

Current and future costs of stroke in the UK

Technical report

Prepared for Stroke Association

September 2026

Prepared for: Stroke Association

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Version: 4.0

Date: 09 September 2026

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Table of Abbreviations

Abbreviation	Definition
ASHE	Annual Survey of Hours and Earnings
ASU	Acute Stroke Unit
CI	Confidence Interval
CRT	Community Rehabilitation Team
CT	Computed Tomography
CVD	Cardiovascular Disease
DES	Discrete Event Simulation
ESD	Early Supported Discharge
EQ-5D	EuroQol 5 Dimensions
GLM	Generalised Linear Model
GP	General Practitioner
GMW	General Medical Ward
ICB	Integrated Care Board
ISDNs	Integrated Stroke Delivery Networks
ILASS	Integrated Life After Stroke Service
LOS	Length Of Stay
MRI	Magnetic Resonance Imaging
mRS	Modified Rankin Scale
NCC	National Cost Collection
NGC	National Guideline Centre
NHS	National Health Service
NI	Northern Ireland
NIHSS	National Institutes of Health Stroke Scale
OBR	Office for Budget Responsibility
ONS	Office for National Statistics
PSS	Personal Social Services
PSSRU	Personal Social Services Research Unit
QOF	Quality Outcomes Framework
ScHARR	School of Health and Related Research
SSCA	Scottish Stroke Care Audit
SSDV	Social Service Day Visit
SSNAP	Sentinel Stroke National Audit Programme
SLSR	South London Stroke Register
SD	Standard deviation
SU	Stroke unit
TIA	Transient Ischaemic Attack
UK	United Kingdom
WSI	Wider Societal Impacts

1. Executive Summary

Stroke is a major UK health challenge, and its impact continues to grow

Stroke has a profound and lasting impact on people's lives. It can affect physical and mental wellbeing, independence, family life and employment, while also creating substantial demand for health, social care and community support services.

To understand the current and future economic burden of stroke in the UK, we conducted a comprehensive analysis of the health, social care and wider societal costs associated with stroke, combining epidemiological projections with economic modelling to estimate both present-day and future impacts. All current and future costs are presented in 2025 prices to provide consistency across analyses and to allow for interpretation of projected future costs in real terms.

We estimated that in 2025 there were over 105,000 new cases of stroke in the UK, and a total of 1.4 million people living with the impacts of stroke from previous years, many of whom continue to experience long-term effects.

These numbers are projected to rise substantially over the next decade. By 2035, the number of new stroke cases is expected to increase by 19%, reaching 125,473 people. Over the same period, the size of the stroke survivor population is projected to increase by 43%, reaching around 2.0 million people.

The growing health challenge of stroke to the UK translates into high annual economic consequences for the nation's health and social care systems that are projected to increase over the next ten years

Note: *Throughout this report, the term "economic burden" is used in its established health economics sense to describe the combined impact of stroke on health outcomes, health and social care services, public finances and wider society. The term is not intended to describe people living with stroke, their families or carers, but rather the economic consequences associated with the condition.*

We estimated that the total annual cost of stroke in the UK in 2025 was £25.71 billion, including £19.06 billion in NHS and Personal Social Services (PSS) costs. The economic burden of stroke on the UK is distributed unevenly across the NHS and PSS sectors. NHS-funded care accounted for £5.34 billion of the NHS and PSS cost total, whereas PSS costs were substantially higher at £13.72 billion. PSS-funded long-term care, including care home provision, represented the largest PSS cost component.

Importantly, the burden of stroke extends far beyond the initial event. Health and social care costs in the first-year after stroke are estimated at £2.43 billion, compared with £16.63 billion in ongoing annual costs for people living with the effects of stroke from previous years. While emergency treatment and rehabilitation in the first-year post stroke are resource-intensive, much of the economic costs arise from long-term impacts of stroke, and the ongoing health, care and support needs experienced by many people after leaving hospital. We estimate that ongoing care and support needs associated with the long-term effects of stroke account for 87% of total NHS and PSS costs.

Beyond NHS and PSS systems, the broader impact of stroke is estimated to be associated with £6.65 billion in wider societal costs to the UK, driven primarily by unpaid productivity losses, lost paid productivity and informal care provided by family and friends.

Looking ahead, NHS, PSS, and wider societal costs are projected to increase substantially. By 2035, the total annual cost of stroke is expected to reach £35.86 billion, representing a 39% increase compared with 2025. NHS and PSS costs are projected to rise to £26.48 billion, while wider societal costs are expected to increase to £9.38 billion, increases of 39% and 41% respectively.

The rising impact of stroke and the associated cost increases over the next decade is driven by an ageing population and welcome improvements in survival after stroke. While more people surviving stroke represents important progress, it also means that more people are living with the long-term impacts of stroke. As the number of people living with stroke increases, so too does the need for ongoing health, social care, financial and wider support.

The growing impact of stroke creates substantial and rising costs for public finances

The impact of stroke extends beyond health and social care services and can also be felt in public finances. We estimated the fiscal cost of stroke to be £2.36 billion in 2025, including £1.62 billion associated with the working-age population and £741.6 million associated with the pension-age population. These costs reflect stroke-related welfare payments and reduced tax revenues and national insurance contributions associated with those who are unable to participate in the labour market due to ill health. Fiscal costs are also projected to rise, reaching £2.88 billion by 2035, an increase of 23% from 2025.

The impact of stroke is not experienced equally, with severity, stroke type and age all influencing recovery, care needs and associated costs

In 2025, the average NHS and PSS cost of supporting someone in their first-year post stroke was estimated to be £23,031 per person. In subsequent years post-stroke, the average ongoing annual NHS and PSS cost associated with continuing care and support needs was estimated to be £11,827 per person.

The impact of stroke varies considerably depending on stroke severity. Severity of stroke is measured using the National Institute of Health Stroke Scale (NIHSS). The NIHSS captures the impact of stroke on key neurological functions including consciousness, vision and motor function, with higher scores indicating greater impairment, and consequentially, a greater need for care. Average first-year costs ranged from £14,979 per person for mild stroke (NIHSS 0–4) to £28,207 for moderate stroke (NIHSS 5–15) and £38,355 for severe stroke (NIHSS 16–42), classified based on published literature[1,2].

Average costs in the first-year following stroke vary according to both stroke subtype (haemorrhagic or ischaemic) and patient age. Variations in these factors contribute to differences in treatment pathways, recovery trajectories, and long-term support needs.

Haemorrhagic strokes are typically associated with greater clinical severity; long hospital stays and more intensive rehabilitation requirements than ischaemic strokes. Consequently, average first-year costs are higher for people who experience a haemorrhagic stroke (£28,415 per person) than for those who experience an ischaemic stroke (£22,197 per person).

Costs also differ across age groups, with older individuals more likely to have multiple comorbidities, greater levels of disability, longer recovery periods, and increased need for community, social care, and residential support services. Estimated average first-year costs increase progressively with age, rising from £15,492 per person among those aged 16–39, to £19,140 among those aged 40–64, £21,612 among those aged 65–74, £25,380 among those aged 75–84, and £25,187 among those aged 85–109.

Conclusion

Our estimates of the total costs of stroke in the UK, both now and over the next decade, highlight a substantial and growing economic burden. The impacts of stroke extend well beyond those experienced by people living with stroke, with consequences for families, carers, healthcare services and society.

At a time when NHS and social care services are already operating under significant capacity and financial pressures, rising stroke incidence and survivorship will place additional demand on hospital services, rehabilitation, primary care, community services and long-term care. Reducing the incidence and long-term consequences of stroke through effective prevention, rapid treatment and high-quality rehabilitation therefore has the potential not only to improve outcomes for people affected by stroke, but also to help mitigate future pressures on stretched health and care systems.

Through prioritisation and investment in stroke across the pathway, from research, prevention, acute care to life after stroke support, policy makers and funders have an opportunity to use these findings to support planning, resource allocation and policy development.

2. Introduction

2.1. The evolving burden of stroke: current impacts and future outlook

Stroke remains a leading cause of death and disability worldwide and continues to represent a major public health challenge in the United Kingdom (UK). Globally, stroke is the second leading cause of death[3]. In the UK, stroke remains a major contributor of cardiovascular disease mortality and a leading cause of long-term disability [4,5].

Recent estimates indicate that there are over 100,000 strokes each year in the UK, with NHS England reporting over 111,000 hospital admissions for stroke in England alone in 2023/24. Improvements in survival are welcome progress, but they also mean more people are living with the long-term effects of stroke. Around 1.4 million people in the UK are now living after stroke, many with physical, cognitive, emotional and psychological changes that affect independence, work, family life and community participation. Many people need ongoing rehabilitation, health and social care support to recover and live well after stroke, while also facing a higher risk of further stroke and premature death[1,6].

Stroke affects not only older populations but also those of working age, with around one quarter of strokes occurring in people in this group. Stroke can reduce an individual's ability to participate in paid work, resulting in productivity losses and long-term economic impacts[7]. These wider effects on quality of life, employment and informal care are incorporated within a Wider Societal Impacts (WSI) framework used in this analysis. More broadly, stroke is a major contributor to cardiovascular disease (CVD), which accounts for around one in four deaths in England, underscoring its importance as a public health priority[8].

