (96)	24.2% (121)	30.1% (150)	22.7% (113)	3.8% (19)
Female n=360	10.3% (37)	13.6% (49)	24.7% (89)	38.6% (139)	12.8% (46)
Totals	15.5% (133)	19.8% (170)	27.8% (239)	29.3% (252)	7.6% (65)
SSNAP UK 2014					
	<60	**60-69 years**	**70-79 years**	**80-89 years**	**90+**
Totals	14.2% (10532)	16% (11866)	26.5% (19710)	32.2% (23913)	11.2% (8286)

Table 2.5: Accommodation at discharge of patients discharged alive

	National Stroke Audit 2015 n754 **% (n)**	**INASC 2008 n1670** **% (n)**
Home	63 (472)	56 (931)
Residential nursing home	13 (98)	19 (324)
Hospital	6 (44)	12 (204)
Off-site rehabilitation	19 (140)	N/A
Other	N/A	8 (127)
Missing	0	5 (84)

2.4.3 Outcome Measures

Newly institutionalised patients to residential care was 8% in the 2015 audit compared with 15% in INASC 2008. The average length of stay for patients discharged alive from hospital was 22.4 days versus 29.8 days in 2008.

Table 2.6: Length of hospital stay

	National Stroke Audit 2015	**INASC 2008**	**SSNAP 2014 ***
Length of stay to discharge alive	Mean 22.4 days	Mean 29.8 days	Mean 17.3
	Median 11 days	Median 14 days	Median 7.2 days
	IQR 6-23 days	IQR 7-30 days	IQR 3-21.1 days
Length of stay to death	Mean 33.4 days	Mean 26 days	N/A
	Median 9days	Median 9days	
	IQR 3-20 days	IQR 3-24 days	

* Length of stay includes length of stay to death

The inpatient mortality rate of 14% compared favorably with the 19% rate found in INASC 2008. Of the patients who died, they were notably older than the national mean for all patients audited and had a higher proportion of females (Table 2.8). This cohort of patients also had higher level of dependency and contained a higher proportion of people residing in nursing home care.

Table 2.7: In hospital mortality

	Deaths n=121	**National total n=874**
Age	80.7	73.3
Male: Female	0.78:1	1.39:1

Table 2.8: Mortality age and gender profile

	National Stroke Audit 2015 **% (n)**	**INASC 2008** **% (n)**	**SSNAP 2014** **% (n)**
Died in hospital	14 (121)	19 (408)	15.3 (10193)

Table 2.9: Preadmission dependency in mortality group

	Deaths n=121	**National total n=874**
Preadmission independent in ADLs	55%	80%
Preadmission living in nursing home	15%	7%

2.4.4 Thrombolysis

In prehospital care of stroke, the adoption of the FAST assessment tool has become the standard and all 27 sites had specific arrangements in place for the rapid transfer of acute stroke patients to hospital. The estimated national thrombolysis rate of 11% was comparable favorably with international rates. Patients receiving thrombolysis included a broad age range and level of dependency and outcome measures were favouring a safe delivery of the service with a mortality rate of 11% (Table 2.10). A more detailed review of how thrombolysis is delivered in Ireland is discussed in chapter 4.

Table 2.10: Thrombolysis group outcomes versus overall national group

	Thrombolysed n=81	**National total n=874**
Age	71.4 (36-93)	73.3 (22-102)
Male: Female	1.13:1	1.39:1
Median length of stay (days)	13.5	11
Preadmission independent in ADLs	83%	80%
Preadmission living in nursing home	7.4%	7%
New admissions to nursing home	7.4%	
Mortality	11.1%	13.8%

2.4.5 Imaging and diagnostics

Access to CT was available 24/7 in all hospitals managing patients with acute stroke (Table 2.11). The quality of CT scanners varied nationally with implications for the provision of assessment for endovascular intervention (clot retrieval). Availability to MRI had not improved substantially since INASC 2008. A higher proportion of patients were undergoing CT imaging when compared with INASC 2008. Almost 70% of patients had their scan performed within 24 hours of arrival to hospital (Table 2.12). Access to other modalities of imaging to assist with diagnosis, aetiology and prognosis showed a wide range of access both regionally and within hospital groups (Table 2.13).

Table 2.11: Emergency imaging access

	National Stroke Audit 2015	**INASC 2008**	**SSNAP 2014**
CT 24/7	100% (27/27)	84% (31/37)	99% (165/167)
Emergency MRI access <24hour	48% (13/27)	32% (12/37)	N/A

Table 2.12: CT Scanning for acute stroke

	National Stroke Audit 2015 % (n)	**SSNAP 2014 % (n)**	**INASC 2008 % (n)**
Number of patients scanned	98.9 (862)	98.6 (73231)	93 (2028)
CT scan within 24 hours	69.8 (610)	N/A	40 (867)

Table 2.13: Availability of diagnostic imaging by hospital group

	Ireland East % (n)	**Dublin Midlands % (n)**	**RCSI Hospitals % (n)**	**University of Limerick % (n)**	**South/South west % (n)**	**Saolta % (n)**
Access to MRI 24/7	17 (1)	0 (0)	25 (1)	0 (0)	0 (0)	0 (0)
Access to MRI Monday-Friday only	83 (5)	100 (5)	75 (3)	100 (1)	83 (5)	100 (5)
Routine MRI scanning within 48 hours	33 (2)	60 (3)	100 (4)	0 (0)	33 (2)	0 (0)
Emergency MRI scanning within 24 hours	33 (2)	60 (3)	100 (4)	100 (1)	33 (2)	20 (1)
Access to carotid duplex 24/7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (00
Access to carotid duplex Monday-Friday only	100 (6)	80 (4)	100 (4)	100 (1)	83 (5)	100 (5)
Routine carotid duplex within 48 hours	50 (3)	60 (3)	100 (4)	100 (1)	83 (5)	0 (0)
Emergency carotid duplex within 24 hours	50 (3)	80 (4)	75 (3)	100 (1)	83 (5)	20 (1)

2.4.6 Stroke units

Stroke units were available in 78% (21/27) of sites. This represented a significant improvement from the single unit available in INASC 2008. Six hospitals had no access to stroke unit care (Fig. 2.2). The number of stroke unit beds available nationally at the time of the audit was 150. However, 61% of inpatients with a stroke at the time of the audit were being managed on a ward other than a stroke unit (Fig. 2.3).

Figure 2.2: Availability of stroke units

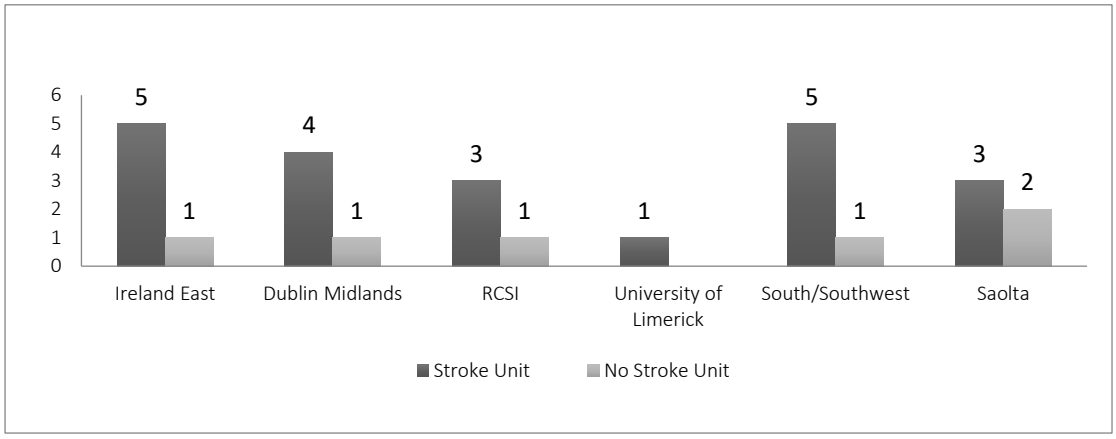
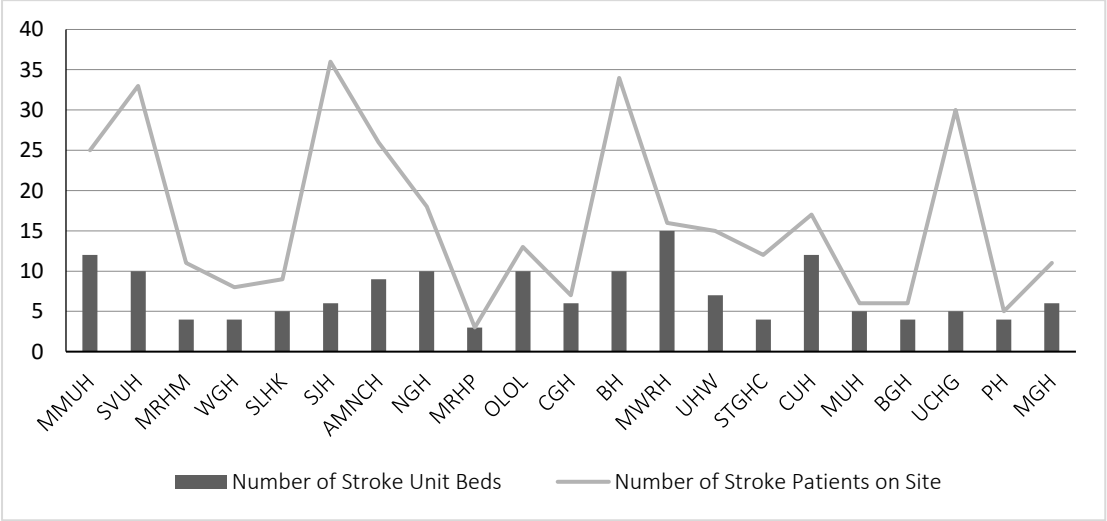


Figure 2.3: Stroke in-patients versus stroke beds



For hospitals with stroke units in place only 29% of patients were admitted directly to a stroke unit on admission, and even considering admissions to higher dependency beds, this only rises to 40% of patients accessing stroke unit care in the important early phase of their care. Inconsistency existed in availability of features recommended in each stroke unit. Most notable inconsistencies included access to continuous physiological monitoring and in nurse training in stroke assessment specifically swallow screening (Table 2.14). A total of 36% of patients had swallow screening performed in the first 24 hours as opposed to over 80% in the SSNAP UK audit.

Table 2.14: Features of a stroke unit

Features of a stroke unit admitting stroke patients acutely	**National Stroke Audit 2015 n=21 % (n)**	**SSNAP 2014 n=109 %**
Continuous physiological monitoring (ecg, oximetry, blood pressure)	57 (12)	88
Access to scanning within three hours of admission*	86(18)	99
A policy for direct admission from the emergency department	86 (18)	50
Specialist ward rounds at least 5 times per week**	71 (15)	30
Acute stroke protocols and guidelines	95 (20)	99
Nurses trained in swallow screening	52 (11)	96
Access to 24-hour brain scanning***	100 (21)	N/A
Nurses trained in stroke assessment and management****	N/A	95

* SSNAP = immediate access to brain scanning

** SSNAP consultant lead ward round 7 times per week v NSA 2015 of 5 times per week

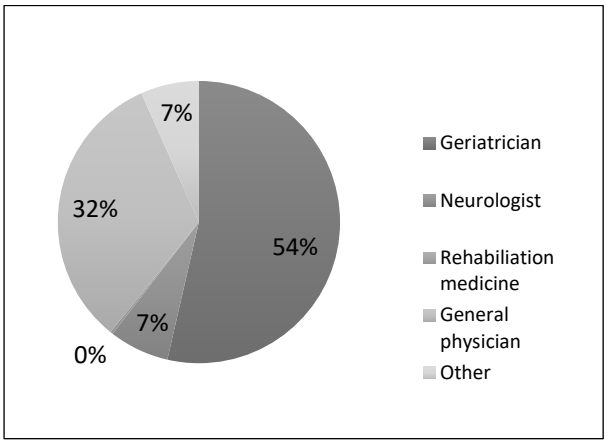
*** SSNAP = not identified as a feature of a stroke unit

**** NSA 2015 = not identified as a feature of a stroke unit

2.4.7 Staffing

Increased numbers of multidisciplinary team specialists in stroke care was notable. A consultant physician with specialist knowledge of stroke was available in 85% (23/27) of sites versus only one third of hospitals in INASC 2008 (Fig. 2.4).

Figure 2.4: Consultant in charge of care



Patients had access to a clinical nurse specialist (CNS) in stroke in 85% (23/27) of sites with two advanced nurse practitioners in stroke in the country, as compared with 5 CNS nationally in INASC 2008. Clear staffing whole time equivalent deficits as per guidelines was noted nationally for all members of the multidisciplinary team (Figs. 2.5, 2.6). One health and social care professional (HSCP) clinical specialist post existed in the country.

Figure 2.5: Nursing deficits based on 1.2 WTE per stroke unit bed

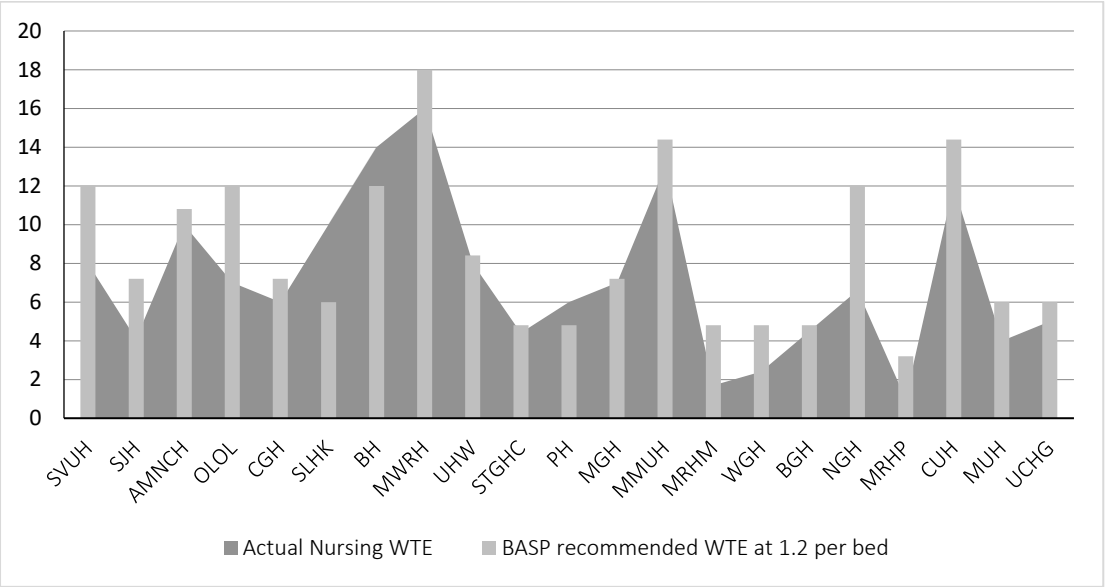


Figure 2.6: PT WTE per vs BASP guidelines

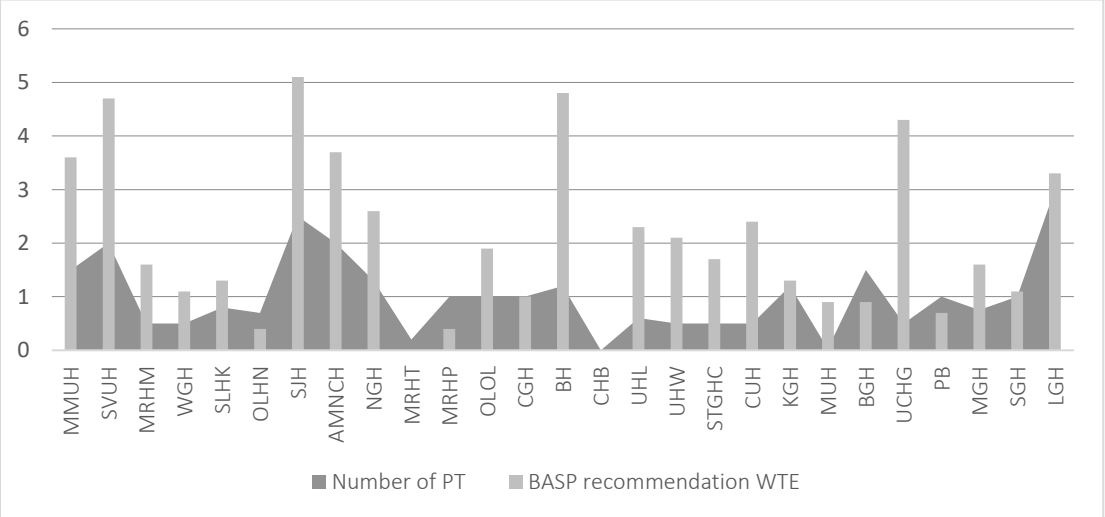


Figure 2.7: OT WTE vs BASP guidelines

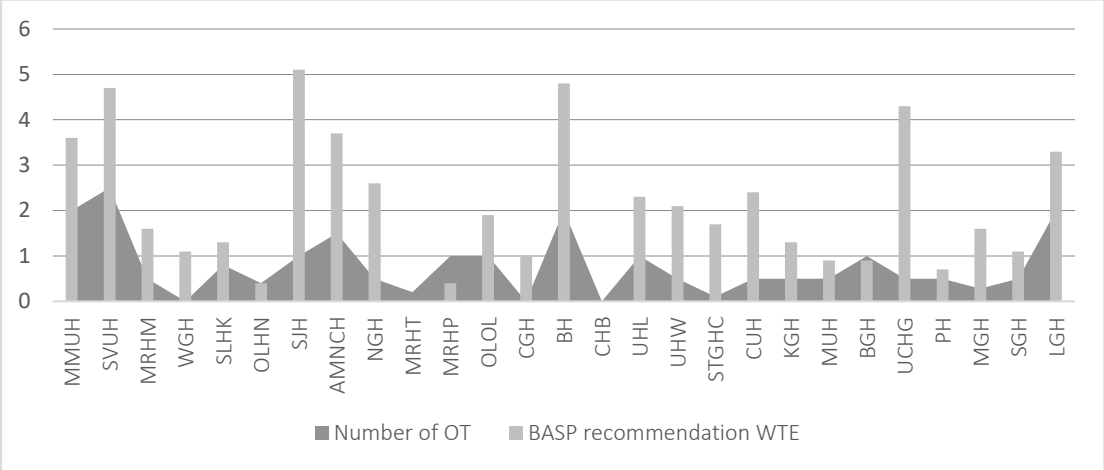


Table 2.15: Patient HSCP assessment in first 48 hours of admission after stroke

	National Stroke Audit 2015- within 48 hours % (n)	**INASC 2006 - within 72 hours % (n)**	**SSNAP 2014 - within 24hrs % (n)**
Speech and language therapist assessment % (n)			
Yes	37 (320)	25 (548)	20.2 (15005) within 12 hours
No	29 (251)	39 (844)	
No but *	33 (296)	33 (713)	
Missing	1 (7)	2 (47)	
Yes applicable	55.4%		
Physiotherapy assessment % (n)			
Yes	53 (466)	43 (929)	48.3 (35813)
No	25 (219)	41 (895)	
No but **	21 (185)	13 (282)	
Missing	0.5 (4)	3 (67)	
Yes applicable	67.6%		
Occupational therapy assessment % (n)			
Yes	30 (262)	N/A	36.5% (27087)
No	43 (374)	N/A	
No but ***	27 (232)	N/A	
Missing	1 (6)	N/A	
Yes applicable	40.8%		

2.4.8 Early supported discharge

A new service since INASC 2008, three early supported discharge teams existed covering four acute hospitals. ESD was available in 15% (4/27) of hospitals versus 74% (135/183) in SSNAP UK 2014.

Patients accessing these services in these hospitals ranged between 14-35% of cases reviewed. However, 5% (41/743) of patients nationally utilised early supported discharge. These were patients who would otherwise have been managed in the acute hospital setting or a rehabilitation facility for a longer period as opposed to being in their own home. The assessment of the organisation of rehabilitation and community services was outside of the remit of this audit. The suggested trend from both the organisational and clinical audit was that community services were under resourced and was further supported by the findings of an audit of the stroke rehabilitation units in Ireland (59).

2.5 Conclusion

The findings of the National Stroke Audit 2015 provided a snapshot of the acute stroke service provided in Ireland. The audit's purpose was to assess current practice against both national and international guidelines. Through the process potential strengths and weaknesses were identified. This provided vital information for planning and development both at local and national level.

A recommendation from INASC 2008 was the creation of a stroke register, which has been implemented with varying uptake. This essential tool can provide real time information on stroke care, thus facilitating clinical audit in a more accessible and reproducible manner. Data capture and review is an essential element of any clinical service to ensure patients are cared for in a manner consistent with the highest standards. The register should be supported and strengthened.

A clear strength observed from the process and findings of the audit is the dedication of frontline staff who provide care to patients every day in every part of the country. Their hard work to improve services for all patients was set against the backdrop of substantial cuts in healthcare budgets, reduced staffing, and a global recession. Many of the improvements seen were supported by stroke multidisciplinary team members going above and beyond their remit, innovating and collaborating, striving to provide the best care possible. It is essential that their endeavor is acknowledged through investment in staff, infrastructure, and services.

Most importantly all patients admitted with an acute stroke, irrespective of age, should have access to the best treatment options, be managed in a stroke unit appropriately equipped and staffed by a trained multidisciplinary team. They should access essential diagnostic tests promptly. They should receive the necessary levels of therapy to

facilitate their recovery and be central to the decision-making and goal setting process. The patient should be clearly informed of their diagnosis and the reason their stroke occurred, provided with education and support in their wishes relating to vocational and residential issues. Ultimately, they should be respected and supported to return to independent living as quickly as is achievable.

3 Chapter Three

A comparison of service organisation and guideline compliance between two adjacent European health services

McElwaine, P., McCormack, J., McCormick, M., Rudd, A., Brennan, C., Coetzee, H., … Harbison, J. (2017). A comparison of service organisation and guideline compliance between two adjacent European health services. European Stroke Journal, 2(3), 238–243. https://doi.org/10.1177/2396987317703209

"It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of Light, it was the season of Darkness, it was the spring of hope, it was the winter of despair"

– A Tale of Two Cities, Charles Dickens, 1859

3.1 Abstract

3.1.1 Introduction

Outcomes in stroke patients are improved by a co-ordinated organisation of stroke services and provision of evidence-based care. We studied the organisation of care and application of guidelines in two neighbouring health care systems with similar characteristics.

3.1.2 Methods

Organisational elements of the 2015 National Stroke Audit (NSA) from the Republic of Ireland (ROI) were compared with the Sentinel Stroke National Audit Programme (SSNAP) in Northern Ireland (NI) and the United Kingdom (UK). Compliance was compared with UK and European guidelines.

3.1.3 Results

Twenty-one of 28 ROI hospitals (78%) reported having a stroke unit (SU) compared with all 10 in NI. Average SU size was smaller in ROI (6 beds vs. 15 beds) and bed availability per head of population was lower (1:30,633 vs. 1:12,037 $p < 0.0001$ Chi Sq). Fifty-four percent of ROI patients were admitted to SU care compared with 96% of UK patients ($p < 0.0001$). Twenty-four–hour physiological monitoring was available in 54% of ROI SUs compared to 91% of UK units ($p < 0.0001$). There was no significant difference between ROI and NI in access to senior specialist physicians or nurses or in SU nurse staffing (3.9/10 beds weekday mornings) but there was a higher proportion of trained nurses in ROI units (2.9/10 beds vs. 2.3/10 beds ($p = 0.02$ Chi Sq).

3.1.4 Conclusion

Whilst the majority of hospitals in both jurisdictions met key criteria for organised stroke care the small size and underdevelopment of the ROI units meant a substantial proportion of patients were unable to access this specialised care.

3.2 Introduction

It is generally accepted that better organisation of stroke services results in better outcomes for stroke patients (34, 60). Accordingly, modern stroke care is often highly structured, utilising models of care and protocols (58) derived from evidence-based guidelines (61-64). However, interpretation of guidelines and how they are implemented, and thus consequent development of services may differ between health services.

The island of Ireland is divided into two government authorities the Republic of Ireland (ROI) and Northern Ireland (NI), which is a component of the United Kingdom. Stroke services in each area have developed separately; the NI health service being a component part of the larger UK National Health Service (NHS) and the ROI being governed by the Irish Health Service Executive (HSE). In an analysis of the second Irish National Stroke Audit (2nd NSA) carried out in the Republic we compared services between the two jurisdictions in terms of resources provided and concordance with European and UK guidance, specifically with NI but with reference to the UK where NI data unavailable.

3.3 Methodology

The 2nd NSA was performed in 2015 under the auspices of the Irish National Clinical Programme for Stroke Care (CPSC) (65). The audit was designed to collect data on patient care and outcome measures that were consistent with Irish National Guidelines and the previous iteration of the national audit in 2008 (66) . It was also designed to allow comparison with other local European health systems.

Data were collected in a format to permit comparison with published European Stroke Organisation (ESO) guidelines and recommendations (58, 63). Due to the close proximity and similar healthcare structure, results were also compared with data from UK audits, both the seven UK Royal College of Physicians Audits 1998–2011 (55, 67) and the current continuous Sentinel Stroke National Audit Programme (SSNAP) which has operated since 2014 and data from which is published quarterly (68). SSNAP collects clinical data prospectively for every stroke patient along the stroke care pathway up to 6 months and includes a biennial acute organisational audit providing a view of the quality of stroke services in the acute setting.

The UK and Ireland have very similar health systems in terms of organisation and medical training structures. The 2nd NSA comprised of two components. The first was an organisational audit comprised of a questionnaire sent to senior administrators and lead stroke clinicians followed by an inspection visit by teams from the national programme consisting of senior specialist medical, nursing and therapy staff representing the CPSC to confirm and clarify reports provided. The second component was a chart audit of a representative sample of individual patients who had received acute stroke care in hospitals over two, 3-month periods 1 January 2014 to 31 March 2014 and 1 July 2014 to 30 September 2014. Chart audit was performed by medical, specialist nursing and therapy staff from each hospital with a superaudit of random chosen centres performed by staff from the CPSC to ensure consistency across sites. The tool was approved by an expert working group prior to dissemination, many of whom had been involved in prior national audits or audits in other jurisdictions. The tool was also reviewed by national quality assurance organisation and was trialled in four hospitals prior to final revisions and national dissemination.

The audit was also conducted in association with an independent non-governmental organisation, the Irish Heart Foundation, to permit external scrutiny and validation of the process. The organisational audit document included 46 core questions with multiple sub-sections relating to the structure, staffing and operation of the service. The chart audit document included 77 core questions to be completed for each subject.

Each hospitals admitting 20 or more acute strokes (ICD, 10 codes: I61, I63 and I64, including sub-categories) in the previous year was requested to complete the organisational audit and hospital chart audit on between 25 and 40 consecutive patients admitted during the periods outlined, depending on the number of patients admitted. Organisational data were compared with published Irish and ESO guidelines and SSNAP data published for NI and UK hospitals for the period April 2013 to March 2014. Patient data were also assessed for concordance with guidelines. Individual patient data was not available for NI for the time period in question and these results were compared with overall UK data. Collected NSA data was initially recorded on paper audit forms and all data were sent to an independent organisation for data entry and tabulation.

SSNAP is published online at the organisation's website. Quantitative results for the Irish and NI/UK audits were statistically evaluated and compared using relative risks (RR) and chi-square statistic to estimate scale of discrepancies and to compare proportions. In comparing staffing levels, chi squares were applied after converting ratios to proportions using the published total bed numbers.

3.4 Results

Data for 874 patients was audited in the ROI of 6035 total strokes (14.5%) admitted to Irish hospitals in 2014. These were compared with 74,307 in the UK SSNAP which

collects prospective data on stroke admissions for England, Wales, and Northern Ireland. Twenty-seven hospitals in Ireland were found to have admitted 20 strokes or more in 2013 (median 177, range 56–412) and were audited.

Twenty-one (78%) of these were found to have stroke units using the three core elements required by the European Stroke Organisation definition, that is a discreet area of a defined ward used exclusively for stroke, specialist medical, nursing and therapy staff and regular multidisciplinary team meetings (58). This compared with 10 of 10 (100%) in Northern Ireland. One NI hospital that reported a 10-bed stroke unit used solely for care beyond 72 h and utilised a thrombolysis bypass process was excluded from our analysis, although acute stroke patients were potentially repatriated to the hospital earlier than 72 h on occasion. All remaining Northern Irish were self-categorised as combined units. In contrast, 10 of the ROI units categorized themselves as acute, the remained as combined.

On inspection it was found that most of the acute units in the ROI also provided substantial post-acute care usually influenced by the availability of unoccupied rehabilitation beds to transfer patients to and the distinction between acute and combined units was unclear. There were 152 stroke beds available for acute care across NI and 150 in ROI. The number of stroke beds per head of population (on 2011 census data from both areas) was 1 per 12,037 for NI and 1 per 30,633 for ROI, representing 2.5 times the number of acute beds per head of population in NI. This compares with 1:20,874 for the United Kingdom as a whole. Direct admission to a stroke unit/high dependency bed reported in 66% of patients in NI versus 40% in ROI and 75% in the UK (RR 2.4 (95% CI 2.3– 2.5), UK vs. ROI). Fifty-seven percent of UK patients were admitted

to the stroke unit within 4 h compared to 11% of patients in ROI (RR 2.0 (95% CI 2.0–2.1)). Fifty-four percent of patients in ROI received care in a stroke unit at some time post-stroke compared to 96% of patients in the UK (RR 11.5 (95% CI 10.6–12.5)).

Complete comparable data for stroke unit admission for NI was not available. All units in NI and ROI had multidisciplinary team meetings to review stroke patients' care at least weekly. Capacity for investigation, physiological monitoring and staffing within stroke units differed significantly between jurisdictions.

Twenty-four-hour CT imaging was available in all sites in ROI and 99% of sites in the UK including all sites in NI. However, capability for 24-h physiological monitoring was available in 54% of units in ROI compared to 91% of UK units (RR 5.1 (95% CI 4.7–5.5)). Twenty-three of 27 ROI sites and all NI sites reported a senior physician with specialist knowledge of stroke care. However, patients in the ROI were significantly less likely to be managed under a senior clinician (consultant grade) with specific stroke training that is geriatrician or neurologist (Table 3.1). Stroke nurse specialists were employed in all the NI units and in 23 of the 27 ROI units. Nursing numbers were compared for staff on duty per 10 acute or combined beds at 10 a.m. weekday mornings, the time of the week when units would have greatest staff numbers present. In ROI, this averaged 2.9/10 beds compared with 2.3/10 beds in NI and 2.4/10 beds in the UK ($p = 0.03$ Chi Sq). There were however significantly more care assistants in the UK and NI 1.6/10 beds compared with 0.9/10 beds in Ireland ($p = 0.02$ Chi Sq). Thus, there was no significant difference in ratio of total nursing/care attendant staff between jurisdictions. Only two (10%) of the ROI units and none of the NI units met the ESO recommended 1:2 total nursing ratio for

low dependency stroke beds and none met the 1.5:1 ratio suggested for high acuity beds in ESO guidelines (58).

Table 3.1: Comparison of specialists managing stroke patients by hospital, ROI versus UK (Chi sq statistic)

Primary Specialty of Consultant	ROI **(n=27)**	UK **(n=192)**	
Geriatrics	54%	72%	<0.0001
Neurology	7%	16%	<0.0001
Internal Medicine	32%	6%	<0.0001
Other	7%	6%	0.2

Ratio of allied health professionals per 10 stroke unit beds is outlined in Table 3.2. It appears that there are a significantly higher proportion of Dieticians and Speech and Language Therapists in ROI than either NI or the UK. However, AHPs in the ROI frequently also have responsibility for stroke patients outside the units and thus actual time per stroke unit patient may be considerably less in ROI given the substantial deficit in stroke unit capacity. The UK also reports numbers of therapy assistants that are not recorded in Ireland for the purposes of determining staff to patient ratios. In general, there was a lower proportion of non-university degree qualified staff in therapy services in the ROI.

All units had local ambulance arrangements for transfer of suspected strokes and pre-notification of Emergency Departments. Thrombolysis including redirect policy to intervention sites is available in 100% of sites in NI versus 96% in ROI, with a reported thrombolysis rate of non-haemorrhagic strokes of 15.1% (NI) versus 10.9% (ROI) ($p = 0.3$). Rates of intra-cerebral haemorrhage were 12.5% in NI versus 15.1% ROI ($p = 0.5$). Patients have access to early supported discharge (ESD) in 73% of NI sites compared to 15% in ROI, translating to 21% (65/312) of all discharged patients using an ESD service in NI versus 5% (41/743) in ROI (RR 3.8 (95% CI 2.6–5.5)).

There was no consistent means in differentiating outcomes between ROI and the UK. Inpatient mortality was not significantly different, ROI versus UK, 14% versus 15.8% (RR 0.9 (95% CI 0.1–1.1)). However, this may be influenced by the availability of home care and early supported discharge services between countries.

Table 3.2: Ratio of allied health professionals per 10 stroke unit beds

Total whole-time equivalents reported (number per 10 Stroke unit beds)	Republic of Ireland	Northern Ireland	P RoI vs NI (chi sq)	United Kingdom*	P RoI vs UK (chi sq)
Total Stroke Unit Beds.	150	152		5250	
Psychologist	2.3 (0.15)	2.7 (0.18)	0.6	71.4 (0.14)	0.5
Dietician	7.9 (0.53)	3.3 (0.22)	<0.0001	120.2 (0.23)	<0.0001
Occupational Therapist	17.7 (1.18)	17.0 (1.12)	0.6	622.1 (1.18)	1.0
Physiotherapist	21.2 (1.41)	19.6 (1.29)	0.3	733.4 (1.40)	0.9
Speech & Language	15.7 (1.05)	6.8 (0.45)	<0.0001	295 (0.56)	<0.0001
% of units with Social Worker	44%	100%	0.04**	97%	<0.0001

*Including both Great Britain and Northern Ireland

** Fisher's exact statistic.

3.5 Discussion

Whilst the majority of hospitals in both Northern Ireland and the Republic of Ireland met key elements of the definition of stroke unit care there were significant deficits in staff levels in both countries. In the ROI whilst the majority of hospitals were found to have stroke units, the relatively small size of units and lower resource meant that a substantial proportion of patients were not able to fully access the specialised stroke care provided.

The study has some limitations. Data collection in the ROI audit was similar to previous UK Sentinel Audit methods (56), that is physical auditing of patient charts. However, this differs from current SSNAP practice where data collection is online and thus less subject to bias from deficiencies in note keeping, data coding, etc. Charts were audited by local staff and whilst the audit group repeat audited charts in a number of randomly chosen hospitals, data collection errors may still have occurred. Errors may also have occurred in classification of stroke unit type. Some smaller hospitals in ROI were not included in the audit if they were subject to an ambulance redirect policy for stroke patients. These hospitals admitted less than 1% of all strokes in 2014 rending operation of effective stroke units or services impracticable. They were excluded from the analysis. Units in ROI were frequently classified as acute however many of these units relied on off-site rehabilitation units for their patients and where delays in transfer were encountered many provided prolonged rehabilitation on-site leaving them closer in definition to combined stroke units.

There were no dedicated onsite stroke rehabilitation units in ROI at the time of the audit. In NI, there is much clearer designation of acute and rehabilitation beds within combined stroke units on acute hospital sites. So, it is likely that the number of beds

available in acute services is overstated. Realistically not all beds, within large combined stroke units in particular, are able to manage patients in the early phase of their stroke. Whilst our intention was to compare data from ROI on patient care with NI and UK data, most NI hospitals were not recording care data routinely to SSNAP in 2014 which was not consistent with practice in the remainder of the UK.

A previous study has compared the management of stroke between cohorts of patients in two individual hospitals in the Republic of Ireland and Northern Ireland (69), but these were not necessarily representative of stroke care nationally. We designed the study to enable us to collect data that would be suitable for comparison with both previous Irish National Audit data but also with ESO and UK data to allow us to determine the quality of organisation and care by international standards. Accordingly, the audit tools used were detailed and comprehensive including elements to permit comparison with ESO, UK and Irish guidelines which differ slightly in some elements. Self-reported organisational audits were validated by site visits conducted jointly by members of the CPSC audit team and clinicians nominated by the Irish Heart Foundation.

This study demonstrates the challenges and difficulties in trying to implement evidence-based care for stroke patients. Guidelines in respect of acute interventions are typically strongly evidence based with support from randomised controlled trial data (61) It is therefore easier to establish strict guidelines and thus measure against them.

Whilst the evidence for stroke units is also strong and the components that represent stroke unit care are agreed (34, 63), it is sometimes difficult to make an arbitrary call as to whether a hospital meets criteria or not. Both ESO and American Stroke Association guidelines (58, 70) have tried to address this by establishing different levels of stroke

unit care based on criteria agreed using Delphi processes but conclusions based on such processes have limitations for example questions have been raised about the evidence in the ESO guidelines for having transcranial Doppler available 24/7 (58)?

The other issue is in resource allocation. At first glance there is little difference between Irish and UK facilities. Notwithstanding that all 10 sites in NI have stroke units versus 78% of sites in ROI, the ratio of nurse and AHP staffing to bed is not dissimilar. Nursing levels in both in ROI and NI were low compared with guideline recommendations. This is important because of the reported association between nursing levels and patient mortality recently reported from UK (71). The significant difference between jurisdictions is in the numbers of properly staffed beds available to cater for case load.

While acknowledging the practicalities of providing stroke unit care in hospitals that admit small numbers of stroke cases per year, there is little benefit in a hospital having a designated stroke unit if an individual cannot routinely expect to be admitted and cared for there. Furthermore, it is important to stress that there is a difference between stroke beds being available for admissions on site and the quality of access to these beds. Access is limited by fluctuations in acuity of stroke casemix, bed availability and staffing levels.

The CPSP was implemented in the Republic of Ireland at a time of the worst economic crisis in the history of the state. Over the period 2009–2013 health service funding was cut by approximately 20% (72), so to have improved the organisation and delivery of stroke care to the extent it has was somewhat of an achievement. However, many of the changes were made by reallocating and re-designating resources and accordingly in many cases services have been developed that just bring them into line with the

guidelines, that is the guidelines were used as a target and whilst they are specific as to the components of good stroke care, they mention little about extent of such care.

It is important therefore that in further iterations of guidelines specific recommendations are included as a necessity to provide adequate beds within stroke units and that these beds be accessible by all patients who need them. In doing so we can help avoid the situation where health services and hospitals can achieve a level of compliance with guidelines but still be unable to provide adequate care for a large proportion of their population.

4 Chapter Four

Thrombolysis for Stroke in Ireland: Increasing access and maintaining safety in a challenging environment

McElwaine P, McCormack J, Brennan C, Coetzee H, Cotter P, Doyle R, Hickey A, Horgan F, Loughnane C, Macey C, Marsden P. Thrombolysis for stroke in Ireland: increasing access and maintaining safety in a challenging environment. Irish Journal of Medical Science (1971-). 2018 May 1;187(2):275-80.

"Coming together is a beginning, staying together is progress, and working together is success"

- Henry Ford

4.1 Abstract

4.1.1 Background

In the setting of a national audit of acute stroke services, we examined the delivery of thrombolytic therapy for ischaemic stroke, and whether current practice was achieving safe outcomes and consistent delivery for patients.

4.1.2 Method

Data obtained from the recent national stroke audit was compared against previous Irish audit, the most recent SSNAP UK stroke audit and the SITS-MOST study.

4.1.3 Results

Thrombolysis was provided in 27 acute hospitals throughout Ireland during the period assessed with 82% (22/27) providing 24/7 access, the remaining sites using redirect policies. Decision to thrombolyse was made by stroke trained consultants in 63% (17/27) of units, with general physicians and emergency medicine consultants covering the other units. Thrombolysis rate for non-haemorrhagic stroke was 11% (n=80/742, CI 95% ±2.23) versus a 1% rate in the 2008 audit. Sites receiving patients through redirect policy had the highest thrombolysis rate, average 24%. Nearly 30% of cases were thrombolysed on the weekend.

83% of cases were managed in a stroke unit at some time during admission versus 54% of the national total cases. 37% of patients were ≥80 years. The mortality rate was 11.3% versus the national mortality rate for nonthrombolysed ischaemic strokes of 10% ($p>0.5$) and this is comparable to SITS-MOST 2007 study 3-month mortality rate of 11.3% ($p>0.5$).

4.1.4 Conclusion

Stroke thrombolysis is being effectively and safely provided in acute stroke services in Ireland despite regular involvement of non-specialist staff. There is still potential to improve thrombolysis rate.

4.2 Background

The evidence for thrombolysis of acute ischaemic stroke was established by the NINDS trial in 1995 (73), and a conditional license for the therapy was granted by the European Union (EU) in 2001. The license was made permanent following the publication of the Safe Implementation of Thrombolysis in Stroke–Monitoring Study (SITS-MOST) and extended to 4.5 hours following the publication of the European Cooperative Acute Stroke Study (ECASS) III (74, 75).

Ireland lagged behind other countries in development of organized stroke services. In 2008 the first Irish National Audit of Stroke Care (INASC 2008) was published (76). A review of 2173 cases revealed that only 1% of patients received thrombolytic therapy, compounded by the fact there was only one stroke unit in existence in the whole country.

In response in 2010 the Irish health service implemented the national stroke programme with the stated aim of developing rapid access to best quality stroke services and reducing death and disability due to stroke (77). These aims were targeted through a number of measures including infrastructural change, limited specialist recruitment, and guideline development, which facilitated a national programme for thrombolysis therapy. Unfortunately, as highlighted previously, this coincided with a financial collapse and severe economic recession in the country, which severely limited the extent of new resource, which could be allocated to develop services. A further challenge was in the distribution of population and acute hospitals across Ireland. Outside the largest cities of Dublin, Cork, Galway and Limerick, populations are quite dispersed. For example, population density in County Dublin is

1459/km^2 compared with a population density of <50/km^2 in 16 of the remaining 25 counties in the Republic of Ireland (6). These areas are supported by a large number of smaller hospitals who are typically unable to provide 24-hour cover by specialist stroke services. This means that 'conventional' means of delivering thrombolysis by stroke specialists is often impossible.

A combination of strategies, under the guidance of the National Clinical Programme for Stroke, were employed to deliver thrombolysis therapy to the entire country including developing a training programme for general physicians to identify and thrombolyse potentially eligible patients, application of a redirect policy in certain areas to allow ambulance paramedics to divert suitable patients to hospitals providing thrombolysis, and introduction of a limited stroke telemedicine service in other areas. In 2015 we repeated a national study to determine the effectiveness of these interventions on thrombolysis practice and safety in Ireland (78).

4.3 Methods

The Irish audit of acute hospital services (NSA 2015) had two components, an audit of the organisational aspects of stroke care in acute hospitals and a clinical audit of stroke care involving the review of clinical case notes for a selected national sample of patients with stroke, with audit protocol approved by a national stroke audit steering group. The data were obtained using validated surveys adapted from the INASC 2008 validated proforma, which in turn was based on the Royal College of Physicians London (RCPUK) National Sentinel Stroke

Audit 2004 Organisational Audit proforma and National Sentinel Stroke Audit 2006 Clinical Audit proforma (Appendix). Modifications and additional questions were added to allow comparison of results with those from the larger UK SSNAP database and with European Stroke organization Guidelines.

The clinical outcomes of patients were studied during the specified six-month period (1 January 2014 – 31 March 2014 and 1 July 2014- 30 September 2014) with a primary diagnosis of stroke (ICD code, I61, I63, I64). Subjects with classification I60 (subarachnoid haemorrhage) were not studied as these patients are predominantly redirected to neurosurgery centres in Ireland under defined protocol.

The data was compared with the findings of the previous Irish audit (INASC 2008), the Sentinel Stroke National Audit Programme (SSNAP) UK acute organisation audit 2014 and the SITS-MOST including data specifically related to the UK (74, 76, 79), Ireland not having participated to any large extent in SITS MOST.

4.4 Results

4.4.1 Organisation of service

Twenty-seven hospitals were identified as managing acute stroke patients in Irish hospitals in 2015, a reduction from the 37 sites identified in the 2008 audit (Fishers Exact p=0.001). Twenty-six of the sites (97%) of the sites had 24/7 coverage for thrombolysis either through on-site access or through emergency service redirect policy. Twenty-four-hour emergency non-contrast CT imaging was available in all sites. Eighty five percent of sites had access to a senior stroke trained specialist, increased from 32% in the previous audit (table 4.1).

Table 4.1: Comparison of organisation of stroke services between Irish audits, 2008 and 2015

	NSA 2015 % (n)	INASC 2008 % (n)
Local ambulance arrangements	100 (27/27)	3 (1/37)
CT scanning access 24/7	100 (27/27)	84 (31/37)
24/7 on site thrombolysis	82 (22/27)	3 (1/37)
24/7 thrombolysis cover with redirect	97 (26/27)	3 (1/37)
Stroke unit available	78 (21/27)	3 (1/37)
Access to stroke specialist	85 (23/27)	32 (12/37)

The decision to thrombolyse was taken by a specialist (predominantly geriatricians) in 17 sites (63%), general physicians in 8 (30%) sites and by emergency department consultants in 2 (7%) sites. Thrombolysis was delivered in the emergency department in 22 (82%) sites, in a high dependency bed e.g. ICU/CCU in 4 (15%) sites and in a stroke unit in one site. Access to specific components of hyperacute care is still lower than the UK (table 4.2).

Table 4.2: Comparison between organisation of stroke services between Ireland and UK

	NSA 2015 % (n)	UK SSNAP 2014 % (n)	Chi Sq p Value
Local ambulance arrangements	100 (27/27)	99 (165/167)	p>0.5
CT scanning access 24/7	100 (27/27)	99 (165/167)	p>0.5
24/7 on site thrombolysis	82 (22/27)	83 (139/167)	p>0.5
24/7 thrombolysis cover with redirect	97 (26/27)	91 (152/167)	p>0.5
Stroke unit available	78 (21/27)	99 (165/167)	p<0.1
Access to stroke specialist	85 (23/27)	99 (181/183)	p<0.001

Stroke units were in 78% of sites (21/27) versus 99% (165/167) in SSNAP UK (p<0.1). Specialists were available in 83% (23/27) versus 99% (181/183) of sites in UK (p<0.001). When assessed against the European Stroke Organisation guidelines for key features for primary stroke centres providing hyperacute care, 22% (6/27) of sites meet recommended requirements (table 4.3).

Table 4.3: Features of primary stroke centres available in Ireland as per ESO guidelines

European Stroke Organisation (ESO) primary stroke centres key recommendations	**Number of sites n=27 (%)**
Availability of 24-hour CT scanning	27 (100)
Established stroke treatment guidelines and operational procedures, including intravenous rtPA protocols 24/7	22 (100)
Close co-operation of neurologists, internists, and rehabilitation experts	18 (67)
Specially trained nursing personnel	23 (85)
Early multidisciplinary stroke unit rehabilitation including speech therapy, occupational therapy, and physical therapy	21 (78)
Neurosonological investigations within 24 hours (extracranial doppler sonography)	17 (63)
Transthoracic echocardiography (TTE)*	13 (48)
Laboratory examinations (including coagulation parameters)	27 (100)
Monitoring of blood pressure, ECG, oxygen saturation, blood glucose, body temperature	21 (78)
Automated ECG monitoring at bedside	12 (44)
All above features *****TTE access taken as urgent (within 24 hours)	6 (22)

4.4.2 Clinical outcomes

Of the total audit sample of 874 cases from 2014, 80 patients received thrombolysis, which represents a thrombolysis rate for non-haemorrhagic stroke of 11% (n=80/742), (Confidence Interval 95% ±2) versus a 1% rate in the 2008 audit. The highest thrombolysis rates were achieved in sites, which received patients via a redirect policy, average rate 24% (37/154). Higher rates were also observed in centres with a stroke specialist versus general physicians (excluding redirect sites), 10.5% versus 5% respectively ($p<0.1$). The median age was 73 (range 36-93), 36% of patients were ≥80 years, with 84% (67/80) were described as independent prestroke and 6% were living in residential care preadmission. These were similar to the nonthrombolysed ischaemic stroke patients (table 4.4).