Current stroke guidelines emphasise rapid access to specialist first-year post-stroke care, including treatment in dedicated stroke units and use of reperfusion therapies such as thrombolysis and thrombectomy where appropriate. Following the acute phase, care pathways focus on timely discharge from hospital and ongoing rehabilitation tailored to patient need, often delivered through early supported discharge and community-based services. These pathways are designed to support recovery, maximise independence, and reduce long-term disability[9]. Capturing the patient experience is also critical in modern stroke rehabilitation guidelines. Rather than focusing solely on physical impairments, clinical frameworks require person-centred care. This means care must be tailored to the individual's goals, preferences, mood, and tolerance rather than rigid or mandated time limits when developing new pathways[10].

Despite progress in prevention, first-year post-stroke care, and rehabilitation over recent decades, stroke incidence and associated costs are projected to rise. Population ageing, increasing prevalence of risk factors, and improved survival are expected to drive growth in both incidence and prevalence. As long-term physical, mental, and emotional care support requirements for stroke survivors increase, the economic burden of stroke is forecasted to increase substantially, placing additional pressure on already constrained health and social care systems.

Understanding the contemporary and future economic burden of stroke is therefore critical for informing policy and resource allocation. Robust and up-to-date evidence is essential to guide the development of policy and research priorities, focusing attention on the right questions to solve the new challenges faced by stroke survivors today and supporting more effective, targeted responses.

Finally, while burden-of-illness estimates are valuable for quantifying scale, they do not in themselves provide solutions. Identifying opportunities to mitigate these costs through effective prevention, treatment and rehabilitation is essential. Increased investment in stroke research and service innovation has the potential to yield substantial returns through avoided healthcare costs, improved quality-of-life, and enhanced productivity. Yet, despite the opportunities for returns in both patient and cost reduction, stroke has historically and continues to receive underinvestment relative to conditions with comparable burden[11].

This study seeks to contribute to this evidence base by updating estimates of the economic burden of stroke in the UK and examining potential future trajectories over the next 5 and 10 years. To achieve this, this study adapts previous economic costing models from National Guideline Centre, (2016) and Patel (2020), to reflect changes in the UK stroke landscape and evidence base.

2.2. Developments in Stroke Policy, Service Delivery, and the Need for Updated UK Stroke Burden Estimates

Since the last national costing analysis for stroke (conducted over a decade ago) the organisation, delivery, and quality of stroke care in the UK have undergone substantial transformation. Earlier economic analyses of stroke in the UK largely relied on data from the Sentinel Stroke National Audit Programme (SSNAP), covering the period 2013–2015 and reflected patterns of care and outcomes prior to major system-wide reforms. Since then, there have been significant developments in clinical guidance, service delivery models, and national policy frameworks that are likely to have altered both the costs and outcomes associated with stroke care:

- First, the National Clinical Guideline for Stroke (sixth edition, 2023) has introduced updated, evidence-based recommendations across stroke care pathways in the UK and Ireland[12]. This includes strengthened guidance on rehabilitation intensity, recommending that stroke survivors receive needs-based, multidisciplinary rehabilitation at higher intensity, reflecting a shift towards more comprehensive subsequent years post-stroke care. Complementary National Institute for Health and Care Excellence (NICE) guidelines on stroke and transient ischaemic attack (TIA) management and stroke rehabilitation (including NG128 and NG236) further reinforce expectations for timely diagnosis, first-year post-stroke treatment, and enhanced rehabilitation provision[13,14].

- Second, stroke was identified as a national priority within the NHS Long Term Plan (2019), driving the development of the National Stroke Programme to improve prevention, treatment, and recovery. This programme has focused on expanding access to evidence-based first-year post-stroke interventions, such as thrombolysis and thrombectomy, alongside improving post-stroke rehabilitation and long-term support[15].

- Third, there have been important structural changes to stroke service delivery. Since 2021, England has implemented Integrated Stroke Delivery Networks (ISDNs), designed to coordinate stroke services across whole pathways, from hyper-acute care through to rehabilitation and life after stroke, based on population needs and best practice [16]. In addition, the introduction of the Integrated Community Stroke Service (ICSS) model (2022) and the Integrated Life After Stroke Service (ILASS) model (2023) reflects a system-wide shift towards better integration between hospital and community-based care, with a greater emphasis on continuity of care and long-term recovery [17,18].

- Fourth, stroke services have also continued to evolve across the UK nations.

    - In Scotland, the Stroke Improvement Plan 2023 outlined priorities across the stroke pathway, including stroke prevention, access to first-year post-stroke treatment, rehabilitation, and long-term support. The plan also reflects a greater focus on holistic, person-centred care, with increased emphasis on rehabilitation and the cognitive and psychological consequences of stroke[19]. In parallel, the Scottish Stroke Care Audit (SSCA) has continued to develop, providing national data on stroke admissions, care processes and outcomes, strengthening the evidence base available to support service improvement and assess changes in stroke care over time[20].

    - In Wales, the Quality Statement for Stroke (2021) established a national vision for improving stroke services, with a focus on reducing variation in care, improving timely access to specialist treatment, and strengthening rehabilitation and long-term support[21]. The statement is being implemented through the NHS Wales National Stroke Implementation Network, which supports service improvement across the stroke pathway, from prevention and acute care to rehabilitation and life after stroke. Together, these developments reflect a continued emphasis on person-centred, equitable stroke care across Wales.

    - In Northern Ireland, the Stroke Action Plan (2022) outlined reforms intended to improve access to specialist stroke treatments, such as thrombolysis and thrombectomy, alongside strengthening rehabilitation, long-term support, and community-based stroke services for stroke survivors [22]. Together, these developments demonstrate continued efforts to improve the organisation and delivery of stroke care across the UK.

- Fifth, there have been important developments in the use of mechanical thrombectomy for acute ischaemic stroke. Evidence supporting the use of thrombectomy for patients with large vessel occlusion increased following publication of the MR CLEAN trial, which reported improved functional outcomes among patients receiving intra-arterial treatment in addition to usual care[23]. In England, NHS England introduced a commissioning policy for mechanical thrombectomy in 2018, facilitating access to the procedure for eligible patients. These developments are likely to have influenced treatment patterns and associated resource use compared with previous cost-of-illness analyses [24].

- Sixth, advances in data collection and performance monitoring have strengthened the evidence base underpinning stroke care. SSNAP has continued to evolve, providing more comprehensive and granular data on patient pathways, treatment timelines, and outcomes [25]. These improvements enhance the ability to evaluate service quality and identify variations in care but also underscore that previous analyses based on earlier SSNAP data may no longer reflect current clinical practice [1,26].

- Finally, renewed emphasis on public awareness and early intervention is illustrated by the relaunch of the NHS 'Act FAST' campaign, which aims to improve recognition of stroke symptoms and reduce delays in accessing emergency care [27]. Earlier diagnosis and faster treatment are expected to influence both outcomes and resource use, with implications for the overall economic burden of stroke.

Taken together, these developments represent substantial changes in the prevention, treatment, rehabilitation, and organisation of stroke care across the UK. They are likely to have altered patterns of resource use, survival, disability,

and long-term care needs in ways that are not captured by earlier cost-of-illness models. Accordingly, there is a clear need to update existing estimates of the economic burden of stroke in the UK using contemporary data and reflecting current clinical practice and service delivery.

This study seeks to address this gap by providing updated estimates of the cost of stroke and examining how these costs may evolve in the future, thereby supporting evidence-based decision-making in policy and resource allocation.

3. Methods

3.1. Approaches to modelling

We conducted four complementary analyses to estimate current stroke-related costs:

1. Modelling NHS and Personal Social Services (PSS) costs in the first-year following a stroke including the acute event
2. Modelling ongoing NHS and PSS costs of stroke after the first-year
3. Modelling wider societal costs
4. Modelling fiscal costs

These were subsequently integrated with population and epidemiological projections to estimate future costs.

In this report, NHS costs refer to healthcare resources funded by the National Health Service, including hospital admissions, emergency care, rehabilitation services, outpatient appointments, primary care, and prescribed medications. PSS costs refer to publicly funded social care and support services provided by local authorities, such as home care, residential and nursing care placements, reablement services, and other community-based support. Distinguishing between NHS and PSS costs is important because stroke generates substantial costs across both the health and social care systems, and the distribution of costs may change over time as patients transition from acute treatment and rehabilitation to longer-term care and support needs.

An expert advisory group was convened to inform the development of the modelling approach and provide independent challenge throughout the project. The group brought together expertise spanning stroke policy, health service delivery, research and evidence generation, population health, health economics, data analytics, and healthcare strategy. The advisory group also included two experts, who contributed personal insights from living with the effects of stroke and provided valuable scrutiny of the assumptions, approach and interpretation of findings. The breadth of perspectives ensured that the analyses were grounded in current clinical and service realities while reflecting the wider impacts of stroke across health and care systems.

The advisory group provided input at key stages of the project, including the selection of data sources, review of methodological assumptions, validation of model structure, interpretation of findings, and consideration of the policy and service implications of the results. Members drew on their experience of stroke prevention, acute care, rehabilitation, long-term support, commissioning, and healthcare decision-making to help ensure that the analyses reflected the patient pathway and current evidence base.

Through regular review and discussion, the advisory group helped strengthen the relevance, credibility, and robustness of the modelling. While responsibility for the final methodology and results remained with the study team, the group's insights were instrumental in shaping the analytical framework and ensuring that the outputs were meaningful to stakeholders across the stroke community. The model was developed within RStudio.

3.1.1 Modelling NHS and Personal Social Services costs in the first-year following a stroke

The core analysis is based on a patient-level pathway modelling approach using a discrete event simulation (DES) framework to represent the progression of individuals through the stroke care pathway over time. Building on established models developed by National Guideline Centre (2016)[28] and Patel (2020)[1], this approach simulates the timing and sequencing of clinically relevant events, including hospital admission, treatment, discharge, recurrence and death. Rather than relying on fixed transition probabilities, the model determines a patient's next event based on their characteristics and patient journey to date. This enables a flexible and more realistic representation of stroke care, capturing variation in LOS across settings and the influence of earlier events on subsequent outcomes. Patients enter the model at stroke onset and move through first-year post-stroke care, rehabilitation, community services, and long-term care, with individual characteristics such as age, sex, stroke type, and severity shaping both care pathways and event risks.

Resource use and costs are accumulated at the individual level based on time spent in different care settings and the services received along each patient pathway. Unit costs are applied to these resource use inputs and aggregated across the simulated population to estimate mean per-patient and total system costs. The model distinguishes between costs during the first-year after a stroke and ongoing costs post-12 months after a stroke to more accurately reflect patterns of care and cost accumulation over time. First-year post-stroke costs capture resource use within the first 12 months following stroke onset, reflecting initial treatment and rehabilitation phases. Ongoing (post-12-month) stroke costs represent ongoing care needs among long-term survivors and are modelled using long-term cost estimates adjusted for survival. This structure allows the analysis to capture both the cost of new stroke events (incident cases)

and the continuing impact in the stroke survivor (prevalent) population, providing a comprehensive assessment of system-wide burden.

3.1.2 Modelling ongoing NHS and Personal Social Services costs associated with longer-term stroke survivorship

Costs of ongoing care and support needs in stroke survivors beyond the first-year are modelled using post-discharge cost estimates adjusted for survival. The model structure allows the analysis to capture the continuing economic impact associated with the ongoing care needs of the stroke survivor population, providing a comprehensive assessment of system costs.

3.1.3 Wider societal costs

Societal costs were estimated using a quality-of-life-based framework commissioned by the Department of Health and Social Care (DHSC), which links health outcomes directly to economic consequences[29]. The model adopts an EQ-5D–centred approach, whereby distributions of Modified Rankin Scale (mRS) scores, stratified by age and sex and derived from SSNAP, and published mapping algorithms are used to estimate quality-of-life weights for three populations: individuals with no stroke history, first-year post-stroke, and subsequent years post-stroke. These EQ-5D profiles are then combined with demographic characteristics to estimate net production and informal care consumption over a 10-year time horizon. This approach enables a unified assessment of societal costs by capturing paid productivity losses, unpaid production and informal care within a single, internally consistent framework using the DHSC Wider Social Impacts (WSI) model to translate health outcomes into economic consequences.

Each cost component is estimated using empirically derived relationships between quality-of-life and economic activity. Paid and unpaid productivity losses, alongside informal care requirements are estimated using regression models, with hours of care valued using national average wages. This integrated approach links health outcomes to associated economic consequences, enabling the estimation of wider societal costs within a single, internally consistent framework. Sensitivity analyses were undertaken on key assumptions, including informal care hours and wage rates, to reflect uncertainty in these parameters.

3.1.4 Fiscal cost modelling

A fiscal impact analysis was conducted from a public finance perspective to estimate the impact of stroke on government revenues and expenditures over the period 2025 to 2035. A population-based costing framework was applied, combining projections of the number of people affected by stroke with assumptions regarding benefit eligibility, uptake, and per-person fiscal costs. Stroke prevalence and incidence rates were used to construct estimates of both new stroke and stroke survivor populations over time, with functional impairment mapped to severity categories to identify those most likely to require state support. Individuals with more severe disability following a stroke were assumed to have a higher likelihood of qualifying for disability-related benefits.

Fiscal impacts were estimated by combining the eligible claimant population with representative cost profiles that reflect both direct welfare payments and, for working-age individuals, indirect effects on tax revenues. For the working-age population, the framework captured reduced labour market participation alongside benefit receipt, incorporating forgone income tax and social contributions as well as disability- and incapacity-related payments. For those above pension age, estimates focused on disability-related transfers, reflecting more limited labour market participation. Eligibility was distinguished from actual receipt through the application of incomplete uptake assumptions, recognising incomplete take-up of benefits in practice. Costs were aggregated across population groups and projected annually over the analysis period, with trends assumed to be driven primarily by changes in stroke prevalence and the number of individuals experiencing severe disability, rather than by changes in policy or behaviour which are not modelled.

3.1.5 Future costs of stroke

The estimation of future stroke-related costs was based on projections of stroke cases in the United Kingdom over the period 2025–2035, combining administrative data on stroke activity with demographic forecasts and evidence-based assumptions on age-specific disease patterns. Projections of new stroke cases (incident cases) were derived by applying age- and sex-specific incidence rates from recent national datasets to population projections, with growth largely driven by demographic change, particularly population ageing, under a potentially conservative assumption of stable underlying incidence rates. Projections of the total size of the stroke patient population (prevalent population) are similarly based on population forecasts but incorporate additional age-specific growth rates in prevalence, especially among older groups, reflecting improved survival and the cumulative increase in individuals living with stroke.

3.2. Pathway model methods for the first-year post-stroke

3.2.1. Modelling approach for the first-year post-stroke

This analysis builds on established modelling frameworks previously developed for England, most notably the National Guideline Centre (NGC) model[28], while drawing more extensively on the refinements introduced by Patel (2020)[1]. The updated approach therefore keeps the individual-level, pathway-based approach of the earlier work, but applies more recent evidence to reflect current practice, including advances in stroke care, post-discharge service areas and cost data.

As with prior studies, the analysis applies a discrete event simulation (DES) framework. A DES approach models the experience of individual patients continuously over time. The model does this by explicitly simulating the time to relevant events such as hospital admission, discharge, stroke recurrence and death. Rather than relying on fixed time cycles or transition probabilities between predefined health states, the DES adopts a "next-event" approach. This structure allows for a flexible and realistic representation of the stroke care pathway, that includes variation in lengths of stay across different care settings and the influence of prior events on subsequent outcomes.

Within this framework, individual simulated patients, parameterised using real-world patient characteristics, enter the model at the point stroke occurs and progress through a sequence of treatment settings that span first-year post-stroke hospital care, inpatient rehabilitation, community-based services and long-term social care. Baseline patient characteristics that include age, sex, stroke type and severity are considered to reflect observed population features, generating a varied simulated patient group. These characteristics influence both the simulated pathways patients follow and the likelihood and timing of subsequent events. Considering the influence of patient characteristics allows the model to capture the between-patient differences in prognosis and patterns of care observed in practice.

As patients move through the simulated pathway, costs build up at the individual level based on resource use, which is linked either to the amount of time spent within each treatment setting or to individual periods of care, depending on the available data and costing approach used for each service. Unit costs are applied to these resource use inputs (patient resource use) to estimate the total cost as a consequence of each patient's care trajectory. These costs are then aggregated over the large number of simulated individuals to produce mean per-patient cost estimates and total costs at the population level.

The approach also distinguishes between the costs in the first-year post-stroke and costs associated with the ongoing needs of stroke survivors in subsequent years. First-year post-stroke costs are calculated based on resource use within the first 12 months following stroke onset. This feature allows the model to reflect first-year post-stroke care pathway and early rehabilitation periods. In contrast, ongoing costs in subsequent years capture the continuing care and support needs of individuals living with stroke beyond the first 12 months. These are approximated using costs representing long-term service use among stroke survivors, and are adjusted to consider survival over time.

3.2.2. Overview of the treatment pathway for stroke patients in the first-year

The treatment pathway for stroke in the first-year is illustrated in **Figure 1**. The pathway reflects the sequences of care that may be experienced by patients following stroke in the UK and provides the structural basis for the discrete event simulation.