Table 4.4: Comparison of baseline demographics and outcomes for thrombolysed ischaemic strokes, nonthrombolysed ischaemic strokes

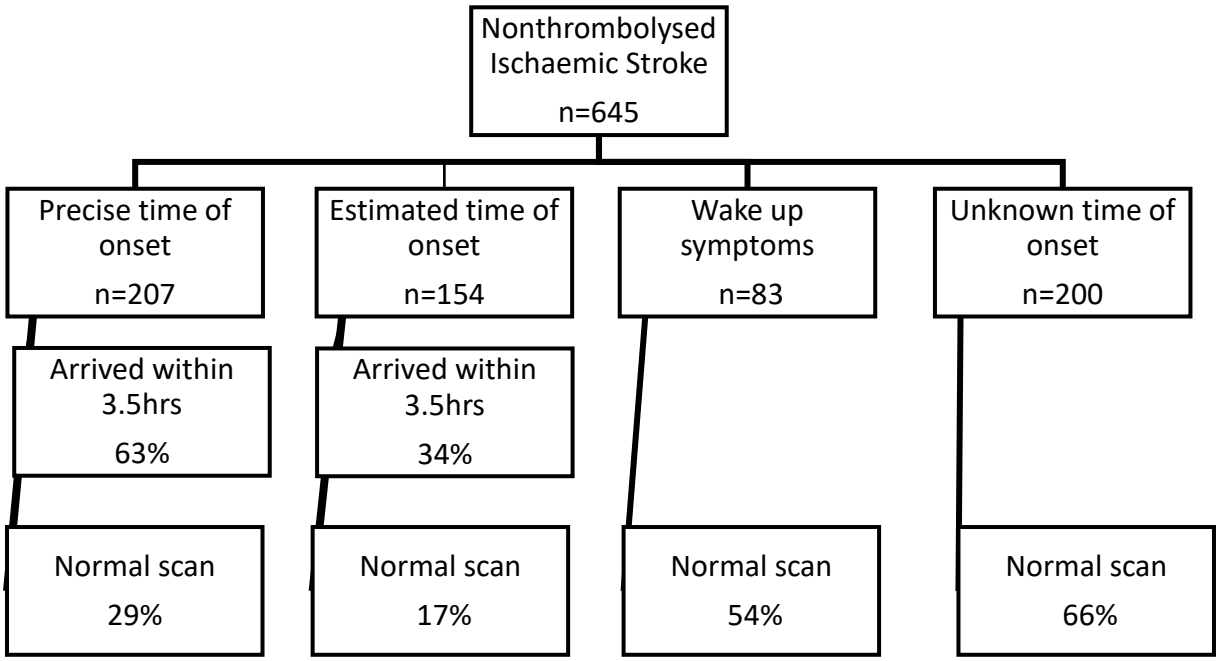
	Thrombolysed (n=80)	**Ischaemic - Not thrombolysed (n=645)**	**Chi sq p value**
Age (years)	71.2 (73)	73.8 (76)	
Gender Ratio	1:0.91	1:0.68	p<0.3
Known Independent preadmission %(n)	84 (67/80)	80 (517/645)	p>0.5
Average LOS days (median)	25.6 (14)	20.7 (10)	
Morality % (n)	11.3 (9/80)	10 (64/645)	p>0.5
Died in first week % (n)	4% (3/80)	2.3 (15/645)	p>0.5
Accessed SU care during admission % (n)	83 (66/80)	52 (337/645)	p<0.001
New nursing home resident % (n)	7.5 (6/80)	7.1 (46/645)	p>0.5
Independent on discharge % (n)	42 (30/71)	53 (341/645)	p<0.2
Anticoagulant or Antiplatelet use prestroke % (n)	54 (43/80)	57 (370/645)	p>0.5
AF as potential aetiology % (n)	38 (30/80)	35 (227/645)	p>0.5

Following on from treatment with thrombolysis, 83% (66/80) of cases were managed in a stroke unit at some time during admission versus 51% (406/793) of the remaining national total cases ($p<0.001$). Half of thrombolysed patients (40/874, 4.6% of total cases) are initially managed in high dependency beds (ICU/HDU), compared with less than 2% of all stroke patients being initially managed in a high dependency bed in the UK ($p<0.001$).

The mortality rate for thrombolysed strokes to discharge was 11.3% (CI ±6.9) versus the national mortality rate for nonthrombolysed ischaemic strokes of 10% (CI ±2.3) (chi sq $p>0.5$). Similar numbers of patients were discharged to residential care, 7.5% of thrombolysed cases versus 7.1% of non-thrombolysed cases (chi sq $p>0.5$).

Of the 645 nonthrombolysed ischaemic strokes, 32% (207/645) had a precise time of onset. Almost two-thirds (63%, 131/207) of this group presented within 3.5 hours, the majority (71%) by ambulance. Of those with a precise time of onset, presenting within 3.5 hours, 45% (59/131) had a normal CT scan (figure 4.1). However median time to scan from hospital presentation for the non-thrombolysed ischaemic patients was 172 minutes (IQ 87- 875mins). With regards a 24/7 service, 28.8% of patients were thrombolysed during the weekend as compared with 18.4% in the UK SITS-MOST patients ($p<0.05$). Just under a quarter (24%) of the thrombolysed patients presented in out of hours periods (8pm-8am), compared with 78% (503/645) of the nonthrombolysed strokes presented to ED during normal working hours (8am-8pm).

Figure 4.1: Nonthrombolysed ischaemic stroke presentation overview



When compared with SITS-MOST, the thrombolysed patients in the Irish audit were older, median age 71 (36-93) versus 68 (59-75) and were less independent at baseline, 85% versus 93% ($p<0.01$). Although formal NIHSS on arrival were not available in the Irish audit, estimates of severity were drawn from presenting symptoms, and may suggest a trend of lower rates of thrombolysis in milder strokes when compared with SITS-MOST (table 4.5).

Figure 4.2: Comparison of baseline demographics and aetiology between NSA 2015 and SITS-MOST

	National Stroke Audit 2015 n=80 (%)	**SITS-MOST n=6483**	**Chi sq p value**
Age (years)	71 (36-93)	68 (59-75)	
Sex (female)	38 (47.5%)	2581 (39.8%)	p<0.2
Independence*	67/79 (84.8)	5899/6337 (93.1)	p<0.01
Hypertension	44/80 (55)	3710/6318 (58.7)	p>0.5
Previous Stroke	19/80 (23.8)	643/6395 (10.1)	p<0.001
Atrial Fibrillation	15/80 (18.8)	1507/6306 (23.9)	p<0.5
Current Smokers	19/80 (23.8)	1474/6114 (24.1)	p>0.5
Aspirin at stroke onset	36/80 (45)	1918/6441 (29.8)	p<0.01
Neurological severity			
Mild	9/78 (11.5)	1494 (23)	P<0.02
Moderate	37/78 (47.4)	2409 (37)	p<0.1
Severe	32/78 (41)	2571 (40)	p>0.5
Cause identified**			
Large vessel (carotid stenosis)	12 (15)	844 (13)	p>0.5
Large vessel (other)	16 (20)	1435 (22.1)	p>0.5
Cardiac origin	31 (38.8)	2270 (35)	p>0.5
Lacunar	1 (1.3)	535 (8.3)	P<0.05
Other	5 (6.3)	1171 (18.1)	p<0.01
Unknown	15 (18.8)	228 (3.5)	p<0.001

* NSA 2015 calculated Barthel Index versus SITS modified Rankin Score

** Unknown in NSA 2015 include possible cardioembolic without confirmed AF and likely cryptogenic stroke

These results are also in the context of improved stroke services in key areas for all patients presenting with stroke symptoms, with 99% (862/874) of all patients undergoing neuroimaging compared with 93% (2028/2173) in 2008 and 70% (610/874) of all patients being scanned within 24 hours compared with 40% (867/2173) in 2008 ($p<0.001$). Similarly access to specialist care improved with 61% of patients under the care of a stroke specialist during their hospital admission compared to 38% in 2008 ($p<0.001$).

4.5 Discussion

In a relatively short space of time Ireland has greatly increased patients' access to thrombolysis therapy, with a tenfold increase in thrombolysis rate from 1% to 11%. This is comparable to other European health services such as the Netherlands, who observed an increase in thrombolysis rate from 6.4% to 14.6% between 2005 and 2012 (80). Notwithstanding the low baseline, which service providers were comparing against, the estimated national thrombolysis rate of 11%, which was primarily achieved through the reorganisation of services, is now on a par with most developed stroke services internationally (81). The outcome for these patients should also be viewed through the evidence that more severe strokes tend to present faster and as such have a better chance of being thrombolysed. When viewing specific sites' thrombolysis rates, it is clear that redirect policies will show improved levels of thrombolysis delivery, given the filtering of appropriate cases to that site. It has also been observed that higher rates are shown in redirection services because of a failure to include all strokes in the denominator including

the nonredirected patients (11). The improved rate in our review was offset nationally by the inclusion of all sites in the national figure.

Adopting a policy of expanding the training and responsibility of thrombolysis delivery to general physicians and emergency specialists was key in achieving this improvement. It appears that this service is being provided in a safe manner within internationally accepted guidelines. However, there is still more to be achieved noting the numbers of patients presenting with ischaemic stroke within the time window and not receiving the treatment. This raises the question that potential cases are being missed. This may be reflected in the fact that lesser experienced physicians may be slow to thrombolysed milder strokes, as well as inefficiencies in the chain of care such as delays in neuroimaging. Coupling the lower rates of milder strokes receiving thrombolysis and, albeit in a small sample size, the higher dependency of the Irish group versus SITS group, the observed lack of effect of thrombolysis on dependency may be reflective of a service in evolution (12).

There are also concerns that thrombolysis services provided by general physicians may thrombolyse higher rates of inappropriate patients, and the data available is unable to quantify this at present in Ireland as is available in the UK for example. Being cognisant of the low sample size, there is a reassuringly comparable mortality rate for thrombolysed cases, coupled with the observation that general physicians are less likely to deviate from guidelines than their more experienced stroke physician colleagues.

There is also evidence that due to limited capabilities of the stroke units within the service, and perhaps compounded by less experienced doctors overcompensating, a high volume of

patients utilise high dependency beds. With the new evidence supporting endovascular intervention, the fact that both treatments are directly linked, the emphasis on providing an efficient thrombolysis service is even more apparent (82). The potential inequity of access is likely to be more evident for endovascular treatment given the challenges highlighted with regard population dispersal in Ireland.

Using the SITS-MOST data, which only included cases, treated within 3 hours of onset and did not include patients over 75 years of age; the inpatient mortality rate of 11.3% was comparable to SITS-MOST study 3-month mortality rate of 11.3%. The sample size is clearly small in comparison to both the UK and SITS-MOST data. However, the trend appears reassuring and for outcome measures such as mortality, the NSA 2015 results are comparable to the national Hospital Inpatient Enquiry (HIPE) register of all stroke admissions. The absence of door to needle times, rates of symptomatic intracerebral haemorrhage, which are key measures of quality of care, and inconsistent use of assessment tools, such as the NIHSS and the mRS, restricts interpretation of results against international evidence. The monitoring of door-to-imaging and door-to-needle times was identified as a minimum requirement by the ESO in managing an acute stroke service (83). These limitations could be offset by better use of the national stroke register, which has been under resourced to date.

4.6 Conclusion

This review further strengthens the benefits of audit of stroke services (84). Continued review of thrombolytics in a stroke service is essential and recording of quality of care metrics in order to facilitate comparison with other jurisdictions is vital. Thrombolysis of ischaemic stroke is still evolving and being refined whether through the time limit it can be safely given, the age profile of patients who receive it or most recently the dose that may be effective in certain patient groups (75, 85, 86). This review highlights that an effective national thrombolysis service is possible with limited investment and appropriate reorganisation and may serve as a template to other jurisdictions with similar challenges.

5 Chapter Five

Discussion

"Faith is taking the first step even when you don't see the whole staircase" – Dr. Martin Luther King

5.1 Stroke and the role of clinical audit

Stroke care should have a place at the forefront of any health service. The impact of stroke on both morbidity and mortality should not be undervalued. This challenge will continue with an ageing population in the developed world and changing risk factor profiles in the developing world (87). Equally the advances in clinical management and the benefit of organisation of care should inspire health services to adopt best practice.

Clinical audit has played a significant role in strengthening the confidence in clinical care of stroke patients. The National Sentinel Stroke Audit in the UK achieved 100% voluntary participation by hospitals and became a benchmark for management of stroke care (48). Clinical audit can verify the accuracy of national stroke registries as achieved in this recent audit and seen in other jurisdictions such as the Get With The Guidelines -Stroke Program register in the USA (88). The first Irish national stroke audit, INASC 2008, gave the HSE national stroke programme the baseline from which to construct a more modern, evidence-based, and patient-centred health service to manage the thousands of people affected by stroke each year in Ireland.

The aims of the national stroke programme were to reduce death and disability related to stroke. The key to achieving this aim was to bring organisation and cohesion to the care of stroke patients, while facing the backdrop of an economic crisis. The use of audit provided the framework for both driving change and assessing progress against both national and international standards.

5.2 National Stroke Audit 2015 and its implications

Conducting an audit of this scale with relative low resources presented challenges but also provided opportunities. The audit cycle progressed through the voluntary engagement of all the specialty teams and stakeholders with interests in the acute care of stroke patients. These teams committed to the process often outside of routine working hours, further underpinning the goodwill and care that staff provide nationally for people impacted by stroke. It also provided direct communication and feedback "on the ground" to the National Clinical Programme for Stroke, highlighting deficits and identifying resources that were not delivering on their potential.

The data gathered from the audit on the organisation of care in the acute hospitals in Ireland, the clinical outcomes that patients' experience, coupled with the information garnered from site visits by the audit team, combined to provide an accurate snapshot of stroke care. The expectation was that the audit would inform debate and discussion nationally among all people with an interest in stroke care.

The audit was representative of the entire Republic of Ireland, covering large urban areas and smaller rural communities (89). The age profiles show how stroke affects people of all ages, with trends increasing with advancing years. However, it is concerning that there is a higher proportion of strokes documented in the under 65 years of age population when compared with INASC 2008. The SSNAP UK results also give a potential window to the future, with a significantly higher proportion of stroke occurring in their oldest population

group. As people begin to survive from previously untreatable conditions such as certain cancers, the relative proportion of people being affected by stroke will likely increase.

Nationally it is also noted that different centres manage potentially different cohorts of people, with the average age per site ranging from 67.3 years to 80.4 years, which has significant implications when planning hospital/regionally specific resources and infrastructure to care for these people, although this could be explained by a random effect given the numbers at individual site level.

The success of the Irish Heart Foundation's Act FAST campaign is evident in that the standard tool used by paramedical staff when managing a patient with suspected stroke is the Act FAST assessment. Nearly two-thirds of patients presented to hospital via ambulance in this audit, however that is significantly less than the 82% in the SSNAP UK 2014. These results underline the importance of renewed support of the IHF Act FAST campaign nationally. The evidence would suggest that the impact of its message on the population has waned with time but it continues to be crucial that populations are aware of stroke symptoms and act quickly (45, 90).

Huge strides have been made with regard emergency access to CT neuroimaging in a timely manner in all sites. Importantly this has involved reorganisation of services so that patients are directed to sites with this level of access. The speed with which imaging is performed has also improved. The primary reason people are not scanned within 24 hours is due to late presentation. Further underlining the importance of stroke symptom education in the general public. Central to the model of best practice in stroke management is access to a

stroke unit (91). Progress had been made since the development of the national stroke programme in the development of this key infrastructure. With 78% (21/27) of sites having a stroke unit, this represented major progress from the single unit that existed at the time of INASC 2008.

In practice the units' model of care was affected by overall patient flow within the hospital, both in admission from the emergency department into the unit and egress out of unit. Protected beds were not standard throughout the units. Regarding national KPIs, 54% of patients were cared for in a stroke unit at some point during their admission (National KPI >50%) and 47% of patients spent over half their admission on a stroke unit (National KPI >50%). This potentially created inconsistency in the care each stroke patient received. The discrepancy between available beds and the number of stroke inpatients was most marked in the larger hospitals.

More work needs to be done to ensure patients' first admission point is the stroke unit and that as many patients as possible access this level of care. Currently care can be inconsistently delivered for individual patients depending on bed access. The role of the stroke unit can also continue to develop within the current system, by potentially reducing requirement on higher dependency beds through clearer bed designation and staffing.

Novel and resourceful ideas for patient care were documented during the site visits to the various units around the country. This innovative practice should be commended and encouraged. These ideas grew out of having an environment where the focus is on the needs of stroke patients specifically, and it is important that each stroke unit is ultimately

defined by the quality of care it delivers and not just the infrastructure the unit provides. Stroke units have been identified as an example of collaborative interdisciplinary working central to contemporary health policy (92).

The multidisciplinary team approach is an essential element to an effective stroke service. This approach functions best when the patients are managed on a dedicated unit, with appropriate numbers of the team available to manage that hospital's workload. This allows for timely assessment, early mobilisation, patient engagement in goal setting, and multidisciplinary team meetings for sharing of information. Despite the recruitment nationally of several multidisciplinary team members, all disciplines show substantial deficits in staff numbers. Patients are being seen for assessment more consistently and more quickly than noted in INASC 2008. However, assessment does not equate to intervention. No patient received the recommended level of daily therapy to promote recovery.

Although improvements have been made in the numbers of specialists working in Ireland, there is still inconsistent and inequitable access to this specialist knowledge throughout the country, with some areas more affected than others. Most specialists work in a dual role, a stroke physician coupled with the responsibilities of a general physician or general neurologist. The opportunities to develop services is restricted by large frontline commitments, not least the participation in thrombolysis on-call rotas.

This high level of commitment also has the knock-on effect of restricting training time to NCHDs, thus missing the opportunity to appropriately train future stroke physicians. This creates an environment where retention of doctors become increasingly challenging, as trainees travel abroad to continue their professional development, leaving positions unfilled and stroke services understaffed. The current doctors working in the stroke service need increased support to avoid this problem escalating. Every effort should be made to retain NCHDs in quality training posts in Ireland, with an ethos of patient-centred care coupled in an innovative and academic environment (93, 94).

There have been many improvements in stroke specific nurse training in accordance with the Stroke Clinical Care Programme. At least one CNS was in post in 85% (23/27) of hospitals compared to 14% (5/37) in INASC 2008. There were two advanced nurse practitioners (ANPs) in post and this number has further improved with a number of candidate ANPs being employed. The specialist nursing role had assisted with the development of key areas including staff training, patient communication, policy development and service audit.

Stroke patients require high levels of nursing care, with intensive monitoring particularly in the first 72 hours (57). This report highlights that nursing staff levels were found to be below the minimum 1.2 WTEs in 86% (18/21) of stroke units. This is particularly concerning as it does not include the required nurse 2.9 WTE per bed in the first 72hrs. If this level were applied only one unit nationally has appropriate staffing levels. A stroke unit operating with below-average nurse/bed ratios may be associated with increased risk of death (71). Clear

designation of stroke bed type would help to ensure there is an appropriate nurse staffing level 24/7 and assist workforce planning.

Prevention is better than cure, and when the two of the most common risk factors associated with stroke are both often asymptomatic but relatively easily assessed, consideration of how the nation's health is screened from a primary prevention point of view will need to be addressed (95). Education and people being empowered to make healthy choices could help reduce the health care utilization into the future. The results of documented aetiologies of stroke were within expected rates, 71% (617/874) of patients having a cause of their stroke identified by discharge (96). Within that identified group there is a high proportion of atrial fibrillation (44%; 269/617). The reported aetiologies underline the heterogeneous nature of stroke as a potential common pathway for many different disease processes. The increased reporting of more uncommon causes of stroke is likely a reflection of access to more sophisticated neuroimaging and the increase nationally to access to expert knowledge.

5.3 Geographic inequality in delivering healthcare

There is a global challenge to delivering equal healthcare and this is particularly evident in stroke. There are multiple components driving this challenge. Often a primary driver of inequality is related to the social hierarchy. However, in Ireland inequality to healthcare can be traced from historic and political consequences and from a fundamental geographic issue (97). The rural urban divide can make provision of stroke services a work of compromise, balancing servicing areas of the greatest need while giving all stroke suffers

equal access to best care. Geography is a fundamental component in the delivery of stroke care as it is a time and distance dependent condition. Essentially it will never be truly equal given the clinical paradigm of "time is brain". The economics of providing hyperacute stroke care do not scale down well.

The Republic of Ireland has some relatively unique issues which have sculpted its health care. Ireland is an island with one large city with a disproportionate volume of the population. There are a few further metropolitan areas primarily located on the coast. The majority of the country is relatively sparsely populated with varying roadway access and even variable weather conditions which impacts on air ambulance services.

Further challenges have developed from historic structure of health services in Ireland. It is clear the impact of high hospital admissions as a result of repeated health policies translates to challenges in protecting specialist beds including stroke unit beds. Numerous reports starting in 1968 had suggested about reducing the number of centres providing acute treatments and focusing specialism in tertiary centers (98). However, it is visible that political, rather than economic and clinical ones have shaped significant areas of Irish healthcare (99). This lack of cohesion and clear planning has led to a fragmented service where elements of care are provided through a number of public and private enterprises Including hospital and community services and preventative diagnostic services.

Stroke services in Ireland must face the modern challenge of rising expectations but first to what is economically deliverable. This pressure however provides an opportunity in innovation particularly in health technology. This immediately raises issues around areas

such as national broadband services which you can have been limited by political influence and around access to best technology through fair tendering processes. The challenges also lend themselves to novel, but evidence-based solutions which include telemedicine in relation to bridging the distance patients need to travel to access specialist care or early supported discharge to help alleviate acute hospital bed use while also providing holistic care to patients at home. One mechanism which has successfully been applied in other specific conditions including hip fractures acute coronary syndromes and trauma is the development of a national pathway with rigorous clinical audit with key performance indicators (100-102). This level of organisation will likely add further benefit to patient outcomes and resource utilization.

5.4 Acute stroke thrombolysis – an example of how reorganisation can achieve better patient outcomes

Thrombolysis of acute ischaemic stroke shifted the entire emphasis in the management of stroke worldwide. The safe expansion and improvement in delivery of thrombolysis in appropriate acute stroke patients is the most obvious improvement in care seen in the National Stroke Audit 2015 compared to INASC.

The relative sporadic and unpredictable nature of potential cases meant that sites' individual thrombolysis rate is far from absolute. The absence of a specific HIPE code for a patient with a stroke who received thrombolysis and the variable uptake in use of the stroke register made it difficult to obtain a true value from a clinical audit point of view. However, it is a variable on the stroke register (HIPE Portal Add-On Screen) which is available to all acute hospitals. It remains a key performance indicator of the national

stroke programme, so the ideal circumstance is to improve the input of data into the stroke register.

Limitations aside, the improvements seen in access and delivery of thrombolysis therapy has been a major success of the national stroke programme. At the time of the previous audit thrombolysis was virtually non-existent. With 82% (22/27) of sites providing a 24-7 service, comparable to the SSNAP UK (83%), and redirect procedures in place in a further 15% (4/27) of sites, the vast majority of the country has a system where a patient with early symptoms consistent with stroke will be directed to a centre which can deliver thrombolysis treatment. The FAST tool is now incorporated into the paramedical transfer notes further improving identification of potential patients who may benefit from this intervention.

The site-specific rates demonstrate a few interesting findings. Firstly, sites receiving redirected patients have higher rates than the average as would be expected. Secondly variation in rates should be taken in the context that certain regions have higher rates of haemorrhagic stroke represented in the audit, or have significant geographical challenges in patients presenting rapidly, and as mentioned above may have been assessed in a period of low activity.

An important finding to highlight is that patients aged between 36 to 93 years received thrombolysis and that 37% of patients were 80 years or older. This is in keeping with the evidence that older people potentially can have more to gain from this intervention (33). It is also worth noting that nearly half of the patients spent a period in a high dependency

bed, in most cases for the purpose of post thrombolysis observation. There is an argument for developing the stroke units' hyperacute capabilities in terms of monitoring, staffing and infrastructure as this could release a large volume of high dependency bed days. It would also allow for a specialist stroke multidisciplinary team to provide assessment and intervention for these patients, not always possible when patients are placed in high dependency beds separate from the stroke unit.

The success of the development of a national strategy for thrombolysis needs to embed the culture of hyperacute management of stroke, particularly in the view of recent advances in intervention and thrombectomy.

5.5 Conclusion and the future of stroke care in Ireland

Overall, the reaudit of stroke services would support the opinion that acute stroke care in Ireland has improved markedly since INASC 2008. Coupled with the clear benefits to patients, is the financial saving to the state from people returning to work or maintaining independence at home rather than in residential care. These savings should be reinvested in providing the national stroke programme the means to build on the work done, and to acknowledge the dedication and hard work of frontline staff caring for people with stroke, all despite the challenging work and financial backdrop of recent years.

The assessment of the organisation of rehabilitation and community services was outside of the remit of this audit. However, as a way of laying the groundwork for a further audit of both external rehabilitation and community services, data was gathered on where and to who patients are referred. This did not give a measure of level of access, waiting times or where

non referral results from absent services but the findings informed the Irish Heart Foundation/HSE National Stroke Audit 2016 – Rehabilitation Units (Appendix B).

Improving outcomes is a core aim of the national stroke programme and the Irish Heart Foundation, specifically reducing unnecessary disability and mortality. The results of National Stroke Audit 2015 show key improvements in patient outcomes following stroke, not least the inpatient mortality rate of 14% among the cases assessed which is 5% lower than in INASC 2008. Through the work of this thesis and the Irish Heart Foundation/HSE National Stroke Audit 2015, which helped validate the use of the national stroke register, the audit has now evolved into a continuous cycle through the National Office of Clinical Audit (NOCA) in the model of SSNAP. This will further support improvement in standards of care

Future modelling of stroke care into the next quarter of this century is being assisted by groups such as the European Stroke Organisation. They have developed a European Stroke Action Plan to guide stroke care improvement up to 2030. The plan encompasses several domains of care with very specific overarching targets including an absolute reduction in the number of strokes in Europe by 10%, that 90% or more of patients are treated in stroke units, to have national plans for the entire chain of care and to fully implement national strategies (103).

This plan provides the roadmap and it is reassuring that audit is highlighted as an important step on that map. The plan outlines that data on service structure, processes and outcomes are essential to fully describe a service. Audit and use of registry data are powerful tools but not sufficient in the absence of enablers to change to produce quality improvement.

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7 Appendices

7.1 Appendix A – Irish Heart Foundation / HSE National Stroke Audit 2015

IRISH HEART FOUNDATION/HSE

NATIONAL STROKE AUDIT 2015

December 2015

IRISH HEART FOUNDATION

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Trinity College Dublin
The University of Dublin

ROYAL COLLEGE OF PHYSICIANS OF IRELAND

Report preparation

This reported was prepared on behalf of the National Stroke Programme in collaboration with the Irish Heart Foundation.

Written by:

Dr. Paul McElwaine, Stroke Research Fellow, National Stroke Programme.

Ms. Joan McCormack, RGN, MSc
Project Manager- National Stroke Audit 2015, Irish Heart Foundation.

Principle Investigator:

Prof. Joseph Harbison, National Stroke Programme Clinical Lead, St James's Hospital, Dublin 8.

Supported by:

Ms. Carmel Brennan, Programme Manager National Stroke Programme.
Ms. Heather Coetzee, Speech and Language Therapy Manager, Mater Misercordiae University Hospital.
Dr. Paul Cotter, Consultant Geriatrician, St Luke's Hospital Kilkenny.
Dr. Rachael Doyle, Consultant Geriatrician, St Vincent's University Hospital and St. Columcille's Hospital.
Prof. Anne Hickey, Senior Lecturer, Royal College of Surgeons Ireland.
Dr. Frances Horgan, Senior Lecturer, Royal College of Surgeons Ireland.
Prof. Peter Kelly, National Stroke Programme Clinical Lead, Mater Misercordiae University Hospital.
Ms. Cliona Loughnane, Researcher Irish Heart Foundation.
Mr. Chris Macey, Head of Advocacy, Irish Heart Foundation.
Mr. Paul Marsden, Researcher Department of Public Health.
Dr. Dominick McCabe, Consultant Neurologist, Adelaide, Meath and National Children's Hospital.
Dr. Riona Mulcahy, Consultant Geriatrician, University Hospital Waterford.
Ms. Imelda Noone, Advanced Nurse Practitioner Stroke, St. Vincent's University Hospital.
Dr. Emer Shelley, Specialist in Public Health.
Dr. Tadhg Stapleton, Assistant Professor, Occupational Therapy, Trinity college.
Prof. David Williams, Stroke Physician, Beaumont Hospital and RCSI

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Finally we would like to acknowledge the patients and carers who live with the impact of stroke every day. Your resilience in the face of adversity and your journey to recovery is inspiring to all health care professionals, and we hope that the outcome of this report will provide the next catalyst to develop world-class stroke care in Ireland.

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ABBREVIATIONS

ADL – Activities of daily living
AMAU – Acute medical admission unit
ANP – Advanced Nurse Practitioner
ASU – Acute Stroke Unit
BASP – British Association of Stroke Physicians
CEO – Chief Executive Officer
CNS – Clinical Nurse Specialist
CT – Computerised tomography
ED – Emergency department
ESD – Early supported discharge
ESO – European Stroke Organisation
ESRI – Economic and Social Research Institute
EWTD – European working time directive
FAST – Face, Arm, Speech, Time
GP – General Practitioner
HIPE – Hospital In-patient Enquiry
HSCP – Health and Social Care Professionals
HSE – Health Service Executive
IHF – Irish Heart Foundation
INASC – Irish National Audit of Stroke Care
ISO – International Organisation for Standardisation
MDT – Multidisciplinary Team
MRI – Magnetic resonance imaging
NCHD – Non-consultant hospital doctor
NSP – National Stroke Programme
PC – Personal Computer
RCP – Royal College of Physicians
SNP – Stroke Network Partnership
SSNAP – Sentinel Stroke National Audit Programme
TIA – Transient ischaemic attack
WTE – Whole time equivalent

FOREWORD

The report of first Irish National Audit of Stroke Care published in 2008 made sobering reading. The care offered to Irish people suffering stroke summarised in that document could at best be described as sub-optimal and in many parameters assessed, care was clearly grossly inadequate leading to increased morbidity, mortality and reduced quality of life in Irish stroke survivors. The audit results laid a challenge to the Irish Health system addressed by the inclusion of stroke care in the HSE's 2009 document, 'Changing Cardiovascular Health: National Cardiovascular Health Policy 2010-2019' and by the launch of the National Clinical Programme for Stroke in 2010. That these initiatives were launched at almost the exact moment that the country entered the worse economic crisis in its history is a matter of historical note and consequently left the task of improving care much more challenging. Whilst the Health service was subject to an employment embargo and health expenditure contracted by more than 10%, the stroke programme was given a small resource and allowed to reappoint to a limited number of vacant posts on the condition that they be used to improve stroke care. Apart from these limited resources our only option was to harness the good will of health service staff, often asking them to change work practices and undertake new responsibilities without being able to offer any recompense or reward. Beyond this we undertook a programme of training, education, organisation and reorganisation of services. In this process the only resource available in abundance was the hard work and enthusiasm of our colleagues in the health service across the country.

This second audit shows encouraging improvement in many areas of stroke care. Inpatient mortality has reduced by more than one quarter, discharge direct to nursing home has reduced by one third and this has been matched with an increase in patients discharged home. Thrombolysis rate has increased more than tenfold.

Whilst these improvements are encouraging they cannot take away from persistent substantial deficits in services. The study shows that less than one third of patients are admitted to a stroke unit on presentation to the hospital and only about a half are admitted to a unit at any time during their stay. Treatment in a stroke unit is the most basic standard in the care of stroke patients and substantially improves chances of independent recovery following stroke. There is a large deficit in the availability of rehabilitative therapies to stroke patients with few patients receiving the level of any therapy recommended in national and international guidelines. Nursing levels are low and this may be reflected in the relatively high rates of urinary catheterisation and post stroke infection in our cohort.

Although at least half of people with stroke suffer anxiety, depression or severe psychological distress, access to psychology is available in only two centres. Early Supported Discharge teams are currently available in only three areas of the country despite copious evidence of their effectiveness in reducing length of stay, disability and need for long-term care. These continued deficits in care undoubtedly contribute to the continued long length of stay in hospital amongst stroke patients in Ireland. Whilst median length of stay has reduced by more than one fifth since the first audit, it still remains nearly 50% longer than in our nearest neighbor, the United Kingdom.

Although improvements in stroke care since the last audit have been associated with very substantial reduction in expenditure on long term and supportive care and in the number of hospital bed days occupied, there has been little additional investment in stroke care since the start of the programme. To maintain the improvements achieved, and to progress care of our fellow citizens suffering stroke to a level commensurate with a modern Western country further investment in stroke services is undoubtedly necessary. This additional need for resource is increased by recent developments in the acute management of patients with acute stroke such as thrombectomy. This intervention which Irish stroke services Ireland have been in the forefront of development, brings the possibility of reducing the mortality and morbidity in some patients with severe strokes by 50%. Offering this complex intervention widely to the Irish people will need a considerable additional investment in new centres and new staff in the next few years. We have however, shown in the last few years that such well targeted investment can reap rewards of a magnitude many times that of the resource committed and that further investment will likewise prove beneficial to the health service and Irish people suffering stroke in the future.

Prof. Joseph Harbison
National Clinical Lead for Stroke
Trinity College Dublin & St. James's Hospital

5th December 2015

MESSAGE FROM THE IRISH HEART FOUNDATION

My predecessor as Medical Director of the Irish Heart Foundation, the late Dr Brian Maurer, wrote in his foreword for the original Irish National Audit of Stroke Care (INASC) in 2007 that "stroke services in Ireland are so poorly organised that they are largely ineffective".

Back then, the audit found that only one hospital in the State had a stroke unit; 1% of patients received clot-busting thrombolysis treatment; acute rehabilitation was available to just one in four patients; and continuing care and long-term recovery programmes were haphazardly organised or didn't exist. The effect of this bleak combination of service deficits was a high toll of preventable death and disability from stroke.

The results of the *Irish Heart Foundation/HSE National Stroke Audit 2015* reveal that huge progress has been made in the last eight years from that desperately low base. Today, 21 hospitals have stroke units; the thrombolysis rate of 11% compares well internationally; and therapy is now available, albeit to fluctuating levels, across all sites. The human impact of these improvements is demonstrated by the reduction in in-hospital mortality from 19% of patients to 14% and the fact that only 8% of patients were newly admitted to nursing homes compared to 15% in 2007.

None of this could have been achieved without the skill and leadership provided by the National Stroke Programme in developing nationwide services essentially from scratch, along with the quite extraordinary dedication and commitment of stroke care professionals around the country. Whilst much of the service development has been a product of the reorganisation of existing resources, the role of the Department of Health and the HSE in allocating dedicated resources to stroke services for the first time ever in the midst of Ireland's extreme economic difficulties and massive reduction in the healthcare budget must also be acknowledged.

However, to overstate the progress made would represent a disservice to people who have already been affected by stroke and who will be struck by the disease in the future. We remain a long way from the objective of eliminating preventable death and disability from stroke, as evidenced by many continuing and severe service deficits.

The audit shows that just 29% of patients are admitted directly to a stroke unit, whilst almost half do not receive treatment in a unit at any point during their stay. Nearly a quarter of hospitals providing acute stroke care do not meet the minimum requirements required for a stroke unit.

In addition, there are staffing deficits in stroke services of 50.2%% for physiotherapists, 61.2% for occupational therapists and 30.9% for Speech and Language Therapists. In addition, only 44% of hospitals had any access to a medical social worker and 19% had access to a neuropsychologist. Just one out of 27 hospitals treating stroke had access to a specialist community stroke team for continuing long-term management of patient and only 11% had a hospital/community stroke liaison worker as part of their services. Three sites had none of the required infrastructure in place for a stroke unit.

These statistics compare deficits, not against what would be considered optimal services, but to *minimum* levels of service required to meet international standards for stroke services. They demonstrate yet again that whilst better services mean more people are surviving their stroke and returning home than ever before, there is still little emphasis on helping survivors to maximise their recovery.

However, if therapy levels are inadequate in hospital, we know they are significantly worse in the community. And whilst community stroke services are beyond the remit of this audit, the near-total absence of community stroke teams and hospital/community liaison it highlights is fuelling a very strong sense among survivors of being saved and then abandoned by the health system at the hospital gates.

A particular omission has been the failure to extend Early Supported Discharge (ESD) services for stroke survivors in the face of compelling evidence of their human and net economic benefit. The survey concludes that the paucity of current coverage nationally by ESD teams likely contributes to lower discharge home rates currently in Ireland than in other countries.

In conclusion, the audit results indicate that stroke services in Ireland are at a crossroads. More has been achieved with current resource levels than anyone could have thought possible when the National Stroke Programme was established. Further improvements in outcomes will require a new commitment to investing in services, not least as stroke incidence rises in line with our ageing population. The futures of very many patients hinge on a higher priority being given to them by policymakers.

On behalf of the Irish Heart Foundation, I would like to thank everyone who participated in the design and collection of data for this audit and everyone on the frontline of stroke care whose daily dedication continues to save the lives and the quality of life of so many people.

Dr Angie Brown
Medical Director of the Irish Heart Foundation

December 2015

EXECUTIVE SUMMARY

Background

Stroke is a leading cause of death and disability worldwide. Over 7,000 people in Ireland are hospitalised following stroke each year. Improved outcomes for stroke patients' has been a policy priority for the HSE as evidenced by the implementation of the national stroke programme (NSP) since 2010.

The NSP identified the key aims of:

- National rapid access to best-quality stroke services
- Prevent 1 stroke every day
- Avoid death and dependence in 1 patient every day

These aims were targeted through the provision of funding, to develop infrastructure and specialist posts within the stroke service nationally, specifically the development of a national programme for thrombolysis therapy, the creation of designated stroke units on sites managing acute stroke patients and the recruitment of medical, nursing and health and social care professionals (HSCP) with specialist knowledge in stroke.

With the changes and progress that have been made in recent years, it was vital that the stroke service underwent a repeat clinical audit to establish the current situation. The Irish Heart Foundation/HSE National Stroke Audit 2015 is a national audit of acute stroke services in hospitals throughout Ireland. It is the second national audit report on stroke services in Ireland following on from the Irish National Audit of Stroke Care (INASC) in 2008.

Methodology

The objective of the audit of acute stroke services was to establish the current level and functioning of services for the care of stroke patients in acute hospitals in the Republic of Ireland. The audit of acute hospital services had two components:
i) An audit of the organisational aspects of stroke care in acute hospitals with regard to their resources for organised stroke care.
ii) A clinical audit of stroke care involving the review of clinical case notes for a selected national sample of patients with stroke.
Twenty-seven sites participated in both the organisational and clinical audit, with each of the participating sites managing at least 20 new patients with stroke per annum.

The organisational audit involved the completion of a proforma detailing the structure of the stroke service on site in advance of a site visit by the audit team. The visit involved a structured interview with key stakeholders in each hospital clarifying any queries with regard service provision and afforded a review of stroke units where they existed. Results represent services in early 2015.

The clinical audit involved chart reviews from each of the participating sites. With each site providing a number of cases relative to the proportion of stroke admissions per annum. Members of the multidisciplinary team performed the chart reviews with the audit team providing training and support during the audit period. The cases were reflective of the care provided to patients discharged during January-March 2014 and July-September 2014. In total 874 cases were included in this audit, which gives a representative national sample of clinical care in stroke in Ireland.

The results were compared against the findings of INASC 2008 and also the Sentinel Stroke National Audit Programme (SSNAP) UK 2014. Comparison with the UK is informative , given the similar casemix and it can be acknowledged that the UK stroke service is more developed given its National Stroke Strategy has been in place since 2007.

Key findings and recommendations

Outcome measures

- The inpatient mortality rate of 14% compares favorably with the 19% rate found in INASC 2008

- Newly institutionalised patients to residential care was 8% in the 2015 audit compared with 15% in INASC 2008

- The average length of stay for patients discharged alive from hospital is 22.4 days versus 29.8 days in 2008

Patients who suffer a stroke in Ireland now have a better chance of surviving and with less disability, and in tandem the health service has made significant cost savings in terms of saved beds days, people returning to work, and reduced costs of residential care. These savings should be reinvested in stroke services in Ireland.

Thrombolysis

- The development of a national strategy for thrombolysis delivery has seen an improvement in prehospital care, with the adoption of the FAST assessment tool as standard and the all 27 sites had specific arrangements in place for the rapid transfer of acute stroke patients to hospital.

- The estimated national thrombolysis rate of 11% is comparable favorably with international rates and is a clear improvement given that thrombolysis provision was virtually nonexistent in INASC 2008.

- The provision of thrombolysis care has involved many physicians working onerous on-call rotas in order to offer the best treatment for patients.

Improving thrombolysis rates should be central to the aims of stroke services nationally. Renewed funding of the Irish Heat Foundation Act FAST campaign will further raise awareness of stroke symptoms in the general population so that pre-hospital care has the opportunity to transfer patients to centres which provide this treatment.
In view of the mounting evidence supporting endovascular intervention in stroke it is imperative that nationally hyperacute stroke services have the staff and infrastructure to offer patients the best treatment possible in an equitable and consistent way.

Imaging and diagnostics

- Access to CT is available 24/7 in all hospitals managing patients with acute stroke

- The quality of CT scanners varies nationally with implications for the provision of assessment for endovascular intervention (clot retrieval).

- Availability to MRI has not improved substantially since INASC 2008. With increased specialist knowledge and demand for diagnostics, it is concerning that some hospitals have very limited access for stroke patients.

- Delays in access to appropriate diagnostics including neuroimaging and cardiac monitoring has led to many hospitals adopting an admit and assess policy

Access to CT imaging has improved. However with increased specialists and developments in stroke care, including endovascular intervention, access to high quality modern scanners is important to offer patients the most appropriate assessment of their stroke. A review of the capabilities of all CT scanners nationally would be beneficial.
Rapid assessment of TIA and potential stroke is a fundamental part of any stroke service. Each site, appropriately resourced, should adopt a system that allows patients to being seen promptly and access diagnostics in timely manner as dictated by numbers of patients requiring the service.

Stroke units

- Stroke units were available in 78% (21/27) of sites. This represents good progress from the single unit available in INASC 2008, but still shows inequity in access to best care as patients in six hospitals have no access to stroke unit care.

- The number of stroke unit beds available nationally at the time of the audit was 150. However 61% of inpatients with a stroke at the time of the audit were being managed on a ward other than a stroke unit.

- For hospitals with stroke units in place only 29% of patients were admitted directly to a stroke unit on admission, and even taking into account admissions to higher dependency beds, this only rises to 40% of patients accessing stroke unit care in the important early phase of their care.

- Inconsistency exists in availability of features recommended in each stroke unit. Most notable inconsistencies included access to continuous physiological monitoring and in nurse training in stroke assessment specifically swallow screening. This is manifest where only 36% of patients had swallow screening performed in the first 24 hours as opposed to over 80% in the SSNAP UK audit.

A stroke unit is the central hub from which the organisation of a stroke service can be coordinated. The provision of stroke unit care is supported by the evidence, reducing morbidity and mortality. Therefore all sites managing acute patients should provide stroke unit care, and all sites should develop their stroke units to provide the highest quality of care possible, including ensuring stroke units are appropriately staffed, equipped, and provide ongoing education and training for staff and patient/carers alike.

Staffing

- Increased numbers of multidisciplinary team specialists in stroke care was notable. A consultant physician with specialist knowledge of stroke was available in 85% (23/27) of sites versus only one third of hospitals in INASC 2008. Patients had access to a clinical nurse specialist (CNS) in stroke in 85% (23/27) of sites with two advanced nurse practitioners in stroke in the country, as compared with only 5 CNS nationally in INASC 2008.

- Clear staffing whole time equivalent deficits as per guidelines was noted nationally for all members of the multidisciplinary team

- Only one health and social care professional (HSCP) clinical specialist post exists in the country.

Although recruitment of multidisciplinary team members through the NSP facilitated improvements in service provision, when compared against guidelines large shortfalls still exist in all disciplines nationally, none more apparent than psychology. Due to this shortfall, HSCPs are unable to provide recommended levels of therapy to patients, instead having to focus on assessments of new patients.

Stroke units for the most part do not have the required nursing staff to manage patients, even when compared with the most modest guideline targets. The role of the clinical nurse specialist should continue to evolve, with support for the development of more advanced nurse practitioners.

Doctors, both at consultant and NCHD grade, should be adequately supported to provide best patient care, service development, clinical training and research for the benefit of the stroke services.

In all disciplines increased numbers of staff is required in order to allow them to provide appropriate care to their patients.

Early supported discharge

- A new service since INASC 2008, only three early supported discharge teams exist covering four acute hospitals

- Patients accessing these services in these hospitals ranged between 14-35% of cases reviewed. These are patients who would otherwise have been managed in the acute hospital setting or a rehabilitation facility for a longer period as opposed to being in their own home.

- The assessment of the organisation of rehabilitation and community services was outside of the remit of this audit. However it was clear substantial deficits exist.

Early supported discharge is an example of a service that is an evidence based, cost effective, patient-centered and that can help increase available bed days in the acute hospital setting. The expansion of this service should be supported nationally. Furthermore an audit should be performed to assess service levels in the community and to ensure more joined-up delivery of post-acute services.

Conclusion

The findings of the National Stroke Audit 2015 provide as snapshot of the acute stroke service provided in Ireland. The audit's purpose was to assess current practice against both national and international guidelines. Through the process potential strengths and weaknesses have been identified. This provides vital information for planning and development both at local and national level.

A recommendation from INASC 2008 was the creation of a stroke register, which has been implemented with varying uptake. This essential tool can provide real time information on stroke care, thus facilitating clinical audit in a more accessible and reproducible manner. Data capture and review is an essential element of any clinical service to ensure patients are cared for in a manner consistent with the highest standards. The register should be supported and strengthened.

The assessment of the organisation of rehabilitation and community services was outside of the remit of this audit. However, as a way of laying the groundwork for further audit of both external rehabilitation and community services, the findings will inform the next phase of the audit. Data was gathered on where and to who patients are referred. This provided an indication of both the scale of community rehabilitation service deficits and the lack of connection between acute services and the community services that do exist. In order to develop more holistic services for stroke survivors, it is crucial that a further audit is carried out to assess service levels in the community and to ensure more joined-up delivery of post-acute services.

A clear strength observed from the process and findings of the audit is the dedication of frontline staff who provide care to patients every day in every part of the country. Their hard work to improve services for all patients was set against the backdrop of substantial cuts in healthcare budgets, reduced staffing, and a global recession. Many of the improvements seen were supported by stroke multidisciplinary team members going above and beyond their remit, innovating and collaborating, striving to provide the best care possible. It is essential that their endeavor is acknowledged through investment in staff, infrastructure and services.

Most importantly all patients admitted with an acute stroke, irrespective of age, should have access to the best treatment options, be managed in a stroke unit appropriately equipped and staffed by a trained multidisciplinary team. They should access essential diagnostic tests promptly. They should receive the necessary levels of therapy to facilitate their recovery and be central to the decision-making and goal setting process. The patient should be clearly informed of their diagnosis and the reason their stroke occurred, provided with education and support in their wishes relating to vocational and residential issues. Ultimately they should be respected and supported to return to independent living as quickly as is achievable.

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BACKGROUND

Introduction

Stroke is a leading cause of death and disability worldwide and it is estimated that cerebrovascular diseases account for up to five percent of total healthcare costs (Evers et al 2004, Rossnagel et al 2005). 7,000 people in Ireland are hospitalised following stroke each year, of whom approximately about 20% die as in-patients per year (ESRI 2014). Evidence based stroke care reduces death and disability cost effectively (Stroke Unit Trialists 2013), however, effective stroke care will only occur if the organisational structure allows and facilitates the delivery of the best treatments at the optimal time (RCP Guidelines). Improved outcomes for stroke patients' has been a policy priority for the HSE as evidenced by the implementation of the national stroke programme since 2010.

The Irish Heart Foundation/HSE National Stroke Audit 2015 is a national audit of acute stroke services in hospitals throughout Ireland. It is the second audit report on stroke services in Ireland following on from the Irish National Audit of Stroke Care (INASC) in 2008.

Acute stroke care services in Ireland

There have been important changes in the organisation and delivery of healthcare in general within the HSE since 2008. In 2010 the National Stroke Programme (NSP) was developed with the key aims of:

- National rapid access to best-quality stroke services
- Prevent 1 stroke every day
- Avoid death and dependence in 1 patient every day

These aims were targeted through the provision of funding, to develop infrastructure and specialist posts within the stroke service nationally, specifically the development of a national programme for thrombolysis therapy, the creation of designated stroke units on sites managing acute stroke patients and the recruitment of medical, nursing and health and social care professionals (HSCP) with specialist knowledge in stroke. In 2011, €4.2m reconfigured funding, from the Acute Hospital Division budget, was provided to support the implementation of the programme objectives.

From the outset the NSP established baselines from which the implementation of the programme can be evaluated. A baseline Hospital Emergency Stroke Services Survey was carried out in 2010 along with a review of workforce. With the changes and progress that have been made in recent years, it was vital that the stroke service underwent a repeat clinical audit to establish the current situation.

The recent establishment of acute hospitals into a small number of groups (Table 2.1), each with its own planned governance and management structure, aims to provide an optimum configuration for hospital services to deliver high quality, safe patient care in a cost effective manner. This report uses the framework of the six hospital groups to present its findings.

Role of the Irish Heart Foundation

The Irish Heart Foundation (IHF) has been working since 1966 to reduce premature death and disability from stroke and heart disease in Ireland. The IHF advocates for better stroke services and care in both hospitals and the community. The IHF developed the Stroke Council, an expert group that provides comprehensive advice and information to the IHF on issues surrounding stroke. The IHF also funded the first ever audit of stroke services in Ireland in 2008.

INASC 2008 – key findings

INASC 2008 was wide ranging in its review of stroke services in Ireland, but some key findings were highlighted within the report. Stroke units were virtually nonexistent, with only one hospital having such a unit. Very few patients were accessing and benefiting from acute interventions such as thrombolysis. Acute rehabilitation was only available to one in four patients or was delayed beyond the point at which it is most effective. Continuing care and long-term recovery programmes were haphazardly organised or did not exist. The patient journey was fragmented and not properly organised. The quality of care was determined by chance, location and a haphazard combination of circumstances. Too many people died from stroke because they could not access optimal treatment sufficiently rapidly. Too many survivors were left with avoidable and unduly prolonged disability.

Evidence on best practice in acute stroke care

As with any clinical audit, acute stroke service performance was measured against recognised standards and guidelines. For the most part the findings were measured against the Irish national guidelines, *Irish Heart Foundation: Council for Stroke, National Clinical Guidelines and Recommendations for the Care of People with Stroke and Transient Ischaemic Attack March 2010.* However where the standard or guideline has changed significantly or where Irish guidelines are not available we also drew from other sources from the UK and internationally including *National clinical guideline for stroke, Royal College of Physicians, Fourth Edition 2012, British Association of Stroke Physicians (BASP), Stroke Service Standards, Clinical Standards Committee, June 2014* and the *European Stroke Organisation (ESO) Recommendations to Establish a Stroke Unit and Stroke Center 2013;44:828-840.*

Overview of audit

The objective of the audit of acute stroke services was to establish the current level and functioning of services for the care of stroke patients in acute hospitals in the Republic of Ireland. The audit of acute hospital services had two components:

i. An audit of the organisational aspects of stroke care in acute hospitals with regard to their resources for organised stroke care
ii. A clinical audit of stroke care involving the review of clinical case notes for a selected national sample of patients with stroke. The audit followed a very similar method and structure to INASC 2008 in order to allow for comparison.

In section 1 the results of the organisational audit are presented, which assessed the organisational structures within Irish hospitals using self-reported survey and site visit data collection. In section 2 the findings of the clinical audit are presented, which encompassed a large national survey of almost 900 clinical cases involving all hospitals managing acute stroke patients. Where appropriate the results are compared with INASC 2008 and also the Sentinel Stroke National Audit Programme (SSNAP) UK 2014 audit of stroke care. Finally in section 3 the recommendations and conclusions from the findings of the audit are discussed.

SECTION ONE: ORGANISATIONAL AUDIT 2015

CHAPTER 1. METHODOLOGY

1.1 Introduction

This chapter describes the data and methods used in the organisational audit phase of the National Stroke Audit 2015. The aim of the organisational audit of hospital-based stroke services was to establish the current level and functioning of services for the care of stroke patients in acute hospitals Ireland, and with regard to their resources for organised stroke care. Use of an organisational audit proforma (Appendix 1) and visits to each participating site allowed each hospital to describe their local stroke service.

1.2 Organisational audit proforma

The organisational audit proforma was adapted from the INASC 2008 validated proforma, the Royal College of Physicians London (RCPUK) National Sentinel Stroke Audit 2004 Organisational Audit Proforma, and with minor modifications for the Irish setting and incorporating recent changes in guidelines. Expert opinion on the content of the questionnaire was provided by the National Stroke Audit Steering Group (Appendix 2). The tool was piloted in August 2014 with good geographic representation. Data is maintained both digitally and in paper record, with access limited to the research team only.

1.3 Recruitment

The National Stroke Audit aimed to recruit all hospitals admitting over 20 acute stroke patients per year. The identification of eligible hospitals was based on data from the National HIPE Office. Communication of the National Stroke Audit commenced in December 2014 with letters sent to each Clinical Director, Director of Nursing, Clinical Stroke Lead and Hospital Manager/CEO, inviting them to participate in the audit.

1.4 Data collection

Health care professionals responsible for stroke services at each site completed the organisational proforma between December 2014 and January 2015. Each hospital was assigned an individual site code to ensure confidentiality. The completed proforma was returned to the project team.
On return of the proforma a date was arranged for a visit to the site. Teams of three people performed the site visits. The teams comprising of a national stroke programme clinical lead, a member of the project team; and a senior nurse or senior HSCP from the national stroke audit steering group. Representation from hospital management, clinical teams and multidisciplinary teams were invited to attend the meeting. The visits took place 5th February to the 31st March 2015 and involved a review of the completed organisational proforma and a visit to the stroke unit if present and to the emergency department.

1.5 Data management and analysis

The project was an audit, using an audit protocol, approved by National Stroke Audit Steering Group. There was no impact with patient care. As advised by National Hospitals' Office from previous INASC 2008, review for all protocols was provided by the expert steering group, with individual hospitals having option to address any local issues with its ethics committee if necessary. Ethical issues relating to data management and protection were discussed with the AMNCH/ St James' Hospital Research Ethics Committee. In advance of the audit, the National Hospitals Office of the Health Service Executive and the Chief Executive Officers of the relevant hospitals permission was obtained.

The data from the proforma were transferred from hardcopy to digital format. Data management and processing was assisted by an ISO accredited data management company. Access to data was restricted to members of the project team. All files both digital and hardcopy were securely stored in a swipe access office with locked filing cabinets and password protected PCs. All sites contributing to this phase of the audit were provided with an interim report of the provisional findings.

1.6 Limitations

This is an audit of acute stroke care and as such does not evaluate the patient journey once discharged. The inclusion of the patient experience is key to service development but time and resources did not allow for this at this point. It is nonetheless central to overall service review and should be considered in the next phase.

CHAPTER 2. ORGANISATIONAL AUDIT RESULTS

2.1 Introduction

The findings of the Organisational Audit 2015 illustrate the substantial developments in stroke services since INASC 2008 while also highlighting some significant deficits that still exist. This chapter will describe the findings of the organisational audit using the section headings within the organisational audit proforma as a framework. The findings are compared against INASC 2008 and the UK Sentinel Stroke National Audit Programme 2014 (SSNAP 2014) where possible. National and hospital group data are presented throughout this section with particular emphasis on key organisational areas.

Reference is made to stroke clinical guidelines throughout this results section. Results are primarily viewed against our own Irish national guidelines;

Guideline A. *Irish Heart Foundation: Council for Stroke, National Clinical Guidelines and Recommendations for the Care of People with Stroke and Transient Ischaemic Attack, Revised Version March 2010*

Where guidelines have been revised or are not present in the Irish guidelines we refer to other sources as follows:

Guideline B. *National clinical guideline for stroke, Royal College of Physicians, Fourth Edition 2012*

Guideline C. *British Association of Stroke Physicians (BASP), Stroke Service Standards, Clinical Standards Committee, June 2014*

Guideline D. *European Stroke Organisation (ESO) Recommendations to Establish a Stroke Unit and Stroke Center Ringelstein et al Stroke. 2013;44:828-840*

2.2 Hospital eligibility and participation

Hospital eligibility

In 2013, the Health Service Executive (HSE) reorganised all acute hospitals in the Republic of Ireland into six adult acute hospital groups (Table 2.1). Each group comprises between four and seven hospitals, each including at least one major academic teaching hospital. For the purpose of this audit every hospital within each hospital group was asked to confirm the number of acute stroke patients admitted each year and hospitals with less than 20 acute stroke admissions per year were ineligible to participate.

Table 2.1 Hospital groups

Ireland East	Dublin Midlands	RCSI Hospitals	University of Limerick	South/South West	SAOLTA
Mater Misercordiae University Hospital	St James's Hospital	Beaumont Hospital	University Hospital Limerick	University Hospital Waterford	University College Hospital Galway
St Vincent's University Hospital	Adelaide, Meath, National Childrens Hospital	Our Lady's of Lourdes Hospital Drogheda	Ennis General Hospital	South Tipperary General Hospital	Portiuncula Hospital
Midland Regional Hospital Mullingar	Naas General Hospital	Cavan General Hospital	Nenagh General Hospital	Cork University Hospital	Mayo General Hospital
Wexford General Hospital	Midland Regional Hospital Tullamore	Connolly Hospital Blanchardstown	St John's Hospital	Kerry General Hospital	Sligo General Hospital
St Luke's Hospital, Carlow Kilkenny	Midland Regional Hospital Portlaoise	Louth County Hospital		Mercy University Hospital	Letterkenny General Hospital
Our Lady's Hospital Navan				Bantry General Hospital	Roscommon General Hospital
St Colmcilles Hospital				Mallow General Hospital	

Hospital participation

All hospital groups were represented and 100% (34/34) of hospitals responded resulting in a total of 79% (27/34) being eligible to participate. It was noteworthy that only one of the hospitals in the University of Limerick group was eligible to participate (Table 2.2).

The total number of acute hospital beds reported from responses to survey at the audit time period was 10,005.

Table 2.2 Hospital groups' participation and bed numbers

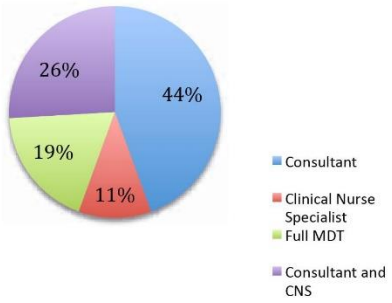
	Number of hospitals in group n	Number of hospitals eligible to participate n (%)	Number of acute hospital beds reported
Ireland East	7	6 (86)	1736
Dublin Midlands	5	5 (100)	2145
RCSI Hospitals	5	4 (80)	1844
University of Limerick	4	1 (25)	437
South/South west	7	6 (86)	2073
Saolta	6	5 (83)	1770
Total	**34**	**27 (79)**	**10005**

Organisational audit proforma completion

The completion of the organisational audit proforma was the responsibility of the clinical lead for stroke, if present, with contributions from the clinical nurse specialist, the multidisciplinary team and hospital management. Figure 2.1 illustrates the team involvement in the process.

In addition, the site visit from the national stroke audit team facilitated a review and clarification of any data points.

Figure 2.1 Completion of organisational audit proforma



2.3 Organisation of care in the emergency department and acute medical assessment units

Pre-hospital care

Paramedical staff should pre-notify the receiving hospital emergency department of any incoming FAST positive patient to facilitate early medical assessment and access to rapid imaging. [Guideline A]

FAST (Face Arm Speech Test) has become standard as pre-hospital screening for suspected stroke (Harbison et al 1999). All 27 acute hospital sites stated that they had specific arrangements with local ambulance services for rapid transfer of acute stroke patients to hospital, with 19% (4/27) having a redirect policy for FAST positive cases to a site that provides thrombolysis. Responses indicate that the mechanisms of early notification varied from site to site and some of the most efficient models encountered could be adopted nationally. This is a significant improvement from the 2008 INASC report, which had local arrangements at 3% of sites (Table

Table 2.3 Ambulance/Paramedical organisation

	National Stroke Audit 2015	INASC 2008	SSNAP 2014
Local ambulance arrangements	100% (27/27)	3% (1/37)	99% (165/167)

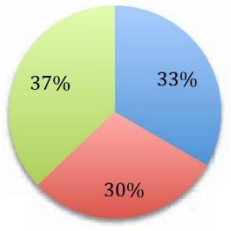
Availability of stroke teams

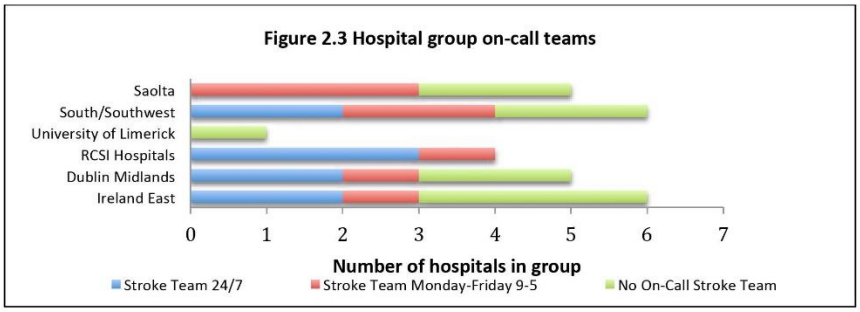
Round the clock on-call availability of an acute stroke specialist either on-site or as part of an stroke network partnership. [Guideline A]

The availability of on-call stroke teams and the service provided within hospitals admitting stroke patients vary (Fig 2.2). On-call stroke teams were available in 63% (17/27) of the hospitals. Examples include a dedicated registrar or medical registrar on site out of hours with access to consultants with specific training in stroke.

For sites with no dedicated stroke team the responsibility for the assessment and management of acute stroke cases, particularly those not viewed as FAST positive cases, lay with the medical team on call. This is one of the challenges when establishing a stroke network partnership so that all patients in each hospital group receive access to specialist knowledge (Fig 2.3).

Figure 2.2 Availability of stroke teams





Imaging in the emergency department

All hospitals receiving acute medical admissions, which include patients with potential stroke, should have on-site access to computerised tomography (CT) scanning of the brain. [Guideline A] This imaging technology should be based on a multi-detector CT system that also facilitates non- venography (≥64 slice scanner is recommended). [Guideline D]

Access to twenty-four on site CT scanning was available in 100% (27/27) of hospitals (Table 2.4). However, in at least two sites the scanners were of low quality being unable to perform angiography. This has implications for the selection and treatment of patients suitable for acute endovascular intervention and intra-arterial clot retrieval.

Table 2.4 Emergency imaging access

	National Stroke Audit 2015	INASC 2008	SSNAP 2014
CT 24/7	100% (27/27)	84% (31/37)	99% (165/167)
Emergency MRI access <24hour	48% (13/27)	32% (12/37)	N/A

Access to thrombolysis

A twenty-four hour, seven-day week, thrombolysis service for acute ischaemic stroke, alone or as part of a stroke network partnership (SNP), using telemedicine solutions should be available. [Guideline A]

Findings showed that 82% (22/27) of sites surveyed provide a 24/7 on-site thrombolysis service. Of the 18% (5/27) remaining hospitals, one site provides a thrombolysis service from Monday - Friday between 9am - 5pm and then cases are re-directed to another hospital; 1 site provides a service on an ad-hoc basis depending on the physician on-call; and 3 sites do not deliver on-site thrombolysis but local arrangements to redirect patients to another site area are in place (Fig 2.4). Results are comparable with UK data (Table 2.5).

Figure 2.4 Access to thrombolysis

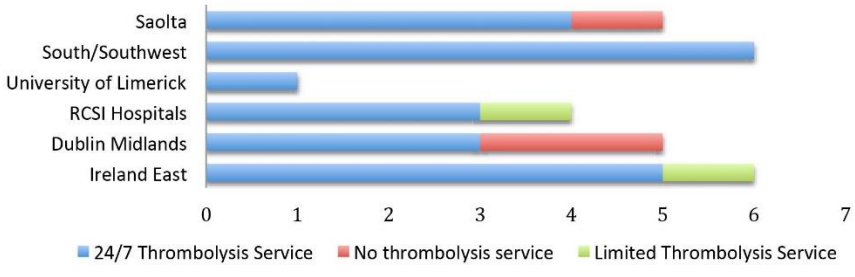


Table 2.5 Comparison of thrombolysis services versus SSNAP 2014

	National Stroke Audit 2015	SSNAP 2014
Thrombolysis service 24/7	82% (22/27)	83% (139/167)
Less than 24/7 service provided but a 24/7 service provided overall involving local arrangements	15% (4/27)	8% (13/167)
No on-site service and less than 24/7 service provided including local arrangements	4% (1/27) *	8% (13/167)
No provision at all	0	1% (2/167)

* Ad-hoc on-site service with no re-direct provision.

Substantial organisational change has occurred since INASC 2008 with regards provision of thrombolysis therapy, almost the entire country has structures and procedures in place 24/7 to direct patients to centres providing this treatment option, where the decision to prescribe this therapy is always made by a consultant often with specialist stroke training (table 2.6).

Endovascular Treatment

The evidence base for supporting thrombectomy and endovascular intervention for appropriate patients with ischaemic stroke increased during the audit period (Nam et al 2015). Two sites were performing thrombectomy, Beaumont Hospital and Cork University Hospital, sites where neurosurgical support is also present for hemicraniectomy. Cork University Hospital provided cover during normal working hours, Monday to Friday, and variably out of hours depending on expertise on call on a given day. The site reported performing seven endovascular procedures in the previous 12 months. Beaumont Hospital provided a twenty-four hour service and an estimated seventy one patients underwent endovascular treatment in the previous 12 months. The challenge of providing endovascular treatment nationally will be discussed in a later section.

Table 2.6. Local availability of stroke teams and thrombolysis service 2015

Hospital	24/7 Stroke team on-call	9-5 Monday-Friday Stroke team on-call	No stroke team on-call	Thrombolysis service 24/7	Thrombolysis service < 24/7	Thrombolysis service < 24/7 but with redirect.	Where is thrombolysis delivered?	Who decides to proceed with thrombolysis?
Mater Misercordaie University Hospital	✔			✔			Emergency department	Stroke consultant
St Vincent's University Hospital		✔		✔			Emergency department	Stroke consultant
Midland Regional Hospital Mullingar			✔	✔			Emergency department	Medical consultant
Wexford General Hospital			✔	✔			Emergency department	Medical consultant
St Luke's Hospital, Carlow Kilkenny	✔			✔			Stroke unit	Stroke consultant
Our Lady's Hospital Navan			✔		✔		Other	Medical consultant
St James's Hospital	✔			✔			Emergency department	Stroke consultant
Adelaide, Meath, National Children's Hospital	✔			✔			Emergency department	Stroke consultant
Naas General Hospital		✔		✔			Emergency department	Stroke consultant
Midland General Hospital Tullamore			✔			✔	Other	Other
Midland General Hospital Portlaoise			✔			✔	Other	Stroke consultant
Our Lady of Lourdes Hospital	✔			✔			Emergency department	Stroke consultant
Cavan General Hospital	✔			✔			CCU	Medical consultant
Beaumont Hospital	✔			✔			Emergency department	Stroke consultant
Connolly Hospital		✔			✔		Emergency department	Medical consultant
University Hospital Limerick			✔	✔			Emergency department	ED consultant
University Hospital Waterford		✔		✔			Emergency department	Stroke consultant
South Tipperary General Hospital		✔		✔			Emergency department	Stroke consultant
Cork University Hospital	✔			✔			Emergency department	Stroke consultant
Kerry General Hospital			✔	✔			Emergency department	Medical consultant
Mercy University Hospital	✔			✔			Emergency department	Stroke consultant
Bantry General Hospital			✔	✔			ICU	Stroke consultant
University College Hospital Galway		✔		✔			Emergency department	Stroke consultant
Portiuncula Hospital			✔			✔	ICU	Medical consultant
Mayo General Hospital		✔		✔			Emergency department	Stroke consultant
Sligo General Hospital			✔	✔			Emergency department	ED consultant
Letterkenny General Hospital		✔		✔			Emergency department	Stroke consultant

Access to the multidisciplinary team in the emergency department/AMAU

> Patients with acute stroke should be assessed and managed by stroke nursing staff and at least one member of the specialist rehabilitation team within 24 hours of admission. [Guideline B]

The ideal situation is for patients to transfer immediately to a stroke unit for assessment by the specialist team. Given that patients can often have prolonged periods in the emergency department (ED), results are presented with regard access to health and social care professionals and specialist nursing in the ED/AMAU. Findings indicate that access to the multidisciplinary team in the emergency department varies widely (figure 2.5).

Access to a clinical nurse specialist (CNS) in stroke in the emergency department is found to be available in 78% (21/27) sites. In 15% (4/27) sites there is no CNS employed.

Access to health and social care professionals (HCSP) in the emergency department is low with 52% (14/27) of sites having no access to physiotherapy, occupational therapy or speech and language therapy. Only one site reports full access excluding psychology to the multidisciplinary team (figure 2.6). INASC 2008 reported that very few hospitals provided therapy assessment in the emergency department. These findings indicate that access to the full range of HSCP's remains limited in the vast majority of hospitals (table 2.7). However it is again important to highlight that the priority should be that patients have immediate access to an appropriately staffed stroke unit.

Figure 2.5 Number of hospitals with access to the multidisciplinary team in the emergency department

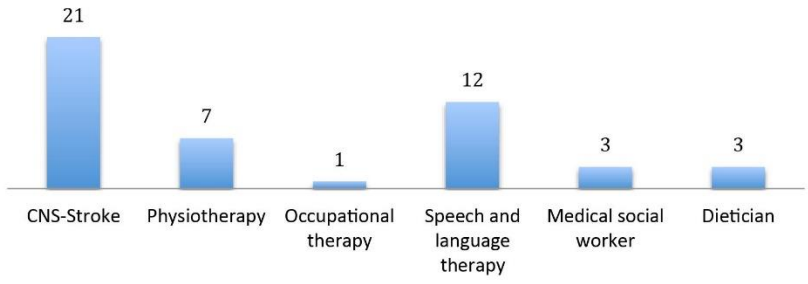


Figure 2.6 Access to HSCP in the emergency department

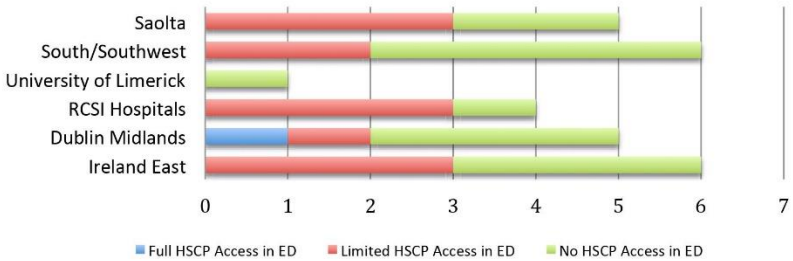


Table 2.7. Local availability of multidisciplinary assessment in the emergency department 2015

Hospital	Physiotherapy	Speech and language therapy	Occupational therapy	Clinical nurse specialist	Medical social work	Swallow screening	Psychology	Dietetics
Mater Misercordaie University Hospital	✔	✔		✔		✔		✔
St Vincent's University Hospital	✔	✔		✔		✔		
Midland Regional Hospital Mullingar		✔		✔				
Wexford General Hospital								
St Luke's Hospital, Carlow Kilkenny				✔				
Our Lady's Hospital Navan				✔				
St James's Hospital	✔	✔	✔	✔	✔	✔		✔
Adelaide, Meath, National Children's Hospital								
Naas General Hospital	✔	✔		✔	✔	✔		
Midland General Hospital Tullamore						✔		
Midland General Hospital Portlaoise								
Our Lady of Lourdes Hospital		✔		✔				
Cavan General Hospital				✔				
Beaumont Hospital		✔		✔				✔
Connolly Hospital	✔	✔			✔	✔		
University Hospital Limerick				✔				
University Hospital Waterford		✔		✔		✔		
South Tipperary General Hospital				✔		✔		
Cork University Hospital				✔		✔		
Kerry General Hospital								
Mercy University Hospital				✔		✔		
Bantry General Hospital	✔	✔		✔		✔		
University College Hospital Galway		✔		✔		✔		
Portiuncula Hospital				✔				
Mayo General Hospital				✔		✔		
Sligo General Hospital				✔				
Letterkenny General Hospital		✔		✔		✔		

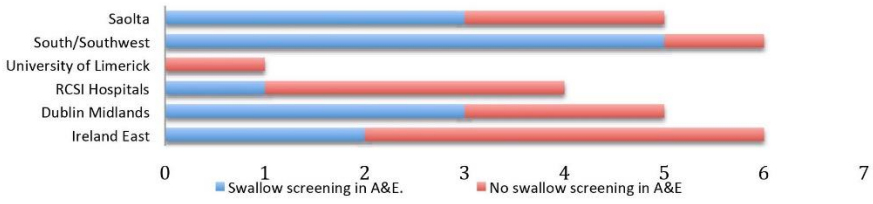
Swallow screening in the emergency department

All patients should be assessed within 3 hours of admission for their ability to swallow, using a validated swallow screening test administered by an appropriately trained person. [Guideline A]

Access to swallow screening in the emergency department was available in 52% (14/27) of hospitals (figure 2.7).

A speech and language therapist or a clinical nurse specialist generally performs the swallow screen; both services provide a Monday-Friday service only. One site reported that all NCHDs in the stroke service were trained to carry out swallow screening, which potentially means that some swallow screens were carried out during the on-call period also. SSNAP 2014 report that 96% of sites (160/167) have nurses trained in swallow screening on duty seven days per week. Swallow screening will be further evaluated in the clinical audit section.

Figure 2.7 Availability of swallow screening in the emergency department



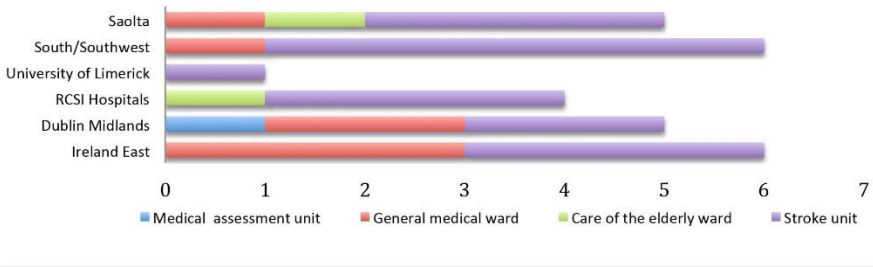
Initial ward of admission from the emergency department

All hospitals providing care for acute stroke patients must make available immediate access to a specialist, acute stroke unit or comprehensive stroke unit. [Guideline A]

Hospitals indicated that a patient with a stroke would most likely be admitted initially to a stroke unit in 63% (17/27) of the sites (figure 2.8).

Comparison can be made with actual admission wards from the clinical audit results and this is discussed further in section 3.

Figure 2.8 Ward most likely to be admitted to from the emergency department



2.4 Organisation of care in the first 24 hours

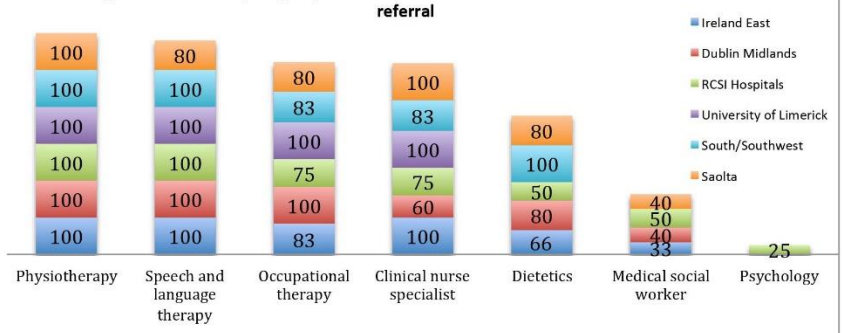
Multidisciplinary team assessments within 24 hours of referral

All patients should receive an initial physiotherapy, occupational, nutrition and speech and language therapy assessment using an agreed procedure or protocol within 24 hours. [Guideline A]

Access to the multidisciplinary team (MDT) within 24 hours of referral is generally good and gaps in medical social work and psychology are reflective a combination of reported reduced need for the service within 24 hours and an absence of personnel (figure 2.9).

All hospitals reported access to physiotherapy within 24 hours of referral, 96% (26/27) to speech and language therapy, 87% (23/27) to occupational therapy, 86% to clinical nurse specialists and 63% (20/27) to dietetics. This access refers primarily to HSCP assessment rather than intervention.

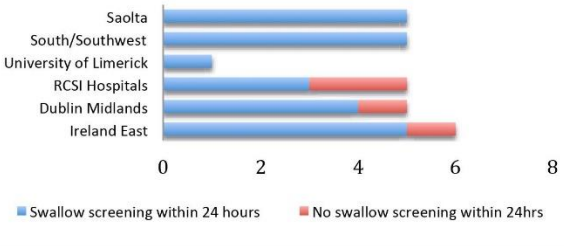
Figure 2.9 % of hospital groups with assessment from the MDT within 24 hours of referral



Swallow screening within 24 hours

There is access to swallow screening within 24 hours of admission in 85% (23/27) of hospitals (figure 2.10).

Figure 2.10 Numbers of hospitals within groups with access to swallow screening within 24 hours



2.5 Imaging

CT and MRI scanning

For all people with acute stroke without indications for immediate brain imaging, scanning should be performed within a maximum of 24 hours after onset of symptoms Rapidly accessible MRI should be available where there is still diagnostic uncertainty after CT scanning. [Guideline A]

CT scanning is available on all sites on a twenty-four hour, seven-day week basis. There is a reported 100% availability for emergency CT within twenty-four hours and reported 100% availability for routine CT scanning within forty-eight hours. Access to CT imaging is further evaluated in the clinical audit section.

MRI access is available at all times in only two hospitals, however 85% of hospitals have access to MRI during the normal working week.

Early follow-up imaging of the carotid arteries is essential and is available in the vast majority of sites within 48 hours.

Table 2.8 summarises the access to MRI and carotid duplex nationally.

Table 2.8 Availability of MRI and carotid duplex scanning by hospital group

	Ireland East % (n)	Dublin Midlands % (n)	RCSI Hospitals % (n)	University of Limerick % (n)	South/South west % (n)	Saolta % (n)
Access to MRI 24/7	17 (1)	0 (0)	25 (1)	0 (0)	0 (0)	0 (0)
Access to MRI Monday-Friday only	83 (5)	100 (5)	75 (3)	100 (1)	83 (5)	100 (5)
Routine MRI scanning within 48 hours	33 (2)	60 (3)	100 (4)	0 (0)	33 (2)	0 (0)
Emergency MRI scanning within 24 hours	33 (2)	60 (3)	100 (4)	100 (1)	33 (2)	20 (1)
Access to carotid duplex 24/7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (00
Access to carotid duplex Monday-Friday only	100 (6)	80 (4)	100 (4)	100 (1)	83 (5)	100 (5)
Routine carotid duplex within 48 hours	50 (3)	60 (3)	100 (4)	100 (1)	83 (5)	0 (0)
Emergency carotid duplex within 24 hours	50 (3)	80 (4)	75 (3)	100 (1)	83 (5)	20 (1)

Transient ischaemic attack/neurovascular service

Patients with TIA should be referred to a hospital with a specialist stroke service for immediate assessment, investigation, and treatment. [Guideline A]

Findings indicate that 26% (7/27) of hospitals have a specialist neurovascular clinic, ranging from daily to once a month clinics. Some sites operate a rapid access service and other services provide a general neurovascular outpatient model. The majority of services require their TIA patients to be admitted in order to access neuroimaging such as carotid duplex and MRI or to access cardiac diagnostics such as holter monitoring or transoesoephageal echocardiogram.

26% of sites had agreed protocols between acute and primary services for the rapid assessment of potential TIA patients. Table 2.9 indicates the access to neurovascular services nationally, identifying improvements since INASC 2008 although neurovascular clinics are less available compared to SSNAP 2014. However as stated many sites choose to admit their patients for rapid assessment and investigation and this approach may suit certain services better than attempting to provide full outpatient based assessment.

Table 2.9 Access to neurovascular service

	National Stroke Audit 2015	INASC 2008	SSNAP 2014
Neurovascular clinic	26% (7/27)	16% (6/37)	98% (163/167)
Provision of a service that enables patients to be seen and investigated within 7 days of minor stroke/TIA	74% (20/27)	16% (6/37)	*

* SSNAP report data based on patients seen and investigated on the same day.

Table 2.10 Summary of national TIA/Neurovascular services

	Access to neurovascular clinic	Clinics per month	Seen and investigated within 24 hours of minor stroke or TIA	Seen and investigated within 7 days of minor stroke or TIA	Rapid access to MRI for patients discharged from the ED within 7 days	Rapid access to carotid duplex for patients discharged from the ED within 7 days	Agreed protocols between acute and primary care services.
Mater Misercordaie University Hospital	✔	20	✔	✔	✔		✔
St Vincent's University Hospital			✔	✔			
Midland Regional Hospital Mullingar			✔	✔			✔
Wexford General Hospital							
St Luke's Hospital, Carlow Kilkenny							
Our Lady's Hospital Navan				✔	✔	✔	
St James's Hospital	✔	8	✔	✔	✔	✔	✔
Adelaide, Meath, National Children's Hospital	✔	20	✔	✔		✔	✔
Naas General Hospital							
Midland Regional Hospital Tullamore							
Midland Regional Hospital Portlaoise					✔		
Our Lady of Lourdes Hospital	✔	4		✔	✔		
Cavan General Hospital				✔	✔	✔	
Beaumont Hospital			✔	✔			
Connolly Hospital	✔	4	✔	✔	✔	✔	✔
University Hospital Limerick				✔		✔	
University Hospital Waterford			✔	✔	✔	✔	
South Tipperary General Hospital	✔	1	✔	✔			
Cork University Hospital	✔	20	✔	✔		✔	✔
Kerry General Hospital					✔	✔	
Mercy University Hospital			✔	✔	✔	✔	✔
Bantry General Hospital			✔	✔		✔	
University College Hospital Galway				✔			
Portiuncula Hospital					✔		
Mayo General Hospital				✔			
Sligo General Hospital				✔	✔	✔	
Letterkenny General Hospital				✔			

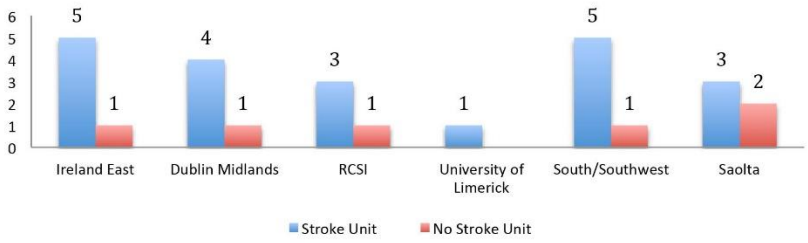
2.6 Stroke unit models

Availability of stroke units

All stroke patients should have immediate access to a stroke unit, where they are cared for by a multi professional team who has specialist knowledge, training and skills in stroke care. [Guideline A]

There is a reported availability of a stroke unit in 78% (21/27) of sites. This is a significant development since INASC 2008, which reported the presence of 1 stroke unit. Of the remaining hospitals three had a ward with a strong emphasis on stroke care and multidisciplinary team working ethic, and with a small amount of reorganisation could be identified as a stroke unit. The remaining three sites had no infrastructure in place for a stroke unit (figure 2.11).

Figure 2.11 Availability of stroke units

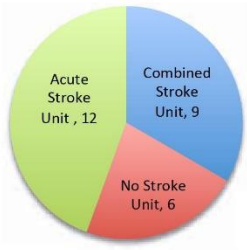


Type of stroke unit

Each organisation was asked to further define the type of stroke unit it operated based on three options;

- Acute stroke unit - stroke patients are accepted acutely but discharged or transferred early, usually within seven days.
- Combined stroke unit - accepts stroke patients acutely and provides rehabilitation for several weeks if necessary.
- Rehabilitation stroke unit - accepts stroke patients once acute phase is complete with a focus on rehabilitation.

Figure 2.12 Type of stroke units available



57% (12/21) of stroke units were defined as acute stroke units with 43% (9/21) defined as combined stroke units, (figure 2.12). One site did identify itself as a rehabilitation stroke unit, and while it had a strong stroke rehabilitation ethos, the beds were not geographically discreet within the generic rehabilitation unit. Table 2.11 indicates the distribution of stroke units throughout the groups.

Table 2.11 Location of stroke units

	Acute stroke unit	Combined stroke unit	No stroke unit
Mater Misercordaie University Hospital		✔	
St Vincent's University Hospital	✔		
Midland Regional Hospital Mullingar		✔	
Wexford General Hospital		✔	
St Luke's Hospital, Carlow Kilkenny		✔	
Our Lady's Hospital Navan			✔
St James's Hospital	✔		
Adelaide, Meath, National Children's Hospital	✔		
Naas General Hospital		✔	
Midland General Hospital Tullamore			✔
Midland General Hospital Portlaoise		✔	
Our Lady of Lourdes Hospital	✔		
Cavan General Hospital	✔		
Beaumont Hospital	✔		
Connolly Hospital			✔
University Hospital Limerick		✔	
University Hospital Waterford	✔		
South Tipperary General Hospital	✔		
Cork University Hospital		✔	
Kerry General Hospital			✔
Mercy University Hospital		✔	
Bantry General Hospital		✔	
University College Hospital Galway		✔	
Portiuncula Hospital	✔		
Mayo General Hospital	✔		
Sligo General Hospital			✔
Letterkenny General Hospital			✔

Stroke unit criteria

All stroke units providing care for acute stroke patients must be in a geographically discrete area, have the capacity to monitor and regulate basic physiological function, access to immediate imaging and be staffed by a specialist multidisciplinary team. [Guideline A]

All sites that admitted stroke patients acutely to their stroke unit were asked if they fulfilled the recommended features of an acute stroke unit.

Table 2.12 compares the results with SSNAP 2014, specifying differences in the features as described. 33% (7/21) of stroke units have all features of an acute stroke unit, table 2.13.

It is important to note that SSNAP 2014 define stroke unit beds according to two types; type 1, beds solely used for the first 72 hours after stroke and type 3, beds used for both the first 72 hours of care and beyond. Only one hospital in this audit defines their beds in this way and for that reason we have compared the data against the type 3 beds in SSNAP 2014.

Table 2.12 Features of a stroke unit

Features of a stroke unit admitting stroke patients acutely	National Stroke Audit 2015 n=21 % (n)	SSNAP 2014 n=109 %
Continuous physiological monitoring (ecg, oximetry, blood pressure)	57 (12)	88
Access to scanning within three hours of admission*	86(18)	99
A policy for direct admission from the emergency department	86 (18)	50
Specialist ward rounds at least 5 times per week**	71 (15)	30
Acute stroke protocols and guidelines	95 (20)	99
Nurses trained in swallow screening	52 (11)	96
Access to 24 hour brain scanning***	100 (21)	N/A
Nurses trained in stroke assessment and management****	N/A	95

* SSNAP = immediate access to brain scanning
** SSNAP = consultant led ward round 7 times per week vs NSA 2015 5 times per week
*** SSNAP = not identified as a feature of a stroke unit
**** National Stroke Audit 2015 = not identified as a feature of a stroke unit

Table 2.13 Acute stroke unit criteria

	Continuous physiological monitoring	Access to scanning within three hours of admission	A policy for direct admission from the emergency department	Specialist ward rounds five times per week	Acute stroke protocols and guidelines.	Access to 24 hour brain imaging	Nurses trained in swallow screening	% of features of a stroke unit that accepts stroke patients acutely
St Vincents University Hospital	✔	✔	✔	✔	✔	✔		86%
St James Hospital	✔	✔	✔	✔	✔	✔	✔	100%
Adelaide, Meath, National Children's Hospital	✔	✔	✔	✔	✔	✔	✔	100%
Our Lady of Lourdes Hospital		✔	✔	✔	✔	✔		71%
Cavan General Hospital	✔	✔	✔	✔	✔	✔		86%
Beaumont Hospital	✔	✔	✔	✔	✔	✔	✔	100%
University Hospital Limerick	✔	✔	✔		✔	✔		71%
University Hospital Waterford	✔	✔	✔	✔	✔	✔	✔	100%
South Tipperary Hospital	✔	✔	✔	✔	✔	✔	✔	100%
Portiuncula Hospital	✔	✔	✔		✔	✔	✔	86%
Mayo General Hospital		✔	✔		✔	✔		57%
St Luke's Hospital, Carlow Kilkenny	✔	✔	✔	✔	✔	✔	✔	100%
Bantry General Hospital	✔	✔	✔	✔	✔	✔	✔	100%
Mater Misercordaie University Hospital		✔	✔	✔	✔	✔	✔	86%
Midland Regional Hospital Mullingar					✔	✔		29%
Wexford General Hospital			✔		✔	✔		43%
Naas General Hospital		✔	✔	✔	✔	✔	✔	86%
Midland Regional Hospital Portlaoise						✔		14%
Cork University Hospital	✔	✔	✔	✔	✔	✔		86%
Mercy University Hospital		✔	✔	✔	✔	✔	✔	86%
University College Hospital Galway		✔		✔	✔	✔		57%

Access to stroke unit beds

Stroke units should be large enough to accommodate all acute suspected neurovascular/stroke admissions to the hospital. [Guideline A]

The results of the organisational audit 2015 identify the variance between the number of designated stroke beds and the number of in-patients with a principal diagnosis of stroke. The data presented is based on the day the proforma was completed in each site, between 7/1/2015 to 25/3/2015.

In total, there were 386 in-patients with a principle diagnosis of stroke. The number of stroke unit beds available nationally was 150. Therefore, 61% of stroke patients were not cared for in a stroke unit.

A needs assessment was undertaken in 51% (17/33) of sites reported to identify the appropriate number of beds required for the population.

Figure 2.13 indicates the appropriate occupancy of stroke patients in designated stroke beds. Ideally beds should be protected for stroke patients only, however in practice and with the bed shortages, patients with other conditions are admitted to stroke units. Figure 2.14 highlights the gap between the number of stroke inpatients and the number of stroke unit beds available. The process did not identify the patients who were awaiting discharge.

Figure 2.13 Stroke unit bed occupancy

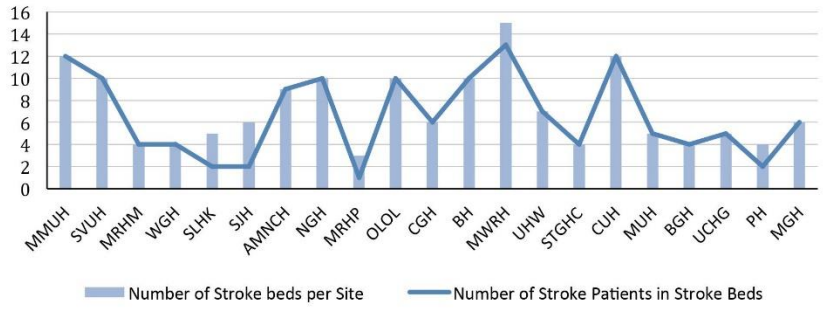
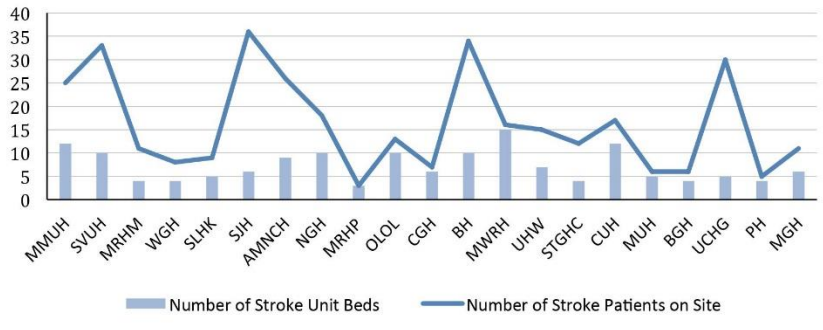


Figure 2.14 Stroke in-patients versus stroke beds

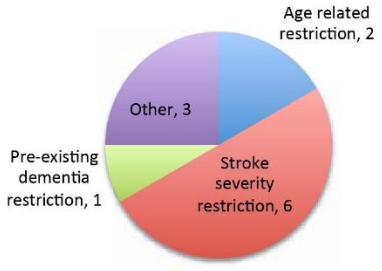


Stroke unit admission criteria

All stroke patients should have immediate access to a stroke unit. [Guideline A]

Established admission criteria were reportedly in place in 76% (16/21) of the stroke units. Restrictions included: by age; severity of stroke; and dementia. However, only 12 sites identified what those criterion were. Six sites identified severe stroke as a restriction to admission to the stroke unit (figure 2.15).
SSNAP 2014 states "exclusion criteria cannot be condoned or justified. No patient should be excluded on the basis of age, stroke severity or co-morbidity".