Patients enter the model at the point of stroke onset and are assumed to present to an acute hospital setting via ambulance conveyance or non-ambulance routes. All patients undergoing urgent diagnostic imaging (CT or MRI scan) to confirm stroke type (ischaemic or haemorrhagic) and guide treatment decisions. Ischaemic stroke is caused by occlusion of an artery supplying blood to the brain, while haemorrhagic stroke results from rupture of a cerebral blood vessel and subsequent bleeding within or around the brain. These subtypes differ in their underlying pathology, treatment pathways and associated healthcare resource use. A patient's initial stroke severity is also identified at this stage, measured using the National Institutes of Health Stroke Scale (NIHSS). This is a standardised tool used to quantify the neurological impairment caused by stroke and to support subsequent years post-stroke care planning. The scale is composed of 15 items, each scoring a specific neurological function on an ordinal scale (typically 0–4). For each item, a score of 0 indicates normal function, while higher scores represent higher levels of impairment [30].

Following imaging, patients are directed to either a general medical ward (GMW) or an acute stroke unit (ASU), depending on local service configuration and capacity constraints. Patients admitted to the ASU receive specialist first-year post-stroke management. At this stage, individuals with ischaemic stroke may receive reperfusion therapies, specifically intravenous thrombolysis and/or mechanical thrombectomy, subject to clinical eligibility and time since symptom onset. While both treatments aim to restore blood flow, they act through different mechanisms and are often used together where clinically appropriate[31].

- Thrombolysis uses clot-dissolving medication to restore blood flow in patients with an ischaemic stroke, typically administered soon after symptom onset [32].
- Mechanical Thrombectomy is a procedure in which a clot is physically removed from a blocked cerebral artery using a catheter [33]. This is a newer, more specialised procedure, often used alongside or instead of thrombolysis if a large vessel occlusion is present.

These treatments aim to restore cerebral blood flow and improve functional outcomes and therefore represent a key determinant of downstream patient trajectories within the model. Post-reperfusion therapy NIHSS scores were then used to infer modified Rankin scale (mRS) scores, as the mRS is a measure of long-term global disability and independence in daily activities for people following stroke [34](lower scores indicate lower disability). Patients not eligible for these interventions proceed without reperfusion therapy. Resource use within the ASU is modelled on a per-day basis, reflecting intensity of acute care. People with haemorrhagic stroke were assumed to have longer hospital stays than those with ischaemic stroke, reflecting the greater severity and complexity of care typically associated with this stroke subtype. A proportion of patients are assumed to initially be admitted to a GMW, typically due to stroke unit capacity constraints. These patients do not receive thrombolysis within the model and are assumed to transfer to a stroke unit (SU) following initial stabilisation. Consistent with the short duration of stay and limited data, no health state transitions are modelled within the GMW phase beyond transfer to SU.

The stroke unit (SU) represents the main inpatient rehabilitation phase. Length of stay and outcomes at this stage are influenced by patient characteristics and prior treatment (e.g. thrombolysis, thrombectomy, or neither). From SU, patients are discharged to a range of post-acute pathways, which drive long-term costs and outcomes. Post-discharge care pathways include:

- Early Supported Discharge (ESD), providing intensive rehabilitation in the patient's home as a substitute for inpatient care;
- Community Rehabilitation Teams (CRT), delivering long-term, lower-intensity rehabilitation in community settings;
- Combined ESD/CRT services, representing integrated pathways that provide coordinated early and ongoing rehabilitation;
- Direct discharge to own home (with or without ongoing support) or to a care home

For ESD, CRT, and combined services, costs are applied on a per-episode basis, reflecting service delivery structures. Patients discharged to home or care home may continue to incur ongoing resource use, including primary care, social care, and home care support, as described in **Table 1**. Following discharge, patients face risks of stroke recurrence and mortality. Recurrence events are modelled by returning individuals to the start of the acute pathway, allowing the model to capture repeated cycles of care and associated costs over time. Mortality can occur at multiple points along the pathway, reflecting both acute and long-term risks.

Overall, this structure enables the model to capture the full continuum of stroke care, from acute treatment through rehabilitation and long-term management, while allowing patient characteristics and prior events to influence subsequent outcomes and resource use in a clinically plausible way.

3.2.3. Key data sources

The model is informed by a combination of national audit data, bespoke analyses, and published evidence to ensure that both current service delivery patterns and patient heterogeneity are appropriately captured. The primary source of pathway-level data is the Sentinel Stroke National Audit Programme (SSNAP) [35], which is a national healthcare quality improvement programme that measures and reports on the quality of stroke care across the NHS in England, Wales and Northern Ireland. SSNAP audits stroke services against evidence-based standards derived from the 2023 National Clinical Guideline for Stroke[14] and provides timely information to clinicians, commissioners, patients and the public to support service improvement. The programme is delivered by King's College London and overseen by a multidisciplinary governance structure involving clinical and patient representatives. SSNAP is the principal source of routinely collected stroke audit data across England, Wales and Northern Ireland.

SSNAP comprises two complementary components:

- SSNAP Clinical Audit: A continuous, prospective audit of stroke care provided in both inpatient and community settings. The audit collects patient-level data on processes of care, rehabilitation, outcomes and follow-up, including six-month outcome assessments where available. Results are reported for both inpatient and community stroke services and enable benchmarking of care quality against national standards. The clinical audit has comprehensive participation from stroke services across England, Wales and Northern Ireland.

- SSNAP Organisational Audits: Periodic audits that assess the organisation, staffing, service configuration and resources available within stroke services. These include separate audits of acute hospital stroke services and community stroke services, providing a national overview of service capacity and compliance with recommended standards of care [36]

To capture the impact of stroke across the whole of the UK, the SSNAP data were supplemented with data from the Scottish Stroke Care Audit (SSCA)[20]. The SSCA is Scotland's national stroke audit and collects information on stroke admissions, patient characteristics, processes of care and outcomes across Scottish stroke services. Unlike SSNAP, however, the SSCA provides a more limited range of publicly available analyses and does not offer the same breadth of routinely reported patient-level and community rehabilitation data. SSNAP data were therefore used wherever possible to inform pathway-level modelling assumptions, with SSCA data incorporated to ensure that estimates reflected the full UK population.

Publicly reported SSNAP clinical audit data for 2024/25[37] were used to inform overall activity levels, including total incident stroke volumes, treatment rates (e.g. thrombolysis and thrombectomy), discharge routes, and overall mortality. However, these outputs provide limited breakdown by age, sex, and stroke severity.

To address this, SSNAP data were supplemented with bespoke analyses using 2023/24 patient-level data[38], which provide more granular distributions across key patient characteristics. In particular, these data inform:

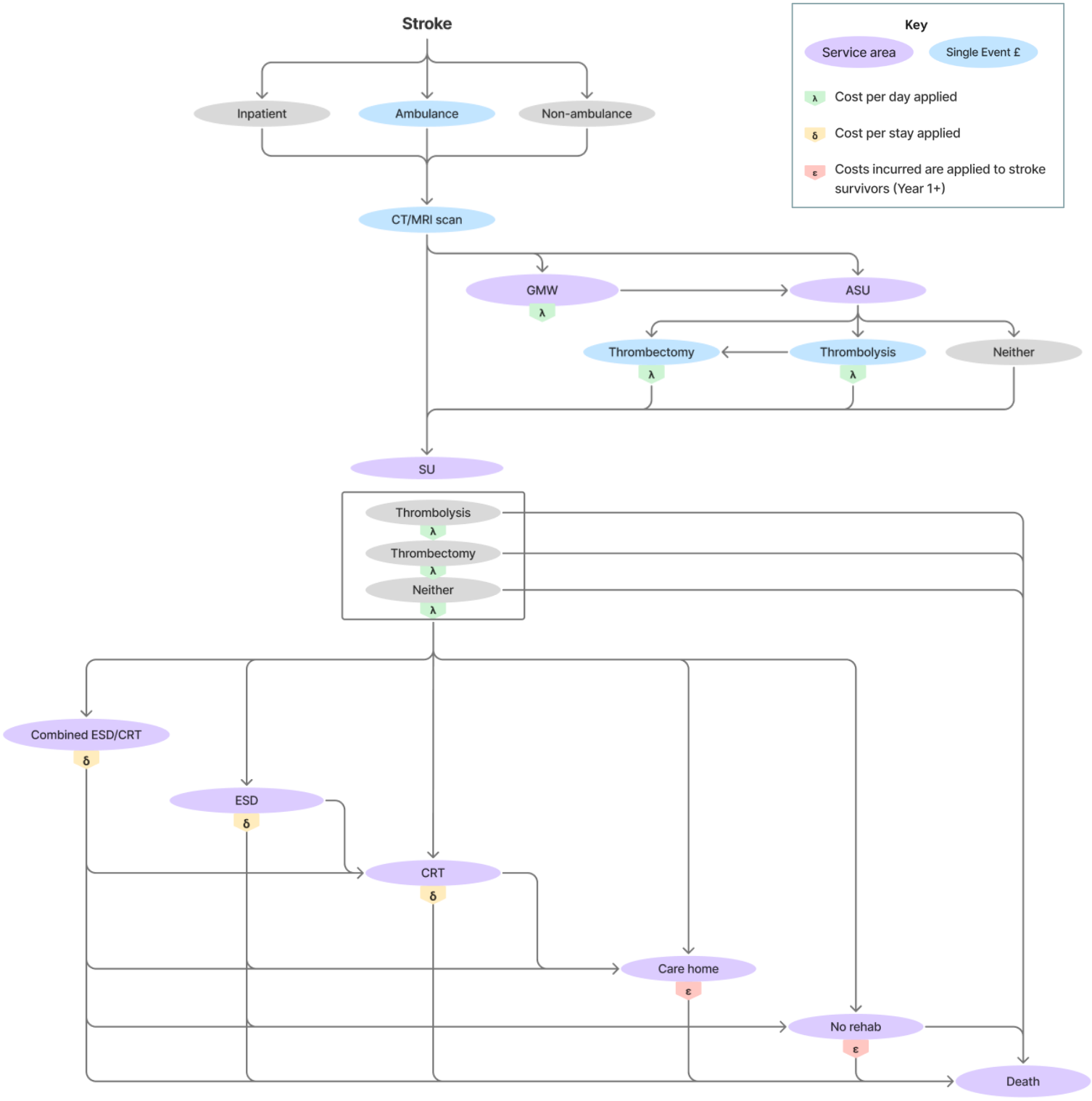
- age- and sex-specific incidence characteristics;
- distribution of stroke severity using NIHSS;
- proportion of ischaemic and haemorrhagic stroke; and
- discharge destinations and post-discharge transitions stratified by age and functional status (mRS).