Figure 2.15 Admission criteria to stroke unit



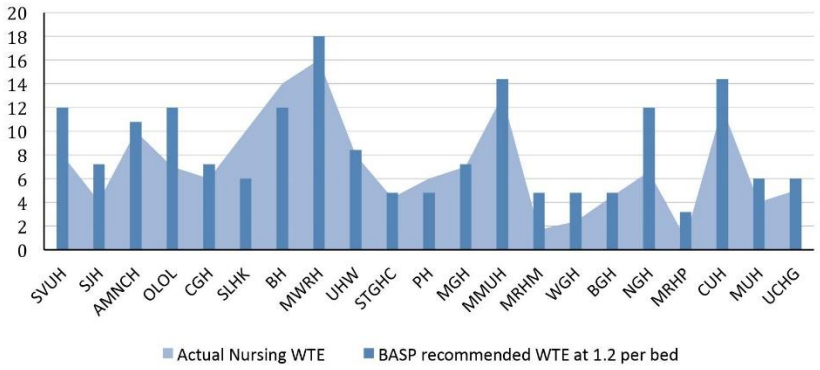
2.7 Staffing

Stroke unit nurse staffing levels

The stroke unit should have sufficient trained nursing staff to provide high quality nursing care. In the first seventy-two hours of admission, patients will require more intensive monitoring and nursing input, requiring a minimum of 2.9 whole time equivalents per beds and thereafter 1.2 WTE per bed. [Guideline C]

Nursing staff levels were found to be below the minimum 1.2 WTEs per stroke unit bed in 86% (18/21) of stroke units (figure 2.16). 7/21 units have staffing deficits of over 30%. This does not take into account the higher requirement for more intensive nursing in the first seventy-two hours after admission. If this level were applied only one unit nationally has appropriate staffing levels. Difficulty arises in estimating stroke unit staffing requirements, which are dependent on the designation of stroke unit beds at each site. It is possible that a patient would require high levels of nursing input in the acute phase of their illness, and then clinically transition to step-down status and then onto the rehabilitation phase in the same hospital bed, particularly in a combined stroke unit model.

Figure 2.16 Nursing deficits based on 1.2 WTE per stroke unit bed



Health and social care professional staffing levels

> All appropriate patients receive a minimum of forty-five minutes of physiotherapy, occupational therapy and speech therapy seven days a week. Provision of this level of therapy requires 1 WTE physiotherapist and occupational therapist per five beds, and 1 WTE speech and language therapist per 10 beds. [Guideline C]

The organisational audit found that in general HSCP numbers were reported based on the entire stroke service rather than the number of beds in the stroke unit. Therefore, data is based on the stroke inpatient numbers on the day of the audit. The BASP 2014 therapy staffing guidance is based on a seven-day service. As such, the WTE equivalents for physiotherapy, occupational therapy, and speech and language therapy have been adjusted to reflect the current five-day service available in the Republic of Ireland; 0.71 WTE per five beds for physiotherapy and occupational therapy, 0.71 WTE for speech and language therapy per ten beds.

There was a staffing deficit of 50.2% for physiotherapists, (figure 2.17), 61.2% for occupational therapists, (figure 2.18), and 30.9% for speech and language therapists (figure 2.19). Currently no patients receive treatment 7 days per week and resourcing is not adequate to provide 45 minutes of physiotherapy, occupational therapy, and speech and language therapy per day if required.

Figure 2.17 PT WTE per vs BASP guidelines

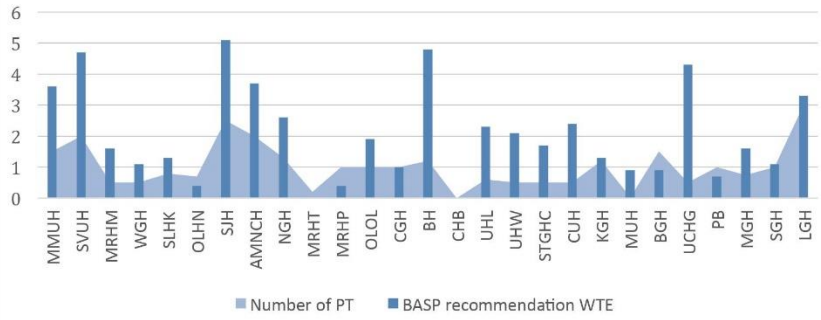


Figure 2.18 OT WTE vs BASP guidelines

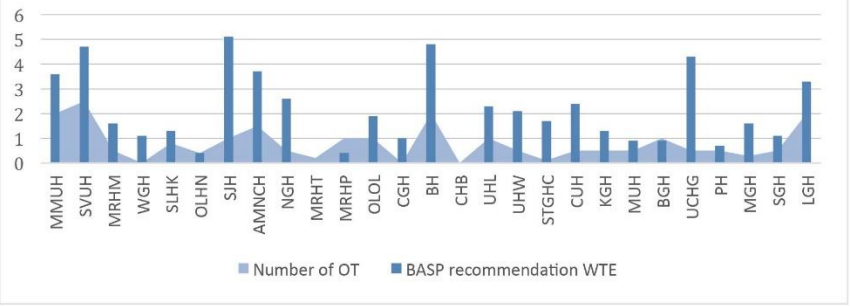
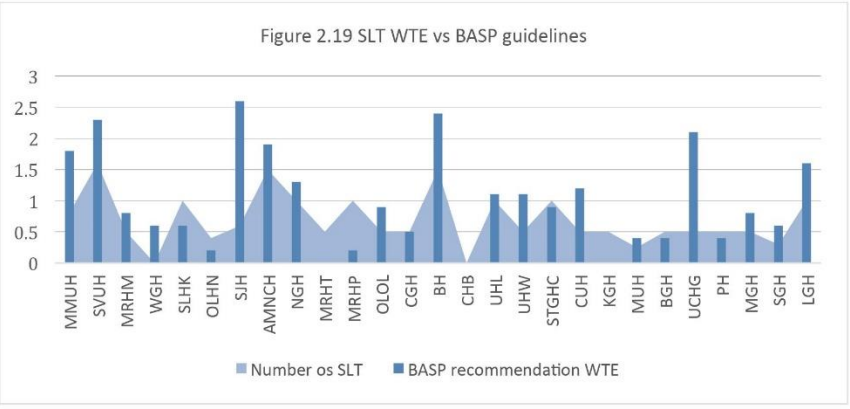


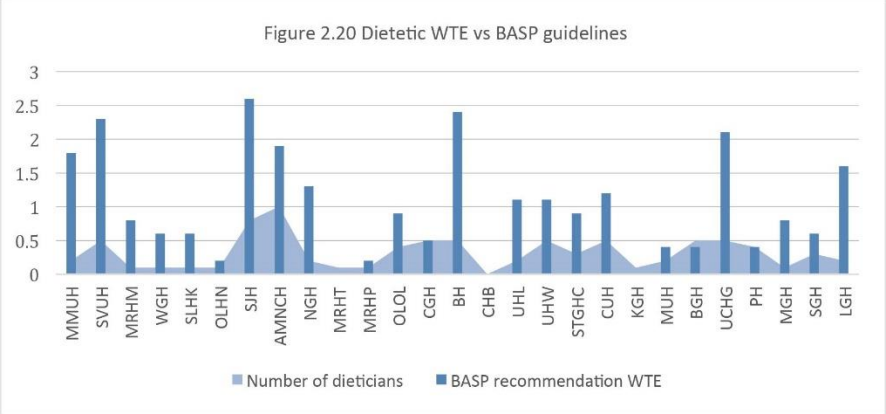
Figure 2.19 SLT WTE vs BASP guidelines



Access to Nutrition Support

People with acute stroke who are unable to take adequate nutrition and fluids orally should be referred to a dietician for detailed nutritional assessment, individualized advice and monitoring. [Guideline A}

Another vital component of stroke unit staffing is appropriate access to specialist dietetics. Dietetics is recommended at 0.71 WTE per ten beds for a five day service. It was found that there was a staffing deficit of 68.9% for dietetics cover nationally, (Figure 2.20).

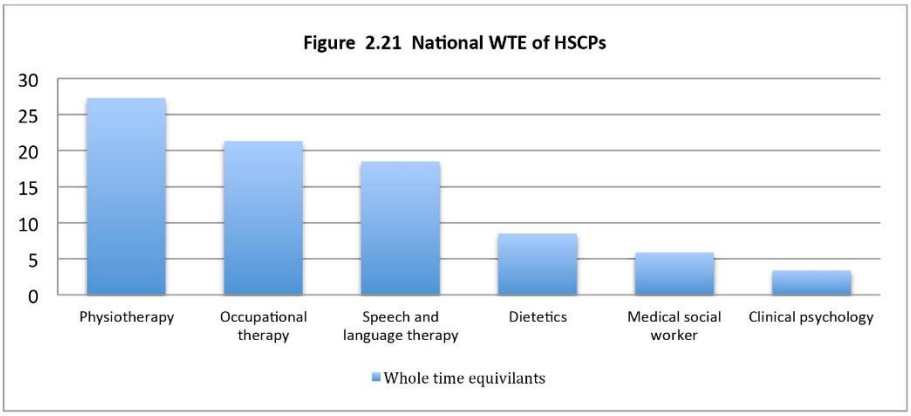


Access to social and psychological services

All stroke patients referred to a social worker should undergo a comprehensive psychosocial assessment and intervention. [Guideline A]

No access to a medical social worker was reported in 56% (15/27) of sites and only 19% (5/27) of sites had access to a clinical psychologist. All patients should have access to medical social work and psychological assessment or support as required.

The total number of WTE HSCPs employed in stroke care is represented in figure 2.21. There is no stroke specific HSCP service in any site during the weekend.



2.8 Specialist roles

Medical specialists in stroke

All hospitals receiving acute medical admissions that include patients with stroke should have a clinical lead for stroke.
All patients should be reviewed by a physician expert in stroke. [Guideline A]

85% (23/27) of hospitals had a consultant physician, with specialist knowledge of stroke, formally recognised as having principal responsibility for stroke services. Table 2.14 shows the improvement in stroke specialism since 2008. In addition, 66% of hospitals have an agreed policy that all, or the majority of patients with acute stroke are admitted under a consultant physician with expertise in stroke care.

Consultant specialists need the support of an NCHD team both for training and service provision. Non-consultant hospital doctor cover varied greatly and it was difficult to collate accurately the deficits in medical staffing. Often NCHDs cross cover both general medical and specialty patients, which made it difficult to assess time dedicated to stroke patients specifically. The effects of variable NCHD numbers and impact of the European Working Time Directive (EWTD) will be expanded on in the discussion section.

Table 2.14 Lead stroke consultant

	National Stroke Audit 2015	INASC 2008
Lead stroke consultant	85%	32%

Clinical nurse specialists in stroke

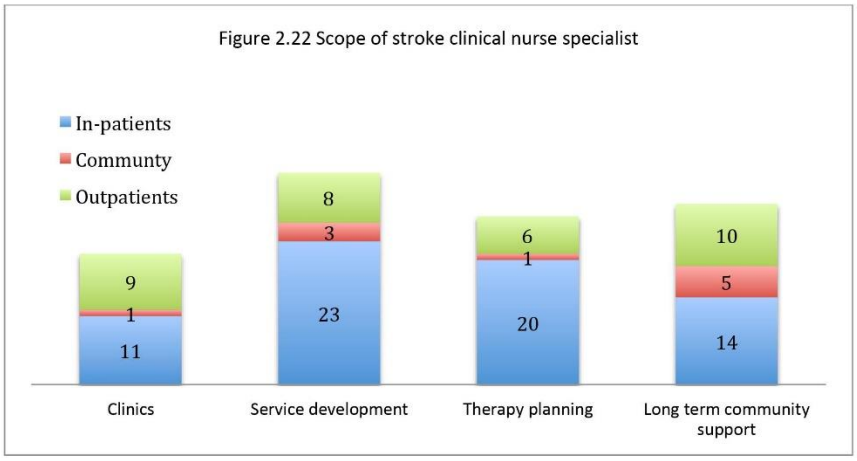
All hospitals receiving acute medical admissions, which include patients with potential stroke, should have a clinical nurse specialist with responsibility for stroke. [Guideline A]

A clinical nurse specialist in stroke was available in 85% (23/27) of hospitals compared to 14% in INASC 2008. One hospital had an advanced nurse practitioner (ANP) in stroke, in addition to a clinical nurse specialist, and one hospital had ANP alone.
The scope of the clinical nurse specialist varied between sites, with an emphasis on inpatient and outpatient services (Figure 2.22), noting that some sites had more than one CNS.

HSCP clinical specialists

A mix of therapy grades is required to deliver optimum care to the person who has had a stroke, and this includes basic, senior and clinical specialist posts. [Guideline A]

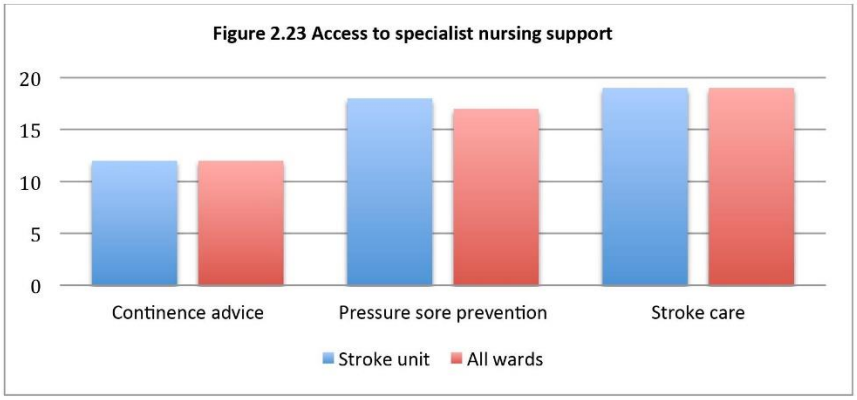
Although there are HSCP with specialist knowledge and interest in stroke working on numerous sites, only one clinical specialist post (in occupational therapy) exists in the whole national acute stroke service.



2.9 Interdisciplinary services

Specialist nursing support

Access to specialist nursing support for stroke patients varied nationally with 57% of stroke units reporting nurse specialist advice in continence, 86% in pressure sore prevention and 91% in stroke care. Figure 2.23 compares access to specialist nursing support between stroke units and general wards.

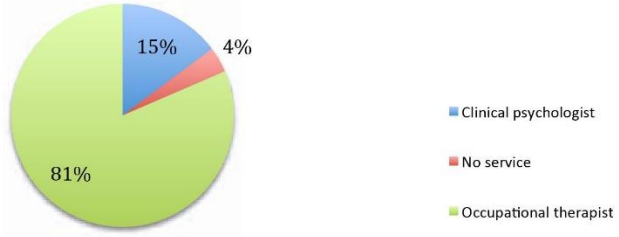


Cognitive assessment

Assessment of higher cognitive function is largely carried out by occupational therapists, figure 2.24. 5 sites (18.5%) had access to a clinical psychology service. 44% (12/27) of hospitals report access to vocational educational/training, however, this service is often accessed off-site.

All patients at risk should be screened periodically for cognitive impairment, using a simple, standardized screen. [Guideline A]

Figure 2.24 Professions completing cognitive assessments



Interdisciplinary record keeping

Stroke care pathways should be available for the acute phase of stroke. [Guideline A]

All disciplines contribute to a single set of patient records in 71% (15/21) of stroke units.
While many hospitals have care pathways for stroke, particularly in the initial admission and/or for thrombolysis patients, only 19% (4/21) use an interdisciplinary care pathway for stroke patients during their stroke unit stay.

Interdisciplinary team meetings

All hospitals held interdisciplinary team meetings for the interchange of information about individual patients, 66% (18/27) of these meetings were exclusively for stroke patients. All members of the interdisciplinary team are represented at varied levels: 11% clinical psychology; 63% dietetics; 100% medicine, nursing and physiotherapy; 96% occupational therapy and speech and language therapy; 41% medical social work. Figure 2.25 outlines interdisciplinary team member representation at team meetings.

The multidisciplinary team should meet weekly to exchange clinical information, agree management plans and set rehabilitation goals with patients. [Guideline A]

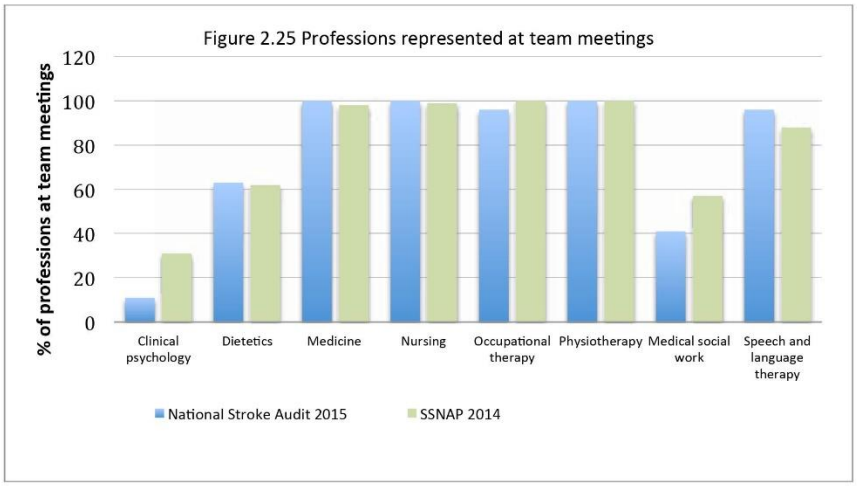


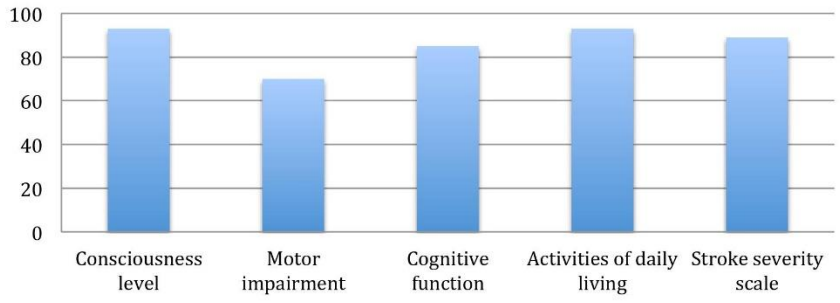
Figure 2.25 Professions represented at team meetings
% of professions at team meetings
120
100
80
60
40
20
0
Clinical psychology
Dietetics
Medicine
Nursing
Occupational therapy
Physiotherapy
Medical social work
Speech and language therapy
National Stroke Audit 2015
SSNAP 2014

Agreed assessment measures

Stroke units should have agreed protocols for acute stroke assessment and treatment. [Guideline A]

Locally agreed protocols for stroke patients were in place for the assessment of: consciousness (figure 2.26), e.g. Glasgow coma scale, 93% (25/27); motor impairment, e.g. modified Rankin scale (mRS), 70% (19/27); cognitive function, e.g. Montreal cognitive assessment (MoCA), 85% (23/27); activities of daily living, e.g. Barthel Index, 93% (25/27); stroke severity scale, e.g. national institute hospital stroke score (NIHSS), 89% (24/27).

Figure 2.26 % of hospitals with agreed assessment measures



Availability of information to inform practice

The findings in this section highlight the use of stroke specific policies, procedures, protocols and guidelines available to staff caring for stroke patients in the stroke unit.

There was greater availability of information to the staff on the stroke unit, although not available on all units. The differences in information available for staff between stroke units and general wards is highlighted in Table 2.15. This is concerning given that 61% of patients with stroke were not cared for in a stroke unit at the time of this audit and suggests a lack of protocols for staff managing stroke patients on a general ward.

Stroke units should have agreed protocols for acute stroke assessment and treatment, management of complications, symptom relief, palliative care and provision of information to patients and carers. [Guideline A]

Table 2.15 Available information to inform practice

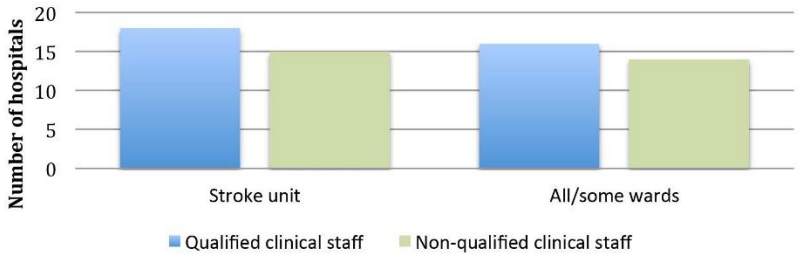
	Stroke unit % (n)	General wards % (n)
Reference information on the functional assessment tools used locally	70 (19/27)	48 (13/27)
Guidelines on clinical management of stroke	74 (20/27)	44 (12/27)
Guidelines on continence management	52 (14/27)	41 (11/27)
Guidelines on swallowing difficulties	70 (19/27)	41 (11/27)
Guidelines on pressure area care	70 (19/27)	48 (13/27)
Up to date information on local and national patients/carers support organisations	67 (18/27)	44 (12/27)
Records of all patients management in the acute phase of stroke	70 (19/27)	55 (15/27)

Continuing education

An ongoing education and professional development programme for all staff involved in stroke care within institutions should be available. [Guideline A]

Stroke units provide access to an in-house continuing education programme in stroke care for qualified clinical staff in 86% (18/21) of sites. Access to continuing education is slightly less for non-qualified clinical staff at 71% (15/21). The data suggests that when continuing education is available on the stroke unit, staff from other wards/service areas may also access this education.

Figure 2.27 Access to in-house education programmes



2.10 Community services access and communication

Communication into the community

Hospital services should have a protocol to ensure that before discharge occurs general practitioners, primary healthcare teams and social services departments are all informed before, or at the time of, discharge. [Guideline B]

On or before discharge from hospital, patients should be given information about and contact details of all relevant statutory, public and voluntary services. [Guideline A]

A discharge summary is reported to be sent to the GP on discharge in all sites. A named contact on discharge was identified in 30% of sites and only 2 two sites had a hospital/community stroke liaison person. Communication of services available in the community varied however it does appear that there is more patient information available to stroke patients on a stroke unit compared to a general ward.

This information is based on what was visible to the patients during the site visit by the visiting audit team. The site visit highlighted that in many case where the information was not visible it was available through the relevant professional e.g. medical social worker, clinical nurse specialist.

Table 2.16 Availability of information on community support services

	Stroke unit n=21 % (n)	General ward n=27 % (n)
Patient/care information literature on stroke	81 (17/21)	26 (7/27)
Patient versions of national or local guidelines/standards	48 (10/21)	11 (3/27)
Community services	48 (10/21)	15 (4/27)
Carer's benefit/allowance	29 (6/21)	19 (5/27)
Local voluntary services	57 (12/21)	11 (3/27)
How to complain	57 (12/21)	44 (12/27)

Access to community services

After leaving hospital, stroke survivors must have access to specialized stroke care and rehabilitation services appropriate to their needs. [Guideline A]

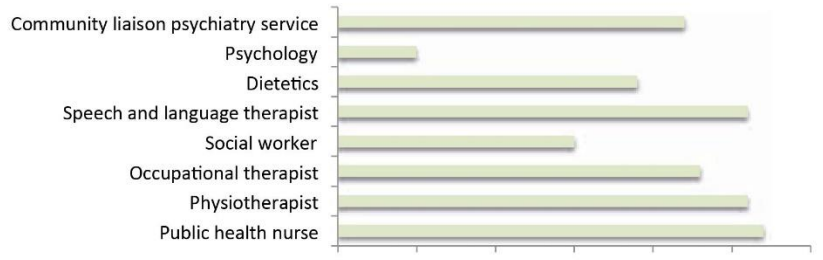
Reported access to services ranged from 100% (27/27) access to public health nurse to 19% (5/27) access to psychology services. Access to community physiotherapy was reported in all but one site, four sites had no access to community occupational therapy. Eight sites reported no access to community dietetics.

Access in this context equates to the ability to refer to a community agency. These findings do not account for waiting times or level of intervention, content or intensity of community based intervention, or if the interventions are stroke specific. It was outside of the remit of this audit to assess whether people in fact accessed services following referral.

A day hospital on-site is available in 30% (8/27) of hospitals, of which half provide access to over sixty five year olds only.

Early supported discharge (ESD) is available in only 15% (4/27) sites. This compares poorly to the SSNAP 2014 report where ESD is available in 74% (135/183) sites.

Figure 2.28 Accessible community services



SECTION TWO: CLINICAL AUDIT 2015

CHAPTER 3. METHODOLOGY

3.1 Introduction

The aim of the clinical audit was to conduct a review of clinical case notes for a selected consecutive sample of patients with stroke. The final sample was taken from 27 participating hospitals within the acute hospital division. The audit of clinical aspects of stroke care involved a retrospective review of clinical case notes for the selected sample of patients in the 27 acute public hospitals.

Total cases per hospital are decided based on volume of stroke admissions (Table 3.1).

Table 3.1 Suggested chart numbers reviewed as per annual stroke admissions

Patient Numbers	Stroke Admissions <100/yr	Stroke Admissions 100-150/yr	Stroke Admissions 150-200/yr	Stroke Admissions >200/yr
Minimum Charts to be audited	**25**	**30**	**35**	**40**

The audit sample included consecutive cases discharged with a primary diagnosis of stroke (ICD 10 codes: I61, I63 and I64, including subcategories) during the specified six month period: ***1 January 2014 – 31 March 2014 and 1 July 2014- 30 September 2014***. We aimed to have a representative portion of patients with ischaemic strokes who received thrombolysis therapy. The chart numbers overall allowed for a national representative sample however the numbers do not allow for comparison between individual hospitals. Individual hospital data are presented in the interest of the stroke teams to assist with service planning and to guide potential areas to target for improvement.

Inclusion criteria were as follows: Admitted with a primary diagnosis of Intracerebral Haemorrhage (I61), Cerebral Infarction (I63), Stroke, not specified as haemorrhage or infarction (I64).
Exclusion criteria were as follows: Cases with subarachnoid haemorrhage (I60); subdural and extradural haematoma (I62); cases related to readmission of a previous event or complications of a previous stroke.

3.2 Data collectors

Local chart auditors were identified through the stroke physician/clinical lead or clinical nurse specialist at each hospital and by means of contact with relevant hospital departments. The chart auditors were provided with written and digital resources for training in use of the audit tool. A helpline was available to support auditors.

3.3 Data collection tools

The audit tool proforma is an adapted version of the validated tool of the Royal College of Physicians London (United Kingdom) (RCPUK) National Sentinel Stroke Audit 2006 Clinical Audit Proforma (Appendix 3). The tool had modifications to reflect the Irish setting and recent changes in guidelines and was reviewed by the National Stroke Programme Specialist Working Group. Data are comparable with INASC 2008 and the UK Sentinel Stroke audit. Completed data tools were collected by the project team for analysis.

3.4 Reliability

The project team performed reliability testing on a proportion of charts from randomly selected hospitals in each group in the form of a reaudit of a sample of 6% of charts.

3.5 Data protection

Security and confidentiality are maintained through the use of passwords. All data were fully anonymised after quality assurance/ reliability testing had taken place. Individual hospital data were confidential to the researcher and the submitting hospital. Data management and processing were assisted by an ISO accredited Data Management company. Access to data were restricted to members of the project team. All files both digital and hardcopy were securely stored in a swipe access office with locked filing cabinets and password protected PCs.

3.6 Ethical issues

The clinical was an anonymous audit involving chart review, using an audit protocol, previously approved by National Stroke Programme Working Group. As advised by National Hospitals' Office from previous INASC 2006, review for all protocols was provided centrally by the expert steering group, with individual hospitals having option to address any local issues with its ethics committee if necessary. There was no impact with patient care. Ethics surrounding data management was discussed with the SJH/AMNCH Research Ethics Committee. In advance of the audit, the National Hospitals Office of the Health Service Executive and the Chief Executive Officers of the relevant hospitals permission was obtained.

CHAPTER 4. CLINICAL AUDIT RESULTS

4.1 Hospital group participation

Hospitals accepting the care of at least 20 acute stroke patients per year were invited to participate in the clinical audit. The number of clinical charts each hospital was asked to review was based on the annual stroke admissions for that hospital as documented in the HIPE report 2014 (Table 4.1).

Table 4.1 Number of chart reviews per hospital

	Stroke admissions <100/year	Stroke admissions 100-150/year	Stroke admissions 150-200/year	Stroke admissions >200/year
Minimum number of charts for audit	25	30	35	40
Number of hospitals in each category	5	7	6	9
Total charts target	125	210	210	360

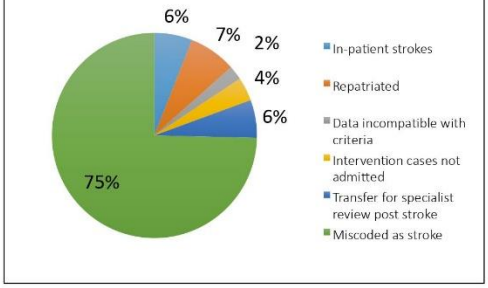
Table 4.2 Hospital participation

Group name	Hospital name	Synonom	Cases n (%)
Ireland East	Mater Misercordiae University Hospital	MMUH	40
	St Vincent's University Hospital	SVUH	40
	Midland Regional Hospital Mullingar	MRHM	34
	Wexford General Hospital	WGH	30
	St Luke's Hospital, Carlow Kilkenny	SLHK	30
	Our Lady's Hospital Navan	OLHN	21
Dublin Midlands	St James Hospital	SJH	37
	Adelaide Meath National Children's Hospital	AMNCH	36
	Naas General Hospital	NGH	35
	Midland Regional Hospital Tullamore	MRHT	24
	Midland Regional Hospital Portlaoise	MRHP	22
RCSI Hospitals	Our Lady of Lourdes Hospital	OLOL	41
	Cavan General Hospital	CGH	28
	Beaumont Hospital	BH	41
	Connolly Hospital	CH	25
University of Limerick	University Hospital Limerick	UHL	40
South Southwest	University Hospital Waterford	UHW	35
	South Tipperary General Hospital Clonmel	STGH	37
	Cork University Hospital	CUH	35
	Kerry General Hospital	KGH	30
	Mercy University Hospital	MUH	30
	Bantry Hospital	BGH	25
Saolta	University College Hospital Galway	UCHG	28
	Portiuncula Hospital	PH	26
	Mayo General Hospital	MGH	35
	Sligo General Hospital	SGH	35
	Letterkenny General Hospital	LGH	34
			Total= 874

Case reviews

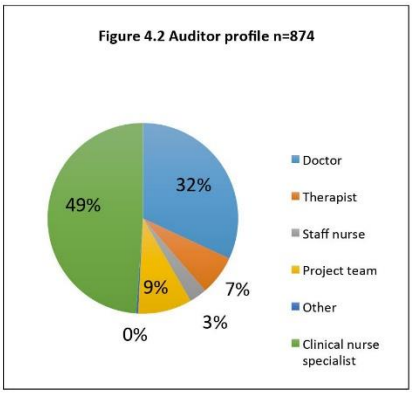
As described in the methodology chapter the auditors reviewed charts from a list created by the HIPE coding office. A proportion of charts were outside the inclusion criteria as set out in the methodology. These cases were excluded and further charts requested for review. In total 1010 cases were reviewed by auditors, 13% (136) were excluded. Miscoding of cases, inpatient strokes and patients admitted as repatriation admissions made up the majority of excluded cases, (Figure 4.1).

Figure. 4.1 Charts reviewed but not used



Auditor discipline

Figure 4.2 Auditor profile n=874



All members of the multidisciplinary team were invited to participate and the numbers of auditor disciplines reflect a good mix of participants (Fig 4.2) Each hospital was requested to designate a lead auditor responsible for the execution of the chart review. The clinical nurse specialists fulfilled this role in 19 of the 27 sites. In the remaining 8 hospitals, 3 clinical leads for stroke led out, 1 clinical director, 1 medical registrar, 1 occupational therapist, 1 director of nursing. One hospital had no staff participation and the project team completed the chart review. In total 89 clinical professionals took part in the clinical audit (Appendix 4).

4.2 Demographic profile

With the projected increases in the age profile of the nation and the age divide with regard access to services for the younger person with disability, the age and gender profile of the current audit is compared with INASC in 2008 and with the SSNAP UK in 2014.

Age and gender profile

Of the 874 cases audited,

- 57% (n=499) were male and 41% (n=360) female.
- Gender related data was missing in <1% of cases (n=5).
- The mean age was 73.3 years and the median was 76 (range 22 - 102 years).
- 24% of cases were under 65 years of age, which is a rise from 19% in INASC 2008.
- 37% were over 80 years.
- Females were significantly older than males with a mean age of 77 versus 71
- Age related data was missing in 2% (15) of cases.

Table 4.3 and table 4.4 summaries age and gender comparison between Ireland 2008 and UK 2014. Variability in age and gender profile of charts reviewed exists between the different hospitals reflecting the catchment areas the hospitals serve (table 4.5)

Table 4.3 Age profile –National Stroke Audit 2015 and SSNAP 2014

National Stroke Audit 2015	<65 years	65-74 years	75+	Mean
Male n=499	30%	26%	44%	71
Female n=360	15%	19%	66%	77
INASC 2008	**<65 years**	**65-74 years**	**75+**	**Mean**
Male n=1124	24%	27%	49%	72
Female n=1021	13%	17%	71%	78

Table 4.4 Age profile-National Stroke Audit 2015 and SSNAP 2014

National Stroke Audit 2015					
	<60	60-69 years	70-79 years	80-89 years	90+
Male n=499	19.2% (96)	24.2% (121)	30.1% (150)	22.7% (113)	3.8% (19)
Female n=360	10.3% (37)	13.6% (49)	24.7% (89)	38.6% (139)	12.8% (46)
Totals	15.5% (133)	19.8% (170)	27.8% (239)	29.3% (252)	7.6% (65)
SSNAP UK 2014					
	<60	60-69 years	70-79 years	80-89 years	90+
Totals	14.2% (10532)	16% (11866)	26.5% (19710)	32.2% (23913)	11.2% (8286)

Occupation

25% of responses were blank for occupation, with a further 11% unknown or not specified. In 17% of responses the person's occupation was described as retired but no further detail. 4% of people's occupation was described as Old Age Pensioner, 5% as Housewife and 4% were either working or retired farmers. Examples from all socioeconomic groups are represented in the findings showing that stroke affects everyone.

Table 4.5 Age and gender profiles totals by hospital group and hospital

	Age	Youngest	Oldest	<65 years %	80+ years %	Gender % Male
National	**73.3**	**22**	**102**	**24**	**37**	**58**
Ireland East	73.5	31	97	25	37	59
Dublin Midlands	71	38	99	31	32	61
RCSI Hospitals	73.1	36	95	24	32	58
University of Limerick	72.8	36	97	23	35	63
South Southwest	74.4	36	102	20	40	55
Saolta	74.2	22	96	22	41	58
MMUH	72.2	43	93	23	28	63
SVUH	75.6	42	94	20	40	55
MRHM	73.1	46	94	24	38	60
WGH	73.6	31	91	20	40	50
SLHK	72.9	47	97	30	37	66
OLHN	73.6	48	91	29	43	52
SJH	73.2	38	95	24	46	60
AMNCH	68.6	42	92	36	22	69
NGH	71.5	40	99	29	31	60
MRHT	69.4	41	93	38	38	46
MRHP	72.3	47	88	27	36	68
OLOL	70.7	36	95	27	24	61
CGH	73.4	50	93	29	32	57
BH	75.5	48	92	17	39	49
CH	72.7	45	93	24	32	68
UHL	72.8	36	97	23	35	63
UHW	75.2	46	99	14	37	51
STGHC	73.2	36	93	24	35	65
CUH	67.3	36	91	37	23	66
KGH	77.8	54	102	13	50	50
MUH	77.8	51	97	17	47	47
BGH	77.2	54	94	12	52	44
UCHG	72.5	47	96	36	39	50
PH	80.4	60	95	8	58	46
MGH	75.4	43	91	14	46	57
SGH	76.4	54	96	14	43	57
LGH	67.3	22	89	35	24	71

4.3 Emergency care

The key to excellent acute stroke care is the organisation of services (Langhorne et al 2002) coupled with a heightened public awareness of the symptoms of stroke and how best to access care. In this section we review the early phase of a patient's journey from the onset of their symptoms to admission to hospital.

Pre-hospital care

The organisational audit identified that all 27 acute hospital sites stated that they had specific arrangements with local ambulance services for rapid transfer of acute stroke patients to hospital. The results of the clinical audit finds that 63.7% (557) arrived via the ambulance service. This compares to 82% (57679) in the UK SSNAP 2014 data. Ambulance transfer notes were available in 63.6% (354) of cases. The audit finds that 45.6% (252/557) of patients were classed as FAST positive or stroke by the ambulance service on arrival to the emergency department.

Stroke onset

The date of stroke was known in 96% (843) of cases. In 72% (603) of cases the patients presented to hospital on the same date as the onset of their stroke. This is similar to the INASC 2008 figure of 71% (1224). Time from onset of stroke to presentation to the emergency department was available in 65% (572) of cases. In the remaining cases the time of onset was either unknown or the patient had a stroke during sleep. Table 4.6 presents the similarities with SSNAP 2014 in the estimation of times of stroke onset.

Table 4.6 Time of stroke onset

	National Stroke Audit 2015 % (n)	SSNAP UK 2014 % (n)		National Stroke Audit 2015 % (n)	SSNAP UK 2014 % (n)
Date of symptom onset			**Time of symptom onset**		
Precise	73.3 (641)	70 (52470)	Precise	36 (314)	33.5 (24924)
Best estimate	18.9 (165)	19.6 (14581)	Best estimate	25.3 (221)	33.1 (24613)
Stroke during sleep	3.4 (30)	9.8 (7256)	Not known	37.9 (331)*	33.3 (24770)
Not known	4.4 (38)◆◆		Missing	0.9 (8)	N/A

* Both not known and stroke during sleep

◆◆Both not known and missing data

The median time from onset to presentation in the emergency department was 2 hours 26 minutes. Fifty-six percent (317) of patients arrived within 3 hours and a further 22% (123) arrived within 6 hours. Twenty-two per cent (124) arrived more than 6 hours post symptom onset. Table 4.7 compares presentation times with the results of SSNAP 2014. A summary of the median times to presentation for each site is presented in Table 4.8, in context that an appropriate range of variability exists from site to site given the chart numbers assessed.

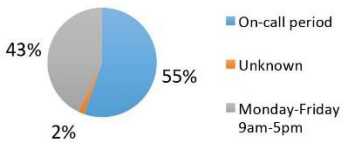
Table 4.7 Stroke onset to hospital presentation

Time of onset to presentation at hospital	National Stroke Audit 2015 n564 (65%)	SSNAP 2014 n49537 (67%)
Median	2hrs 26mins	2hrs 25mins
Lower IQR	1hr 21mins	1hr 18mins
Upper IQR	6hrs 6mins	7hrs 13mins

Presentation to the emergency department

It was found that the number of patients who presented to the emergency department within office hours (Monday-Friday, 9am-5pm) was 43% (375), 55% (484) presented outside of these hours and in 2% (15) of cases it was unknown, (Figure 4.3).

Figure 4.3 Presentation to hospital during the on-call period



Time to admit

Time to admission from time of presentation was available in 80% (n=702) of cases. The average time to admit patients following presentation was 316 minutes (IQR 51-380 mins), which varied greatly from site to site. This variation in part was due to the model of care on each site e.g. in Acute Medical Units (AMUs), time to admit can be the same as time to present as the decision to admit is made at first contact with a physician.

Table 4.8 National summary of median time to presentation to ED following symptom onset

	Median Time of Onset to Presentation (hrs:mins)	Inter quartile range
National	**2:26**	**1:21 – 6:06**
Ireland East	2:15	1:19 – 6:04
Dublin Midlands	3:06	1:13–10:18
RCSI Hospitals	2:54	1:23 – 8:16
University of Limerick	2:15	1:31 – 4:11
South Southwest	2:23	1:25 – 5:51
Saolta	2:17	1:32 – 4:33
MMUH	1:53	0:59 – 4:56
SVUH	3:09	1:39 – 7:02
MRHM	2:35	1:30 – 4:47
WGH	2:05	1:25 – 4:25
SLHK	2:14	1:18 -11:15
OLHN	1:32	1:00 – 3:50
SJH	4:10	1:32–10:39
AMNCH	3:30	1:50 – 7:39
NGH	1:59	1:06 – 4:38
MRHT	3:03	1:14 – 25:12*
MRHP	2:20	1:16 – 4:58
OLOL	4:11	2:14–11:38
CGH	2:05	1:13– 3:22
BH	2:38	1:31– 5:41
CH	2:16	1:11– 7:00
UHL	2:15	1:31– 4:11
UHW	1:59	1:25– 4:12
STGHC	2:20	1:20– 3:39
CUH	4:24	1:42 - 11:02
KGH	2:50	1:47 – 3:25
MUH	3:53	1:10 – 7:23
BGH	2:00	1:13 – 5:21
UCHG	2:41	1:35 - 9:31
PH	3:11	1:37 – 5:40
MGH	2:11	1:48 – 5:19
SGH	2:01	1:04 – 3:47
LGH	2:01	1:33– 3:54

4.4 Imaging

One of the areas which emerged from the INASC 2008 audit where a large deficit and inequality existed was in access to neuroimaging. At the time 30% (11/37) of hospitals did not have access to CT scanning within 48 hours. The national guidelines recommended basic requirements with regards imaging in stroke, and in order to fulfil these requirements a hospital needed to provide 24 hour access to CT scanning.

Emergency CT scanning

CT scanning after stroke is high at 98.6% (862); however, it was found that 30.2% (264) of patients were not scanned within 24 hours. The main reason for not scanning within 24 hours was patients not arriving at the hospital within 24 hours of symptom onset 47% (125). Other reasons included; not initially clinically indicated, palliative care needs, time of onset unclear. In 27% (72) of cases, no clear reason was identified as to why the patient not scanned within 24 hours. MR imaging was reported to have been carried out in 45% (390) of cases at some point during their admission.

Table 4.9 CT scanning

	National Stroke Audit 2015 % (n)	SSNAP 2014 % (n)	INASC 2008 % (n)
Number of patients scanned	98.9 (862)	98.6 (73231)	93 (2028)
CT scan within 24 hours	69.8 (610)	N/A	40 (867)

Stroke types shown by scan

Table 4.10 outlines the pathological diagnosis following initial neuroimaging with a normal scan but a clinical picture consistent with stroke accounted for 37.4% of cases. These cases would often have further imaging to clarify the diagnosis including MRI. Table 4.11 outlines national variation in pathological diagnosis following initial imaging with higher rates of intracerebral haemorrhage noted in certain sites during the audit period.

Table 4.10 Diagnosis following initial neuroimaging

	Infarct % (n)	Intracerebral haemorrhage %(n)	Unknown % (n)
National Stroke Audit 2015	82.9 (725)	15.1 (132)	2 (17)
INASC 2008	64 (1389)	15 (332)	21 (453)
SSNAP 2014	87.7 (65193)	10.8 (8038)	1.4 (1076)

Table 4.11 National breakdown of pathological diagnosis following initial neuroimaging

	Infarct %	Haemorrhage %
National	82.9	15.1
Ireland East	85.6	14.4
Dublin Midlands	87.2	12.8
RCSI Hospitals	88.7	11.4
University of Limerick	87.5	12.5
South Southwest	84.9	15.9
Saolta	77.1	22.8
MMUH	87.5	12.5
SVUH	85	15
MRHM	91.2	8
WGH	83.4	16.7
SLHK	86.7	13.3
OLHN	76.2	23.8
SJH	88.6	11.4
AMNCH	88.5	11.5
NGH	85.7	14.3
MRHT	82.6	17.4
MRHP	90	10
OLOL	90.2	9.8
CGH	92.3	7.7
BH	82.5	17.5
CH	82	8
UHL	87.5	12.5
UHW	71.4	28.6
STGH	83.4	16.6
CUH	88.6	11.4
KGH	89.6	10.3
MUH	90	10
BGH	83.3	16.7
UCHG	66.6	33.3
PH	69.6	30.4
MGH	71.4	28.5
SGH	79.4	20.6
LGH	94.1	5.9

Time to Scan

The following results show how quickly patients have neuroimaging performed from the onset of their symptoms (Table 4.12) and also importantly how efficiently they have neuroimaging performed when they present to the hospital i.e. door to scan time (Table 4.13). The findings on neuroimaging dictate the management pathway of each patient. The speed with which imaging is performed has important bearing on the patients' outcome as it impacts on consideration for interventions such as thrombolysis therapy or thrombectomy.

The national figures show a median time of 15 hours 44 minutes (interquartile range 2hrs 44mins-20hrs 13mins) from onset of symptoms to performance of neuroimaging.

Table 4.12 National variation in time to have first neuroimaging performed upon presentation to hospital

	Median Time to Scan from Onset (hrs:mins)	Interquartile range (hrs:mins)
National	**15:44**	**2:44 – 20:13**
Ireland East	15:42	2:37 – 20:41
Dublin Midlands	18:34	3:00 - 23:01
RCSI Hospitals	13:43	2:45 – 16:58
UL	10:54	2:34 – 17:33
South Southwest	16:03	2:24 – 20:39
Saolta	15:55	3:19 - 19:31

Table 4.13 National median time to CT scan from presentation

	Median time to scan from presentation (hrs:mins)	Interquartile range (hrs:mins)
National	**9:23**	**1:09 – 15:05**
Ireland East	10:29	1:06 – 17:47
Dublin Midlands	10:02	1:30 -13:32
RCSI Hospitals	6:57	1:00 – 9:29
University of Limerick	7:37	0:52- 13:09
South Southwest	8:57	1:04 -16:03
Saolta	10:22	1:30 – 16:16
MMUH	8:09	0:49-6:17
SVUH	4:58	1:12 -6:45
MRHM	7:30	0:39 -9:38
WGH	20:03	7:24 -24:50
SLHK	10:25	1:22 -19:21
OLHN	15:44	1:36 -18:41
SJH	5:38	1:37 -5:38
AMNCH	7:14	1:00 -7:07
NGH	13:43	1:04 -19:20
MRHT	15:48	2:40 -21:16
MRHP	11:06	3:28 -17:25
OLOL	8:10	0:59 -13:48
CGH	8:17	0:47-15:12
BH	4:17	1:02 -4:16
CH	7:26	2:16 -14:46
UHL	7:37	0:52 -13:09
UHW	7:25	0:47 -10:50
STGH	10:51	1:27 -19:51
CUH	5:23	0:34 -5:36
KGH	5:00	0:40 -6:48
MUH	12:52	1:25 -23:07
BGH	10:34	1:26 -13:16
UCHG	10:47	1:24 -14:18
PH	12:04	2:10 -17:06
MGH	12:14	1:31 -16:03
SGH	9:29	1:46 – 15:40
LGH	7:51	1:07-15:41

4.5 Stroke units

The stroke unit represents the hub from where stroke care can be centrally organised, including patient monitoring, multidisciplinary team interaction and staff education and training. Only one stroke unit existed in Ireland at the time of the INASC 2008 audit, so substantial changes have occurred in the interim. We assessed whether people were accessing these improved numbers of stroke units and how quickly. We also acknowledged the requirement of acute stroke patients for higher dependency care in the early phases of their illness. The results should be taken in the context of the National Stroke Programme KPIs that at least 50% of patients are admitted to a stroke unit and that at least 50% of their stay is on a stroke unit.

There are three primary types of stroke unit. Firstly an acute stroke unit (ASU) where patients are managed in the very early phase of the stroke usually up to 7 days, secondly a rehabilitation unit which acts as a transition from acute care to further recovery for patients with ongoing rehabilitation needs which cannot be met in the community and lastly a combined stroke unit which has elements of both models.

Admission profiles

The majority, 42% (369), of patients with a diagnosis of stroke are admitted to a general ward directly from the emergency department with 29% (249) admitted directly to a stroke unit. This compares with 73% direct admission to a stroke unit in the UK SSNAP 2014, (Table 4.14) and 53% (467) spent more than 4 hours in the emergency department following decision to admit. Thirteen per cent (120) of cases were reported to have spent some period of their admission in a high dependency bed, e.g. ICU, HDU, and CCU.