SSNAP data are also the primary source for modelling discharge pathways following inpatient care. Data from the 2024/25 national clinical audit were used to estimate total discharges and aggregate pathway proportions, while 2023/24 data were used to derive detailed distributions of discharge destination. All patients recorded within the relevant time periods were included.

A limitation of the available data is that 2023/24 discharge distributions were only reported for patients discharged to 'ESD or CRT' combined categories. To address this, these proportions were reweighted using aggregate pathway-level proportions for ESD, CRT and combined ESD/CRT services to produce a more representative distribution of post-discharge pathways within the model.

Additional evidence sources were used where SSNAP data alone were insufficient. Length of stay in acute settings draws on both SSNAP data and earlier modelling work developed by the National Guideline Centre[28]. Mortality and recurrence risks are informed by published cohort studies [39]. Costs were largely based on national unit cost collections, including the NHS National Cost Collection and PSSRU [40,41], supplemented by micro-costing evidence (e.g. Byrne, 2022 [42]), and resource use from the previous model by Patel 2020[28]. See **Table 1, Table 15** and **Table 16** for all data requirements and unit costs associated with each treatment service across the acute stroke pathway.

Figure 1: Flow of patients through the treatment pathway model for stroke patients in the first-year post-stroke



Abbreviations: ASU: Acute stroke unit; CT: Computed Tomography; ESD: Early Supported Discharge; CRT: Community rehabilitation team; SU: Stroke Unit Inpatient Care; GMW: General Medical Ward; MRI: Magnetic Resonance Imaging.

Table 1: Data inputs by treatment unit included in the pathway model

Treatment unit	Length of stay	Mortality	Potential next destinations	Resource use	Other inputs
Acute stroke unit (ASU) and thrombolysis and thrombectomy	Generalised Linear Model (GLM) with family of gamma and log link: • Age • Sex • Thrombolysed patients – NIHSS after thrombolysis • Non-thrombolysed patients – NIHSS when admitted to hospital • Discharge destination	Mortality probability in ASU was dependent on age group and mRS. Mortality differed between thrombolysed and non-thrombolysed patients. All causes mortality was used for both groups.	SU, ESD, CRT, Combined ESD/CRT, own home or care home.	Reperfusion therapy and acute stroke unit stay.	Thrombolysed patients: mRS when leaving ASU was dependent on NIHSS 24 hours after thrombolysis and age group. Non-thrombolysed patients: mRS when leaving ASU was dependent on NIHSS when admitted to hospital. Thrombectomy patients: Non-thrombolysed mRS scores were adjusted using estimates from Badhiwala (2015)[43].
General medical wards (GMW)	Fixed average LOS.	No mortality in the model. SSNAP only collected data for patients who entered stroke units and period is typically short.	ASU	GMW stay	Proportion that were admitted to GMW (rather than ASU) after brain scan. No health state change involved in GMW was due to the lack of data and relatively short period of time in GMW.
Stroke unit (SU)	Dependent on whether patients received thrombectomy, thrombolysis or neither.	Dependent on age and mRS on arrival at SU.	ESD, CRT, Combined ESD/CRT, own home or care home.	SU cost per day	Daily rehabilitation costs were estimated using a weighted average from Oct-Dec 2025 SSNAP country portfolio results[37]. Daily rehabilitation costs were estimated using a weighted average from Oct-Dec 2025 SSNAP country portfolio results.[37]
ESD	No LOS applied as service is assigned a cost per episode.	Dependent on age and mRS at arrival at ESD	CRT, own home or care home	Cost per stay	Reweighting from 'ESD or CRT' discharge distributions dependent to aggregate proportions.
Combined ESD/CRT		Dependent on age and mRS at arrival at ESD/CRT			
CRT		Dependent on age and mRS at arrival at CRT	Own home or care home.		
Discharged to own home or care home	LOS at own home/care home after discharge is determined by a discrete event algorithm.	Survival curve is dependent on age, sex, mRS at discharge and stroke type (Cox regression).	Patients might have stroke recurrence after discharge. Due to limited data to model recurrent at any stage recurrence is only considered here. This is aligned with previous stroke models.	GP visits, care home (if newly admitted), home care (usage by age and mRS) and SSDV	Proportion of patients discharged to own home or care home. No health state change after discharge (unless patients have a recurrence).
Stroke recurrence	Same pathway as first stroke (dependent on age and severity)	Same pathway as first stroke	Same pathway as first stroke.	Same pathway as first stroke	Recurrence rate and severity from Flach (2020)[39]. Measure independent from age and previous severity.

Abbreviations: ASU: Acute stroke unit; CRT: Community rehabilitation team; ESD: Early supported discharge; GLM: Generalised linear model; GMW: General medical wards; GP: General Practitioner; LOS: Length of stay; mRS: modified Rankin Scale; NIHSS: National Institutes of Health Stroke Scale; SLSR: South London Stroke Registry; SSDV: Social service day visit; SSNAP: Sentinel Stroke National Audit Programme; SU: Stroke unit.

3.2.4. Incident stroke population

The incident stroke population (i.e. representing new stroke cases) was modelled using an updated approach based on recent national audit datasets. Baseline incidence rates were derived from the most recent (2024/25) available Sentinel Stroke National Audit Programme (SSNAP) and Scottish Stroke Care Audit (SSCA) data, which provide comprehensive coverage of hospital-admitted stroke cases across England, Wales, Northern Ireland, and Scotland[20,37]. SSNAP data from 2023/24 requested for this analysis[38] provided detailed age- and sex-specific rates, which were then reweighted to the combined total of UK cases and national totals for each UK nation. As the model used inputs from 2025/26 databases, ONS projections[44] were applied to ensure that all populations from 2024 were adjusted to reflect 2025 as the base year. These estimates produced a 2025 incident stroke population of 105,490, which was applied across the pathway model as well as the wider societal and fiscal models explored in later sections. See **Table 2** for estimates of acute stroke cases by age, sex and country.

Table 2: 2025 Incident stroke population by age, sex and UK nation

Age	Female					Male				
	UK	England	Scotland	Wales	Northern Ireland	UK	England	Scotland	Wales	Northern Ireland
16-39	786	630	86	45	25	919	736	100	53	29
40-64	10,525	8,433	1,149	606	338	12,305	9,860	1,343	708	395
65-74	10,230	8,196	1,116	589	328	11,960	9,583	1,305	688	384
75-84	15,478	12,401	1,689	891	497	18,097	14,500	1,975	1,042	581
85-109	11,612	9,304	1,267	668	373	13,578	10,879	1,482	781	436
Total	48,630	38,964	5,307	2,799	1,560	56,860	45,558	6,205	3,273	1,824

Abbreviations: UK: United Kingdom

SSNAP data also provided the distribution of acute stroke cases by stroke type and severity. Stroke type was classified as either ischaemic stroke, caused by the blockage of an artery, or haemorrhagic stroke, caused by the rupture of a blood vessel. Stroke severity was measured using the National Institutes of Health Stroke Scale (NIHSS), which assesses neurological impairment across domains including consciousness, language, sensory function, and motor function, with higher scores indicating greater severity of impairment. **Table 3** demonstrates the acute stroke cases reported by stroke severity (NIHSS score), stroke type, and UK nation.

Table 3: 2025 UK Incident stroke population by severity, type and UK nation

Subgroup		UK	England	Scotland	Wales	NI
Stroke severity*	Mild	53,370	42,762	5,824	3,072	1,712
	Moderate	36,355	29,129	3,968	2,092	1,166
	Severe	15,765	12,631	1,720	907	506
Stroke type	Haemorrhagic	14,145	11,333	1,544	814	454
	Ischaemic	91,345	73,189	9,969	5,257	2,930

Abbreviations: NIHSS: National Institutes of Health Stroke Scale.
*Stroke severity was classified as either mild (NIHSS 0–4) moderate (NIHSS 5–15) or severe (NIHSS 16–42).