Table 4.14 Initial ward of admission from the emergency department

Ward type	National Stroke Audit 2015 % n=874	SSNAP UK 2014 % n=74307
Medical assessment unit, Clinical decision unit	17 (148)	21 (15507)
Stroke unit	29 (249)	73 (54292)
ITU/CCU/HDU	11 (98)	1.9 (1432)
Other	42 (379)	4 (3076)

Admission to stroke units

In total 54% (472) of patients were cared for in a stroke unit compared to 1.9% (42) in INASC 2008. Of the 249 patients admitted directly to the stroke unit 61% (153) waited in the emergency department for over four hours (table 4.15). INASC 2008 found that 2% (1) of patients were admitted to a stroke unit within four hours. The mean time from hospital admission to admission to a stroke unit was 1.7 days (median 1, range 0-93 days, IQR-0-2) compared to 6 days in INASC 2008. SSNAP 2014 reports a median time from presentation to admission to a stroke unit of 3 hours 36 minutes (IQR-2hrs 9mins - 7hrs 1min). Documentation of dates of arrival to the stroke unit was good in 97% (457/472) of cases. However time of admission was not audited in this round and so comparison to SSNAP 2014 was not available.

Table 4.15 Admission to a stroke unit within 4 hours

	INASC 2008 n=42	National Stroke Audit 2015 n=249
Stroke unit patients admitted within 4hours	2% (1)	39% (96)
	UK SSNAP 2014 n=74307	**National Stroke Audit 2015 n=874**
Total number of patients to stroke unit within 4hours	58% (42283)	11% (96)

Length of stay in stroke unit

54% (472) of patients were admitted to a stroke unit and 86% (407) of that cohort spent more than 50% of their stay in the stroke unit (figure 4.4).
The mean length of stay in a stroke unit is 14.9 days, range 0-151days.
Table 4.16 compares the location where patients spend 50% of their hospital stay compared to INASC 2008

Figure 4.4 Location of patients for >50% of their hospital stay.

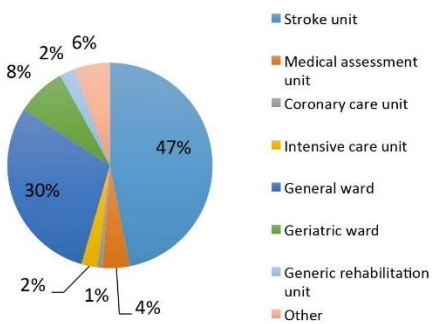


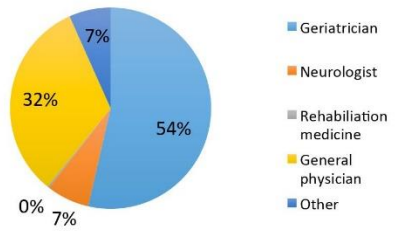
Table 4.16 Comparison of location of patient for over half of their hospital stay versus INASC 2008

	Stroke unit % (n)	MAU	CCU	ICU	General ward	Geriatric medicine ward	Generic rehabilitation unit	Other
National Stroke Audit 2015 n=874	47 (407)	4.2 (37)	0.8 (7)	2.5 (22)	29.5 (258)	7.7 (67)	2.4 (21)	5.6 (49)
INASC 2008 n=2173	1 (24)	1 (21)	0.3 (7)	2 (52)	69 (1496)	8 (183)	4 (78)	14.7 (319)

Consultant in charge of care

It is a standard of care that all patients are managed by a team with specialist knowledge in stroke medicine. The majority of patients were under the care of consultant geriatricians at some point during their admission. Figure 4.5 indicated the spread of clinical specialties who care for stroke patients.
This compared to the INASC 2008 where the majority (61%) of stroke patients were under the care of a general physician.

Figure 4.5 Consultant in charge of care



National results on stroke unit admissions

Access to stroke units for each hospital is outlined in Table 4.17. As highlighted in the organisational audit, not all sites managing acute strokes have a stroke unit either now or at the time period of the clinical audit. It should also be noted that a number of sites use higher dependency beds to manage patients specifically in the early or hyperacute phase of stroke e.g. post thrombolysis delivery.

Table 4.17 National summary of stroke unit admission rates

	Patients admitted to a stroke unit from the emergency department %	Patients initially admitted to a high dependency unit %	Stroke unit admission anytime %
National	**29**	**11**	**54**
Ireland East	21	18	41
Dublin Midlands	21	10	40
RCSI Hospitals	37	7	61
University of Limerick	55	3	83
South Southwest	27	11	59
Saolta	34	10	65
MMUH	10	33	65
SVUH	0	10	0
MRHM	32	21	56
WGH	20	7	27
SLHK	67	6	87
OLHN	0	33	0
SJH	24	8	46
AMNCH	44	6	56
NGH	20	20	69
MRHT	0	8	0
MRHP	0	5	0
OLOL	20	7	83
CGH	57	4	75
BH	63	5	66
CH	0	12	0
UHL	55	3	83
UHW	49	2	83
STGH	16	14	51
CUH	40	9	51
KGH	0	3	0
MUH	37	13	87
BGH	12	28	80
UCHG	36	14	61
PH	27	12	54
MGH	63	11	74
SGH	40	6	86
LGH	0	9	44

4.6 Casemix

Important factors in a patient's chances of recovery and return to independent living in the community are the number of preexisting conditions they have and also the social supports around them (Glass et al 1993). Increasingly people are living to an older age often alone in their accommodation while managing multiple conditions and taking various medications. This section outlines the types of patient the acute stroke services care for and the risk factors that are present prior to the stroke event.

Pre-admission accommodation

Results show that 92% (800/873) of patients were living at home prior to stroke. This information was missing in 1 case. Data relating to whether the patient was living alone was missing in 44% (386/874) of cases and so considered unreliable, however, it does appear that 7.9% had a preexisting home care package in place.

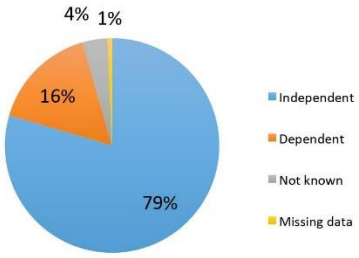
Table 4.18 Pre-admission accommodation

	Living at home	Residential nursing home	Hospital	Other
National Stroke Audit 2015	92%(800)	7% (61)	0.1% (1)	1.4% (12)
INASC 2008	92% (1934)	6% (127)	0.7% (15)	1% (27)

Functional level pre-stroke

The level of functional independence in patients prior to stroke was described as independent in approximately 80% of cases. 16% were described as dependent and in 4% of cases dependence was unknown (figure 4.6). INASC reported that 73% were independent pre-stroke in 2008. The UK SSNAP 2014 data finds that 72.4% have no significant disability prior to stroke (mRS 0-1). There was a very high prevalence of smoking, 20% (175) smoked prior to admission and 9% (77) said they drank alcohol to excess.

Figure 4.6 Functional level pre-stroke2015



Prevalence and management of risk factors prior to stroke

Pre-existing co-morbidities

The presence of known co-morbidities prior to stroke was recorded in 92% (804) of cases audited. 77.8% of those cases had a pre-existing co-morbidity with hypertension (58.6%) which was the most common condition. Atrial fibrillation was diagnosed in a quarter of patients before their admission. Of note 15.7% of patients had hypertension and atrial fibrillation, 9% had atrial fibrillation and a previous stroke or TIA, and 3.7% had hypertension, dyslipidemia, and atrial fibrillation prior to their stroke. Table 4.19 shows a comparison of this data with INASC 2008 and the UK SSNAP 2014 data.

Table 4.19 Pre-existing comorbidities

	National Stroke Audit 2015 % (n=874)	INASC % (n=2173)	UK SSNAP 2014 % (n)
Atrial fibrillation	24.3 (212)	22 (469)	20.7 (15385)
Previous stroke/TIA	22.9 (200)	25 (541)	27.3 (20292)
Diabetes mellitus	16.1 (141)	12 (260)	19.4 (14424)
Dyslipidemia	24.5 (214)	17 (372)	N/A
Hypertension	58.6 (512)	51 (1108)	53.7 (39918)
MI/Angina	11.3 (99)	14 (307)	N/A
Valvular heart disease	3.9 (34)	4 (92)	N/A

Table 4.20 Prevalence of multiple comorbidities

Number of comorbidities	National Stroke Audit 2015 % (n)	INASC % (n)	UK SSNAP 2014 % (n)
0 comorbidities	21.5(188)	22 (479)	25.8 (19204)
1 comorbidity	26.8 (234)	29 (626)	35.8 (26577)
2 comorbidities	28.8 (252)	24 (524)	26.5 (19705)
3 comorbidities	15.7 (137)	25 (544)*	9.8 (7300)
4 comorbidities	5.9 (52)	N/A	1.9 (1394)
5 comorbidities	1.3 (11)	N/A	0.2 (127)

Prevention treatment for known modifiable stroke risk factors prior to admission

Pharmacological agents are often prescribed to reduce the risk of first stroke or prevention of further stroke from conditions such as hypertension, dyslipidemia or atrial fibrillation. In this cohort of patients 61% were on antihypertensive medication and 11.9% were prescribed anticoagulation. 43% were taking statin medication prior to admission. Of the 212 patients with known atrial fibrillation 39% (83) were on anticoagulation prior to admission, with 43% (91) on an antiplatelet, and a further 18% (38) on no blood thinning treatment. Medication pre- and post-discharge and how it compares to known risk factors are reviewed in a later section.

Table 4.21 Pre-stroke prevention treatment

Medications	National Stroke Audit 2015 % (n)	INASC 2008 % (n)
Antihypertensives		
Ace inhibitor	35 (308)	26 (567)
Alpha blocker	4 (34)	3 (71)
Beta blocker	31 (273)	18 (386)
Calcium channel blocker	19 (162)	10 (208)
Thiazide diuretic	8 (66)	9 (189)
Other	5 (42)	5 (105)
None	22 (190)	44 (954)
Antiplatelet/anticoagulant		
Aspirin	40 (346)	33 (724)
Clopidogrel	7 (65)	5 (114)
Dipyridamole	0.6 (5)	0.5 (11)
Warfarin	9 (76)	6 (136)
Asasantin retard	1.4 (12)	1 (29)
NOACs	2.9 (25)	N/A
Other	1 (8)	0.7 (15)
None	28 (241)	48 (1040)
Lipid lowering treatment		
Statin	43 (371)	21 (455)
Ezetimide	1 (10)	0.1 (3)
Niacin	0 (0)	0 (0)
Fibrates	0 (0)	0.05 (1)
Omacor	0.1 (1)	0.1 (3)
Other	0.1 (1)	0.1 (1)
None	35 (306)	75 (1627)

Pill burden, the number of medications a patient takes on a daily basis, is an important issue for both patient satisfaction, compliance and safety profile of medications (Osterberg et al 2005). Table 4.22 shows the breakdown of how many patients are on multiple agents in certain drug therapy categories. We found that 75% (n=654) of patients were on at least one medication prior to admission and that almost 8% (n=69) of patients had evidence of polypharmacy (5 or more medications) from just these drug classes.

Table 4.22 Number of medications prescribed on admission

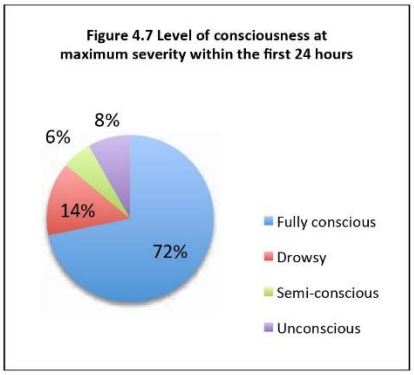
Number of medications	Antihypertensives % (n)	Antiplatelet/Anticoagulant % (n)	Cholesterol treatment % (n)
None	38.8 (339)	45.3 (396)	56.8 (496)
1	30.8 (269)	47.9 (419)	42.7 (373)
2	21.4 (187)	6.8 (59)	0.5 (5)
3	8.6 (75)	0 (0)	0 (0)
4	0.3 (3)		
5	0.1 (1)		

4.7 Standards of care

In this section the findings of the patient's journey are presented and the care they receive up to the point of discharge from the acute hospital. Stroke multidisciplinary teams use specific guidelines when caring for patients with acute stroke, and the findings demonstrate how often it appears the teams are meeting those guidelines. It is helpful to view these results in the context of the findings of the organisational audit in particular with regard staffing. Firstly the results are presented to give a picture of the level of disability that patients present with in the early phase of their stroke. Secondly the findings are presented on a number of key interventions or assessments at different time points.

Standards within 24 hours

Levels of consciousness and impairments during the first 24 hours



The audit assessed the maximum severity of level of consciousness in the first 24 hours, with four options available (Figure 4.7). 72% were reported as fully conscious and 8% unconscious. SSNAP identify level of consciousness on arrival and report 83% as fully conscious and 3% unconscious. INASC specified the maximum severity within 7 days and reported 60% fully conscious and 14% unconscious. Low levels of consciousness in the initial phase of stroke is an early predictor of poorer outcome .

Symptoms and deficits documented with the first 24 hours

In relation to the symptoms documented within the first 24 hours each data point is calculated based on number of responses. The validation process showed a high rate of correlation for affirmative answers compared to answers of 'no' or 'not known'.
The results indicate the positive results for each symptom and deficit.
Documentation of symptoms and deficits within the first 24 hours identified motor deficits in 71% of cases, followed by dysarthria (difficulty in articulation of speech) and dysphasia (difficulty in understanding and content of speech). Approximately 44% of the patients had at least 3 symptoms from the options presented in the first 24 hours.

Table 4.23 Symptoms and deficits within 24 hours n=number of responses

Symptom/Deficit	National Stroke Audit 2015 % (n)
Motor deficits n=868	71 (616)
Dysarthria n=864	43.1 (374)
Dysphasia n=871	37.9 (330)
Sensory impairment n=858	31.7 (272)
Cognitive difficulties n=864	31.4 (271)
Visual/perceptual difficulties n=868	29.2 (253)
Changes in mood n=856	7 (60)

Swallow screening, visual field function and sensory function assessment at 24 hours.

Assessment of swallow screening was noted at 3 hours and at 24 hours as per national guidelines. The UK SSNAP 2014 records the initial swallow screening marker at 4 hours up to 72 hours. While the result of 6% swallow screening at 3 hours cannot be compared to INASC 2008 it is markedly below the SSNAP results of 55.8% within 4 hours. Only 36% of appropriate patients had their swallow screened within 24 hours. Assessment of visual fields and sensory testing remains largely unchanged since 2008. Comparison with the UK SSNAP data was not possible as it does not specify these item points, possibly as they are considered within the NIHSS which this audit has not identified as a data point.

Table 4.24 Patient assessment at 24 hours

	National Stroke Audit 2015	INASC 2008	SSNAP 2014
Swallow screening within 3 hours % (n)			
Yes	6 (53)	N/A	55.80*
No	73 (638)		
No but	20.3 (177)**		
Missing	0.7 (6)		
Yes applicable	7.6		
Swallow screening within 24 hours % (n)			
Yes	29.4(257)	26 (564)	81.20***
No	51.4 (449)	55 (1188)	
No but****	18.4 (161)	17 (365)	
Missing	0.8 (7)	2 (56)	
Yes applicable	36		
Formal visual assessment % (n)			
Yes	47.8 (418)	46 (992)	
No	34.1 (298)	29 (633)	
No but*****	17.4 (152)	22 (479)	
Missing	0.7 (6)	3 (69)	
Yes applicable	58.9		
Formal sensory assessment % (n)			
Yes	56.3 (492)	53 (1157)	
No	26.3 (230)	21 (466)	
No but******	16.9 (148)	22 (471)	
Missing	0.5 (4)	4 (79)	
Yes applicable	67.7		

* SSNAP 2014 = within 4 hours
** No, but if: Impaired level of consciousness is documented
*** SSNAP 2014 = within 4 hours + within 12 hours + within 24 hours
**** No, but if: Impaired level of consciousness is documented
***** /****** No, but if: Impaired level of consciousness/communication is documented

Standards within the first 48 hours.

Assessment by health and social care professional within 48 hours.

With regard to therapy during admission the audit finds that responses for each profession varied. Based on responses to each discipline, referrals at any point during admission to the different therapists were; physiotherapy - 79% (686/867), occupational therapy - 70% (603/863), speech and language therapy - 62% (533/862), psychology 3.5% (29/824). Data related to goal setting and patient participation in goal setting was unreliable and so is not used in this report.

Both INASC and SSNAP collate admission times differently, Table 4.25 indicates the results of assessments within 48 hours per discipline and compares to 72 hours in INASC and 24 hours in SSNAP.

Table 4.25 Patient assessment in first 48 hours of admission after stroke

	National Stroke Audit 2015- within 48 hours % (n)	INASC 2006 - within 72 hours % (n)	SSNAP 2014 - within 24hrs % (n)
Speech and language therapist assessment % (n)			
Yes	37 (320)	25 (548)	20.2 (15005) within 12 hours
No	29 (251)	39 (844)	
No but ∗	33 (296)	33 (713)	
Missing	1 (7)	2 (47)	
Yes applicable	55.4%		
Physiotherapy assessment %(n)			
Yes	53 (466)	43 (929)	48.3 (35813)
No	25 (219)	41 (895)	
No but ∗∗	21 (185)	13 (282)	
Missing	0.5 (4)	3 (67)	
Yes applicable	67.6%		
Occupational therapy assessment %(n)			
Yes	30 (262)	N/A	36.5% (27087)
No	43 (374)	N/A	
No but ∗∗∗	27 (232)	N/A	
Missing	1 (6)	N/A	
Yes applicable	40.8%		

∗ No but… if: the patient's swallowing is documented as normal, patient is still unconscious, patient dies within 48 hours, patient is receiving palliative care.

**No but … if: patient dies within 48 hours, patient is receiving palliative care, no physical need/deficit.

***No but … if: patient died within 48 hours, the patient is still unconscious, it is documented that the patient had no difficulties performing everyday activities, patient is receiving palliative care.

Standards of care within 48 hours

Standards of care within 48 hours have remained comparable in relation to nutrition. Screening for nutrition e.g. MUST, and assessing falls risk was not widely used until recent years and so cannot be compared against INASC. Commencement on aspirin within 48 hours has risen from 45% in INASC 2008 to 70% in the current audit. Numbers receiving nutrition and methods of taking nutrition have not changed considerably.

Table 4.26 Standards of care within 48 hours.

	National Stroke Audit 2015- within 48 hours % (n)	INASC 2008 - within 72 hours % (n)
Aspirin commenced by 48 hours		
Yes	70 (609)	45 (950)
No	7 (63)	32 (672)
No but *	22.5 (197)	22 (470)
Missing	0.5 (5)	4 (82)
Yes applicable	89.9%	
Nutritional screening within 48 hours		
Yes	33 (291)	N/A
No	56 (492)	N/A
No but **	9 (80)	N/A
Missing	1 (11)	N/A
Yes applicable	36.7%	
Was patient receiving nutrition by 48 hours		
Yes	82 (716)	81 (1767)
No	8 (70)	7 (152)
No but ***	9 (81)	8 (176)
Missing	1 (7)	4 (78)
Yes applicable	90.3%	
Type of method used to feed		
Oral	77 (672)	82 (1455)
Nasogastric/PEG****	7 (58)	12 (216)
Intravenous	3 (28)	4 (70)
Missing	13 (116)	1 (26)
Falls assessment		
Yes	66 (575)	N/A
No	25 (222)	N/A
Missing	9 (77)	N/A

* No, but… if: the patient died, patient had intracerebral haemorrhage, there was a documented contraindication to aspirin or they were given an alternative antiplatelet or anticoagulant.
** No, but… if: patient refused or patient receiving palliative care.
*** No, but… if: patient refused or patient receiving palliative care.
****PEG- percutaneous endoscopic gastrostomy

Standards within 7 days.

Health and social care professional standards within 7 days.

Communication assessments by speech and language therapy have increased since INASC 2008 from 29% (636) to 49% (427). When adjusted to allow for patients who do not require assessment the rate rises to 79% (427/541), however this is below the SSNAP rate of 91.6% (31691). Similarly, rates of assessment within 7 days by occupational therapy has risen from 22% (476) to 58% (508) since INASC 2008. Again, adjusting for rates of assessment based on appropriate patients the rate rises to 78% (508) which is lower than the SSNAP result of 97.2% (57331). Assessment by a medical social worker within 7 days remains similar with reports from INASC 2008. Social services are community based in the UK and data is not comparable in this report.
It was evident that by discharge 79% of patients were referred to a physiotherapist, 70% to occupational therapy, 62% to speech and language therapy, and 3.5% to psychology. Responses with regard goal setting performed poorly in reliability testing but we will review this important area further in the discussion section of the report.

Table 4.27 7 day standards for HSCP assessment

Standards	National Stroke Audit 2015 n=874	INASC 2008 n=2173
Communication assessment by SLT % (n)		
Yes	49 (427)	29 (636)
No	13 (114)	30 (658)
No but *	37 (326)	37 (804)
Missing	1 (7)	3 (74)
Yes applicable	78.9	
Occupational Therapy assessment % (n)		
Yes	58 (508)	22 (476)
No	16 (144)	45 (977)
No but **	25 (216)	30 (646)
Missing	1 (6)	3 (74)
Yes applicable	77.9	
Medical Social Worker assessment % (n)		
Yes	18 (162)	13 (283)
No	34 (300)	38 (835)
No but ***	47 (409)	45 (982)
Missing	0.5 (3)	3 (73)
Yes applicable	35.1	

* No but… if: patient died within 7 days; the patient was still unconscious; it is documented that the patient had no communication problems; patient is receiving palliative care.

** No but… if: patient died within 7 days; the patient was still unconscious; it is documented that the patient had no difficulties performing everyday activities; patient is receiving palliative care.

*** No but… if: patient not referred to social worker; patient died within 7 days; patient refused.

Management of urinary continence.

The management of urinary continence findings are remarkably similar to INASC 2008 (Table 4.28). There does appear to be fewer catheterisations due to urinary incontinence down to 17% (32) compared to 31% (179) in INASC 2008, however, it remains poorly documented as to the reason why a patient was catheterised. Data adjusted to promote continence in incontinent patients only suggests that 25.5% (82/322) have a continence plan which is lower than the INASC 2008 result of 30% (278/918). SSNAP 2014 reports that 76.9% (26791) of applicable patients have a documented continence plan.

Table 4.28 Continence management

Standards	National Stroke Audit 2015 n=874	INASC 2008 n=2173
Indwelling urinary catheter % (n)		
Yes	21 (183)	26 (569)
No	74 (644)	70 (1515)
No but	5 (41)	N/A
Missing	1 (6)	4 (89)
Yes applicable	21.9%	
Reason for catheterisation n=183 % (n)		
Urinary retention	22 (41)	15 (83)
Pre-existing catheter	4 (8)	2 (14)
Urinary incontinence	17 (32)	31 (179)
Fluid balance monitoring	23 (42)	21 (119)
Critical skin care	7 (13)	6 (36)
Not documented	22 (40)	25 (145)
Other	6 (10)	N/A
Missing	16(29)	5 (30)
Plan to promote urinary continence % (n)		
Yes	9 (82)	13 (278)
No	26 (226)	23 (498)
No but *	63 (552)	58 (1255)
Missing	2 (14)	7 (142)
Yes applicable	25.5%	

* No but... if: patient is continent; patient died within 7 days; patient is unconscious; patient is receiving palliative care.

Prevalence of urinary tract infection and pneumonia rates in 7 days.

The development of urinary tract infections is comparable with SSNAP 2014, table 4.29.
Rates of pneumonia are higher than reported in SSNAP, table 4.29.

Table 4.29 Urinary tract infection and pneumonia prevalence in 7 days

	National Stroke Audit 2015	SSNAP 2014
Urinary tract infection % (n)		
Yes	6 (54)	5 (3311)
No	90 (783)	91.8 (61301)
Not known	4 (37)	3.3 (2186)
Pneumonia % (n)		
Yes	16 (144)	8.5 (5702)
No	79 (692)	88.2 (58931)
Not known	4 (38)	3.2 (2165)

Standards by discharge.

Screening by discharge.

There is an increase in the numbers of patients weighed during their admission, 65% (566) from 41% (891) in INASC 2008. Assessment of mood and cognition have increased moderately, however, when adjusted to include applicable patients only the results are poor in comparison to SSNAP 2014 with mood assessed 37.5% (289/770) versus 85.6% (34390) in SSNAP 2014 and cognitive assessment 58.4% (437/748) versus 84% (34390) SSNAP 2014.

Table 4.30 Screening by discharge

Standards	National Stroke Audit 2015 n=874	INASC 2008 n=2173
Was patient weighed % (n)		
Yes	65 (566)	41 (891)
No	26 (228)	45 (980)
No but *	9 (76)	11 (242)
Missing	0.5 (4)	3 (60)
Yes applicable	70.9%	
Assessment of mood % (n)		
Yes	33 (289)	28 (612)
No	54 (474)	56 (1222)
No but **	12 (104)	13 (278)
Missing	1 (7)	3 (61)
Yes applicable	37.5%	
Assessment of cognition % (n)		
Yes	50 (437)	41 (879)
No	36 (311)	42 (922)
No but ***	14 (126)	14 (314)
Missing	0	3 (58)
Yes applicable	58.4%	

* No but... if: patient died within 7 days, patient unconscious throughout.
** No but... if: patient died within 7 days, patient unconscious throughout.
*** No but... if: patient died within 7 days, patient unconscious throughout or receiving palliative care.

Care planning

Documentation of multidisciplinary team case discussions with a senior decision maker was reported at 51% (445/874) and of applicable cases at 65% (445/684). This question did not correlate well within the validation audit, with results lying outside the interquartile range for this data point. There may have been some misinterpretation of the question.

Table 4.31 Standards of care by hospital (applicable case results presented)

	Swallow Screen at 24 hours %	SLT at 48 hours %	OT at 48 hours %	Physio at 48 hours %	Nutrition Screen %	Weighed during admission %
National	**36**	**56**	**41**	**68**	**37**	**71**
Ireland East	41	61	41	75	51	84
Dublin Midlands	38	52	37	73	33	82
RCSI Hospitals	36	52	44	70	46	70
UL	18	47	43	60	0	74
South Southwest	35	54	42	58	26	53
North Northwest	37	64	42	66	39	65
MMUH	39	68	34	67	49	81
SVUH	33	60	31	68	64	92
MRHM	39	64	74	89	40	93
WGH	45	68	80	86	73	79
SLHK	58	43	0	83	57	96
OLHN	28	50	19	59	11	50
SJH	47	79	36	79	75	80
AMNCH	67	54	29	71	3	88
NGH	30	50	35	79	25	91
MRHT	17	21	72	72	27	83
MRHP	11	42	12	61	28	52
OLOLHD	16	37	37	78	19	68
CGH	50	62	62	84	89	72
BH	53	54	54	74	21	64
CH	25	16	16	32	82	86
MWRH	18	43	43	60	0	74
UHW	60	71	71	80	17	45
STGH	13	0	0	52	15	41
CUH	24	23	23	48	19	47
KGH	45	70	70	75	100	0
MUH	13	67	67	46	0	97
BGH	91	20	20	38	0	70
UCHG	19	20	20	73	21	56
PH	11	21	21	64	5	68
MGH	59	12	12	60	0	60
SGH	16	65	65	75	56	33
LGH	64	68	68	60	91	100

4.8 Risk factors and secondary prevention

An important risk to suffering a stroke is having had a previous stroke. This underlies the importance of appropriate screening and management of the causes of stroke in the secondary prevention setting. Coupled with this principle is the clear communication and education of modifiable risks to the patient including smoking, alcohol consumption and physical activity. Underpinning successful risk reduction in any disease process is empowerment of patients through knowledge of their condition.

Risk factors defined at discharge

In 71% (617) of cases the cause of stroke was identified by discharge. In 13% (112) of cases the cause was not identified and in 16% (139) of cases the cause was not documented. Data was missing in 0.7% (6) of cases. Table 4.32 presents the comparison with INASC 2008, which is similar in most items, however, the biggest variance is the number of cases identified with atrial fibrillation in patients with a known cause of stroke increased from 28% (317) in 2008 to 44% (269) in the current audit. This is the only risk factor data collected in SSNAP 2014 and the reported rate is 21.5% (12174).

In just under 30% of cases, 2 or more risk factors were identified as implicated in the cause of stroke. Review of the 20% 'other' causes shows how heterogenous stroke can be. A number of cases are reported secondary to vertebral and carotid dissection, dyslipidemias, and structural cardiac problems such as ventricular thrombus, aortic arch atheroma and diseased valves. Amyloid angiopathy is an uncommon but important cause of stroke. Hypo-perfusion or reduced blood flow to the brain generally due to low blood pressure also was identified in a number of cases. Medications were associated with the aetiology for example sub-therapeutic control of anticoagulation leading to further atrial fibrillation related stroke and stroke potentially caused by the drugs themselves e.g. chemotherapeutics and NSAIDs. Rarer cases were also reported including antiphospholipid syndrome, lupus related stroke, and CADASIL.

Table 4.32 Risk factors as identified at discharge

	National Stroke Audit 2015 n=617 % (n)	INASC 2008 n=1114 % (n)
Carotid stenosis	14 (89)	11 (118)
Current smoker	16 (100)	14 (156)
Alcohol excess*	7 (41)	6 (67)
Atrial fibrillation	44 (269)	28 (317)
Myocardial infarction within last month	1 (6)	4 (48)
Hypertension	50 (302)	56 (623)
Diabetes mellitus	14 (88)	14 (154)
Other	20 (123)	N/A

* (no. of units per week >14 for females, >21units for males)

Lifestyle risk factors

Documentation of lifestyle factors, relevant to the patient, to promote secondary prevention following stroke has improved since INASC 2008. Table 4.33 presents documentation of discussion with the patient and/or the carer of lifestyle issues where the lifestyle factor is relevant.

Initially, 20% (175) of patients were documented as smokers on admission and 9% (77) were documented as drinking alcohol to excess. However, on discharge the data suggests that more patients required information on smoking cessation (247) and alcohol reduction (193) than were initially reported as having these risk factors on admission. However of the 175 patients identified as current smokers on admission, 57% (100) had documented evidence of smoking cessation advice or support.

Table 4.33 Documentation of lifestyle risk factor discussion

Risk factor	National Stroke Audit 2015 % (n)	INASC 2008 % (n)
Smoking cessation	46 (113)	13 (199)
Alcohol reduction	35 (68)	10 (149)
Exercise	41 (173)	12 (193)
Diet	44 (202)	20 (318)

Lipid profiles.

Sixty-four per cent of patients had a cholesterol profile checked. This revealed an average cholesterol result of 4.38 (Range 1.92-9.74) and a LDL average of 2.53 (range 0.5-6.83). Over 28% (164/560) of cholesterol levels checked were 5.0 or over and 32% (159/499) had a LDL level of 3.0 or greater.

Discharge medication profile

Following a stroke event, particularly an ischaemic type event, a number of medications are potentially indicated based on the risk factor profile of the patient. Table 4.34 summaries the prescribing trends in the major medication classes targeted following stroke, noting that half the patients discharged are on aspirin and two-thirds of patients are on statins. These trends will be discussed further in the discussion section.

Table 4.34 Discharge medication

Class	Medication	National Stroke Audit 2015 n=874 % (n)	INASC 2008 n=2078 % (n)
Anti hypertensives	Ace inhibitor	40 (352)	45 (941)
	Alpha blocker	3 (28)	4 (89)
	Beta blocker	28 (244)	22 (453)
	Calcium channel blocker	19 (166)	12 (256)
	Thiazide diuretic	5 (48)	10 (213)
	Other	3 (25)	4 (89)
Antiplatelet/antithrombotic	Aspirin	50 (434)	50 (1037)
	Clopidogrel	12 (103)	9 (191)
	Dipyridamole	1 (12)	2 (46)
	Warfarin	12 (101)	13 (274)
	NOAC	10 (86)	N/A
	Asasantin retard	2 (19)	7 (137)
	Other	2 (15)	1 (25)
Lipid lowering treatment	Statin	65 (572)	56 (1158)
	Ezetimide	0.5 (5)	0.4 (9)
	Niacin	0.1 (1)	0.05 (1)
	Fibrates	0.3 (3)	0.1 (2)
	Omega 3	0.1 (1)	0.05 (1)
	Other	0.2 (2)	0.7 (15)

4.9 Patient communication and research

Discussion with patients about diagnosis and prognosis has slightly improved since INASC 2008. However only marginally more than 50% of patients have discussions about their diagnosis documented, with even less documenting discussing about prognosis.

Table 4.35 Communication and research

	National Stroke Audit 2015	INASC 2008
Documented evidence of discussion with patient about diagnosis % (n)		
Yes	51 (444)	22 (469)
No	28 (244)	50 (1087)
No But*	21 (183)	24 (530)
Missing	0.3 (3)	4 (87)
Documented evidence of discussion with patient about prognosis % (n)		
Yes	37 (312)	18 (382)
No	41 (364)	53 (1162)
No But**	22 (193)	25 (533)
Missing	0.5 (5)	4 (96)

Answer No but…

*/** Patient unconscious throughout died or has severe receptive or cognitive difficulties.

4.10 Discharge planning from hospital and onward referral

Continuing with the theme of good communication this section deals with how hospital stroke services communicate and manage a patient's discharge. This vital step can often be the source of difficulties including absence or delay of therapy and community supports, and readmissions due to medication errors for example (Payne et al 2002). With regards onward referral for services, information gathered relates the intention to refer to services as described in the medical notes. This does not equate to the actual experience of follow up of the patient and was outside the remit of this audit.

Assessment of carers' needs

Documentation of assessment of carers' needs has marginally improved at 30% (260) but even when adjusted for applicability, only 51% of cases document that carers have their needs assessed. Documentation of teaching skills to carers remains low but when adjusted for applicability 45% of cases have documentation of skills being taught. Of those who had a home visit 53% (19) of visits included the patient, which is down from 77% (118) in INASC 2008.

Table 4.36 Documentation of assessment of needs at home

	National Stroke Audit 2015	INASC 2008
Assessment of carers needs % (n)		
Yes	30 (260)	24 (524)
No	28 (244)	39 (857)
No But	41 (360)	32 (692)
Missing	1 (10)	5 (100)
Skills required to care for patient at home were taught % (n)		
Yes	16 (136)	12 (257)
No	19 (163)	19 (400)
No But	65 (570)	65 (1420)
Missing	0.5 (5)	4 (96)
Home visit performed % (n)		
Yes	4 (36)	7 (153)
No	28 (241)	27% (588)
No But	68 (590)	62 (1342)
Missing	1 (7)	4 (90)

Answer No but…

* if patient died; patient discharged to institutional care; it is documented that the carer is not participating in the patient's care; patient was self-caring by discharge

** if it was documented that there was no carer, if patient sent to another hospital /institution; was functionally competent, there was no change in functional ability from before stroke; if plan to perform home visit on discharge; patient died or patient or care refused.

*** if it was documented that there was no carer, if patient sent to another hospital /institution; was functionally competent, there was no change in functional ability from before stroke; if plan to perform home visit on discharge; patient died or patient or care refused.

Information to the general practitioner (GP)

A discharge letter was sent at some point to the GP in 89% (776) of cases, although it was unclear how many letters were prepared before or at the time of discharge as recommended in the RCPUK guidelines. The death of the patient was the main reason for not sending a discharge summary to the GP along with transfers to rehabilitation from the acute care setting. Within the discharge letters 90% (698) have a documented diagnosis, 84% (655) have a treatment plan, 54% (421) document complications, 83% (643) document the medications on discharge and 41% (318) describe functional ability on discharge (INASC 2008 report 24%).

Table 4.37 Discharge letter information

	Diagnosis	Treatment	Complications	Medications on discharge	Functional Ability
National Stroke Audit 2015	90% (698)	84% (655)	54% (421)	83% (643)	41% (318)
INASC 2008					24% (512)

Onward referral from hospital

Table 4.38 Early supported discharge summary

National Stroke Audit 2015	
Early supported discharge team n=41	
Mater Misercordiae University Hospital	n= 14 (35% of their patients)
ANMCH/St James's Hospital	n=12 (16% of their patients)
University College Hospital Galway	n=4 (14% of their patients)
Other	n=11

With regards onward referral for services significant numbers of patients were transferred to offsite rehabilitation units where more definitive follow up in the community is arranged. Early supported discharge is a new service since the INASC 2008 audit with 3 teams covering 4 hospitals (1 Mater Misercordiae University Hospital, 1 University College Hospital Galway, and 1 AMNCH/St James's). Other sites had patients referred to ESD, possibly as their home address was within the catchment of the ESD team, and Naas General Hospital have developed an outpatient based version of ESD in the absence of an available team.

Table 4.39 summarises referral intentions following acute admission. It is important to note that intention to refer on discharge was assessed from the medical notes and does not provide information on speed of access, type or intensity of assessment/intervention provided for various community services.

Table 4.39 Referral into community services

	National Stroke Audit 2015 % (n/number of responses)
Early supported discharge team	5.2 (41/743)
Public health nurse	29.9 (223/746)
Physiotherapy	13.7 (102/742)
Occupational therapy	13.9 (104/745)
Speech and language therapy	8.7 (65/745)
Clinical nutrition	2.5 (19/746)
Psychology	0.4 (3/745)
Liaison psychiatry	2 (13/744)
Community rehabilitation team	2.4 (18/743)
Hospital based therapy out patients	5.2 (39/744)
Day hospital	4.2 (31/743)
In patient rehabilitation unit	5 (37/743)
Off site rehabilitation unit	17.2 (128/746)
Baggot Street Hospital	0.8 (6/734)
National Rehabilitation Hospital	4.3 (32/743)
Volunteer Stroke Scheme	0.14 (1/743)
Headway	0.9 (7743)

4.11 Outcome

A strength of performing clinical audit is in assessing outcome against designated standards and guidelines. In stroke medicine as with most illnesses, reviews of mortality figures, level of disability and discharge location are key markers in quality of care. Lengths of stay results are also presented, although interpretation of these results must factor in the different models of care on the various acute hospital sites.

Hospital length of stay

Data related to length of stay for patients who had died were available in 100% of cases. Length of stay data for survivors were missing in 1% (6) of cases. Results indicate that the average length of stay when discharged alive has reduced by 7 days since INASC 2008. However while the mortality rate has reduced, the length of stay to death has increased by 7 days. SSNAP 2014 include both deaths and survivors in their length of stay data. When this data is adjusted to include both, the results indicate that the length of stay rises to 27.9 days, 10 days more than the UK. Variation exists from site to site nationally depending on model of care provided. A number of sites provide onsite rehabilitation, which has the knock on effect of increasing average length of stay in these units.

Table 4.40 Length of hospital stay

	National Stroke Audit 2015	INASC 2008	SSNAP 2014 *
Length of stay to discharge alive	Mean 22.4 days	Mean 29.8 days	Mean 17.3
	Median 11 days	Median 14 days	Median 7.2 days
	IQR 6-23 days	IQR 7-30 days	IQR 3-21.1 days
Length of stay to death	Mean 33.4 days	Mean 26 days	N/A
	Median 9days	Median 9days	
	IQR 3-20 days	IQR 3-24 days	

* Length of stay includes length of stay to death

Discharge level of disability

The median Barthel Index score upon discharge was 19, where a score of 20 equates to full independence and a score of 0 equates to complete dependence on all activities of daily living. Over half of patients were discharged either fully independent or near-full independence, with 52% (378/727) discharged with a Barthel score of 19-20. Eleven per cent of discharge patients (81/727) had a Barthel score of 3 or less, indicating severe impairment of activities of daily living. Just under 10% of patients (72/744) were reported discharged home with a home care package.

Table 4.41 National summary of length of stay and discharge location

	ALOS (days)	Median LOS (days)	IQR 25 LOS	IQR 75 LOS	Discharged home %	Discharged to offsite rehab %	Discharge to NH %
National	**22.1**	**11**	**6**	**23**	**54.7**	**16.3**	**11.4**
Ireland East	21.4	10	5	22.75	51.3	23.8	8.8
Dublin Midlands	30	11.5	6	29	66.7	6.2	13.7
RCSI Hospitals	19.5	10	6	15.25	57.8	18.5	9.6
UL	11.2	9	7	14	58.9	17.5	12.8
South Southwest	20.1	11	6	25	49.5	16.2	15.8
North Northwest	22.5	12	7	24.5	49.7	14.2	8.4
MMUH	17.9	11	6	19	50	27.5	7.5
SVUH	28.5	15	6.5	31.5	52.5	25	12.5
MRHM	13.3	10	5	15.5	58.8	11.8	2.9
WGH	21.2	11.5	6	19.25	44.8	41.4	6.9
SLGH	12	6	4	12	53.3	20	6.7
OLHN*	39.8	22	7	68	45	15	20
SJH*	52.1	39	10	87	56.8	5.4	19.4
AMNCH	19.8	10	6.5	20.5	69.4	8.3	5.5
NGH	29.9	10	5	26	76.5	3	14.7
MRHT	12.35	9	3.75	15.5	75	0	8.7
MRHP	27.47	14	8	26	54.6	13.6	18.2
OLOLD	9.2	9	6	13	52.5	34.1	7.3
CGH	15.8	12	7	21	57.1	21.4	7.1
BH	21.7	12.5	8.25	21	63.4	13.9	13.9
CHB*	40.15	9.5	5	29.75	60	8	12
MWRH	11.2	9	7	14	58.9	17.5	12.8
UHW	24.3	8.5	5.75	35.75	22.9	25.7	22.9
STGH	14.3	11.5	6	16.25	51.4	29.7	16.2
CUH	15.1	7	4	13.5	68.6	5.9	2.9
KGH*	20.8	16.5	6.75	36.75	53.3	0	13.3
MUH	17.8	11	7	20	34.5	30	24.1
BGH*	34.5	26.5	10	40.5	64	0	16
UCHG	33.9	22	13	39.25	57.1	0	10.7
PH	18.2	11	8	18.25	38.5	16	12.5
MGH	13.9	11	9.25	16.5	25.7	48	5.7
SGH	9.8	7	5	13	52.9	23.5	2.9
LGH*	37	18	9.25	42.75	73.5	0	12.1

- Onsite rehab facility

Discharge accommodation

More patients were discharged home from the acute hospitals compared to INASC 2008, 63% vs 56% (table 4.42). However, SSNAP 2014 indicates that 79% (39490) of patients are discharged home, with the support of early supported discharge and community rehabilitation teams in 8% (7685) of cases. The paucity of current coverage nationally by ESD teams likely contributes to lower discharge home rates currently in Ireland.

Table 4.42 Accommodation at discharge of patients discharged alive

	National Stroke Audit 2015 n753 % (n)	INASC 2008 n1670 % (n)
Home	63 (472)	56 (931)
Residential nursing home	13 (98)	19 (324)
Hospital	6 (44)	12 (204)
Off-site rehabilitation	19 (140)	N/A
Other	N/A	8 (127)
Missing	0	5 (84)

This audit also specified off-site rehabilitation as discharge accommodation data point, which was not specified in INASC 2008 nor SSNAP 2014. Adding this data point has likely affected rates reported both for discharge home and to long term care. It could be inferred therefore that the ultimate discharge home rate is higher than 63%. However ultimate discharge to residential nursing homes may be slightly higher than reported as not all rehabilitation can successfully discharge to home. This change may also explain the variance between discharges to hospital from 12% in 2008 to 6% in 2015, 'hospital' may have been off-site rehabilitation in many cases.

Seven per cent (61) of patients were admitted to the acute hospital from a residential nursing home with two-thirds (40) of these patients being discharged back to the nursing home. These patients are included in the total numbers of discharges to residential nursing homes. When adjusted to account for new cases of institutionalised patients the rate falls from 15% in INASC 2008 to 8% in 2015.

In-patient mortality

In-patient mortality data was available for 99% (868) of cases (1%, 6 cases missing). All of the missing cases indicate that the patient did not die as an in-patient. 14% (121) died as an in-patient down from 19% (408) in INASC 2008 and less than the 15.3% (10193) reported in SSNAP 2014. A more detailed discussion of mortality figures is discussed in a later section.

Table 4.43 Mortality

	National Stroke Audit 2015 % (n)	INASC 2008 % (n)	SSNAP 2014 % (n)
Died in hospital	14 (121)	19 (408)	15.3 (10193)

4.12 Thrombolysis of ischaemic stroke

81 cases of patients who received thrombolysis were reported within the 874 case total. This suggests a national thrombolysis rate of 10.9% when excluding haemorrhagic strokes. This rate compares favourably with SSNAP UK 2014. Table 4.44 shows thrombolysis rates both nationally and locally, with the caveat that our audit captured a particular point in time and as stated previously the sample sizes are small and therefore comparison between sites is not appropriate. Where the different thrombolysis rates from different sites are presented for the local stroke teams' interest, confidence intervals are also included.

Table 4.44 National thrombolysis figures

The youngest person reported to receive thrombolysis was 36, and the oldest person was 93 years of age. 37% of patients receiving thrombolysis were 80 years or older.

	Thrombolysed n=81	National total n=874
Age	71.4 (36-93)	73.3 (22-102)
Male: Female	1.13:1	1.39:1

As would be expected but important to highlight, more patients arrive by ambulance, present sooner and are scanned quicker in the group receiving thrombolysis.

Table 4.45 Factors affecting thrombolysis rate

	Thrombolysed n=81	National total n=874
Ambulance arrival	88%	64%
Median time of onset to presentation (mins)	85	146
Median time of onset to scan (mins)	142	373
Median time to scan from presentation (mins)	46	182

Table 4.46 Thrombolysis group outcomes versus national group

	Thrombolysed n=81	National total n=874
Median length of stay (days)	13.5	11
Preadmission independent in ADLs	83%	80%
Preadmission living in nursing home	7.4%	7%
New admissions to nursing home	7.4%	
Mortality	11.1%	13.8%

Similar levels of dependency prestroke appear in the thrombolysis group when compared with the national total. Of note 6 patients who were nursing home residents received the treatment. The mortality rate is 11% in thrombolysis group.

Patients who received thrombolysis had both higher use of high dependency beds and overall stroke unit admissions when compared to the national group. The higher dependency bed use can be explained by local hospital procedures to admit patients to these beds following receipt of thrombolytic agents.

Table 4.47 Stroke unit access for thrombolysis group

	Thrombolysed n=81 %	National total n=874 %
Admitted to SU initially	41	29
Admitted SU anytime	82	54
>50% of stay in SU	68	47
High dependency bed admission	48	11

Table 4.48 Standards of care for thrombolysis group

	Thrombolysed n=81 %	National total n=874 %
Swallow at 24 hours	55	36
Aspirin at 48 hours	91	91
SLT at 48 hours	83	56
Physio at 48 hours	74	68
OT at 48 hours	42	41
Pneumonia	22	16
Catheter inserted	32	22

Swallow assessment by 24 hours for patients who received thrombolysis is higher than the national average. Assessment in general is higher for most therapies in the first 48 hours despite access to these patients often being restricted in the first 24 hours. Catheter insertion appears higher than the national average as does the rate of pneumonia cases.

Existing comorbidities were present in 75% of the thrombolysis group, comparable with the national figure, although there was a higher rate of previous stroke or TIA in this group. The lower anticoagulant rate most likely is explained by the fact these patients will often be excluded from thrombolytic therapy due to bleed risk.

Table 4.49 Casemix of thrombolysis group

	Thrombolysed n=81 %	National total n=874 %
Existing Comorbidities	75	78
Previous Stroke or TIA	23.5	23
Already on aspirin	44	40
Already on anticoagulant	6	12
Presenting with motor symptoms	88	71
Presenting with dysphasia	58	38
Cause identified	79	71
AF as causal factor	38	31
Carotid stenosis as causal factor	16	10

Table 4.50 Comparison of thrombolysis rates nationally

	Thrombolysed (n)	Thrombolysis rate excluding bleeds % n=742	95% Confidence Interval	Thrombolysis rate of total strokes % n=874
National	**81**	**10.9**	**±-2.24**	**9.3**
Ireland East	23	13.8	±-5.2	11.8
Dublin Midlands	12	9.6	±4.8	7.8
RCSI Hospitals	12	10	±5.37	8.9
UL	13	37.1	±16.01	32.5
South Southwest	15	9.2	±4.46	7.8
North Northwest	6	4.9	±3.81	3.8
MMUH	11	31.4	±15.38	27.5
SVUH	3	8.8	±9.56	7.5
MRHM	5	16.1	±12.95	14.7
WGH	1	4	±7.68	3.3
SLHK	2	7.7	±11.86	6.7
OLHN	1	6.3	±10.24	4.8
SJH	4	12.1	±11.14	10.8
AMNCH	4	12.5	±11.46	11.1
NGH	4	13.3	±12.16	11.4
MRHT	0	0		0
MRHP	0	0		0
OLOL	1	2.7	±5.23	2.7
CGH	1	3.9	±7.39	3.6
BH	8	23.5	±14.26	19.5
CH	2	8.7	±11.52	8
UHL	13	37.1	±16.01	32.5
UHW	3	12	±12.74	8.6
STGHC	3	9.7	±10.41	8.1
CUH	2	6.5	±8.65	5.7
KGH	1	3.7	±7.12	3.3
MGH	4	14.8	±13.4	13.3
BGH	2	9.5	±12.55	8
UCHG	1	5.3	±10.04	3.6
PH	0	0		0
MGH	2	8	±10.63	5.7
SGH	1	3.6	±6.87	2.9
LGH	2	6.25	±8.39	5.9

4.13 Mortality

The mortality figures show an inpatient mortality rate of 14% (n=121) compared with 19% in INASC 2008 and 15.3% in SSNAP UK 2014. Every effort was made to obtain a reflective figure of inpatient mortality but in the process of chart review missing charts potentially (see Figure 4.1) would affect the overall accuracy of the figure. However when compared with available data from the stroke register, the national figure appears accurate. The mortality rate is very encouraging when compared internationally.

As expected this group were significantly older than the national average and as also be expected with increasing age, the gender ratio shifts towards increasing female deaths.

Table 4.51 Mortality age and gender profile

	Deaths n=121	National total n=874
Age	80.7	73.3
Male:Female	0.78:1	1.39:1

Table 4.52 Preadmission dependency in mortality group

	Deaths n=121	National total n=874
Preadmission independent in ADLs	55%	80%
Preadmission living in nursing home	15%	7%

Higher levels of pre-stroke disability is evident as is a higher rate of nursing home residents among the cases of death due to stroke.

The vast majority of patients arrive by ambulance likely indicating both a measure of premorbid condition and severity of stroke.

Table 4.53 Factors related to speed of presentation in mortality group

	Deaths n=121	National total n=874
Ambulance arrival	92%	64%
Median time of onset to presentation	118mins	146mins

A comparison of stroke unit admissions rates between the patients who died during the admission and the national figures (Table 4.54) shows similar levels of access.

Table 4.54 Stroke unit access for mortality group

	Deaths n=121 %	National total n=874 %
Admitted to SU initially	29	29
Admitted SU anytime	41	54
>50% of stay in SU	36	47
High dependency bed admission	19	11

The results relating to standards of care are outlined below in Table 4.55, taken in the context that a large proportion of these standards of care could not be applied to the mortality group due to the severity of their stroke or impaired level of consciousness. As would be predicted a higher rate of pneumonia is reported in the mortality group. It is also noted that the mortality group were more likely to be seen for swallow screening and speech and language therapy than the national group.

Table 4.55 Standards of care for mortality group

	Deaths n=121 %	National total n=874 %
Swallow at 24 hours	61	36
Aspirin at 48 hours	80	91
SLT at 48 hours	70	56
Physio at 48 hours	63	68
OT at 48 hours	34	41
Pneumonia	40	16
Catheter inserted	50	22

A higher rate of previous stroke or TIA is reported in the mortality group. Atrial fibrillation was identified in over a third of patients who died (Table 4.56).

Table 4.56 Casemix of mortality group

	Deaths n=121 %	National Total n=874 %
Existing Comorbidities	75	78
Previous Stroke or TIA	24	23
Already on aspirin	39	40
Already on anticoagulant	18	12
Presented with motor symptoms	79	71
Presented with dysphasia	60	38
Cause identified	59	71
AF	35	31
Carotid stenosis	5	10

Table 4.57 summarises the mortality figures nationally for the hospitals and hospital groups. Again the sample size is too small to be accurate measure of mortality rate at local level as indicated by confidence intervals were supplied. The mortality rate is a crude rate and average age by hospital suggest that the underlying age of the patients is the biggest influence on the mortality rate rather than the quality of care for example.

Table 4.57 Mortality rates by hospital groups and hospitals

	Mortality rate %	Confidence intervals	Average age
National	**13.8**	±2.3	80.7
Ireland East	9.7	±4.2	80.1
Dublin Midlands	10.4	±4.8	81.6
RCSI Hospitals	13.3	±5.7	78.5
UL	12.5	±10.3	80.6
South Southwest	16.1	±5.2	82.1
Saolta	20.3	±6.3	80.4
MMUH	7.5	±8.16	71.3
SVUH*	0	N/A	N/A
MRHM	17.7	±12.8	79.8
WGH	6.7	±8.9	84.5
SLHK	16.7	±13.4	80.4
OLHN	14.3	±14.9	86
SJH	10.8	±10	77
AMNCH	13.9	±11.3	86
NGH	5.7	±7.7	88
MRHT	16.6	±14.9	76.5
MRHP	4.5	±8.7	88
OLOLD	4.9	±6.6	74.5
CHG	17.9	±14.2	76.6
BH	14.6	±10.8	80.2
CH	20	±15.7	80
MWRH	12.5	±10.3	80.6
UHW	20	±13.3	80.7
STGH	8.1	±8.8	78
CUH	11.4	±10.5	80.3
KGH	33	±16.8	86.1
MUH	6.6	±8.9	86
BGH	20	±15.7	78.6
UCHG	28.6	±16.7	76.5
PH	27	±17.1	86.3
MGH	22.9	±13.9	77.9
SGH	17.1	±12.5	80
LGH	8.8	±9.5	84.7

* SVUH had no cases of deaths included in their cohort, related to charts being unavailable during audit process, which would have effected rate (see figure 4).

SECTION 3: RECOMMENDATIONS AND CONCLUSIONS

CHAPTER 5. Recommendations and Conclusions

5.1 Introduction

The first Irish national stroke audit, INASC 2008, gave the HSE national stroke programme, in partnership with the Irish Heart Foundation, the baseline from which to construct a more modern, evidence-based, and patient-centered health service to manage the thousands of people affected by stroke each year in Ireland.

The aims of the national stroke programme were to reduce death and disability related to stroke. The key to achieving this aim was to bring organisation and cohesion to the care of stroke patients. This was manifest through a number of specific areas including the provision of specialist posts in the management of stroke in the various disciplines, the development of the infrastructure and resources to increase the number of stroke units nationally and to ensure that all patients who develop symptoms of stroke will have access to evidence based treatments including thrombolytic therapy of ischaemic stroke.

The national stroke audit 2015 sought to assess how much progress has been made against both national and international standards, bringing attention to areas that have improved significantly and identifying areas of weakness, thus providing the next building block for the national stroke programme and the Irish Heart Foundation to inform planning and development of stroke services in the coming years.

Some of the most significant findings of the audit are discussed below, aiming to bring the data gathered from the audit on the organisation of care in the acute hospitals in Ireland together with the clinical outcomes that patients' experience. The areas covered in this section are not exhaustive and the expectation is that this report will inform debate and discussion nationally among all people with an interest in stroke care.

5.2 Demographics

The audit is representative of the entire Republic of Ireland, covering large urban areas and smaller rural communities (Kearney et al 2011). The age profiles show how stroke affects people of all ages, with trends increasing with advancing years. However it is concerning that there is a higher proportion of strokes documented in the under 65 years of age population when compared with INASC 2008. The SSNAP UK results also give a potential window to the future, with a significantly higher proportion of strokes in their oldest population group. As people begin to survive from previously untreatable conditions such as certain cancers, the relative proportion of people being affected by stroke may increase.

Nationally it is also evident that different centres manage potentially different cohorts of people, with the average age per site ranging from 67.3 years to 80.4 years, which has significant implications when planning hospital/regionally specific resources and infrastructure to care for these people.

5.3 Onset and presentation

Vital to the whole process of stroke management and recovery is that people who develop symptoms of stroke recognise the symptoms, and in doing so are then directed to a hospital with the expertise and facilities to provide the right care to the right person every time.

The success of the Irish Heart Foundation's Act FAST campaign is evident in that the standard tool used by paramedical staff when managing a patient with suspected stroke is the Act FAST assessment. Nearly two-thirds of patients presented to hospital via ambulance in this audit, however that is significantly less than the 82% in the SSNAP UK 2014. These results underline the importance of renewed support of the IHF Act FAST campaign nationally. The evidence would suggest that the

impact of its message on the population has waned with time but it continues to be crucial that populations are aware of stroke symptoms and act quickly (Hickey et al 2010, Mellon et al 2011).

All 27 sites report arrangements with local ambulance services for rapid transfer of patients. Crude measures of the effectiveness of these arrangements could include thrombolysis rates or time from onset to presentation, however that would not take into account significant other factors including patient awareness of symptoms, social isolation, or road access for example. Patients are presenting on the same day as their stroke in similar numbers when compared to INASC 2008, and also the median time of onset of symptoms to presentation mirrors the SSNAP UK 2014 data. Perhaps underlining the 24/7 nature of stroke care, 55% of people present to the emergency department outside of 'office' hours (Monday-Friday, 9am-5pm).

In the context of hyperacute management of stroke with both thrombolysis and/or thrombectomy, a significant challenge is apparent that in over 38% of cases a time of onset of symptoms is unknown, marginally higher than the UK (33%). Nationally the median time of onset to presentation varies appreciably from site to site, with some large urban hospitals having the longer times on the face of our results. The reasons for this may include the casemix of stroke patients attending these departments and those potentially milder stroke episodes present later in the large hospitals and not at all in some more peripheral sites.

Almost two-thirds (17/27) of hospitals report having a stroke team on call to provide acute care, however almost half of these are only able to cover Monday-Friday 9am-5pm. This remains a challenge for the stroke network partnership to ensure patients have access to medical staff with specialist knowledge in stroke care. This emphasizes the need for appropriate systems to be in place to ensure all patients are assessed at diagnosis and treated in a timely manner.

5.4 Imaging and diagnostics

Huge strides have been made with regard emergency access to CT neuroimaging in a timely manner in all sites, with 100% of sites having 24 hour access to on-site CT scanning. Importantly this has involved reorganisation of services so that patients are directed to sites with this level of access. As well as having access to CT, the speed with which imaging is performed has also improved, with over three-quarters of patients being scanned within 24 hours of stroke onset as compared to 40% in INASC. The primary reason people are not scanned within 24 hours is due to late presentation.

Outside of emergency access to CT, which is a 24-7 service, all sites report access to routine CT scanning within 48 hours, although outpatient CT scanning access varied greatly from site to site and was also influenced by outpatient use of MR imaging for suspected stroke or TIA.

MRI was rarely available outside of normal working hours, although 2 sites reported 24-hour access. 85% of hospitals have access to MRI during the normal week, although this was not always on-site and in certain cases involves arrangements with other institutions to access the MR scanner, which has the potential to cause delays. This was evident in that only 2 hospital groups have hospitals that all have access to emergency MRI within 24 hours and only 1 hospital group has access for all its hospitals for more routine imaging within 48 hours. Notwithstanding this finding, 45% of patients had a MRI performed at some point during their admission.

Similarly urgent access to carotid imaging varies nationally and within the hospital groups. This deficit was often offset by the use of CT angiography imaging of carotid vessels. However not all sites routinely performed CT angiography or they had CT scanners which were underpowered to perform the necessary scan. This difficulty also has implications with regard the hyperacute management of stroke, which is discussed later.

Most notable was the impact that access to imaging and diagnostics had on TIA/neurovascular services, with only 26% of hospitals providing neurovascular clinics, with great variation in number of clinics per week in the different sites. Coupled with this was the finding that only 26% of sites had

agreed protocols with the primary care services on the rapid assessment of potential TIA patients. In the context of these findings and driven by the need for consistent access to diagnostics the majority of sites choose to admit potential TIA patients and expedite their tests as inpatients. Thus 74% of sites reported they provided a service, which enabled patients to be seen and investigated within 7 days of their potentially minor stroke, or TIA, which is a significant improvement from the 16% of sites reported in INASC2008, aided in part by the development of the national guidelines.

TIA should be viewed as a continuum of stroke disease, and no less serious. The most important element to TIA management is timely access to diagnostics and specialist opinion. In some sites for example this has been achieved through medical admission to short stay units, where other sites have successfully developed rapid access outpatient based services. Essentially sites need to ensure that the model of care they provide is timely to access and efficient in its use of resources (Lavallée et al 2007).

Cardiac diagnostics including heart rhythm analysis e.g. Holter monitoring and echocardiography are also essential tools in the assessment and management of patients with stroke or suspected stroke. It is perhaps a deficit in this audit that access to these tests was not more formally assessed. However it was clear from the site visits and the clinical notes that patients often require admission to access these tests or have prolonged admissions in view of need for these diagnostic tests to ensure appropriate management and treatment.

5.5 Thrombolysis of ischaemic stroke

In total 81 cases of patients who received thrombolysis for ischaemic stroke were identified within the clinical audit. The relative sporadic and unpredictable nature of potential cases meant that sites' individual thrombolysis rate are far from absolute, hence confidence intervals were included with the quoted rate which on an individual site basis was a small cohort of patients. The absence of a specific HIPE code for a patient with a stroke which was thrombolysed and the variable uptake in use of the stroke register makes it difficult to obtain a true value from a clinical audit point of view. However it is a variable on the stroke register (HIPE Portal Add-On Screen) which is available to all acute hospitals. It remains a key performance indicator of the national stroke programme so the ideal circumstance is to improve the input of data into the stroke register.

Limitations aside, the improvements seen in access and delivery of thrombolysis therapy has been a major success of the national stroke programme. At the time of the previous audit thrombolysis was virtually nonexistent. With 82% (22/27) of sites providing a 24-7 service, comparable to the SSNAP UK (83%), and redirect procedures in place in a further 15% (4/27) of sites, the vast majority of the country has a system where a patient with early symptoms consistent with stroke will be directed to a centre which can deliver thrombolysis treatment. The FAST tool is now incorporated into the paramedical transfer notes further improving identification of potential patients who may benefit from this intervention.

On arrival to the emergency department procedures are in place for rapid access to neuroimaging, with two-third of sites having a stroke team on call either 24-7 or during normal working hours to perform the clinical assessment. The decision to proceed with thrombolysis is always made at consultant level, in 63% of sites the decision being made by a physician with specialist knowledge in stroke. The primary site for delivery of the thrombolytic agent is the emergency department.

The national thrombolysis rate of between 10 -11% is comparable to international rates, with the UK rate in SSNAP UK 2014 being approximately 12% of all strokes. It also validates the KPI rate reported on a quarterly basis from the national stroke register. The site specific rates demonstrate a few interesting findings. Firstly sites receiving redirected patients have higher rates than the average as would be expected. Secondly variation in rates should be taken in the context that certain regions have higher rates of haemorrhagic stroke, or have significant geographical challenges in patients presenting rapidly, and also as mentioned above may have been assessed in a period of low activity.

An important finding to highlight is that patients aged between 36 to 93 years received thrombolysis and that 37% of patients were 80 years or older. This is in keeping with the evidence that older people potentially can have more to gain from this intervention (Emberson et al 2014). It is also worth noting that nearly half of the patients spent a period in a high dependency bed, in the vast majority of cases for the purpose of post thrombolysis observation. There is an argument for developing the stroke units' hyperacute capabilities in terms of monitoring, staffing and infrastructure as this could release a large volume of high dependency bed days. It would also allow for a specialist stroke multidisciplinary team to provide assessment and intervention for these patients, not always possible when patients are placed in high dependency beds separate from the stroke unit.

With regards standards of care, the thrombolysed group of patients is accessing HSCP assessment more consistently than the overall group, probably due to higher rates of stroke unit admission. The higher rates of pneumonia compared to the national rate (22% versus 16%) in this group are a concern. Generally low rates of swallow screening within 3 hours may be correlate. Also of concern are high rates of catheter insertion (32%), and although an excess of urinary tract infections was not noted, urinary catheters are restrictive from a mobility point of view.

The success of the development of a national strategy for thrombolysis needs to embed the culture of hyperacute management of stroke, particularly in the view of recent advances in intervention and thrombectomy.

5.6 Stroke unit

Central to the model of best practice in stroke management is access to a stroke unit (Stroke Unit Trialists 2013). Progress has been made since the development of the national stroke programme in the development of this key infrastructure. With 78% (21/27) of sites having a stroke unit, this represents major progress from the single unit that existed at the time of INASC 2008. A further 11% (3/27) of sites have a strong ethos in stroke care but are lacking the discrete geographical space within the hospital to be identified as having a stroke unit.

Sites self-reported on the type of unit that was available to patients from three models of stroke unit. However in practice the units' model of care was affected by overall patient flow within the hospital, both in admission from the emergency department into the unit and egress out of unit. Protected beds were not standard throughout the units. Only 29% of patients were admitted directly to a stroke unit, and even taking into account admissions to higher dependency beds, this only rises to 40% of patients. With regard to national KPIs, 54% of patients were cared for in a stroke unit at some point during their admission (National KPI >50%) and 47% of patients spent over half their admission on a stroke unit (National KPI >50%).

Inconsistency exists in availability of features recommended in each stroke unit. Most notable inconsistencies included access to continuous physiological monitoring and in nurse training in stroke assessment specifically swallow screening. Just over half of the sites reported undertaking a needs assessment identifying appropriate bed numbers for their population. However a number of units were oversubscribed, with over 60% of patients being managed outside of a stroke unit at the time of the organisational audit. This potentially created inconsistency in the care each stroke patient received. The discrepancy between available beds and the number of stroke inpatients was most marked in the larger hospitals.

Staffing of the stroke units will be discussed in the section below on the individual health care professionals but it is important to state that stroke units need to be staffed by appropriate numbers of specialist multidisciplinary team members.

Novel and resourceful ideas for patient care were documented during the site visits to the various units around the country. This innovative practice should be commended and encouraged. These ideas grew out of having an environment where the focus is on the needs of stroke patients specifically, and it is important that each stroke unit is ultimately defined by the quality of care it delivers and not just the infrastructure the unit provides. An environment of sharing knowledge

throughout the country should also be encouraged and this is already been seen through links established by the clinical nurse specialists in stroke.

More work needs to be done to ensure patients' first admission point is the stroke unit and that as many patients as possible access this level of care. The role of the stroke unit can also continue to develop within the current system, by potentially reducing requirement on higher dependency beds through clearer bed designation and staffing.

5.7 Multidisciplinary team access

The multidisciplinary team approach is an essential element to an effective stroke service. This team functions best when the patients they care for are managed on a dedicated unit, with appropriate numbers of the team available to manage that hospital's workload. This allows for timely assessment, early mobilisation, patient engagement in goal setting, and multidisciplinary team meetings for sharing of information. Individual discipline findings are discussed below, however it is important to highlight some general points with regard the multidisciplinary team.

- Despite the recruitment nationally of a number of multidisciplinary team members, all disciplines show substantial deficits in staff numbers, with the low levels of psychology available to patients particularly evident.
- Patients are being seen for assessment more consistently and more quickly than noted in INASC 2008.
- Assessment does not equate to intervention. No patient receives the recommended level of daily therapy to promote recovery.
- Weekly multidisciplinary team meetings are occurring in all sites, although recording of agreed plans could be better documented.
- Swallow screening levels are inadequate, particularly when compared with the SSNAP UK 2014 figures.
- Cognition and mood screening are haphazard and often overlooked
- Information provided to patients with regards diagnosis, recovery and services needs to be improved.
- Agreed protocols and assessment tools are more standardised across the sites than previously noted.
- There is a paucity of HSCP clinical specialists available to lead stroke care in Ireland, despite evidence of significant specialist skills within this staffing group.
- Admissions to wards other than the stroke unit is restricting patient access to the multidisciplinary team.
- Access to rehabilitation is inconsistent with an absence of early supported discharge in a number of urban areas.

- Medical

  Although improvements have been made in the numbers of specialists working in Ireland, there is still inconsistent and inequitable access to this specialist knowledge throughout the country, with some areas more affected than others. Most specialists work in a dual role, a stroke physician coupled with the responsibilities of a general physician or general neurologist. The opportunities to develop services is restricted by large front line commitments, not least the participation in thrombolysis on-call rotas.

  This high level of commitment also has the knock on effect of restricting training time to NCHDs, thus missing the opportunity to appropriately train future stroke physicians. This creates an environment where retention of doctors become increasingly challenging, as trainees travel abroad to continue their professional development, leaving positions unfilled and stroke services understaffed. The current doctors working in the stroke service need increased support to avoid this problem escalating. Every effort should be made to retain NCHDs in quality training posts in Ireland, with an ethos of patient-centered care coupled in an innovative and academic environment (Imrie 2014, Macraith 2014).

- Nursing

There have been many improvements in stroke specific nurse training in accordance with the Stroke Clinical Care Programme. At least one CNS is in post in 85% (23/27) of hospitals compared to 14% (5/37) in INASC 2008. There are currently two advanced nurse practitioners (ANPs) in post. The specialist nursing role has assisted with the development of a number of key areas including staff training, patient communication, policy development and service audit. All sites should have access to a clinical nurse specialist in stroke, and the role should continue to develop including an expansion of the number of ANPs.

Nurses, particularly those working in stroke units, need to be trained specifically in stroke medicine in a formal way with a focus on neurological monitoring, careful positioning and handling, and dysphasia screening and while there have been improvements in the development of clinical specialism there is some concern related to the care available to patients at the bedside.

Stroke patients require high levels of nursing care, with intensive monitoring particularly in the first 72 hours (BASP 2014). This report highlights that nursing staff levels were found to be below the minimum 1.2 WTEs in 86% (18/21) of stroke units. This is particularly concerning as it does not include the required nurse 2.9 WTE per bed in the first 72hrs. If this level were applied only one unit nationally has appropriate staffing levels. A stroke unit operating with below-average nurse/bed ratios may be associated with increased risk of death (Bray, 2014). This deficit is particularly stark at nighttime and weekends. Given that 55% (484) of patients present outside of office hours it is important that nurse-staffing levels are maintained at appropriate levels at nighttime and at weekends.

In general terms difficulty arises in estimating stroke unit staffing requirements, which are dependent on the designation of stroke unit beds at each site. It is possible that a patient would require high levels of nursing input in the acute phase of their illness, and then clinically transition to step-down status and then onto the rehabilitation phase in the same hospital bed, particularly in a combined stroke unit model. Clear designation of stroke bed type would help to ensure there is an appropriate nurse staffing level 24/7 and assist workforce planning.

- Physiotherapy

Symptoms related to loss of muscle power or control were the most common, being reported in over 70% of patients, with 79% of patients referred to physiotherapy at some point during their admission. All sites reported access to physiotherapy within 24 hours during the normal working week, and 68% of appropriate patients were seen within 48 hours. Agreed protocols for assessment of motor impairment was reported in 70% of hospitals.

These findings are in the context of a staffing deficit for physiotherapy of 50.2% and represents the disciplines ability to primarily provide assessment. The emphasis often has to be on the newest admission thus limiting rehabilitation opportunities for those already inpatients. Staffing levels would need to be improved in order for patients to receive recommended daily levels of therapy.

- Speech and language therapy (SLT)

The rates of swallow screening in general are still low, only 52% of hospitals report that there is access to swallow screening in the emergency department. Access to early swallow screening (within 3 hours) falls well below the recommended and UK rates. When considered in conjunction with increasing rates of pneumonia, training of members of the stroke multidisciplinary team in performing standardised swallow screening is an urgent requirement. Currently swallow screening is only available during the regular working week, whereas to ensure swift access on call, weekend and night staff should be included in training.

For those identified as having a possible swallow problem or speech deficit is important they can access SLT promptly. Over 43% of patients presented with evidence of either a speech deficit or symptom and a total of 62% of patients were referred to SLT at some point during their admission. By 48 hours, 56% of patients requiring SLT review were seen and 78.9% of patients had a formal communication assessment performed within 7 days.

These findings are in the context of a staffing deficit for SLT of 30.9% and as with all HSCPs, represents the disciplines ability to primarily provide assessment. Assessment is also often prioritised to swallow assessment only, as staffing levels allow, leaving speech assessment often delayed in the early phase of recovery. Staffing levels would need to be improved in order for patients to receive recommended daily levels of therapy.

- Occupational therapy (OT)

The organisational audit highlighted the shortfall in OT numbers compared to the BASP recommendation in the vast majority of sites, with an overall deficit of 61.2%. This shortfall was reflected in the clinical audit where the percentages of patients seen by OT in the first 48 hours was lower than PT and SLT, (between 30 to 48% seen by OT in the first 48 hours), although the referral rates for OT were equivalent to PT and SLT in the first 48 hours.

There was an improvement in the numbers seen by occupational therapy in the first seven days post stroke with over 70% of the stroke patients seen for initial occupational therapy assessment. This finding perhaps highlights the more acute medical needs in the first 48 hours post stroke and maybe less need for occupational therapy involvement at this very early stage, but an increased need for occupational therapy involvement once the patient has been medically stabilised and is ready to commence more active rehabilitation. However, there is still a shortfall with regard to occupational therapy assessment within the first seven days post stroke with just over 20% of stroke patients not seen by occupational therapy. Only 12 sites had reported access to vocational rehabilitation after stroke.

Cognition screening and assessment, which is often requested from OT, is performed in 58% of patients by discharge. The emphasis for OT is often placed on other areas due to staffing restrictions, such as seating assessment. In order for patients to receive the recommended level of OT input staffing numbers need to be improved.

- Clinical nutrition

Only 37% of patients had evidence of nutritional screening performed within 48 hours of admission. However 91% of patients were receiving some means of nutrition by 48 hours. Only 71% of appropriate patients had evidence of being weighed by discharge. With 70% of sites reporting access to community clinical nutrition, just 3% of all patients were discharged with a plan of referral to community clinical nutrition.

A deficit in staffing in clinical nutrition was noted nationally of 68.9% as per BASP guidelines for multidisciplinary team members, with the majority of dietetics services are not dedicated time and are provided from general medical or care of the elderly services. In the majority of clinical nutrition services, provision is limited to priority cases only i.e. enteral (tube) feeding. This has implications when using nutritional screening tools identify at risk patients but service restrictions means they cannot access assessment and intervention.

- Medical social work

Significantly low whole time equivalents are reported nationally for medical social work, a profession which is recommended to be available to all patients admitted with stroke. In a number of sites the role of medical social work is performed by other professions e.g. discharge coordinators. However that role covers a very narrow spectrum of the role of medical social work in the care of patients with stroke, missing opportunities for more

detailed provision of information about services and vocational options, as well as counseling and family/carer support. Where resourcing is lacking, reduced referral or awareness for requirement for referrals are likely sequelae. As for all hospitals staffing should be considered relative to patient need, but complete absence of services is hard to justify.

- Psychology

Acknowledged as a poorly developed service in stroke care in Ireland, psychology has the lowest number of whole time equivalents of any discipline. Only 3.5 % of patients are referred to psychology within 7 days of admission, despite the high levels of psychological symptoms which people who suffer a stroke develop (Hackett et al 2014). Mood and cognitive screening are low, but in the absence of psychological services to support the stroke team, screening currently just further highlights the dearth of referral options available.

- Other HSCP

Although not specifically assessed in this audit it is also worth noting the potential role of a clinical pharmacist to the stroke service as part of the multidisciplinary team, which has been piloted in some services. The benefits include medication reconciliation both on admission and discharge, inpatient medication prescription review, and patient education and assistance with medication concordance in patients with aphasia for example.

It is also important to highlight the contribution of the health care assistants, therapy assistants and other support staff e.g. catering, who all adopt the principles of patient-centered multidisciplinary stroke care, particularly on the stroke units.

5.8 Casemix and risk factor profile

Levels of functional independence pre-stroke were proportionately higher when compared to INASC 2008, 80% versus 73%. Preadmission accommodation levels were very similar with over 90% of people living at home before their stroke event. Approximately one in five people were current smokers. When comparing with previous results, rates of prevalence of risk factors for stroke were comparable to the INASC 2008, with rates of existing atrial fibrillation (24% versus 22%) and of previous stroke or TIA (23% versus 25%). A concern would be the high proportion of patients with multiple comorbidities, with over 50% of patients having two or more comorbidities associated with increased stroke risk.

Prevention is better than cure, and when the two of the most common risk factors associated with stroke are both often asymptomatic but relatively easily assessed, consideration of how the nation's health is screened from a primary prevention point of view will need to be addressed. Education and people being empowered to make healthy choices could help reduce the health care utilization into the future.

The results of documented aetiologies of stroke are within expected rates, 71% (617/874) of patients having a cause of their stroke identified by discharge (Kelly et al 2012). Within that identified group there is a high proportion of atrial fibrillation (44%; 269/617). The reported causes underline the heterogeneous nature of stroke as a potential common pathway for many different disease processes. The increased reporting of more uncommon causes of stroke is coupled somewhat to the access to more sophisticated neuroimaging and the increase nationally to access to expert knowledge.

Improvement in discussions with patients around lifestyle modification should be highlighted. A challenge to promoting change in patient lifestyle behavior may be that the behavior is very well established. However the benefits and cost effectiveness of improving uptake in regular exercise, healthy diet, smoking cessation and sensible alcohol consumption has been clearly documented.

5.9 Medication trends

A significant area assessed in this audit involved data gathering on medications prescribed to prevent stroke and treatment both on admission and discharge. Appropriate evidence based prescribing is of utmost importance for the patient and the health service alike in terms of cost, medication effectiveness, and safety (Gallagher et al 2008, Cahir et al 2010).

In simple terms, more patients were on medications such as antihypertensives or statins on admission than noted in INASC 2008. The rate of statin prescription was particularly marked with 43% of patients on statin therapy in comparison to 21% in INASC 2008. This increased trend was seen in most drug classes. Anticoagulation rates before admission were 12%, which is double the 6% seen in INASC 2008. 61% of patients were on at least one antihypertensive drug although the exact indication for the medication was not documented, with over 30% of patients on two or more antihypertensives.
When just taking the drug classes relevant to stroke almost 8% of patients had evidence of polypharmacy (5 or more medications), which can have implications with regard increased adverse events and hospital admissions (Hajjar et al 2007). These results further support the case for secondary prevention strategies at a population level.

ACE inhibitors/Angiotensin Receptor Blockers remain the most widely prescribed antihypertensive medications patients are leaving hospital taking, with a noted drop in prescribing of thiazide diuretics from 10% to 5%. Half of the patients are discharged on aspirin. Anticoagulant prescribing shows similar proportions of patients discharged on warfarin (12% versus 13%), despite 10% of patients being prescribed novel anticoagulants which were unavailable at the time of INASC 2008. This implies that more people are being anticoagulated possibly due to higher rates of atrial fibrillation being identified in hospital and application of guidelines on inappropriate use of aspirin in the secondary prevention of stroke in nonvalvular atrial fibrillation. Almost two-thirds of patients are discharged on a statin.

Following a stroke, patients are often faced with the prospect of being on multiple medications for the rest of their life. In view of this it is important that guidelines are closely followed with regard appropriate prescribing so as not to overburden patients with unnecessary tablets while also being mindful of the cost of inappropriate prescribing.

5.10 Communication and patient engagement

In targeting a patient-centred model of care, communication is key. Patients should be fully informed and full participants in their care and management. Documented evidence of discussion of diagnosis in the medical notes has improved since INASC 2008, but still almost 50% of cases had no evidence to support the discussion taking place. Similarly documentation of collaborative goal setting, specifically patient involvement in goal setting, was low. These two areas are good examples of elements of care that are likely frequently performed but often not documented. This also highlights the need for a discussion on what are key entries in the medical record in communicating the patient's care to members of the multidisciplinary team.

Multidisciplinary team communication is further challenged by disparate clinical records for these patients. Only 29% of patients had a unified clinical record. Only 19% of stroke units use an interdisciplinary care pathway during stroke unit admission. Increasing standardisation of care pathways, communication and documentation should be key aims to improving equity and access of care. This would provide a framework to evidence positive practice which is currently either not documented or not occurring.

A strength of sites having access to a stroke unit not highlighted earlier is that it provides a hub for the provision of information about stroke and its impact for patients and carers and also aids coordination of education sessions, particularly through the role of the clinical nurse specialists and HSCPs. Stroke units had better access than general wards to patient friendly information on stroke, vocational

support, and information on community services. However this was not seen at all sites and is an important part of the principle of a stroke unit.

In general terms communication and links with the primary care physician needs to be improved. Clear pathways need to be in place to ensure that these doctors know where to refer patients and how quickly they can be expected to be seen, particularly in case of TIAs. There also needs to be much clearer discharge communication with primary care physicians, particularly if the patient is not for further follow up. Duplication of testing and referrals, medications errors, unnecessary emergency department attendances are just some of the potential sequelae from poor communication between hospitals and the community.

5.11 Rehabilitation and community services

The assessment of the organisation of rehabilitation and community services was outside of the remit of this audit. However as a way of laying the groundwork for further audit of both external rehabilitation and community services, data was gathered on where and to who patients are referred. This does not give a measure of level of access, waiting times or where non referral results from absent services. However the findings will inform the next phase of audit planned for the coming years.

The three early supported discharge (ESD) teams now servicing four centres show levels of activity that are improving patient flow, and most importantly discharging to their own homes in a timely fashion. National access to ESD teams would likely have a significant impact on discharge home rates when compared to UK rates. These successful teams may be replicated in other jurisdictions with similar success.

5.12 Outcomes

Improving outcomes is at the centre of the aims of the national stroke programme and the Irish Heart Foundation, specifically reducing unnecessary disability and mortality. The results of National Stroke Audit 2015 show a number of key improvements in patient outcomes following stroke.

The inpatient mortality rate of 14% among the cases assessed is 5% lower than noted in INASC 2008. This is in the context of a higher proportion of intracerebral haemorrhage in the current audit (15.4% versus 12%) which is associated with a higher mortality rate.

The average length of stay is over one week shorter than previously found in INASC 2008, with the median length of stay reduced by three days. However the median length of stay is four days longer than the SSNAP UK 2014, potentially related to more accessible and developed community services, and more widely available early supported discharge in the UK.

A more useful measure of performance of a stroke service is admissions to nursing homes. The results show that 11.4% of patients were discharged to nursing homes, however only 8% of the patients were newly institutionalised compared with 15% in INASC 2008, with the caveat that some patients who were transferred to offsite rehabilitation may have ultimately required nursing home care. Over half of the patients were discharged with little or no impairment of activities of daily living (Barthel 19-20).

Overall these outcome measures would support the opinion that acute stroke care in Ireland has improved markedly since INASC 2008. Coupled with the clear benefits to patients, is the financial saving to the state from people returning to work or maintaining independence at home rather than in residential care. These savings should be reinvested in providing the national stroke programme the means to build on the work done, and to acknowledge the dedication and hard work of frontline staff caring for people with stroke, all despite the challenging work and financial backdrop of recent years.

APPENDICES

Appendix 1.

Irish Heart Foundation/ HSE
National Stroke Audit
2015

ORGANISATIONAL AUDIT PROFORMA

The Audit Proforma that has been chosen for use in the audit of hospital-based stroke services in Ireland mirrors the proforma used in INASC 2006 which itself was adapted from the Royal College of Physicians (UK) National Sentinel Stroke Audit 2004 Organisational Audit Proforma. This is a well developed and validated audit tool and will allow for comparison of data with the previous INASC and recent UK data. It is for this reason that significant variations from previous INASC 2006 have not been encouraged. It was necessary, however, to make some adjustments for application in relation to the most up to date guidelines and the Irish context.

This proforma should describe your stroke services as at *date*____/____/_____ .

Please complete all questions. In some cases you will either be directed to a later question or a response will apply based on answers to key questions.

SECTION 1 SITE CODE: [ ]

Auditor Discipline: (tick all that apply)

Doctor ○ *Ward Manager* ○ CNS ○ Therapist ○ Other ○ (please specify)

[……..]

IMPORTANT, PLEASE NOTE:

Did your hospital manage >20 cases of acute stroke in 2014? YES ○ NO ○

If yes, then please proceed with completing proforma. If your hospital had <20 cases in 2014 then no need to proceed further. Please return this form to Project Team, National Stroke Audit , Old Stone Building, Trinity Postgraduate Centre, St James's Hospital, Dublin 8.

ACUTE HOSPITAL

1. What is the size of the hospital / number of beds [ ]

HOSPITAL CASELOAD

2i. How many patients with acute stroke are there in the hospital site on the day of form completion? [ ]

2ii. How many of these patients would you estimate presented acutely to the Emergency Department/MAU? [ ]

PRESENTATION AT HOSPITAL

3. (i) Are there specific arrangements with the local ambulance service for emergency/rapid transfer to hospital for acute stroke patients?

Yes O No O

If no, why not?

[……]

(ii) How do the majority of Stroke Patients present to the hospital?

Please select only one option from:

Via ED	O
Admit direct to hospital	O
Transfer for Intervention	O
Unknown	O

(iii) Are there agreed stroke protocols between acute and primary care service(s)?

Yes O No O

(iv) Emergency Services at the hospital for Stroke Patients

Who is the stroke patient normally first seen by?

Please select only one option from:

ED/MAU Nurse	O
ED/MAU NCHD	O
ED Consultant	O
Stroke Consultant	O
Medical Consultant	O
Medical NCHD	O
Stroke NCHD	O
Other, specify	O

(v) Is there a Stroke Team on call?

No	O
Yes, 24 hours, 7 days	O
Yes, 9-5 Mon-Fri	O
Yes, other specify	O *[……]*

(vi) Is there access to CT imaging for patients in ED/MAU?

Yes (24/7) O
Yes (Other) O [……..]
No O
Unknown O

If yes is it;
On site 24/7 O
On site 9-5 Mon-Fri O
Off site 24/7 O
Off site 9-5 Mon-Fri O
Off site Out of Hours O
Other O
[……..]

(vii) Is there access to MRI imaging for patients in ED/MAU?
Yes O
No O
Unknown O

If yes is it:
On site O
Off site O

(viii) Do you provide a routine thrombolysis service?
Yes, 24 hrs, 7 days O
Yes, 9-5, Mon-Fri O
Yes, other [……]
No O

Unknown O

(ix) For patients presenting acutely, most commonly where is thrombolysis delivered?
ED O
MAU O
Stroke Unit O
HDU/ICU O
Other O [……..]

(x) Who normally assesses the patient for thrombolysis?
ED/MAU NCHD O
ED Consultant O
Stroke NCHD O
Stroke Consultant O
Medical Consultant O
Other O [……]

(xi) Who decides to proceed with thrombolysis?
ED NCHD O

ED Consultant	O
Stroke NCHD	O
Stroke Consultant	O
Medical Consultant	O
Other	[……]

(xii) Does your hospital provide endovascular treatment e.g. thrombectomy?

Yes, 24 hrs, 7 days	O
Yes, other	O
No	O
Unknown	O

If yes: (

a) How many patients underwent endovascular treatment in the last 12 months? [……]

(b) How many patients were transferred to your hospital for assessment for endovascular treatment? [……..]

(c)Of the transferred patients, how many patients required admission to your hospital? [……]

(d) How many consultant level interventional radiologists are on the emergency endovascular rota? [……..]

(xiii) Is there multidisciplinary assessment in ED?

	Yes	No	Unknown
- Physiotherapy	O	O	O
- Speech & language therapy	O	O	O
- Occupational therapy	O	O	O
- Clinical Nurse Specialist	O	O	O
- Medical social work	O	O	O
- Swallow Screening	O	O	O
- Psychology	O	O	O
- Dietician	O	O	O
- Other [Specify]	O	O	O

(xiv) Is there multidisciplinary assessment within 24 hours of referral?

	Yes	No	Unknown
- Physiotherapy	O	O	O
- Speech & language therapy	O	O	O
- Occupational therapy	O	O	O
- Clinical Nurse Specialist	O	O	O
- Medical social work	O	O	O
- *Swallow screening*	O	O	O

-	Psychology	O	O	O
-	Dietician	O	O	O
-	Other [specify]	O	O	O

4. Which ward is a patient with acute stroke ***most likely*** to be admitted to? (select one option)

Medical Assessment Unit	O
General medical ward	O
Care of the Elderly	O
Stroke unit	O
Surgical ward	O
Other	O

If other please specify ……

SECTION 2 STROKE UNIT MODELS

ORGANISATION OF CARE

Stroke Unit

Definition*: Stroke Unit*

A dedicated, geographically clearly defined area or ward in a hospital, where stroke patients are admitted and cared for by a multiprofessional team (medical, nursing, and therapy staff) who have specialist knowledge, training, and skills in stroke care with well-defined individual tasks, regular interaction with other disciplines, and stroke leadership. This team shall coordinate stroke care through regular (weekly) multiprofessional meetings.

5. Does the hospital have a specialist stroke unit or units? Yes O No O

IF YES,

6. What is the total number of specialist stroke unit beds? [ ] specialist stroke beds

If NO go straight to Question 17

SECTION 3 TYPE OF STROKE UNIT

Answer the following questions according to the type(s) of unit(s).

ACUTE STROKE BEDS
Definition: Patients are accepted acutely but discharged or transferred early (usually within 7 days)

REHABILITATION STROKE BEDS
Definition: accepts patients after a delay of usually 7 days or more and has a focus on rehabilitation

COMBINED STROKE BEDS
Definition: No separation between acute and rehabilitation beds. Accepts patients acutely but also provides rehabilitation for at least several weeks if necessary.

ACUTE STROKE BEDS
Definition: Patients are accepted acutely but discharged or transferred early (usually within 7 days)

7. i) Number of beds designated for acute stroke care [ ]
(If you do not have a unit of this type answer 0)

7. ii) Which of the following features does this unit provide?
(Tick all that apply)

a. continuous physiological monitoring (ECG, oximetry, blood pressure) O

b. access to scanning within 3 hours of admission O
c. a policy for direct admission from A&E O
d. specialist ward rounds at least 5 times a week O
e. acute stroke protocols/guidelines O
f. access to 24 hour brain imaging O
g. nurses trained in swallow screening O

7. iii) How many of the following *nursing* staff are there usually on duty at 10.00 am in the morning (on a normal week-day) on the acute stroke unit?

a. Qualified nurses (excludes student nurses) [ ]
b. Care assistants [ ]
Enter 0 if no staff of that grade

7. iv) How many whole-time equivalents (WTE) *nursing* staff are there usually on duty over a 24-hour period?
a. Qualified nurses (excludes student nurses) [ ] WTE
b. Care assistants [ ] WTE

REHABILITATION STROKE BEDS

Definition: accepts patients after a delay of usually 7 days or more and has a focus on rehabilitation

8. i) Number of beds designated for stroke rehabilitation [ ]
(If you do not have a unit of this type answer 0)

8. ii) How many of the following *nursing* staff are there usually on duty at 10.00am in the morning (on a normal week-day) on the rehabilitation stroke unit?

a. Qualified nurses (excludes student nurses) [ ]
b. Care assistants [ ]
Enter 0 if no staff of that grade

9. If you have both acute and rehabilitation stroke units are they on the same ward? Yes ○ No ○

COMBINED STROKE BEDS

Definition: No separation between acute and rehabilitation beds. Accepts patients acutely but also provides rehabilitation for at least several weeks if necessary.

10. i) Number of beds if combined stroke unit [ ]
(If you do not have a unit of this type answer 0)

10 ii) How many of the following *nursing* staff are there usually on duty at 10.00am in the morning (on a normal week-day) on the combined stroke unit?

a. Qualified nurses (excludes student nurses) [ ]
b. Care assistants [ ]
Enter 0 if no staff of that grade

SECTION 4 ALL STROKE UNITS

ALL STROKE UNITS

11. Has a needs assessment been undertaken by your hospital to identify the appropriate number of beds for the population served before the stroke unit opened?
Yes ○ No ○

12. How many stroke patients are there in total on your stroke unit(s) today? [ ]

13. If you have a stroke unit/stroke units, is there a named Social Worker attached to the multi-disciplinary team? Yes ○ No ○

14. (i) Do(es) your stroke unit(s) operate admission criteria? Yes ○ No ○

If YES,

14. ii) Which of the following criteria apply? (tick all that apply)

	Acute SU	**Rehab SU**	**Combined SU**
Either			
a) None	☐	☐	☐
Or (tick all that apply)			
b) Age related	☐	☐	☐
c) Stroke severity	☐	☐	☐
d) Preexisting dementia	☐	☐	☐
e) Other	☐	☐	☐
If other please specify	[ ]	[ ]	[ ]

15. a)What is the establishment of whole time equivalents (WTEs) of the following professionals for each of the 3 types of stroke unit (where applicable)?
If it is not possible to differentiate the staffing for each type of unit complete total number for each profession.

		Acute SU	**Rehab SU**	**Combined SU**	**Total**
i.	Clinical Psychology	[ ]	[ ]	[ ]	[ ]
ii.	Dietetics	[ ]	[ ]	[ ]	[ ]
iii.	Occupational Therapy	[ ]	[ ]	[ ]	[ ]
iv.	Physiotherapy	[ ]	[ ]	[ ]	[ ]
v.	Speech & Language Therapy	[ ]	[ ]	[ ]	[ ]
vi.	Social worker	[ ]	[ ]	[ ]	[ ]
vii.					

(Enter 0 if no establishment)

15. b) Is STROKE SPECIFIC cover provided by any of the therapies at the weekend?

i) Physiotherapy Yes ○ No ○
If yes give details e.g. respiratory, mobilization, other please specify

[……..]

ii) Occupational Therapy Yes ○ No ○
If yes give details e.g. splinitng, seating, other please specify

[……..]

iii) Speech and Language Therapy Yes ○ No ○
If yes give details e.g. swallow assessment, other please specify

[……..]

16. How many sessions of nonconsultant hospital doctors (NCHD) time are there per week in total for each of the 3 types of stroke unit (where applicable)?

Acute SU	Rehab SU	Combined SU	Total Sessions
[ ]	[ ]	[ ]	[ ]

SECTION 5 OTHER MODELS OF STROKE CARE

OTHER MODELS OF STROKE CARE

17 Is there an agreed policy that all or / the majority of acute stroke patients are admitted under a lead Consultant Physician with an interest in stroke?
Yes ○ No ○ Other [please specify……..]