3.2.5. Inpatient services

3.2.5.1. Patient transport

The cost of the ambulance service was included for patients arriving at hospital by ambulance, based on PSSRU 2024[40] data inflated to 2025 prices[45]. The analysis assumed that 73.2% of all patients arrived via ambulance, based on 2025 SSNAP data[37].

3.2.5.2. Brain imaging

Two imaging modalities are included in the analysis: computed tomography (CT) and magnetic resonance imaging (MRI). In line with the National Clinical Guideline for Stroke[14], all patients are assumed to undergo brain imaging following admission, with imaging undertaken within 1 hour for those with urgent indications and within 12 hours for all other patients. Following diagnostic imaging, patients are allocated either to an acute stroke unit (ASU) or a general medical ward (GMW). Time in the model is measured from admission to the ASU or GMW, at which point the patient's care pathway begins.

Table 4: Brain imaging assumptions

Assumptions	Explanation
100% of patients receive brain imaging during their hospital stay	2025 SSNAP data reported that more than 99% of stroke patients receive brain imaging in hospital[37].
The brain imaging scan is 100% accurate	Expert opinion from previous NGC model[28].
96% of patients are undergo CT imaging, with the remaining 4% undergoing MRI imaging	2023/24 SSNAP[38] data were applied as estimates were not available in the 2025 clinical audit.

Abbreviations: CT, computed tomography; MRI, magnetic resonance imaging; NCG, National Guideline Centre; SSNAP, Sentinel Stroke National Audit Programme.

3.2.5.3. Acute stroke unit (ASU) pathways and reperfusion therapies

Within the inpatient component of the model, care is structured into two distinct phases: the acute stroke unit (ASU), where patients receive initial acute management by specialist staff, and the stroke unit (SU), where specialist longer-term care and rehabilitation are delivered. Patients admitted to the ASU with ischaemic stroke may receive reperfusion therapies, including thrombolysis and/or thrombectomy, depending on clinical eligibility. Length of stay in ASU was estimated by fitting a generalised linear model (GLM) developed for the NGC model by patient's age, sex, NIHSS score, discharge destination and thrombolysis status (see NGC Appendix for full details[46]).

Thrombectomy and thrombolysis have different indications and treatment windows:

- Thrombolysis is generally administered within 4.5 hours of symptom onset. While an official lower limit is not strictly defined, it is rarely used for NIHSS scores <4 unless the deficits are highly disabling[47].
- A thrombectomy is typically approved for patients with an NIHSS score ≥ 6. However, evolving guidelines and imaging protocols allow for treatment in lower-severity strokes (NIHSS <6) if the patient has highly disabling symptoms[48].

Transitions from NIHSS to mRS for thrombolysed and non-thrombolysed patients were consistent with the Patel et al (2020) model in lieu of more up-to-date data[46]. Patel et al (2020) did not incorporate thrombectomy and therefore no NIHSS to mRS scores for this population were available for use for this analysis. To account for this limitation, non-thrombolysed transition rates were adjusted using odds ratios from a 2015 meta-analysis[43]. This approach maintains consistency with the underlying modelling framework while allowing the model to capture the impact of thrombectomy as an additional acute intervention. Length of stay (LOS) in the ASU was estimated using a generalised linear model (GLM) developed for the previous NGC model. As the original model only included thrombolysis and no evidence was identified to quantify the independent impact of thrombectomy on ASU LOS, patients receiving thrombectomy were assumed to have the same ASU LOS as thrombolysis patients after adjustment for age, sex, NIHSS score, discharge destination and thrombolysis status. Uncertainty surrounding this assumption, together with uncertainty in thrombectomy and thrombolysis uptake rates and procedure costs, was explored through sensitivity analyses.

Table 5: ASU and reperfusion therapy assumptions

Assumption	Explanation
All patients were assumed to be admitted to ASU.	No data were identified on the proportion of people attending ASU versus directly to SU.
Daily cost in ASU was based on the weighted average of stroke CC codes in 2024/25 NCC data[40].	This approach aligned with previous stroke costing models, with values tested during sensitivity analyses[1,46].

Abbreviations: ASU, Acute Stroke Unit; SU, Stroke Unit; ESD, Early Supported Discharge; CRT, Community Rehabilitation Team; GLM, Generalised Linear Model; LOS, Length of Stay; CC, Currency Code; NCC, National Cost Collection.

Conversely, inpatient stay within the stroke unit was based on data requested from the 2023/24 SSNAP audit[38]. Beyond this time frame, all other services along the inpatient pathway were costed as a 'cost per episode' due to the lack of data surrounding time spent within each service.

Table 6: Length of stay estimates within inpatient care settings

Item	LOS (days)	Source
GMW (days)	2 (fixed)	2013-15 SSNAP as reported in the NGC model appendix[39].
ASU (days)	36.0 (maximum)	2013-15 SSNAP[39] (dependent on age, sex, NIHSS, discharge destination and thrombolysis status). ASU LOS for thrombectomy was assumed to be the same as thrombolysis.
Stroke Unit	**Mean LOS (SD)**	
Thrombectomy	27.70 (36)	2023/24 SSNAP[32]. These were adjusted during sensitivity analyses.
Thrombolysis	17.40 (30:9)	
Neither procedure	17.10 (26.4)	

Abbreviations: LOS: Length of Stay; ASU: Acute Stroke Unit; GMW: General Medical Ward; SSNAP: Sentinel Stroke National Audit Programme; NIHSS: National Institute of Health Stroke Scale.

3.2.5.4. General medical wards admission

A proportion of patients are admitted to a general medical ward (GMW) rather than an ASU when first admitted to a hospital because of a lack of hospital beds in the ASU. Patients admitted to a GMW on hospital arrival were assumed not to receive thrombolysis. The model assumed that all patients placed within the GMW pathway are transferred to an SU.

Due to a lack of available contemporary data on the proportion of patients admitted to GMW and associated costs, it was assumed GMW admissions and costing sources were consistent with Patel et al (2020) previous stroke cost model[1].

Table 7: Assumptions of general medical wards admission

Assumptions	Explanation
No severity changes in GMW	There is no data on how stroke patients' health state will be changed in GMW, nor how patients were treated in GMW could vary from hospital to hospital.
No thrombolysis or thrombectomy available in GMW	General medical wards are typically not equipped for acute hyper-acute stroke interventions.[49]
All patients will be transferred to ASU after GMW	95.4% of patients admitted to stroke unit at some point at the first admitting hospital[37]. For simplicity, we assumed that all are, since the pathway for the remaining patients would be varied and difficult to model.
Fixed LOS on GMW (before transfer to ASU).	Given the small numbers, length of stay by patients' initial severity and age group could not be differentiated, therefore a constant value was used.
Unit cost was estimated using the excess bed day cost to supplement costs of being hospitalised from NHS Payment Scheme 2025/26[50] data.	Unit costs were estimated based on assumptions taken from Patel et al (2020) and NGC (2016) stroke costing models[1,46]

3.2.5.5. Stroke unit inpatient rehabilitation

Stroke unit (SU) inpatient rehabilitation represents the post-acute phase of stroke inpatient care and is considered the "conventional discharge" pathway. Stroke unit length-of-stay data were based on 2023/24 bespoke SSNAP data[38] (see **Table 7**). A cost per day was applied, including an excess bed-day cost from NHS Payment Scheme 2025/26[50], alongside the weighted average median rehabilitation time per day for motor, physical, cognitive and other therapy, derived from the SSNAP portfolio results for October to December 2025[31]. This cost was tested during sensitivity analyses as the advisory group highlighted that stroke rehabilitation services vary across patient populations and services. Following admission to the stroke units, patients could be discharged to ESD or CRT or they might not require further rehabilitation and therefore be discharged to own home or care home.

Table 8: Stroke unit inpatient rehabilitation assumptions

Assumptions	Explanation
Mean length of stay (LOS) in SU inpatient rehabilitation was dependent on reperfusion status and not on patient age or severity.	2023/24 SSNAP[38] data reported mean length of stay (LOS) by treatment group only (thrombectomy, thrombolysis, or neither procedure). Sensitivity analyses were conducted to explore alternative LOS assumptions.
Unit cost was estimated by combining the excess bed day cost of hospitalisation from the NHS Payment Scheme 2025/26[50] with the weighted average median time spent receiving rehabilitation reported in SSNAP.	2023/24 SSNAP[38] data report average rehabilitation activity and duration rather than patient-specific resource use estimates. Therefore, weighted average rehabilitation time and costs were applied, with excess bed-day costs included to account for remaining inpatient stay costs. Sensitivity analyses tested costing assumptions.