Mobile Stroke Team

Definition – a multidisciplinary team (excluding specialist ward-based nursing staff) providing care / consultation to acute stroke patients admitted to a variety of teams in the hospital in a variety of settings

18 i) Do you have a mobile stroke team? Yes ○ No ○

IF NO, go to question 19

IF YES,

18 ii) Which of the following are regular members of the team? (Tick all that apply)

a. Specialist doctor	○ [ ] WTE*
b. Stroke CNS	○ [ ] WTE
c. Social worker	○ [ ] WTE
d. Speech and language therapist	○ [ ] WTE
e. Physiotherapist	○ [ ] WTE
f. Occupational therapist	○ [ ] WTE
g. Dietician	○ [ ] WTE
h. Psychologist	○ [ ] WTE
i. Other (please specify) ……	

* A specialist doctor would include a consultant trained in stroke e.g. Geriatrician or Neurologist or a Physician with a particular interest in stroke

18 iii) How many "multidisciplinary ward rounds" are conducted per week? [ ]

18 iv) How many patients has the team seen in the last week? [ ]

19 i) Do you have a specialist early supported discharge team especially for stroke?
Yes ○ No ○

IF NO, go to question 20

IF YES,

19 ii) Which of the following are regular members of the team? (Tick all that apply)

a. Specialist doctor	O [ ] WTE *
b. Stroke CNS	O [ ] WTE
c. Social worker	O [ ] WTE
d. Speech and language therapist	O [ ] WTE
e. Physiotherapist	O [ ] WTE
f. Occupational therapist	O [ ] WTE
g. Dietitian	O [ ] WTE
h. Psychologist	O [ ] WTE
i. Other (please specify)……..	

* A specialist doctor would include a consultant trained in stroke e.g. Geriatrician or Neurologist or a Physician with a particular interest in stroke

20 (i) Is there a specialist stroke community team (i.e. treats stroke only) in your area for continuing longer- term management? Yes O No O

20 (ii) Is there a generic community team (i.e. treats stroke among other conditions) in your area for continuing longer-term management? Yes O No O

SECTION 6 MIXED REHABILITATION UNITS

MIXED REHABILITATION UNIT (GENERIC REHABILITATION UNIT)

Definition: A Mixed rehabilitation unit (generic rehabilitation unit) – a multidisciplinary team (including specialist nursing staff) in a ward providing a generic rehabilitation service but not exclusively caring for stroke patients.

21. Do you have, or have access to a mixed (generic) rehabilitation unit (managing patients with a range of problems including stroke)?

Yes O No O

If NO, please proceed to Q 21 (iv)

If you avail of more than one off site unit please combine the total beds

21. i) Is this unit On site O Off site O Other O

Tick all that apply.

21 ii) How many beds are in the unit?

On site [ ] Off site [ ] Other [ ]

21 iii) How many beds are for stroke patients? [ ]

21 iv) Is the generic rehabilitation unit run by?

Rehabilitation Specialist Doctor O

Stroke Specialist O

Other (please specify) O [……..]

OTHER MODEL OF STROKE CARE

21.(v) What is the model of stroke care at your hospital if not addressed by the above options ?

Briefly describe

21. (v)How many of the following *nursing* staff are there usually on duty at 10.00am in the morning (on a normal week-day) in the unit?

a. Qualified nurses (excludes student nurses) [ ]

b. Care assistants [ ]

Enter 0 if no staff of that grade

21 (vi) Which of the following team members are present in the unit?

(Tick all that apply)

a. Doctor O [ ] WTE

b Social worker O [ ] WTE

c. Speech and language therapist O [ ] WTE

d. Physiotherapist O [ ] WTE

e. Occupational therapist O [ ] WTE

f. Dietician O [ ] WTE

g. Psychologist O [ ] WTE

h. Other (please specify)……..

Enter 0 if no staff of that grade

SECTION 7 IMAGING

22.

Imaging Services	**CT**	**MRI**	**Duplex Carotids**
i) Do your inpatients have 24/7 access to the following?	Yes ○ No ○	Yes ○ No ○	Yes ○ No ○
ii) Access Mon-Fri 9-5 only?	Yes ○ No ○	Yes ○ No ○	Yes ○ No ○
iii) Routine scanning within 48 hours?	Yes ○ No ○	Yes ○ No ○	Yes ○ No ○
iv) Emergency Scanning within 24 hours?	Yes ○ No ○	Yes ○ No ○	Yes ○ No ○
v) Access to consultant neuroradiologist cover for stroke patients within 3 hours of admission	Yes ○ No ○	Yes ○ No ○	N/A
vi) Access to consultant radiologist cover for stroke patients within 3 hours of admission	Yes ○ No ○	Yes ○ No ○	N/A
vii) Outpatient scanning within 2 weeks for minor stroke/TIA	Yes ○ No ○	Yes ○ No ○	Yes ○ No ○
viii) Rapid access for patients discharged from ED/MAU within 24 hours	Yes ○ No ○	Yes ○ No ○	Yes ○ No ○
ix) Rapid access for patients discharged from ED/MAU within 7 days	Yes ○ No ○	Yes ○ No ○	Yes ○ No ○

SECTION 8 TIA/NEUROVASCULAR SERVICE

TIA/NEUROVASCULAR OUTPATIENT SERVICE

23. Do you have a neurovascular clinic? Yes ○ No ○

IF YES,

24. i) How many clinics within a 4 week period? [ ]

ii) What is the current average waiting time for an appointment? [ ] days

25. i) Do you have a service, which enables patients to be seen and investigated

- Within 24 hours of minor stroke or TIA? Yes ○ No ○
- Within 7 days of minor stroke or TIA? Yes ○ No ○

ii) How many TIAs would your service admit for assessment and investigation? [ ]

26. Are there agreed TIA protocols between acute and primary care service(s)?
Yes ○ No ○

27. i) Did you receive annual funding from the National Stroke Programme to assist TIA services?
Yes ○ No ○

ii) If yes, what was the funding used for?

[……..]

SECTION 9 ENDARTERECTOMY/ENDOVASCULAR TREATMENT

CAROTID ENDARTERECTOMY

These questions do not relate to quality standards but are to provide validation of carotid endarterectomy audit data.

28. i) Is carotid endarterectomy surgery performed within the hospital?
Yes ○ No ○

If NO; Which hospital do you send your patients to?

……..

28. ii) **If YES,**

a) No. of surgeons performing carotid endarterectomy within the hospital
[ ]

b) No. of procedures performed within the last 12 months in the hospital

[ ]

c)* No. of patients referred from stroke services for carotid endarterectomy

[ ]

29. Do you have a formal arrangement in place with an endovascular centre for the transfer of your patients?

Yes ○ No ○

30. Have any of your patients undergone carotid stenting?

Yes ○ No ○

SECTION 10 SPECIALIST ROLE

MEDICAL STAFF

31. i) Is there a consultant physician with specialist knowledge of stroke who is **formally recognised** as having principal responsibility for stroke services?

Yes ○ No ○

31. ii) How many formal sessions are there per week of senior doctor time for the management of stroke (including Outpatient Clinics):

a) Consultant [ ] sessions per week

b) Registrar [ ] sessions per week

c) Senior House officer [ ] sessions per week

d) Is this reflected in a formal sessional commitment? Yes ○ No ○

OTHER STROKE SPECIALIST ROLES

A CLINICAL NURSE SPECIALIST IN STROKE CARE

DEFINITION: is a nurse in specialist practice who has undertaken formal recognised post registration education relevant to stroke at higher diploma level. Such formal education is underpinned by extensive experience and clinical expertise in stroke care. The specialist practice will encompass a major clinical focus, which comprises assessment, planning, delivery and evaluation of stroke care given to patients and their carers in hospital, community and outpatient settings. The specialist nurse will work closely with medical and paramedical staff and may make alterations in prescribed clinical options along agreed protocol driven guidelines. The specialist also participates in nursing research and audit and acts as a consultant in education and clinical practice to nursing colleagues and the wider multidisciplinary team.

32 i) **Stroke Specialist Nurse e.g. clinical nurse specialist**	Do you have a stroke Specialist nurse? Yes ○ No ○ If Yes: Services offered (Tick all that apply)			
	Clinics	Service Development	Therapy planning	Long term community support
Inpatient	☐	☐	☐	☐
Community	☐	☐	☐	☐
Outpatient	☐	☐	☐	☐

32 ii) **Specialist therapist/s with specialist knowledge of stroke**	Do you have a specialist therapist/s with specialist knowledge of stroke? Specify therapist [……] How many? [ ] Yes ○ No ○If Yes Services offered (Tick all that apply)			
	Clinics	Service Development	Therapy planning	Long term community support
Inpatient	☐	☐	☐	☐
Community	☐	☐	☐	☐
Outpatient	☐	☐	☐	☐

SECTION 11 INTERDISCIPLINARY SERVICES

INTERDISCIPLINARY SERVICES (refers to on site services only)
For the following questions answers for Stroke Unit apply to <u>any type of stroke unit</u> (acute, rehabilitation or combined) and are <u>distinct from a generic rehabilitation unit</u> (managing patients with a range of problems including stroke). And All wards, Some and None refer to all wards in the hospital other than stroke unit or rehabilitation unit wards

33. Is access to specialist nursing support routine for: (please mark all that apply)

		<u>If applicable</u>		<u>Other wards in the hospital</u>		
		Stroke Unit	**Rehab Unit**	**All Wards**	**Some**	**None**
i.	Continence advice?	☐	☐	○	○	○
ii.	Pressure sore prevention?	☐	☐	○	○	○
iii.	Stroke Care?	☐	☐	○	○	○

Continuing Education

34.i) Is there an in-house programme for the continuing education of qualified staff in management of stroke?

If applicable		Other wards in the hospital		
Stroke Unit	Rehab Unit	All Wards	Some	None
☐	☐	○	○	○

34.ii) Is there an identified in-house training programme, which includes issues relevant to the management of stroke for non-qualified clinical staff?

If applicable		Other wards in the hospital		
Stroke Unit	Rehab Unit	All Wards	Some	None
☐	☐	○	○	○

34iii) Do patients have access to a clinical psychologist and provision of the following aspects of care?

Mood assessment	Yes	○	No	○
Higher Cognitive Function Assessment	Yes	○	No	○
Mood treatment	Yes	○	No	○
Higher Cognitive Function Treatment	Yes	○	No	○

Non-Cognitive behavioural problems assessment and/or treatment Yes ○ No ○

If no to all above, do other disciplines perform assessment? OT ○ SALT ○

34.iv) Do patients have access to services which support them to remain in, return to, or withdraw from work AND/OR education or vocational training?

Yes ○ No ○

TEAM WORKING

Records

35. i) Do all professions contribute to a single set of patient records for the management of stroke? (please mark all that apply)

If applicable		Other wards in the hospital		
Stroke Unit	Generic Rehab Unit	All Wards	Some	None
☐	☐	○	○	○

35. ii) Does the Hospital have an interdisciplinary care pathway for stroke?

Yes ○ No

SECTION 12 TEAM MEETINGS

TEAM MEETINGS

36. (i) Are there team meetings for the interchange of information about individual patients? (please mark all that apply)

If applicable		Other wards in the hospital		
Stroke Unit	Generic Rehab Unit	All Wards	Some	None
☐	☐	○	○	○

(ii) Are these meetings exclusively for stroke patients ? Yes ○ No ○

(iii) How often are team meetings held? [ ]

(iv) Which of the following disciplines regularly attend the team meetings? (please mark all that apply)

		If applicable		Other wards in the hospital		
		Stroke Unit	Generic Rehab Unit	All Wards	Some	None
a.	Clinical Psychology	☐	☐	○	○	○
b.	Dietetics	☐	☐	○	○	○
c	Medicine (senior doctor)	☐	☐	○	○	○
d.	Nursing	☐	☐	○	○	○
e.	Occupational Therapy	☐	☐	○	○	○
f.	Physiotherapy	☐	☐	○	○	○
g.	Medical Social Work	☐	☐	○	○	○
h.	Speech & Language Therapy	☐	☐	○	○	○
i.	Other (state which)	[ ]	[ ]	[ ]	[ ]	[ ]

SECTION 13

AGREED ASSESSMENT MEASURES

37. Is there a locally agreed assessment protocol for stroke, which indicates the appropriate use of agreed measures for the following?

i)	Conscious level (e.g. Glasgow coma scale)	Yes ○	No ○
ii)	Motor impairment ((e.g. MRC, Motricity Index)	Yes ○	No ○
iii)	Cognitive function (e.g. Mental Test score)	Yes ○	No ○
iv)	Activities of Daily Living (eg Barthel, FIM)	Yes ○	No ○
v)	Stroke Severity Scale (e.g. SSS, NIH)	Yes ○	No ○

Availability of Information to Inform Practice

38. Do staff have ready access to: (please mark all that apply)

	If applicable		Other wards in the hospital		
	Stroke Unit	**Generic Rehab Unit**	**All Wards**	**Some**	**None**
i Reference information on the functional assessment/measurement tools used locally?	☐	☐	○	○	○
ii. Practice / hospital guidelines on:					
a) Clinical management of stroke	☐	☐	○	○	○
b) Continence management	☐	☐	○	○	○
c) Swallowing difficulties	☐	☐	○	○	○
d) Pressure area care	☐	☐	○	○	○
iii. Up-to-date information on local and national patients/ carers support organisations?	☐	☐	○	○	○
iv. Records of all patients' management in the acute phase of stroke?	☐	☐	○	○	○

SECTION 14 COMMUNICATION

COMMUNICATION WITH PATIENTS AND CARERS

	If applicable		Other wards in the hospital		
	Stroke Unit	Generic Rehab Unit	All Wards	Some	None
39. Does the organisation of the ward/unit enable patients to have access to their management plan? (Please mark all that apply)	☐	☐	○	○	○

40. Is there patient information literature **displayed** in unit/ward on the following? (please mark all that apply)

		If applicable		Other wards in the hospital		
		Stroke Unit	Generic Rehab Unit	All Wards	Some	None
i)	Patient / carer information literature on stroke	☐	☐	○	○	○
ii)	Patient versions of national or local guidelines/standards	☐	☐	○	○	○
iii)	Community Services	☐	☐	○	○	○
iv)	Carer's Benefit/allowance	☐	☐	○	○	○
v)	Local voluntary agencies e.g. Volunteer Stroke Scheme VSS	☐	☐	○	○	○
vi)	How to complain?	☐	☐	○	○	○

41. Does the Stroke service have formal links with patients' and carers' organisations for communication on service provision, audit and future plans? Yes ○ No ○

42. Is there a community user group for stroke? Yes ○ No ○

43. Is there a policy to give patients a named contact on transfer from hospital to community? Yes ○ No ○

SECTION 15 DISCHARGE PLANNING / REHABILITATION

44 (i) Do you send a discharge summary to the GP? Yes ○ No ○

44 (ii) Do you have a hospital / community stroke liaison person/nurse? Yes ○ No ○

44 (iii) Do you have access to the following community services?
(please rate level of access - tick all that apply)

a. Public Health Nurse Yes ○ No ○

b. Physiotherapist Yes ○ No ○

c. Occupational Therapist Yes ○ No ○

d. Social Worker Yes ○ No ○

e. Speech/language therapist Yes ○ No ○

f. Dietician Yes ○ No ○

g. Psychologist Yes ○ No ○

h. Community Liaison Psychiatric Nurse Yes ○ No ○

i. Community Liaison Psychiatric Service Yes ○ No ○

j. Other (please specify)……..

44 (iv) Do you have a day hospital in your hospital? Yes ○ No ○

IF No, please proceed to Q45

44 (v) In the day hospital is there open access to those under 65 years with stroke?

Yes ○ No ○

44 (vi) Does the day hospital have therapy cover? Yes ○ No ○

(please mark all that apply and indicate WTE)

a. Nursing Yes ○ No ○ [ ] WTE
b. Physiotherapist Yes ○ No ○ [ ] WTE
b. Occupational therapist Yes ○ No ○ [ ] WTE
c. Social worker Yes ○ No ○ [ ] WTE
d. Speech and language therapist Yes ○ No ○ [ ] WTE
e. Psychologist Yes ○ No ○ [ ] WTE
f. Dietician Yes ○ No ○ [ ] WTE
g. Other please specify……

44. (vii) How often can patients be seen in the day hospital? [ ]

44. (viii) How many patients are seen in the day hospital in one year? [ ]

44. (xi) How many of these are stroke patients? [ ]

SECTION 16 STROKE SERVICE PLANS

STROKE SERVICE PLANS

45. What are your hospitals plans for stroke services?

46. Have you submitted a plan for stroke services in your service plan?

NOTES

This section is for you to clarify your answers to any questions. Identify the question number(s), which applies to each comment.

APPENDIX 2. Members of the IHF/HSE National Stroke Audit 2015 steering group

Ms	Carmel	Brennan	Programme Manager National Stroke programme
Ms	Heather	Coetzee	Speech and language therapy manager Mater Misercordiae University Hospital
Dr	Paul	Cotter	Consultant Geriatrician, St Luke's Hospital, Kilkenny
Dr	Rachael	Doyle	Consultant Geriatrician, St Columcille's Hospital
Prof	Joe	Harbison	National Clinical Lead Stroke Programme (Gerontology)
Prof	Anne	Hickey	Senior Lecturer RCSI
Ms	Frances	Horgan	Stroke Council Representative
Prof	Peter	Kelly	National Clinical Lead Stroke Programme (Neurology)
Ms	Cliona	Loughnane	Researcher IHF
Mr	Chris	Macey	Head of Advocacy, Irish Heart Foundation
Mr	Paul	Marsden	Researcher Department of Public Health Tullamore
Dr	Dominick	McCabe	Consultant Neurologist, AMNCH
Ms	Joan	McCormack	Project Manager National Stroke Audit
Dr	Paul	McElwaine	Research Fellow National Stroke Programme
Prof	Riona	Mulcahy	Consultant Geriatrician, University Hospital Waterford
Ms	Imelda	Noone	Advanced Nurse Practitioner Stroke, St Vincent's University Hospital
Dr	Emer	Shelley	Specialist in Public Health
Dr	Tadhg	Stapleton	Stroke Council Representative
Prof	David	Williams	Stroke Physician Beaumont Hospital & RCSI

Appendix .

IHF/HSE National Stroke Audit 2015

CLINICAL AUDIT PROFORMA

The patient cases to be audited are retrospective consecutive cases with a primary diagnosis of stroke (ICD 10 codes: I61, I63 and I64 or ascertained via other methods) discharged from hospital from the National HIPE listing over a 6 month period from the January 2014 – March 2014 and July 2014 – September 2014. Please refer to accompanying help booklet and video for instruction on how to complete the form. The number of charts reviewed is relative to the number of stroke cases managed per annum.

Patient Numbers	Stroke Admissions <100/yr	Stroke Admssions 100-150/yr	Stroke Admissions 150-200/yr	Stroke Admssions >200/yr
Minimum Charts to be audited	25	30	35	40
Number of consecutive thrombolysed cases*	5	10	10	15

*cases can be included in minimum chart total

Helpline: 018963554 Email: jmccorrmack@irishheart.ie

Date Completed: _____/_____/_____

SITE CODE: [ ] (to be issued by Project Manager)
Auditor Discipline(s)
A1) Clinical Audit □ Medicine □ CNS/Nursing □ Therapy □ Other
Specify _____
Auditor Initial: _____

PATIENT AUDIT NUMBER: [_____]
(Please ensure this is accurately documented- number will be assigned by clinical audit lead)

DEMOGRAPHIC INFORMATION

B1) Age: _____

B2) Gender: Male □ Female □

B3) Occupation (if known): _____

B4) Was the patient already an inpatient at the time of stroke? Yes □ No □
If Yes, do not include case in data set

Was the patient thrombolysed (+/-endovascualar intervention)? Yes □ No □
If yes, please take note of chart number on master list provided and keep chart available for review by project team. Supplemental data will be obtained by project team on thrombolysis delivery. Proceed with proforma from section 1 as normal.
If no, then proceed to section 1

SECTION 1 STROKE ONSET AND HOSPITAL STAY

Please make every effort to find the date and time of stroke

1.1 Date of stroke/Time of Onset: [/ /] [:] (dd/mm/yyyy) (hh:mm 24hour clock)

1.1i This **date** is precise □ This date is a best estimate □
Stroke during sleep □ Not known □

1.1ii This **time** is precise □ This time is a best estimate □
Stroke during sleep □ Not known □

1.2i Date of presentation to ED: [___ /____ /_____] (dd/mm/yyyy)

1.2ii Time of presentation: [___ :____] (HH:MM, 24 hr clock) Not known □

1.2iii Date of admission: [___ /____ /_____] (dd/mm/yyyy)

1.2iv Time of admission: [___ :____] (HH:MM, 24 hr clock) Not known □

1.3 Did the patient die whilst still an inpatient? Yes □ No □

1.4 Date of discharge (If discharged alive): [_____ /_____ /_____] (dd/mm/yyyy)

1.4i Length of stay to discharge alive: [____] days

1.5 Date of death(if applicable): [____ /____ /_____] (dd/mm/yyyy) Not applicable □

1.6 To the best of your knowledge was the patient still alive 30 days after the onset of their stroke?
Yes □ No □ Not known □

ADMISSION/DISCHARGE

1.7 Did the patient arrive by ambulance? Yes □ No □ Don't' Know □

If **yes**

1.7(i) Is there a copy of the ambulance transfer notes? Yes □ No □

1.7(ii) Were they classed as a FAST positive or Stroke by ambulance service assessment)? Yes □ No □

1.8i Where was the patient initially admitted to?

Medical assessment unit □
Clinical decisions unit □
Coronary care unit □
Intensive care unit/ □
High dependency unit □
Acute/combined stroke unit □
Other ward □
Discharged from ED □

1.8ii Is it evident from the that the patient spent >4hours in the Emergency Department following decision to admit? Yes □ No □ Unknown □

1.9 Was the patient treated in a Stroke Unit (or units) at any time during their stay? Yes □ No □

1.10 Was the patient admitted to an Acute or Combined stroke unit within 4 hours of arrival at hospital? Yes □ No □

1.11i Did the patient spend over 50% of their stay on a stroke unit? Yes □ No □

1.11ii If **yes**, what type of unit did they spend that time in? (Tick all that apply)
Acute stroke unit □
Rehabilitation stroke unit □
Combined stroke unit □

1.11iii If **no**, where did the patient spend over 50% of their time?
Medical assessment unit □
Coronary Care Unit □
Intensive Care Unit □
General □
Geriatric Ward □
Generic Rehabilitation Unit (ie not a stroke rehab unit) □
Other □
Specify_____

1.11iii Did the patient any period of their admissionin a high dependency bed i.e ICU/HDU/CCU? Yes □ No □

1.12 Date of admission to stroke unit [_____/_____/_____] (dd/mm/yyyy) (if known)

1.13 Date of discharge from stroke unit [_____/_____/_____] (dd/mm/yyyy) (if known)

1.14 During their stay was the patient under the direct care (not a consultation only) of a:

(tick all that apply)

Consultant Geriatrician	Yes □	No □	Don't know □
Consultant Neurologist	Yes □	No □	Don't know □
Consultant in Rehabilitation Medicine (Rehabilitationist)	Yes □	No □	Don't know □
General Physician (non-geriatrician)	Yes □	No □	Don't know □
Other	Yes □	No □	Don't know □

SCAN

1.15 Did the patient have a brain scan after the stroke? Yes □ No □ Not known □

If **No**:

1.15i Reason the patient did not have scan:
Patient refused/unable to co-operate □
Palliative care(comfort measures only) □
Scan not routinely available □
Not considered clinically indicated □

If **Yes**:

1.15ii Date of first brain scan after the stroke [___/____/_____] (dd/mm/yyyy) Not known □

**Please make every effort to find the date and time of scan*

1.15iii Time of first brain scan after the stroke [___ :___] (HH:MM, 24 hr clock) Not known □

1.15iv Has a brain scan been carried out within 24 hours of the stroke? Yes □ No □

If **no**, reason the patient did not have a scan within 24 hours:

Patient refused/unable to co-operate □
Palliative care (comfort measures only) □
Scan not routinely available □
Not considered clinically indicated □
Patient did not arrive at hospital within 24 hours □
Other □
If other, specify _____

1.15v Following the scan what was the pathological diagnosis?

Infarct □
Normal Scan but clinical assessment consistent with acute ischaemic stroke □
Intracerebral Haemorrhage (does not include extradural, subdural, subarachnoid haemorrhage) □

1.16 Did the patient have an MR Brain performed during admission? Yes □ No □

SECTION 2 CASEMIX

CO-MORBIDITIES and RISK FACTORS

2.1 Did the patient have any of the following co-morbidities prior to admission?
Yes □ No □

2.1i If **yes**, please select all that apply

Atrial fibrillation	□
Previous stroke or TIA	□
Diabetes mellitus	□
Hyperlipidaemia (total cholesterol >5 or LDL >3.0 mmol/L)	□
Hypertension (systolic >140 or diastolic >85)	□
Myocardial infarction or angina	□
Valvular heart disease (aortic or mitral valves)	□

2.2 Did the patient have any of the following risk factors? Yes □ No □

2.2i If **yes**, please select all that apply

Current smoker	□
Alcohol excess (no. of units per week > 14 for females, > 21 males)	□

PRE-ADMISSION

2.3i Living accommodation pre stroke:

Home	Yes	□	No	□		
	If **yes**, Lived alone?	Yes	□	No	□	
	If **yes**, with existing home care package?	Yes	□	No	□	
Residential / Nursing home	Yes	□	No	□		
Hospital	Yes	□	No	□		
Other	Yes	□	No	□		

2.3ii Was the patient independent in everyday activities before the stroke? *(e.g. Barthel 19-20, Rankin <3)* Yes □ No □ Not known □

2.3iii Living accommodation at discharge:

Home	Yes	□	No	□		
	If **yes**, Living alone?	Yes	□	No	□	
	If **yes**, with home care package?	Yes	□	No	□	
Residential / Nursing home	Yes	□	No	□		
Hospital	Yes	□	No	□		
Off-site rehab	Yes	□	No	□		
Other	Yes	□	No	□		

2.3iv Was the patient discharged to long-term residential care?

Yes temporarily	□
Yes permanently	□
No	□
Not known	□

2.4 Was the patient on the following medication before admission? Yes □ No □

2.4i If YES which classes of drugs were prescribed? (tick all that apply):

Antihypertensives		Antiplatelet/thrombotic		Lipid lowering treatment	
ACE inhibitor or Angiotensin-II receptor antagonists	☐	Aspirin	☐	Statin	☐
Alpha Blocker	☐	Clopidogrel	☐	Ezetimibe	☐
Beta Blocker	☐	Dipyridamole	☐	Niacin	☐
Calcium Channel blocker	☐	Warfarin	☐	Fibrates	☐
Thiazide diuretic or thiazide-like diuretic	☐	NOACs	☐	Omega 3	☐
Other	☐	Aspirin/dipyridamole combination* (Asasantin Retard)	☐	Other	☐
None	☐	Other	☐	None	☐
		None	☐		

DURING ADMISSION

2.5 Did the patient have any of the following during **the first 24 hours**?

i Dysphasia	Yes	□	No	□	Not known	□
ii Dysarthria	Yes	□	No	□	Not known	□
iii Motor deficits	Yes	□	No	□	Not known	□
iv Sensory Inpairment	Yes	□	No	□	Not known	□
v Cognitive Difficulties	Yes	□	No	□	Not known	□
vi Visual/Perceptual Difficulties	Yes	□	No	□	Not known	□
vii Changes in mood	Yes	□	No	□	Not known	□

2.6 Did the patient develop a urinary tract infection in the first 7 days of admission as defined by having a positive culture or clinically treated? Yes □ No □

2.7 Did the patient develop pneumonia which was a) treated with antibiotics or b) decision not to treat documented by medical team during their admission after stroke? Yes □ No □

2.8 What was the worst level of consciousness at the time of maximum severity within the first 24 hours after stroke?

Fully conscious □
Drowsy □
Semi-conscious (not fully rousable) □
Unconscious (responds to pain only/no response) □

2.9 With regard therapy during admission:

	Physiotherapy	Occupational Therapy	Speech and Language	Psychology
2.9i Was the patient referred for the following therapy at any point during the admission?	Yes □ No □	Yes □ No □	Yes □ No □	Yes □ No □
2.9ii If therapy was indicated were rehabilitation goals documented for this therapy?	Yes □ No □ No but* □	Yes □ No □ No but* □	Yes □ No □ No but* □	Yes □ No □ No but* □
2.9iii Is there evidence of patient particpation during goal setting?	Yes □ No □ No but □*	Yes □ No □ No but □*	Yes □ No □ No but □*	Yes □ No □ No but □*

*No but where patient chose not to participate or was not able to participate because of the severity of their cognitive and linguistic impairments, or therapy not indicated)

2.10 Dependency at discharge (using the Barthel ADL Functional Assessment Scale)

Bowels	0 = Incontinent (or needs to be given enemata) 1 = Occasional accident (once/week) 2 = Continent	0 1 2	○ ○ ○
Bladder	0 = Incontinent, or catheterised 1 = Occasional accident (max once per 24 hrs) 2 = Continent (over 7 days)	0 1 2	○ ○ ○
Grooming	0 = Needs help with personal care 1 = Independent face / hair / teeth / shaving	0 1	○ ○
Toilet Use	0 = Dependent 1 = Needs some help, can do something alone 2 = Independent (on and off, dressing / wiping)	0 1 2	○ ○ ○
Feeding	0 = Unable 1 = Needs help cutting, etc 2 = Independent (food in reach)	0 1 2	○ ○ ○
Mobility	0 = Immobile 1 =Wheelchair independent including corners etc. 2 =Walks with help of one person (verbal or physical) 3 = Independent (may use stick etc.)	0 1 2 3	○ ○ ○ ○
Transfer	0 = Unable - no sitting balance 1 = Major help (one / two people) can sit 2 = Minor help (verbal or physical) 3 = Independent	0 1 2 3	○ ○ ○

Dressing	0 = Dependent 1 = Needs help, can do half unaided 2 = Independent (including buttons, zips, laces etc)	0 1 2	○ ○ ○
Stairs	0 = Unable 1 = Needs help (verbal/physical) 2 = Independent	0 1 2	○ ○ ○
Bathing	0 = Dependent 1 = Independent	0 1	○ ○

SCORE _____/ 20

SECTION 3 STANDARDS WITHIN THE FIRST 48 HOURS

Where the patient has been transferred from another hospital and data for the questions below is not available use the "No but.." option.

PATIENT ASSESSMENT FIRST 24 HOURS

3.1i Has a validated swallow screening test (not gag reflex) been specifically recorded in the 3 hours?

Yes □ No □ No, but □

Answer **No, but** if: impaired level of consciousness is documented (e.g. NIHSS)

3.1ii Has a validated swallow screening test (not gag reflex) been specifically recorded in the first 24 hours?

Yes □ No □ No, but □

Answer **No, but** if: impaired level of consciousness is documented (e.g. NIHSS)

3.2 Is there a formal assessment documented of?

i) Visual fields Yes □ No □ No, but □
ii) Sensory testing Yes □ No □ No, but □

Answer **No, but** if impaired level of consciousness/communication is documented.

3.3 Is there a documented falls risk assessment? Yes □ No □

PATIENT ASSESSMENT FIRST 48 HOURS

3.4 Had the patient commenced Aspirin by 48 hours after stroke?

Yes □ No □ No, but □

Answer **No, but** if: the patient died, patient had intracerebral haemorrhage, there was a documented contraindication to aspirin or they were given an alternative antiplatelet or anticoagulant

3.5 Has swallowing been assessed within 48 hours of admission by a speech and language therapist?

Yes □ No □ No, but

Answer **No, but...** if: patient's swallowing is documented as normal: patient is still unconscious; patient died within 48 hours; patient is receiving palliative care.

3.6 Has the patient been assessed by a physiotherapist within 48 hours of admission?

Yes □ No □ No, but □

Answer **No, but...** if: patient died within 48 hours; patient is receiving palliative care, no physical need/deficit

3.7 Was the patient assessed by an occupational therapist within 48 hours of admission?

Yes □ No □ No, but □

Answer **No, but...** if: patient died within 48 hours; the patient was still unconscious; it is documented that the patient had no difficulties performing everyday activities; patient is receiving palliative care.

3.8 Was a nutritional screening (e.g. MUST) completed within 48 hours of admission?

Yes □ No □ No, but □

Answer **No, but...** if: patient refused or patient receiving palliative care

3.9i Was the patient receiving nutrition by 48 hours of admission?

Yes □ No □ No, but □

Answer **No, but...** if: patient refused or patient receiving palliative care

If yes,

3.9ii Which of the following methods was in use?

Oral □
Nasogastric/PEG □
Intravenous □

SECTION 4 STANDARDS WITHIN 7 DAYS

4.1 Has there been an initial assessment of communication problems by the speech and language therapist within 7 days of admission?

Yes □ No □ No, but □

Answer **No, but**... if: patient died within 7 days; the patient was still unconscious; it is documented that the patient had no communication problems; patient is receiving palliative care.

4.2 Was the patient assessed by an occupational therapist within 7 days of admission?

Yes □ No □ No, but □

Answer **No, but...** if: patient died within 7 days; the patient was still unconscious; it is documented that the patient had no difficulties performing everyday activities; patient is receiving palliative care.

4.3 Did the patient have *an indwelling* urinary catheter in the first week after admission?

Yes □ No □ No, but □

If yes which of the following have been documented as the reason for urinary catheterisation?

Please select all that apply

a. ☐ urinary retention
b. ☐ pre-existing catheter
c. ☐ urinary incontinence
d. ☐ need for accurate fluid balance monitoring
e. ☐ critical skin care
f. ☐ not documented
g. ☐ other
please specify

4.4 Is there a plan to promote urinary continence?

Yes □ No □ No, but □

Answer **No, but...** if: patient is continent; patient died within 7 days; patient is unconscious; patient is receiving palliative care.

SECTION 5 BY DISCHARGE

5.1 Is there evidence that the patient was weighed at least once during admission?

Yes □ No □ No, but □

Answer **No, but...** if patient died within 7 days; patient unconscious throughout.

5.2 Is there evidence in the multi-disciplinary notes of a social work assessment within 7 days of referral?

Yes □ No □ No, but □

Answer **No, but...** if: patient not referred to Social Worker; patient died within 7 days; or patient refused.

5.3 Is there evidence that the patient's mood has been assessed, either by medical team/multidisciplinary team documenting mood status or through use formal assessment tool?

Yes □ No □ No, but □

Answer **No, but...** if: patient unconscious throughout; or patient died within 7 days

5.4. Is there evidence that the patient's cognitive status has been assessed using a valid screening tool, or a function-based assessment by an occupational therapist for whom formal screening is not appropriate e.g. Patients with communication difficulties?

Yes □ No □ No, but □

Answer **No, but...** if: patient unconscious throughout; or patient died within 7 days, or receiving palliative care.

CARE PLANNING

		Yes	No	No but
5.5	Is there documented multidisciplinary team case discussion with senior decision maker?	○	○	○

Answer **No, but...** if: patient died / discharged within 7 days; patient is receiving palliative care.

SECTION 6 RISK FACTORS AND SECONDARY PREVENTION

STROKE RISK FACTORS DEFINED AT DISCHARGE

6.1i Has(ve) the probable underlying cause(s) for the stroke been identified?

Yes □ No □ Not documented □

If **yes**,

6.1ii Which of the following? (Tick all that apply)

Carotid stenosis	☐
Current smoker	☐
Alcohol abuse no. of units per week (21 female 28 men)	☐
Atrial Fibrillation	☐
Myocardial Infarction within the past month	☐
Hypertension	☐
Diabetes mellitus*	☐
Other	☐

If other specify_____

		Yes	No	No but
6.2	Have the following risk factors been discussed with the patient and/or carer?			
Smoking cessation		□	□	□
Alcohol reduction		□	□	□
Exercise		□	□	□
Diet		□	□	□

Answer **No, but…** if patient died; remained profoundly impaired, risk factor not relevant

6.3 i) Is there a documented measure of blood cholesterol?

Yes □ No □ No, but □

This may include any point in the year prior to this episode)

Answer **No, but**… if: patient died in hospital; remained profoundly impaired

ii) If **YES**: What was the Total Cholesterol _____
LDL _____
HDL _____

If **YES** to (ii)

iii) Has the patient received dietary advice to reduce fat intake?
Yes □ No □ No, but □
Answer **No, but**… if: remained profoundly impaired

6.4i Has blood pressure been recorded as above normal after the acute phase (first 3 days) (systolic >140, or diastolic > 90) on 3 or more occasions?

Yes □ No □ No, but □

Answer **No, but**... if: blood pressure was normal; patient died; patient refused

6.4ii) If **YES** what classes of drugs were prescribed (tick all given):

ACE inhibitor	☐
Angiotensin-II receptor antagonists	☐
Alpha blocker	☐
Beta blocker	☐
Calcium channel blocker	☐
Thiazide diuretic	☐
Other	☐
None	☐

6.5i Which treatment was the patient on at discharge?

(Tick all that apply. If "none" select the reason)

Antihypertensives		**Antiplatelet/thrombotic**		**Lipid lowering treatment**	
ACE inhibitor or Angiotensin-II receptor antagonists	□	Aspirin	□	Statin	□
Alpha Blocker	□	Clopidogrel	□	Ezetimibe	□
Beta Blocker	□	Dipyridamole	□	Niacin	□
Calcium Channel blocker	□	Warfarin/other anticoagulant	□	Fibrates	□
Thiazide diuretic and thiazide-like diuretic	□	NOAC	□	Omega 3	□
Other	□	Aspirin+Dipyridamole (Asasantin Retard)*	□	Other	□
None	□	Other	□	None	□
		None	□		

6.5ii **If None**, reasons for not prescribing

Antihypertensives		**Antiplatelet/thrombotic**		**Lipid lowering treatment**	
Not indicated	☐	Not indicated	☐	Not indicated	☐
Patient refused	☐	Patient refused	☐	Patient refused	☐
Under review	☐	Under review	☐	Under review	☐
Contra-indications	☐	Haemorrhagic stroke	☐	Patient life expectancy <2 years	☐
		Other Contra-indications	☐	Other Contra-indications	☐

SECTION 7 PATIENT COMUNICATION AND RESEARCH

COMMUNICATION

7.1 Is there documented evidence that there has been discussion with the patient about:

	Yes	No	No but
i. Diagnosis	□	□	□
ii. Prognosis	□	□	□

Answer **No, but...** if patient unconscious throughout or died or has severe receptive or cognitive difficulties.

7.2 Were the carer's needs for support assessed separately?

Yes □ No □ No, but □

Answer **No, but...** if it was documented that there was no carer,

7.3 Is there evidence that the skills required to care for the patient at home were taught?

Yes □ No □ No, but □

Answer **No, but...** if: patient died; patient discharged to institutional care; it is documented that the carer is not participating in the patient's care; patient was self-caring by discharge.

7.4 Was a home visit performed?

Yes □ No □ No, but □

Answer **No, but...** if: the patient was sent to another hospital/institution; or was functionally competent; or there was no change in functional ability from before stroke or ifplan to perform visit on discharge, or; patient died; or patient or carer refused.

If yes,

7.4i was this:

by a professional with the patient? □
by a professional without the patient? □

RESEARCH

7.5 Is this patient in a research study where they (or a relative) have given written consent/assent?

Yes □ No □

SECTION 8 DISCHARGE PLANNING FROM HOSPITAL AND ONWARD REFERRAL

Information to GP

8.1i Is there documented evidence that on the day of discharge (or the day following death) the GP was informed (by fax, phone, e-mail or letter) of the patient's discharge / death?

8.1ii If **no** is there evidence that a letter was sent at some stage Yes □ No □

include date of letter dd/mm/yyyy [/ /]

8.2 Does the discharge summary to the GP have any of the following?

Diagnosis	□
Treatment	□
Complications	□
Medications on discharge	□
Functional ability on discharge	□

8.3 What are the plans for this patient's onward referral for rehabilitation after discharge from the acute hospital?

Early Supported Discharge Team	Yes □	No □
Public Health Nurse	Yes □	No □
Community HSCP Services		
Physiotherapy	Yes □	No □
Occupational therapy	Yes □	No □
Speech and language therapy	Yes □	No □
Clinical Nutrition	Yes □	No □
Psychology	Yes □	No □
Liaison Psychiatry	Yes □	No □
Community Rehabilitation Team	Yes □	No □
Hospital based therapy out patients	Yes □	No □
Day Hospital	Yes □	No □
In patient rehabilitation unit	Yes □	No □
Off site Rehabilitation Unit	Yes □	No □
Baggot Street (for Dublin Hospitals)	Yes □	No □
National Rehabilitation Hospital	Yes □	No □
Volunteer Stroke Scheme	Yes □	No □
Headway	Yes □	No □
Other	Yes □	No □

If other specify_____

8.4i On discharge did the patient is there evidence that the patient required any of the following:

New Home Care Package	Yes □	No □
Long term Care	Yes □	No □
Equipment to Support Discharge	Yes □	No □

8.4ii If **yes** to any of the above is there any evidence of delays in accessing these services

New Home Care Package	Yes □	No □
Long term Care	Yes □	No □
Equipment to Support Discharge	Yes □	No □

Notes:
This section is for you to clarify your answers to any questions. Identify the question number (s) which apply to each comment. (Online version allows you to enter comments next to each individual question)

Appendix 4

	Lead Auditor Name	Auditor Name	Auditor Name	Auditor Name	Auditor Name
MMUH	Ms. Tara Daly	Annik De Dios	Prof. S Murphy	Bridget Flanagan	Dr. R Finnegan
		Leona Higgins	Libby Cunningham	Dr M O'Hare	
		Niamh Davis	Leona Higgins	Dr Kirstyn James	
SVUH	Ms. Imelda Noone	Dr T Hayakawa	Ruth Maxwell	Dr D O'Shea	
		Dr B McAuliffe	Mervyn Hollywood	Mary Kate Meagher	
MRHM	Ms. Sinad Gallagher	Dr C Fallon	Dr S Tselapeck	Dr S Ahmad	
	Dr S Carter	Dr S G Chong	Dr B Drumm	Caroline Colgan	
WGH	Ms. Karina Somers				
SLHK	Ms. Hannah Murugan	Dr P Cotter	Dr R McGovern		
OLHN	Ms. Mary Flanagan	Dr N Wrigley Kelly	Dr R Ali	Dr R Mehmood	
SJH	Ms. Suzanne Walsh	Helen Flynn	Anne Connolly	Dr R McDonagh	
		Dr N O'Regan	Roisin Kelly		
AMNCH	Ms. Nicola Coogan	Suzanne Green			
NGH	Ms. Trish Daly				
MRHT	Dr. Teresa Donnelly	Dr. M S Khan	Dr. A Ibrahim		
MRHP	Mr. Mark Hough	Siobhan McCann	Catriona Blackie	Wendy Yell	
OLOL	Ms. Fiona Connaughton	Claire Prendergast			
CGH	Ms. Frances Smith				
BH	Ms. Emma Hickey	Dr A Leahy	Dr E Gaynor	Leonie Weekes	
CH	Dr P McElwaine				
UHL	Ms. Nora Cunningham	Monica Clancy	Frances Shinkins		
UHW	Ms. Breda Jones	Dr M S Zaheer			
STGHC	Dr Sinead Stoneman	Dr A Arooj			
CUH	Mr. Glen Arrigan	Elizabeth Maloney	Denis Curtin	Ronan McGinty	Elaine Shanahan
		John Quealy	Stephen Ryan	Marie Gaughan	
KGH	Dr. Helena Moore				
MUH	Ms. Karen Fitzgerald	Nan Kearney			
BGH	Ms. Noreen Lynch	Dr B Carey			
UCHG	Dr. Stephanie Robinson	Trish Daly	Paul Marsden		
PH	Mary J Barrett	Geraldine Devine			
MGH	Ms. Niamh Murtagh	Dr T O'Malley	Dr I Marion	Dr O Whelan	
SGH	Ms. Una Moffat				
LGH	Dr. Sara Mello				

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Notes

Irish Heart Foundation
50 Ringsend Road, Dublin D04 T6X0
T: +353 1 6685001
www.irishheart.ie

www. hse.ie

7.2 Appendix B - Irish Heart Foundation / HSE National Stroke Audit Rehabilitation Units 2016

IRISH HEART FOUNDATION/HSE

NATIONAL STROKE AUDIT
Rehabilitation Units
2016

October 2016

IRISH HEART FOUNDATION

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Trinity College Dublin
The University of Dublin

ROYAL COLLEGE OF PHYSICIANS OF IRELAND

Report preparation

This reported was prepared on behalf of the National Stroke Programme in collaboration with the Irish Heart Foundation.

Written by:

Dr. Paul McElwaine, Stroke Research Fellow, National Clinical Programme for Stroke, St. James's Hospital.

Ms. Joan McCormack, RGN, MSc
Programme Manager, National Clinical Programme for Stroke, RCPI

Principle Investigator:

Prof. Joseph Harbison, National Stroke Programme Clinical Lead, St James's Hospital, Dublin 8.

Supported by:

Dr. Paul Cotter, Consultant Geriatrician, St Luke's Hospital Kilkenny**.**

Dr. Frances Horgan, Senior Lecturer, Royal College of Surgeons

Ms. Cliona Loughnane, Researcher, Irish Heart Foundation

Mr. Chris Macey, Patient Advocacy, Irish Heart Foundation

Ms. Carmel Brennan, Project Specialist, HSE

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Foreword

The care of people with stroke in Ireland has improved since the National Clinical Programme for Stroke was established in 2009-2010. Stroke deaths in Ireland have reduced by more than 15% and the emergency care for stroke patients provided in most Irish acute hospitals is now quite good and we are at the cutting edge of delivery of some new therapies such as thrombectomy.

However, quality of care has not increased as much in other areas of stroke management. The incidence of stroke is rising 4-5% per year but we still have a severe shortage of stroke unit beds to accommodate them or the specialist nursing, therapy and medical staff we need to care for them. We have only about half the acute stroke unit beds we need to meet international standards and, this report shows, an even lower proportion of specialist rehabilitation beds. Deficits in Allied health professionals range from 40% to 80% in acute hospitals and this report reveals a deficit of at least one third in most therapy areas in our Rehabilitation hospitals when compared to our neighbours in the UK, who would not be extravagantly staffed themselves from an international standpoint.

We still have only three small, under resourced Early Supported Discharge teams for stroke when these are considered a basic element of care in most Western European countries.

As a consequence in 2015 stroke outcomes apart from mortality deteriorated for the first time since the creation of the programme. This deterioration is unfortunate but not unexpected in the context of the current level of fixed and insufficient resource and an increasing number of patients.

The Stroke programme has been regarded as a success for the HSE but this does not mean that the care of stroke patients in Ireland is not deficient in many aspects and that Irish people still do not end up with unnecessary, avoidable disability because of lack of resource and facilities to give them appropriate care.

Prof. Joseph Harbison
National Clinical Lead for Stroke
Trinity College Dublin & St. James's Hospital

5th October 2016

Key Findings

The survey results from 26 of 29 eligible rehabilitation units showed:

- Bed access to rehabilitation units was age restricted for patients in almost half of sites surveyed.
- Sites did not consistently have access to accurate admission and discharge data to monitor patient flow.
- A quarter of sites had a dedicated unit or ward for stroke patients. This compares with three-quarters of units in the UK.
- Approximately 40% of sites had a stroke specialist responsible for the management of stroke patients' rehabilitation.
- Although patients had access to physiotherapy, occupational therapy and speech and language therapy on all sites, three-quarters of sites felt their patients were not to receiving the recommended levels of daily therapy.
- Psychology services were accessible in less than a third of sites, with access not available within a working week on any site.
- Half of sites felt that training was available to patients and carers to manage the consequences of stroke.
- Less than a fifth of sites had access to an early supported discharge (ESD) team.
- Rehabilitation units were heavily dependent on voluntary organisations to provide support services for stroke patients.
- Sites highlighted the lack of psychology services, community rehabilitation teams and community based health and social care professionals as particular challenges to care provision.

The findings would suggest the following **recommendations** as per guidelines:

- Dedicated stroke rehabilitations beds should be increased and age restrictions addressed in order to provide equitable access to care nationally.
- An increase in the number of Health and Social Care Professionals is required to ensure patients receive appropriate levels of therapy to achieve best recovery outcome.
- Psychology services are inadequate and need investment.
- An increase in the number of ESD/community rehabilitation teams is required to ensure appropriate patients do not remain in hospital/rehabilitation units longer than is necessary.
- Patient centred services such as vocational rehabilitation, self-management and carers' training are inadequate and need to be available on all rehabilitation sites.
- Improvements in data management of stroke patients' journey is required including adequate resourcing of the stroke register.

Background

Stroke is a leading cause of death and disability worldwide. In Ireland, approximately 10,000 people have a stroke related event annually, with 7,000 acute hospital admissions and upwards of 30,000 people living in the community with disabilities as a result of a stroke. Essential to minimising poor outcomes for people affected is the rehabilitation they receive while recovering the ill effects of their stroke.

The first phase of a new audit of stroke services in Ireland, *Irish Heart Foundation/HSE National Stroke Audit 2015*, demonstrated that acute stroke services have improved over the last ten years. However as the clock moves away from the early hours of stroke management, deficiencies in services provided become more apparent. The acute audit also highlighted that almost 20% of stroke patients discharged from acute hospitals are admitted to rehabilitation units.

In the current phase of the audit cycle, a review of post-acute stroke care was undertaken, encompassing a patient's journey from after their first week of care while remaining an inpatient receiving rehabilitation. The review primarily focuses on external sites and units with affiliations to local hospitals, or where no such external sites exist, on the inpatient rehabilitation services provided in a few select hospitals. It is important to highlight for clarity that there are different stages and models of rehabilitation for patients following stroke including the immediate (acute) phase, postacute inpatient phase, and community based rehabilitation by early supported discharge (ESD) or community rehabilitation teams (CRT) or ongoing maintenance rehabilitation in the community. This survey is restricted to reviewing postacute inpatient rehabilitation services.

The survey provided is designed based on guidelines adapted from the following sources:

- *Irish Heart Foundation: Council for Stroke, National Clinical Guidelines and Recommendations for the Care of People with Stroke and Transient Ischaemic Attack March 2010*
- *National Clinical Guideline for Stroke, Royal College of Physicians, Fourth Edition 2012*
- *British Association of Stroke Physicians (BASP), Stroke Service Standards, Clinical Standards Committee, June 2014*

As comparison with the UK is informative given the similar casemix, the survey was guided by questions included in the Sentinel Stroke National Audit Programme (SSNAP) audit of post-acute stroke services.

Methodology

Primary Objective
To survey rehabilitation units throughout the Republic of Ireland, which accept and manage the recovery phase of patients who suffered acute stroke, and assess level of organisation of services against national and international guidelines. Rehabilitation units were defined as sites accepting patients from acute hospitals services and providing inpatient rehabilitation prior to a patient being discharged home or to another facility e.g. National Rehabilitation Hospital.

Specific Objectives

- Identify number of stroke specific rehabilitation units that exist in Ireland
- Identify number of beds available to stroke patients for rehabilitation and whether they are stroke specific beds
- Estimate levels of activity as compared against HIPE discharge data
- Quantify levels of Medical/Nursing/Health and Social Care Professionals working in rehabilitation units
- Estimate quality of access to therapy
- Highlight innovation within local services

This project is the first cycle of a phase of audit of rehabilitation services for stroke patients in Ireland as part of the overall plan for the National Stroke Programme.

The intention to survey all rehabilitation units throughout Ireland was discussed with all acute service local teams including clinical directors and management as part of the communication strategy for the *Irish Heart Foundation/HSE National Stroke Audit 2015*. As part of the acute services audit, sites were asked to identify units to which they refer patients for ongoing rehabilitation.

Twenty nine sites were identified as accepting patients from acute hospitals for stroke rehabilitation through this process, primarily consisting of offsite units from the acute hospitals, or where no alternative existed, onsite in a separate unit.

Clinical leads and clinical nurse specialists were sent reminder letters of the survey process in early March 2016. Throughout March 2016, all identified sites were contacted by telephone to explain the aims and objectives of the survey and to identify a lead on each site who would be responsible for survey completion. Support for completion of forms was provided by the audit team including hotline and email support to clarify any queries.

The survey was distributed in hardcopy format to each site, with digital copies available on request. The survey (Appendix) was designed using the validated questionnaire from the Sentinel Stroke National Audit Programme (SSNAP) audit of post-acute services, with adjustments to survey for the Irish context.

Data Management

Completed surveys were requested to be returned by post to the National Stroke Audit Office, Trinity Centre for Health Sciences, Dublin. Returned surveys are stored in a swipe access building in a locked office in a secure filing cabinet. Digital data was maintained on a password secure PC within the locked office. Importantly no patient sensitive questions are included in the survey, with all questions relating to organisation of services.

Ethical Issues

This survey has no direct impact on patient care. However individual sites had the option to address any local issues with its ethics committee if required.

Figure 1: National distribution of eligible sites

Table 1: Returned surveys

Site	County	Primary hospital affiliation	Abbreviation
Bantry General Hospital	Cork	Bantry General Hospital	BGH
Dungarvan Community Hospital	Waterford	University Hospital Waterford	DCH
Hospital of the Assumption	Tipperary	University Hospital Limerick	HOA
Kerry University Hospital	Kerry	Kerry University Hospital	KUH
Letterkenny University Hospital	Donegal	Letterkenny University Hospital	LUH
Louth County Hospital	Louth	Our Ladys of Lourdes, Drogheda	LCH
Merlin Park Hospital	Galway	University College Hospital, Galway	MPH
Monaghan General Hospital	Monaghan	Cavan General Hospital	MGH
Our Lady's Hospital	Sligo	Sligo University Hospital	OLH
Peamount Hospital	Dublin	Tallaght Hospital	PH
Roscommon Hospital	Roscommon	Mayo General Hospital	RH
Royal Hospital Donnybrook	Dublin	St. Vincent's University Hospital	RHD
Sacred Heart Hospital	Carlow	St. Lukes's Hospital	SCH
St Camillus' Hospital	Limerick	University Hospital Limerick	CAM
St Columba's Hospital	Kilkenny	St. Luke's Hospital	COLUM
St Columcille's Hospital	Wicklow	St. Vincent's University Hospital	LOUGH
St Finbarr's Hospital	Cork	Cork University Hospital and Mercy University Hospital	FIN
St Ita's Community Hospital	Limerick	University Hospital Limerick	ITA
St James's Hospital	Dublin	St. James's Hospital	SJH
St John's Community Hospital	Sligo	Sligo University Hospital	SJCH
St John's Enniscorthy	Wexford	Wexford General Hospital	SJE
St Joseph's Hospital,	Dublin	Beaumont Hospital	SJR
St Mary's Hospital,	Dublin	Mater Misercordiae University Hospital	SMD
St Mary's Hospital,	Westmeath	Midlands Regional Hospital, Mullingar	SMM
St Patrick's Hospital	Tipperary	South Tipperary General Hospital	SPT
St Patrick's Hospital	Waterford	University Hospital Waterford	SPW

RESULTS

Introduction

Twenty-six surveys were returned from 29 valid sites representing organisation of services in the rehabilitations sites between March-June 2016. Near 100% completion of these surveys was achieved with little missing data. However it must be noted that results are based on self-reported responses and were not challenged for accuracy, as was the case in the first phase of the audit.

Results are presented as the survey was designed (Appendix). At the beginning of each section guidelines are presented in italicised text boxes, drawing heavily from the British Association of Physicians 2014 guidelines, which are succinct and also specific in their recommendations.

These results should be viewed as the first part of a cycle of audit on rehabilitation units, with a repeat of the cycle planned for 2019. Hopefully, the design of future audits of these vital services will have full participation and extended reach in its ability to capture useful data.

The variation in bed designation from returned surveys, the exact nature of service provided, and inconsistency in staffing numbers led to difficulties in quoting exact levels of whole time equivalent (WTE) staff for stroke patients. Notwithstanding the lack of directly applicable guidelines on appropriate staffing levels the further patients move from the acute phase of their stroke, the results attempt to give a snapshot of multiprofessional teams working with patients recovering from stroke.

Comparison with other jurisdictions is helpful, particularly in providing perspective to results achieved against the guidelines, with the caution that direct comparison between two different health services is challenging. The findings are viewed against the SSNAP UK results of post-acute services from 2015 in a separate section.

Section A – General Information

All patients with stroke have access to a designated stroke rehabilitation inpatient unit and subsequently a specialist stroke team within the community if required.

All medically stable patients with stroke are transferred from the acute stroke unit without delay. There should be no exclusion policy restricting entry to the stroke rehabilitation unit.

From the 26 (26/29) sites who responded to the survey, 46% (12/26) had bed access which was age restricted (Figure 2). This was restricted to over 65 year olds in 58% (7/12) of these sites.

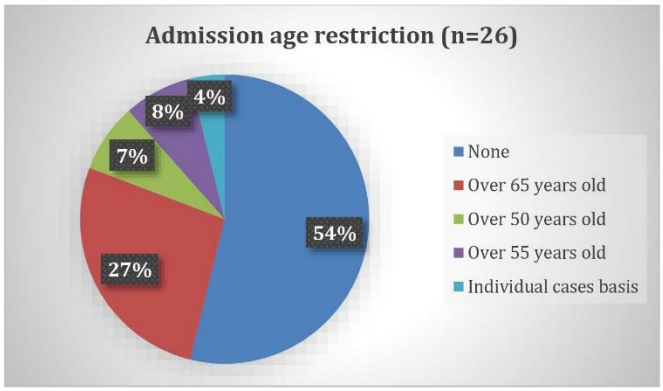

Figure 2: Bed access age restriction

Over all sites there were 559 beds available for all rehabilitation including stroke and other conditions such as orthopaedic problems although on two sites, which were level two type hospitals (local hospital with selected GP-referred medical patients), these beds were potentially available to medical admissions also and not only for rehabilitation.

In 27% (7/26) there was a dedicated unit or ward for stroke patients, with one further site having dedicated beds but no dedicated ward/unit. In total there were 104 dedicated beds identified for stroke rehabilitation patients, with one site providing 29 of those beds. Figure 3 provides an overview of the distribution of rehabilitation beds. Some sites with dedicated stroke units only quoted the dedicated stroke beds in some instances, which underrepresents the number of general rehabilitation beds on some sites.

From the responses there were 191 stroke patients across all sites who were undergoing rehabilitation, median 7 patients (range 1-29).

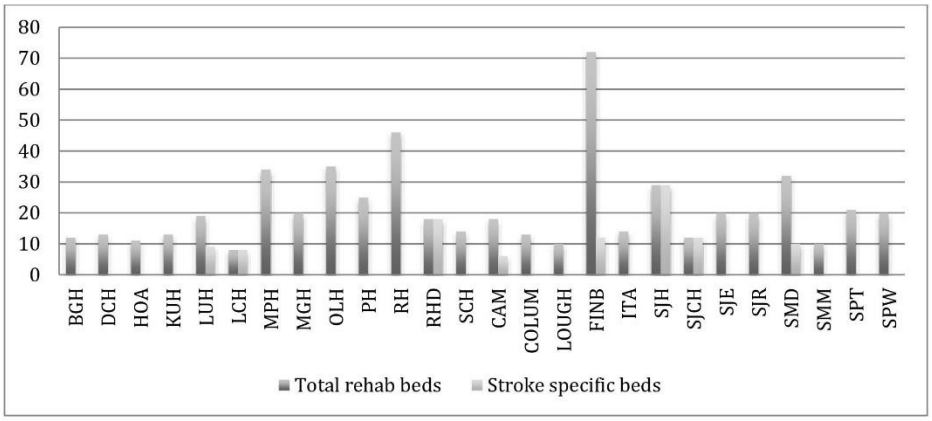

Figure 3: Numbers of stroke rehabilitation beds

Sites were asked how many admissions they had received over the previous 12 months. Thirteen of the sites provided what was felt to be an accurate number, which equated to 830 patients across these sites. The remaining thirteen sites either had to estimate numbers of admissions or the number was unknown.

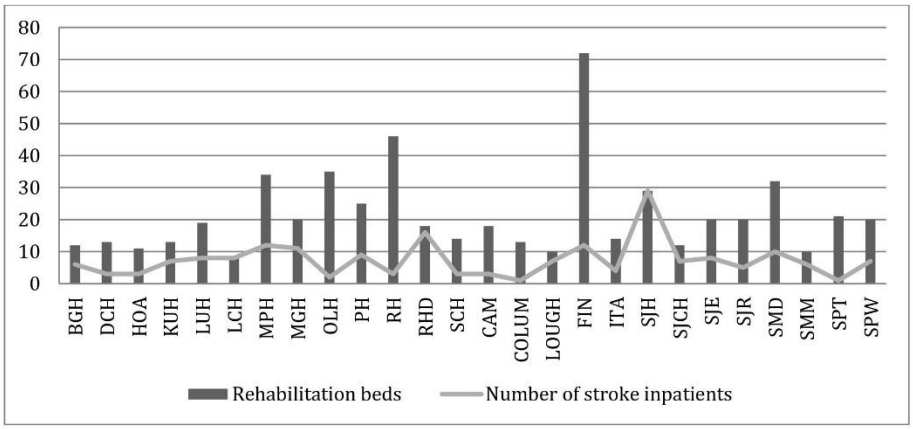

Figure 4: Rehabilitation bed occupancy by stroke patients

Section B – Medical specialty cover

The rehabilitation unit has regular stroke physician input into the review and medical management of patients.

A stroke specialist provides cover for stroke patients in 42% (11/26) of sites with a further 42% being provided by a medical consultant, most commonly a geriatrician. The degree of cover varied and was not captured in this survey.

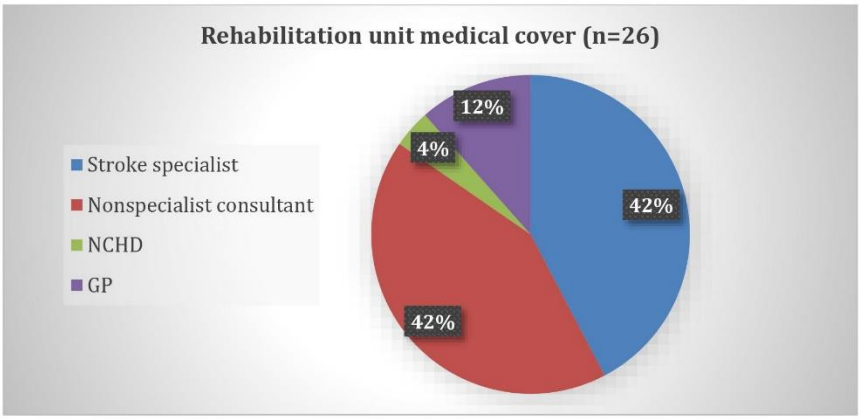

Figure 5: Medical cover provision

Out of normal working hours medical cover is provided by a Non Consultant Hospital Doctor (NCHD) in 46% (12/26) of sites with 35% being provided by out of hours General Practitioner (GP) services.

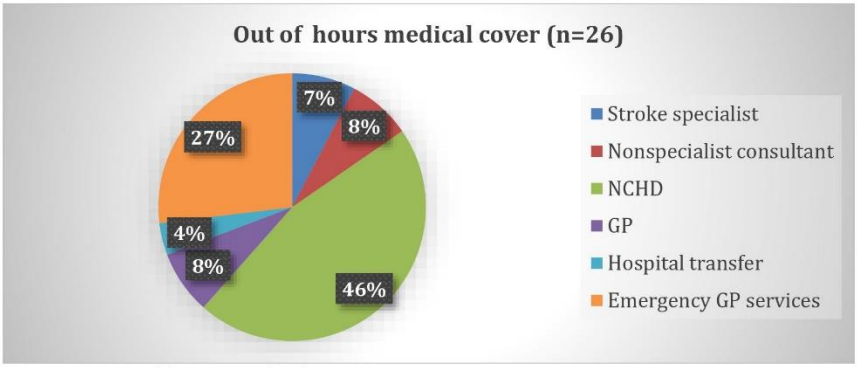

Figure 6: Out of hours medical cover

There are consultant led ward rounds at least once a week in 92% (24/26) sites, with 35% having rounds twice or more per week. Doctor led outpatient services are

available on site in 39% (10/26) of sites, the majority being on sites where the acute services are co-located. However 4 sites used their day hospital facility for medical follow up.

As a measure of neurorehabilitation specialist service access, spasticity services were accessible to 19% (5/26) of sites with at least a 2-week waiting time for review the norm.

Section C – Nursing

Each stroke rehabilitation unit and service should be organised as a single team of staff with specialist knowledge and experience of stroke and neurological rehabilitation including nursing

Nursing staffing levels were returned on 96% (25/26) sites. Numbers quoted are for all rehabilitation beds and per 10 rehabilitation beds (not stroke specific as per guidelines).

An estimated 115 nurses were normally on duty at 10 am for 547 rehabilitation beds across the 25 sites. A median of 2 nurses was estimated per 10 rehabilitation beds across all units (1.7-2.3 IQ).

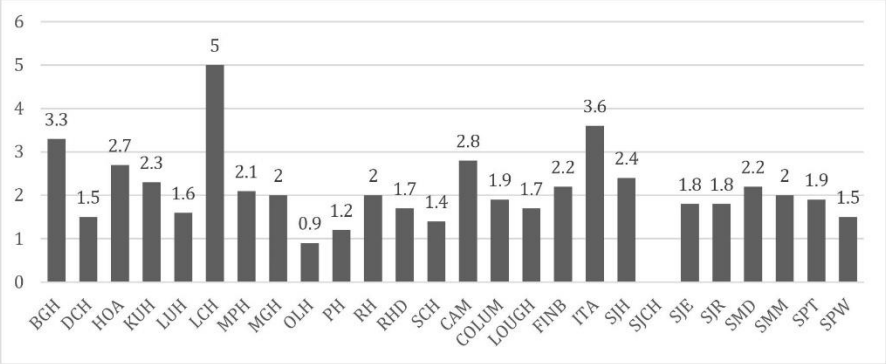

Figure 7: Number of nurses per 10 rehabilitation beds

For all 26 sites, 58% of these nurses were trained in stroke assessment and management. With 3 sites having all nurses quoted as on duty at 10 am being trained in stroke assessment, swallowing screening and continence management.

A clinical nurse specialist was accessible to 54% (14/26) of sites, 64% being offsite access.

Opportunities for nurses to attend internal and external training in courses related to stroke management was available in 89% (23/26) sites.

Section D - Health and Social Care Professionals

All appropriate patients receive a minimum of 45 minutes of physiotherapy/ occupational therapy/ speech and language therapy per day.

All patients have access to specialised neurorehabilitation services.

Patients had access to physiotherapy, occupational therapy, and speech and language therapy on each of the 26 sites.

Access five days a week to these therapies was available in 96%, 89%, and 54% of sites (physiotherapy, occupational therapy, and speech and language therapy respectively).

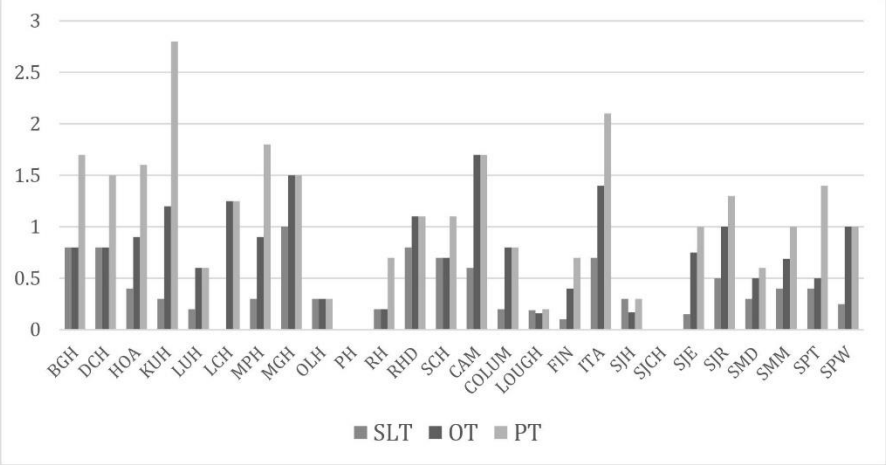

Figure 8: HSCPs per 10 rehabilitation beds

Teams were asked if **any** of their patients received the recommended 45 minutes of therapy in the required discipline daily. 15% (4/26) of sites felt none of their patients met this guideline, with 23% (6/26) stating that 100% of their patients met the required levels.

Teams were also asked about access to other disciplines required for a rehabilitation service, summarised in table 2.

31% of sites had access to clinical psychology, with no site having access within a working week. 50% of sites had access to a medical social worker, with just under two thirds of these available within a working week. All sites quoted access to dietetics with 81% available within 7 days of referral.

85% of sites responded that opportunities were in place for HSCPs to attend internal or external training courses related to stroke management.

Discipline	Accessible n (%)	Within 5 days n (%)
Clinical psychology	8 (31)	0 (0)
Medical Social work	13 (50)	8 (31)
Dietetics	26 (100)	15 (58)
Rehabilitation/ Therapy assistants	19 (73)	18 (69)
Orthotics	14 (54)	2 (8)
Orthoptics	10 (38)	3 (12)
Podiatry	19 (73)	4 (15)
Pharmacy	22 (85)	19 (73)

Table 2: Access to rehabilitation disciplines

Section E – Multiprofessional Team

Every person with stroke involved in the rehabilitation process should participate in setting goals unless they choose not to or are unable to participate because of the severity of their cognitive and linguistic impairments.

Realistic goals agreed with patient and carers should guide the use of specific treatment modalities.

All sites discussed stroke patients at a multiprofessional team meeting (MPTM), in all cases at least one per week, with 6 sites having meetings more than once per week.

The regular attenders varied from site to site and are summarised in table 3.

50% of sites use one set of patient case notes for all disciplines to contribute to. Patient goal setting is formally documented in the case notes in 77% of sites, with agreed goals between patients/carers in 69% of sites.

Discipline	Regular attender n= 26 (%)
Clinical psychology	1 (4)
Dietetics	8 (31)
Nursing/nurse manager	25 (96)
Occupational therapist	26 (100)
Physiotherapist	26 (100)
Social worker	8 (31)
Specialist doctor	20 (77)
Specialist nurse	8 (31)
Speech and language	20 (77)

Table 3: MPTM attenders

Section F – Assessment

All patients undergoing stroke rehabilitation should be screened for cognitive deficits, visual neglect, attention deficits and emotional problems and have access to specialist clinical psychology input.

Standardised assessment of patients for cognitive difficulties is performed on all patients in 89% (23/26) of sites, with mood being assessed using a standardised tool in 27% (7/26) of services. Counselling services are accessible in 27% of sites.

Formal vision and perception assessment is accessible in 77% of services, the vast majority being performed in offsite facilities such as outpatient setting in acute hospitals. 96% of sites perform a nutritional screen of all inpatients in their service.

Section G – Pre-discharge planning

The stroke rehabilitation service provides comprehensive secondary prevention advice and treatment

The stroke rehabilitation unit actively involves families and carers in day-to-day care and rehabilitation

All appropriate patients receive advice regarding a return to driving

All eligible patients receive appropriate support and treatment to enable a return to work

92% (24/26) of services responded that secondary prevention strategies are in place prior to patients' discharge. 39% (10/26) describe access for patients to self-management tools and/or courses.

Half of sites (13/26) felt that training for managing stroke consequences was available to patients and carers within their service.

Driving assessment, predominantly off-road assessment was available in 35% (9/26) sites, with a large dependence on referrals to the Irish Wheelchair Association or private companies to access on road assessment.

Only 27% (7/26) of sites felt they provided access to vocational rehabilitation to enable a return to work. Twenty-two of the services described access to the National Rehabilitation Hospital (NRH), with an estimated 114 patients referred to the NRH in previous calendar year from these 22 sites (range 0-27). This number may not include patients referred initially in the acute hospital who transferred to offsite rehabilitation as an alternative site for ongoing input.

Section H – Discharge and follow up care

The stroke rehabilitation service provides comprehensive information to community services and primary care

The stroke rehabilitation service has established links with the voluntary sector.

All eligible patients have access to an Early Supported Discharge scheme.

All patients receive follow-up six months after hospital (or ESD scheme) discharge and annually thereafter.

89% (23/26) of services responded that they contact the patient's primary care team prior to or on the day of discharge. The means of contact was not covered in this survey e.g. discharge letter versus phone call.

Just 19% (5/26) of services had access to early supported discharge (ESD) and 39% (10/26) described access to a community rehabilitation team (CRT).

77% of services provide a follow up outpatient review; with a similar number offering readmission to patients if late or new rehabilitation needs are identified at follow up.

Just under three quarters (19/26) provide regular follow up to patients discharged with feeding tubes.

Community voluntary organisations were described as accessible to patients in 92% (24/26). Common examples include the Irish Heart Foundation (IHF) Volunteer Stroke Scheme (VSS), Acquired Brain Injury Ireland (ABI), Headway, the Irish Wheelchair Association (IWA), and the National Council for the Blind of Ireland (NCBI), and the Carer's Association.

The inpatient rehabilitation services were asked what community services they felt would be the most beneficial to their service, and to list three if appropriate.

The most common response was access to psychology services, which was highlighted in 58% (15/26) services. With 27% (7/26) the next most common response for increasing access to ESD or CRT or combination of the two.

Lack of access to community therapy was highlighted for most disciplines, with speech and language being the most common response.

Section I – Examples of innovation in stroke rehabilitation

Local teams provided numerous examples of innovative projects and services aimed at providing better all-round care for stroke patients. This was in spite of the financial backdrop that has framed the last number of years within the Irish health service. The following are just a few examples of activities and programmes developed by local teams. Although not all sites provided information, it was clear that all sites aim to provide the best and most up-to-date care to their patients.

Education sessions for both patients and carers are ongoing in many sites such as the carers' information evening session for aphasia in St. James's Hospital.

Making therapy sessions more effective for patients was also commonly highlighted including the use of joint sessions or quiet therapy rooms for patients with attention deficits. Novel approaches included the 'Tasty Tales Baking Group' coordinated by OT in Bantry General Hospital and GRASP (Graded Repetitive Arm Supplementary Programme) in St. Camillus in Limerick.

St Columcille's Hospital noted the benefits of the introduction of a patient questionnaire on discharge, which led to the development of a patient garden and wellness programme. This was achieved through local fundraising.

St. Finbarr's in Cork, a HSE award-winning unit, also developed a patient garden for the purpose of outdoor exercise and gives every patient a discharge information pack on completion of their inpatient rehabilitation.

The Royal Hospital Donnybrook has a service targeting safe and efficient discharge of patients via an 'Action Van Service' which utilises a mobile technician who can expedite assessment and installation of essential equipment or minor adaptations in the home environment.

Isoldes' stroke rehabilitation unit in St. Mary's Dublin emphasised the importance of a stroke support group and promoted the IHF FAST campaign through a red t-shirt day on their unit.

The Louth County Hospital has effectively used and coordinated all available services for local patients as well as developing a patient garden.

Finally, the Community Hospital of the Assumption in Thurles had targeted engaging with local businesses and services in optimising the environment for people post stroke in the form of a 'Gold Star' status for appropriate facilities. This shows that units are not just looking at their own inpatient services but trying to effect change for people once home.

By highlighting these innovations it is hoped it may stimulate discussion and collaboration nationally to try and ensure that good ideas have an opportunity to reach the most people helping achieve best practice across all services.

SSNAP Post acute survey comparison

Background

The Intercollegiate Stroke Working Party (ICSWP) of the Royal College of Physicians UK extended the remit of SSNAP UK to audit the organisation of stroke care after patients are discharged from acute stroke unit care.

Their report, *Post-acute organisational audit December 2015*, provided the first comprehensive information about UK stroke services that were provided to support stroke survivors after the acute phase.

Results comparison

The UK results represent the post-acute inpatient care (services which provide inpatient rehabilitation) of 74% (116/157) of eligible services identified by SSNAP UK.

The clearest difference between the two jurisdictions is in the number and availability of stroke specific services/units within the rehabilitation sites surveyed, 27% versus 73%.

Service Organisation	Ireland n=26	UK n=116
Stroke specific service/unit	27%	73%
Total number of beds that may be used by stroke patients (median (IQR))*	18.5 (13-24)	16 (10-23)
Days per week there is a consultant led ward round (median (IQR))	1 (1-2)	1 (1-2)
Stroke specialist providing medical cover	42%	60%
Stroke admissions over previous 12 months (median (IQR))	55 (33-72)	76 (38-146)

* UK quote dedicated stroke beds versus general rehabilitation beds in Ireland

Table 4: Comparison of service organisation Ireland versus UK

Service Organisation	Ireland n=26	UK n=116
Number of registered nurses on duty at 10AM for rehabilitation beds within service Median (IQR)*	3.5 (3-5)	3 (2-4)
Number of registered nurses on duty at 10AM per 10 rehabilitation beds for this service Median (IQR)	2 (1.7-2.3)	1.7 (1.3-2.2)

* UK quote dedicated stroke beds versus general rehabilitation beds in Ireland

Table 5: Estimated nursing levels comparison Ireland versus UK

Access to the core members of HSCP team is similar between Ireland and the UK. Although there is a higher numbers of therapy assistants available in the UK. There are lower numbers of medical social workers available to Irish rehabilitation units. Noted as an area of concern in the UK report, access to psychology services in Ireland is at 31% versus 51% in the UK.

Access to HSCP	Ireland % (n)	UK % (n)
PT	100 (26/26)	100 (116/116)
OT	100 (26/26)	100 (116/116)
SLT	100 (26/26)	92 (107/116)
Therapy assistants	73 (19/26)	98 (114/116)
Dietetics	100 (26/26)	86 (100/116)
MSW	50 (13/26)	71 (82/116)
Psychology	31 (8/26)	51 (59/116)

Table 6: Comparison of HSCP access Ireland versus UK

In general, the median number of therapists available per 10 rehabilitation beds was lower in Ireland than the UK.

Service Organisation	Ireland n=26	UK n=116
WTE OT MEDIAN (IQR)	1.1 (1-2)	2 (1.2-2.8)
WTE OT per 10 beds MEDIAN (IQR)	0.8 (0.5-1)	1.3 (0.9-1.7)
WTE PT MEDIAN (IQR)	2 (1.15-3)	2 (1.4-3)
WTE PT per 10 beds MEDIAN (IQR)	1.1 (0.7-1.5)	1.5 (1-2.2)
WTE SLT MEDIAN (IQR)	1 (0.4-1)	0.9 (0.4-1.2)
WTE SLT per 10 beds MEDIAN (IQR)	0.3 (0.6-0.2)	0.5 (0.3-0.9)

* UK quote dedicated stroke beds versus general rehabilitation beds in Ireland

Table 7: Comparison of HSCP WTE Ireland versus UK

Differences are apparent in patient-centred services, perhaps reflective of the lower numbers of stroke specific services available.

Patient-centred services	Ireland % (n)	UK % (n)
Self-management	39 (10/26)	59 (68/116)
Carer training	50 (13/26)	73 (85/116)

Table 8: Comparison of patient-centred services Ireland versus UK

Two areas outside the remit of our survey are worth noting. Firstly, the SSNAP UK audit identified 161 and 210 eligible ESD and CRT teams respectively in the UK compared with the 3 existing ESD teams available in Ireland, highlighting a clear service gap here.

Secondly, that vocational rehabilitation was being carried out by 15% (92/599) of the post-acute services who provided data. The majority of this rehabilitation was taking place in people's homes or workplaces. Their report suggests that vocational rehabilitation is a low commissioning priority in the NHS. In the Irish service, just over a quarter of sites had access to vocational rehabilitation but this did not equate to delivery of that rehabilitation, either by quality of access or speed of access. Infrastructure appears not to exist to provide this form of rehabilitation in the home or work environment.

DISCUSSION

Discussion

This is the first national survey to specifically look at inpatient postacute rehabilitation in stroke in Ireland. When reviewing the findings of the survey, it is important to keep the results in the context of a requirement to develop an equitable and fully inclusive service for all people who suffer the consequences of stroke and that policies and guidelines should be patient and carer centred.

The survey has some important limitations to highlight. The rehabilitation units had challenges in obtaining accurate data around number of admissions and discharge destination of patients due to a lack of a system support, such as HIPE (Hospital Inpatient Enquiry). The designation of beds was answered somewhat inconsistently, with some units quoting all units beds and others where a specialist unit existed only quoting the stroke specific beds. The upshot being that the total rehabilitation bed number is an estimate over the 26 sites but the stroke specific bed numbers are more accurate. For consistency and comparison staffing levels were reported as per 10 rehabilitation beds in keeping with other reports. This can present an overestimation of staff in smaller units of for example 6-8 beds. The purpose is to provide an estimate of staffing, and given the variation in the types of units providing rehabilitation, it was always likely that some inconsistency would be evident.

From the returned surveys, 559 rehabilitation beds were identified across 26 sites. Only a quarter of sites had a dedicated stroke unit or ward. Nearly half of sites had an age restriction policy for stroke admissions. Stroke specialist cover was available in 42% of sites with at least weekly consultant physician rounds in 92% of cases. Although it could be viewed as extremely challenging to have speciality beds and physician cover in every site, in particular in smaller rehabilitation units, when viewed from a national perspective there is still large deficiencies and inequity in patient access to specialist stroke rehabilitation throughout the country. Ultimately there appears to be low levels of general rehabilitation beds throughout the country.

The lack of dedicated stroke units also can lead to barriers in developing speciality services. Access to spasticity clinics was used as a proxy of how developed specialty services were on each site. Only 19% of sites felt this service was accessible to them, which suggests that speciality services are still very much in their infancy nationally.

One such specialist service is the Brain Injury Programme in the NRH. This programme has access to inpatient beds to treat different types of brain injury including stroke. However taking into account that approximately 120 patients are discharged from the NRH annually with a diagnosis of ischaemic or haemorrhagic stroke excluding subarachnoid haemorrhage, the survey results show that a similar number were referred from the 22 rehabilitation sites alone. This suggests that capacity to accept stroke patients is restricted (National Rehabilitation Hospital, Jan 2009).

Opportunities for training for nursing staff were available in 89% of sites. However only 58% of nurses quoted as working at 10am on normal duty were trained in stroke

assessment. This lack of training was also a concern from the SSNAP UK postacute survey (T Lancet 2015). This highlights an on-going challenge in providing training to staff, particularly in sites where staffing levels are restrictive in freeing up members of the team to attend courses, both internally and externally.

The core members of the HSCP team were available on all sites. However less than a quarter of sites felt that all stroke patients were receiving the recommended levels of therapy per day, 15% stating that none of their patients were receiving the levels recommended. Coupled with the evidence that levels of HSCPs per 10 rehabilitation beds is lower than the UK, there is support that increased numbers of HSCPs may be required to achieve guidelines for stroke rehabilitation.

At the end of their inpatient journey it is clear that people face uncertainty around on-going rehabilitation access. Only 19% of sites described access to the 3 ESD teams currently available. CRT was available to only 39% of sites. This suggests deficits in both structure and volume of community services. The knock-on effect is often twofold. Firstly patients spend longer in inpatient facilities. Rehabilitation teams feel they cannot discharge patients without appropriate services being available. This has an upstream effect of slowing access for the acute services to offsite rehabilitation beds. Secondly, a sudden reduction in therapy input upon discharge home can impact the rehabilitation gains achieved. Given the strong evidence in support of ESD (Wren et al 2014), it is essential that new teams are developed nationally to address the problems outlined above.

Psychology services are clearly poorly available, with only 31% of sites describing access to these services and none having psychology available within a working week of referral. Added to the lack of counselling services (27% of sites) and the fact that large numbers of people suffer from psychological consequences of stroke (e.g. depression, anxiety), there is a need to develop better patient centred services (Hackett et al 2014).

Related to such need, only half of sites were able to provide training to patients and carers for managing stroke consequences and even less (27%) have access to vocational rehabilitation. Of note, vocational rehabilitation in the UK, although having clear deficits, was not age restricted. With the population either required or seeking to extend their working life beyond 65 years of age, a review of how vocational services are provided is necessary.

All rehabilitation units showed a reliance on the support of voluntary organisations in order to provide adequate services. This included areas such as functional assessments for example as provided by IWA and NCBI, provision of specialist neurorehabilitation services by ABI and Headway, and community support and education as covered by the Irish Heart Foundation, Volunteer Stroke Scheme and local stroke support groups. These invaluable services, and many others like them, need recognition for the excellent work they do while also acknowledging the gaps in services that exist within the structure of the general health service.

The difficulty sites encountered in accessing data again highlights the need to properly resource the stroke register, which could potentially provide real-time data on patient flow within the service and assist within planning both in the short and long term. This in turn may negate the need for larger audit projects, although the audit process in itself is helpful in asking units to take time to review their service provision. Currently, the stroke register is completed on a voluntary basis within the acute services and does not extend to include rehabilitation facilities.

There is notable heterogeneity in the organisation of services across the hospital and community services. This is largely due to the historical consequence that services grew separately in varied models of care with different governance structures in place. It is clear that in clinical care especially in stroke care, an overall national organisational structure helps improve efficiency of services, access to services and ultimately clinical outcomes patients.

What is also notable is the level of expertise, commitment and willingness to improve that is apparent within the rehabilitation units managing patients' dealing with the consequences of their stroke. Given the clear benefits of optimising stroke recovery it is essential that these health care professionals have the opportunity to continue to provide the best of care in a properly resourced and efficient rehabilitation service.

In conclusion, this survey represents an initial step in reviewing compliance with recommended guidelines in stroke rehabilitation in the postacute phase of stroke care. The report should provide stimulus for addressing deficiencies in rehabilitation services for stroke patients. It provides a baseline from which progress in improving services can be re-evaluated in tandem with the acute stroke services. Improvements will ensure all stroke patients are given an optimum opportunity to recover to independent living with appropriate supports.

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Appendix

Survey proforma

Section A – General Information

A1 From which hospitals do you normally accept patient referrals?

1)_____

2)_____

3)_____

4)_____

A2 (i) Is your bed access age restricted? Yes ☐ No ☐

(ii) If **yes**:

- Over 65 ☐
- Under 65 ☐
- Other (please specify) ☐ _____

A3 How many rehabilitation beds are available to all patients on site? _____

A4 Is there a rehabilitation unit/ward dedicated to stroke patients on site?

Yes ☐ No ☐

A5 (i) Are there dedicated beds to stroke patients on site?

Yes ☐ No ☐

(ii) If **yes** how many? _____

A6 How many patients are currently inpatients recovering from a stroke event on your rehabilitation ward/unit? _____

A7 How many stroke patients have been treated in the last 7 calendar days by your service?_____

A8 (i) How many stroke patient admissions have you received in the last 12 months (e.g. January-December 2015)?_____

(ii) This number is: accurate ☐ estimate ☐ unknown ☐

A9 How many stroke patients have been discharged to nursing home/residential care in the last 12 months (e.g. January- December 2015)?_____

(ii) This number is: accurate ☐ estimate ☐ unknown ☐

Section B – Medical specialty cover

B1 Who provides medical cover for stroke patients on this service (select one only)?

- Stroke specialist doctor (Consultant level/staff grade) ☐
- Non-specialist doctor (Consultant level/Staff grade) ☐
- Non-consultant hospital doctor (NCHD) ☐
- GP ☐
- Other (please specify) ☐

_____

B2 In case of medical problems arising out of normal working hours, who provides cover for patients?

- Stroke specialist doctor (Consultant level/staff grade) ☐
- Non-specialist doctor (Consultant level/Staff grade) ☐
- Non-consultant hospital doctor (NCHD) ☐
- GP ☐
- Other (please specify) ☐

_____

B3 How many days per week is there a consultant led ward round? _____DAYS

B4 (i) Are there doctor led outpatient services occurring on site for stroke patients?

Yes ☐ No ☐

(ii) If **yes** please specify which?

_____

_____

_____

B5 (i) Does your service have access to a spasticity service?

Yes ☐ No ☐

(ii) If **yes** please specify where?
_____

(iii) If **yes** what would be the average waiting time for review? _____DAYS

Section C – Nursing

C1 How many registered nurses are normally on duty at **10am** for rehabilitation beds as quoted in question **A3**? _____

C2 Of those nurse on duty at **10 am** how many are trained in:

(i) Swallow screening _____

(ii) Stroke assessment and management e.g. _____

(iii) Urinary and bowel continence _____

C3 How many registered nurses are normally on duty at **10pm** for the beds as quoted in question **A3**?_____

C4 What is the total establishment whole time equivalent's (WTE's) of nurses, which treat:

(i) Stroke patients _____WTEs

(ii) All rehabilitation patients _____WTEs

C5 (i) Does your service have access to a clinical nurse specialist in stroke?

Yes ☐ No ☐

(ii) If **yes**:

- Onsite ☐
- Offsite ☐
- Both ☐

C6 Is there any opportunity for nurses to attend internal or external training courses related to stroke management?

Yes ☐ No ☐

Section D - Health and Social Care Professionals

D1 Do patients have access within your service to the following therapy staff?

(i)	Occupational therapy	Yes ☐	No ☐
(ii)	Physiotherapy	Yes ☐	No ☐
(iii)	Speech and language therapy	Yes ☐	No ☐

D2 How many days per week do your patients have access to these disciplines?

(i)	Occupational therapy	_____Days per week
(ii)	Physiotherapy	_____Days per week
(iii)	Speech and language therapy	_____Days per week

D3 How many individuals does this service have?

(i)	Occupational therapy	_____
(ii)	Physiotherapy	_____
(iii)	Speech and language therapy	_____

D4 What are the total establishment whole time equivalents (WTEs)?

(i)	Occupational therapy	_____WTEs
(ii)	Physiotherapy	_____WTEs
(iii)	Speech and language therapy	_____WTES

D5 (i) Do any patients receive a recommended 45 minutes of therapy daily (Monday to Friday) from required therapies?

Yes ☐ No ☐

(ii) If **yes** what percentages (estimate) of patients receive this level of therapy daily? _____%

D6 (i) Do your patients have access to the following disciplines while inpatients on your service?

(ii) And if **yes** how soon can they be reviewed (please tick most appropriate response for each discipline where accessible?

Discipline	**Accessible**	**Within 5 days**	**Within 7 days**	**>7days**	**> 1 Month**
Clinical psychology	Yes ☐ No ☐	☐	☐	☐	☐
Medical Social work	Yes ☐ No ☐	☐	☐	☐	☐
Dietetics	Yes ☐ No ☐	☐	☐	☐	☐
Orthotics	Yes ☐ No ☐	☐	☐	☐	☐
Rehabilitation/Therapy assistants	Yes ☐ No ☐	☐	☐	☐	☐
Orthotics	Yes ☐ No ☐	☐	☐	☐	☐
Orthoptics	Yes ☐ No ☐	☐	☐	☐	☐
Podiatry	Yes ☐ No ☐	☐	☐	☐	☐
Pharmacy	Yes ☐ No ☐	☐	☐	☐	☐
Other (specify) _____	Yes ☐ No ☐	☐	☐	☐	☐

D7 Is there any opportunity for HSCPs to attend internal or external training courses related to stroke management?

Yes ☐ No ☐

Section E – Multiprofessional Team

E1 (i) Are all stroke patients discussed at a multiprofessional team meeting?

Yes ☐ No ☐

(ii)If **yes**, how often?

- Less than once a week ☐
- Once a week ☐
- Twice a week ☐
- More than twice per week ☐

E2 Which disciplines regularly attend these meetings (tick all that apply)?

- Clinical psychologist ☐
- Dietician ☐
- Occupational therapist ☐
- Physiotherapist ☐
- Social worker ☐
- Specialist doctor ☐
- Specialist nurse ☐
- Speech and language therapist ☐
- Nursing/Nursing manager ☐
- Other please specify ☐
- _____

E3 Do all disciplines contribute to one set of case notes for the patient?

Yes ☐ No ☐

E4 Does your service formally document patient goals (e.g. specified, time-bound, measurable outcomes) in the case notes?

Yes ☐ No ☐

E5 Are these goals agreed with patients/carers?

Yes ☐ No ☐

Section F – Assessment

F1 Do all patients receive cognitive screening with a standardized tool e.g. MMSE/MOCA?

Yes ☐ No ☐

F2 Do all patients have mood assessed with a standardized tool?

Yes ☐ No ☐

F3 Do patients have access to a counseling service while an inpatient?

Yes ☐ No ☐

F4 (i) Do patients have access to formal vision and perception assessment?

Yes ☐ No ☐

(ii) If **yes** where?

_____

F5 (i) Do all patients receive a nutritional screen while an inpatient in your service?

Yes ☐ No ☐

(ii) If **yes** how often:

- Weekly ☐
- Monthly ☐
- Only on admission ☐
- Other (specify) ☐

Section G – Pre-discharge planning

G1 Are secondary prevention strategies in place prior to patients' discharge?

Yes ☐ No ☐

G2 Do stroke patients/carers have access to self-management tools and/or courses?

Yes ☐ No ☐

G3 Do patients and/or carers have access to training for managing stroke consequences? Yes ☐ No ☐

G4 (i) Do all relevant patients have access to driving assessment on site?

Yes ☐ No ☐

(ii) If **yes**, is it:

- Off-road ☐
- On road ☐
- Both ☐

G5 Where do you refer patients for on road assessment?

_____

_____

G6 (i) Do all eligible patients have access to vocational rehabilitation to enable a return to work?

Yes ☐ No ☐

(ii) If **yes**, where is this available?

- Onsite ☐
- Other ☐
- (Please specify) _____

G7 (i) Do you have access to referrals to the National Rehabilitation Hospital (NRH)? Yes ☐ No ☐

(ii)If yes how many patients did you refer to the NRH in the previous calendar year (Jan 2015-Dec 2015)? _____

Section H – Discharge and follow up care

H1 Are patient's primary care team contacted prior to or on day of discharge about patient's condition?

Yes ☐ No ☐

H2 Do patients have access to an Early Supported Discharge team (ESD) if required?

Yes ☐ No ☐

H3 Do patients have access to a community rehabilitation team on discharge?

Yes ☐ No ☐

H4 Are all patients provided with a follow up outpatient review upon discharge?

Yes ☐ No ☐

H5 If patients are observed to have late or new rehabilitation needs as outpatients, do they have access to readmission for further therapy?

Yes ☐ No ☐

H6 Do all patients discharged from hospital with a feeding tube receive regular follow up?

Yes ☐ No ☐

H7 (i) Do patients have access to voluntary organisations to support them in the community?

Yes ☐ No ☐

(ii) If yes could you please list them?

_____
_____
_____
_____
_____
_____
_____

H8 Are there community services that you do not have access to or limited access to but feel would be most beneficial to your service (please list 3 if appropriate)?

1)_____

2)_____

3)_____

Section I - Innovation in Stroke Rehabilitation

This section provides the opportunity for rehabilitation teams to highlight novel approaches and ideas, including innovative ways of addressing common problems affecting stroke patients, their carers and the staff who help them rehabilitate. Through collaboration, innovation, and education, stroke rehabilitation services could improve nationally. Please provide a brief description of any such programmes, projects or policies developed or adapted in your service. Please provide any supportive documentation if available with this completed survey.

Description of project:

_____

_____

_____

_____

_____

_____

Notes