3.2.6. Post-inpatient discharge services

Inputs relating to community rehabilitation services were primarily informed by SSNAP clinical audit data and published evidence describing the delivery and costs of ESD, CRT and combined ESD/CRT services. During development of the report, additional SSNAP community rehabilitation data became available, including information on rehabilitation activity and patient outcomes following community stroke services. These data were reviewed to assess whether they could inform the modelling of community rehabilitation pathways. However, incorporating these data would have required material changes to the model framework and the introduction of additional assumptions regarding rehabilitation outcomes and their downstream impact on discharge pathways, resource use and long-term costs. Consequently, the base-case analysis retained the original modelling approach (as per Patel 2020[1]) across all community rehabilitation services to ensure consistency within the model structure.

Given uncertainty regarding some community rehabilitation inputs, sensitivity analyses were undertaken for selected assumptions, including unit costs associated with ESD, CRT and combined ESD/CRT services. Additional sensitivity analysis was undertaken for discharge destinations following combined ESD/CRT, reflecting uncertainty regarding the proportion of patients discharged to care homes from this pathway.

3.2.6.1. Early supported discharge (ESD)

ESD is a service designed to facilitate earlier discharge from an inpatient environment by delivering equivalent rehabilitation interventions in a patient's home. Eligibility within the model was restricted to patients discharged to a private residence, reflecting routine clinical practice whereby ESD is typically offered only to individuals who can be safely supported at home by informal caregivers.

Model inputs were primarily derived from 2024/25 SSNAP data and adjusted using 2023/24 SSNAP data to reflect appropriate discharge destination patterns by age and modified Rankin Scale (mRS). However, important limitations in SSNAP data constrained its direct use for costing. In particular, SSNAP does not report therapy minutes per day for ESD, and reported LOS reflects the overall duration under the service (approximately 36–103 days) rather than the number of days on which therapy is actively delivered (typically 1–6 days).

Due to these limitations, an alternative approach to costing was required. Resource use and cost inputs were informed by the cost-consequence analysis reported in Byrne (2022)[42], which provided a detailed

characterisation of staff time, service delivery, and overall cost structure of six stroke-specific ESD teams (**Table 9**). The weighted average per-patient costs from teams A–F were applied and inflated to 2025 prices to estimate ESD costs in the model. This resulted in a per-patient cost estimate of £2,281, which aligns with values reported in Patel et al (2020) model, which had access to patient-level data. This approach avoids reliance on incomplete SSNAP clinical audit data and offers a more comprehensive and internally consistent basis for estimating costs than earlier modelling approaches.

Table 9: Cost estimates applied from Byrne 2022

ESD delivery teams						
Costs	**A***	**B***	**C**	**D**	**E**	**F**
Overall (£)	£108,777 (£446,679)	£258,333 (£688,261)	£700,424	£383,844	£856,725	£1,679,273
Staff (£)	£106,849 (£427,397)	£243,040 (£660,638)	£666,185	£356,144	£820,334	£1,558,385
Travel (£)	£1,333 (£13,331)	£12,180 (£22,000)	£32,799	£20,000	£40,569	£70,932
Caseload	183 (696)	312 (551)	440	268	509	874

Abbreviations: ESD: Early supported discharge
*A and B services offered both ESD and community rehabilitation, with the costs in parentheses reflecting the combined figures for the whole service.

Table 10: ESD modelling assumptions

Assumptions	Explanation
Patients are all assumed to require the same resource use during their time within ESD.	Patient-level variation in therapy intensity and resource use is not routinely available within the data sources used to inform the model. Alternative service costs were explored through sensitivity analysis.
All patients in ESD programs are living at home.	ESD services are intended for individuals who can be safely supported at home following hospital discharge.
Mortality following discharge was consistent across all post-inpatient rehabilitation services.	Evidence was insufficient to robustly estimate rehabilitation pathway-specific mortality effects.

Abbreviations: ESD: Early supported discharge

3.2.6.2. Combined ESD/CRT

Combined ESD/CRT refers to a single management structure that enables patients to leave hospital sooner and receive intensive, coordinated therapy at home, before continuing to receive long-term rehabilitation if needed. This is a new addition to the stroke model pathway that has been incorporated following the work of the Integrated Community Stroke Service model[18] (ICSS). The ICSS is part of the National Stroke Service model, coordinating transfer of care of stroke survivors from hospital, and providing home-based stroke rehabilitation through a specialist multidisciplinary team structure. While the ICSS model is specific to England, integrated community stroke services and early supported discharge models are established features of stroke care pathways across the UK, making the findings broadly relevant to service delivery in each UK nation. Data on the proportion of patients entering combined ESD/CRT were available from 2024/25 SSNAP annual clinical audit[37], and were used to reweight the same 2023/24 patient characteristic distributions[38] used for ESD and CRT services.

Discharge following receipt of combined ESD/CRT was not readily available from the 2023/24 bespoke SSNAP data, thus six-month data from 2025 SSNAP periodic community portfolio results[37] were applied. This dataset reported discharge destinations by rehabilitation team, in which those labelled 'Combined ESD/CRT' were pooled to generate aggregate proportions for discharge to either own home, care home, CRT or death. However, patient-level age and disability severity (modified Rankin Scale; mRS) distributions were not available for individuals receiving combined ESD/CRT. To allow discharge destinations to vary according to patient characteristics within the model, the aggregate combined ESD/CRT discharge proportions were reweighted using the age- and mRS-specific distributions observed among patients discharged from ESD services in the 2023/24 SSNAP dataset. This approach was considered preferable to applying uniform discharge probabilities to all patients receiving combined ESD/CRT regardless of age or disability severity.

Table 11: ESD/CRT modelling assumptions

Assumption	Explanation
The age- and mRS-specific discharge distributions for combined ESD/CRT patients were estimated by reweighting aggregate combined ESD/CRT discharge destinations using ESD patient distributions.	The patient-level age and disability severity distributions were unavailable for combined ESD/CRT. Aggregate discharge destinations were therefore reweighted using ESD patient distributions rather than assuming identical discharge probabilities for all patients.
Resource use estimates and unit costs were consistent across all patients attending combined ESD/CRT.	Detailed resource use by patient severity and therapy type was unavailable for combined ESD/CRT services. Using sensitivity analyses, alternative cost assumptions were explored.
Mortality following discharge was consistent across all post-inpatient rehabilitation services.	There was insufficient evidence to robustly estimate pathway-specific mortality effects associated with combined ESD/CRT services.

Abbreviations: ESD: Early supported discharge; CRT: Community Rehabilitation Team

Estimating the cost per episode for a combined ESD/CRT service was also challenging because earlier stroke cost models did not include a combined service model and SSNAP does not routinely report service-level costs. Therefore, the latest IPSOS ICSS evaluation data[51] were used to estimate costs. These data were based on three national pilots testing ICSS-style delivery rather than separate ESD and CRT services. A weighted average from two representative teams was applied to estimate a typical cost per combined ESD/CRT episode. Given uncertainty regarding the appropriate unit cost for combined ESD/CRT services, alternative cost assumptions were explored through sensitivity analyses using estimates from Bryne 2022[42].

3.2.6.3. Community rehabilitation

Community Rehabilitation Teams (CRT) provide a range of therapies designed to help survivors regain lost skills, maximise independence, and adapt to life at home after a stroke. It shifts the focus from hospital-based care to the patient's residence or local community. Compared to ESD, it is more likely to be delivered over a long time and is less intensive.

Costs associated with CRT were identified as one of the main sources of uncertainty for the first-year post-stroke from an NHS perspective in the Patel (2020) analysis[1]. As with ESD, however, resource use associated with CRT is not sufficiently captured within SSNAP. The same top-down costing approach from Byrne (2022) was therefore applied [42.] Removing the ESD-specific costs and caseloads from the combined teams in **Table 10** (A and B) resulted in £1,021 per CRT episode (£1,511 in 2025 prices[45]).

The cost structure includes whole time equivalent units by staff type and NHS salary band, alongside information on team meetings and training opportunities, variations in rurality and associated travel/time costs (See **Table 12** below). This represents an improvement on previous cost estimates from Patel et al (2020), which assumed a course of community rehabilitation cost £2,833, based on PSSRU 2014[52] (£3,889 in 2025 prices[45]). The 2014 cost had also been inflated from a 2005 study that costed a recuperative care facility that had an average LOS of 33 nights[53]. This unit cost therefore includes many costs not related to stroke-specific community rehabilitation programs that occur in community centres for outpatients. Adjustments to the unit cost were applied during sensitivity analyses.

Patients receiving CRT were assumed to transfer only to their own home, a care home or death as only a negligible proportion in SSNAP were reported to transfer to another CRT or ESD service. Due to insufficient care home data for this analysis, CRT was also assumed to only occur at home.

Table 12: Components of the CRT cost structure included in Byrne 2022

MDT composition by WTE	Training	MDT weekly meetings	Geography
• Doctors • OT/ PT/ SLT (grades 5-7) • Nurses • Clinical psychologists • Social workers • Assistant practitioners (grade 4) • Rehabilitation assistants (grade 3) • Clinical support workers (grade 2) • Dieticians • Administration • Manager	• Nurses • Therapists • Rehabilitation assistants	• Core team attendance • ESD member attends acute meeting • Weekly service >5 days	• Travel costs • Rurality score

Abbreviations: MDT: Multi-disciplinary Team; WTE: Whole-Time Equivalent; CRT: Community Rehabilitation Team; OT: Occupational Therapy; PT: Physical Therapy; SLT: Speech and Language Therapy; ESD: Early Supported Discharge

Table 13: CRT modelling assumptions

Assumptions	Explanation
Patients were assumed to require the same resource use during their time within CRT.	Variation in patient-level therapy intensity and resource use was not available within the model inputs. Alternative service costs were explored through sensitivity analysis.
All patients in CRT programs are living at home.	Patients' location data during CRT (own home versus care home) was unavailable.
CRT patients were assumed to transfer only to their own home, a care home or death.	Transfers between community rehabilitation pathways were uncommon within available SSNAP data.
Mortality was assumed to be the same as those discharged to own home or care home.	Compared to ESD, it is more likely to be over a long time but is less intensive. In our model, we assumed CRT patients would be treated in their own home or within a care home.

Abbreviations: CRT: Community Rehabilitation Team; ESD: Early Supported Discharge; SSNAP, Sentinel Stroke National Audit Programme.

3.2.7. Discharged to own home or care home

Patients were categorised as 'Discharged to own home or care home' once all treatment and rehabilitation procedures were completed. The proportion of patients discharged to own home or care home was obtained from 2024/25 SSNAP and used to reweight age- and mRS-specific discharges reported from 2023/24 SSNAP requested data[38]. Following discharge and completion of any ESD/CRT programme, patients were assumed to receive post-discharge health and social care services, including GP visits, home care and social services day visits (SSDVs). SSDVs refer to attendance at local authority-funded day care or day centre services that provide social support, supervision, recreational activities and community-based care for people living with the long-term consequences of stroke[52]. Unlike home care, which is delivered in an individual's home, SSDVs are provided in a community setting and are intended to support independence and social participation.

For modelling purposes, social care service costs were assumed to be funded by local authorities. However, it is recognised that some individuals fund part or all of their social care directly, and the balance between public and private funding varies between individuals and care settings. This has important implications for affordability, access to care and inequalities in outcomes. Robust evidence on the proportion of stroke-related social care costs met through self-funding was not identified. Consequently, the analysis focuses on estimating the total social care costs associated with stroke, rather than the distribution of those costs between individuals and local authorities.

Resource use associated with discharge to own home or care home was estimated using published evidence and SSLR data. The number of stroke survivors living in care homes was informed by a UK prospective study[47]. Resource use associated with discharge to own home or care home was taken from Patel et al. (2020) and Xu et al. (2018), as more recent evidence was not identified. This included long-term GP visits (14.1 visits per year) and SSDVs (1.52 visits per year), based on mean utilisation

reported for all stroke survivors in SLSR data[28]. Annual costs associated with home care were determined according to patient age and mRS (**Table 16**).

Table 14: Assumptions applied to those discharged to own home or care home

Assumptions	Explanation
NHS costs	
It was assumed that health state (mRS) does not change after the patient is discharged (unless they have a stroke recurrence).	There was a lack of data on patient's health state or severity changes after discharge. mRS may change due to many reasons post discharge including those which are non-stroke related, accounting for all possible reasons is not feasible from a modelling perspective.
It was assumed that people discharged to their own home or care home stay in the same setting until death or stroke recurrence.	No data were identified to inform the proportion of patients that move between home and care home.
Patients in a care home do not require home care and social day centre services.	These services are generally provided to people who live in their own home.
NHS resource use	
All patients discharged to own home or care home were assumed to require 14.1 GP visits per year.	Frequency of GP visits is from SLSR*; the mean number for all stroke patients was used.
Social care resource use	
Care home cost per day is assumed to be the same across all patients.	Published literature was not available for post-stroke care home costs by patient characteristics.
Mean annual number of home care visits per patient were estimated by age group and mRS - see **Table 16.** People aged 16-39 were assumed to not incur home care costs.	Based on SLSR survey data[a] collected 3 months post-discharge[b]. No data were available for those aged 16-39 or stratified by sex or stroke type.
All patients discharged to own home or care home were assumed to have 1.5 social services day centre visits per year.	SLSR[a] survey data reported the mean annual visits reported across all stroke patients[b]. Data were not available for the frequency of visits dependent on patient characteristics.

Abbreviations: SLSR: South London Stroke Registry; NHS: National Health Service; GP: General Practitioner; SSNAP: Sentinel Stroke National Audit Programme.
a) Reported in the NGC model[28] but source not referenced.
b) Total annual cost was tested during sensitivity analyses.

3.2.8. Unit costs

All unit costs included in the pathway model are outlined in **Table 15** and **Table 16** NHS costs were primarily based on UK 2024 National Cost Collection data[40] while social care costs were taken from 2024 from the 2024 PSSRU Unit Costs of Health and Social Care report[41], unless otherwise specified.

Table 15: NHS and social care unit costs

Cost Item*	Unit cost**	Data Sources
Ambulance	£272	PSSRU 2024 Table 6.1.1[40]
CT	£118	NCC 2024/5 HRG RD20A[40]
MRI	£194	NCC 2024/5 HRG RD01A[40]
Thrombolysis	£1,757	NCC 2024/5 HRG YR23A-B (day-case)[40]
Thrombectomy	£4,982	NCC 2024/5 DEV34 (Mechanical Thrombectomy Stent Retrievers and Clot Retrievers)[40]
ASU per day	£1,075	NCC 2024/5 HRG AA35A-F (average cost per day of short-stay) [46]
GMW per day	£301	NHS Payment Scheme 2025/26 for HRGs AA35A–AA35F[46] (Per day long stay payment for days exceeding trim point). Assumed to be two days based on previous model estimates [30].

Cost Item*	Unit cost**	Data Sources
Stroke unit per day	£346	£301 (excess bed day cost) plus weighted average of rehabilitation time as reported in SSNAP's periodic Country Results Portfolio (Oct-Dec 2025)[29]
ESD cost per stay	£2,281	Byrne 2022[42] (£1,542), inflated to 2025/26 prices.
Community rehabilitation per patient referred	£1,511	Byrne 2022 [42] (£1,021), estimated using ESD and CRT combined teams and inflated to 2025/26 prices.
Combined ESD/CRT cost per stay	£10,575	IPSOS 2024 data [51], drawn from three national pilots of an ICSS-style integrated service model, were used to estimate the cost of a combined ESD/CRT episode. Costs were calculated using a weighted average across two representative pilot teams. As there is limited evidence on the unit cost of integrated ESD/CRT services, alternative assumptions based on Byrne 2022 [42] were explored in sensitivity analyses to test the robustness of the results.
Care home per day	£288	PSSRU 2024 1.3. Establishment cost per permanent resident week was reported (includes A to E) [52].
GP visits	£172	PSSRU 2024[52] Staff cost taken from PSSRU 2014 [53] - 23.4 minutes + 12 minutes travel time.
SSDV	£87	PSSRU 2014 - Local authority day care attendance by older people (average 2.5 times per week). Mean cost per day care attendance by older people (£49)[52]. Later editions of PSSRU costs did not report SSDV and as such, the value from the 2014 edition was inflated to 2025 prices. Average visit frequency per year assumed using SLSR (1.52 visits). Mean number for all stroke patients was used[9].
6-month follow-up	£203.72	Weighted average face-to-face and non-face-to-face outpatient appointment (WF01A-B): NCC 2024/25 - Outpatient Care within a Stroke Medicine Service: Non-consultant-led Non-Admitted Attendance, Follow-up
Home care	Various	Detailed in **Table 16** below.

Abbreviations: GMW: General Medical Ward; ASU: Acute Stroke Unit; ESD: Early Supported Discharge; CRT: Community Rehabilitation Team; SSDV: Social Service Day visit; NCC: National Cost Collection; SLSR: South London Stroke Registry; PSSRU: Personal Social Services Research Unit; GP: General Practitioner; NHS: National Health Service; MRI: Magnetic Resonance Imaging; CT: Computed Tomography; SSNAP: Sentinel Stroke National Audit Programme
*Meals on wheels were removed from the updated 2025 model as provision has significantly declined since 2015[55].
**All costs were inflated to 2025/26 prices using PSSRU 2024 inflation indices calculator assuming a constant inflation rate from years 2023 to 2025[45].

The model applies home care costs for people living in their own home, depending on their age group and mRS score. Costs were estimated based on an assumed number of hours of community care received, with the number of hours increasing as age and mRS score increases. Data on the proportion of patients receiving community care packages was sourced from SLSR data reported in the NGC model[28].

Table 16: Home care costs for people living in their own home

Age group	mRS	Unit cost* (weekly)	Proportion of patients who used the service [d]	Yearly cost (£)
40-74	1	£37[a]	10.30%	£333
	2	£148[b]	14.30%	£1,848
	3	£370[c]	20.00%	£6,461
	4		44.40%	£14,343
	5		0.00%	£14,343
75-100	1	£37[a]	25.00%	£808
	2	£148[b]	20.00%	£2,584
	3	£370[c]	58.30%	£18,833
	4		57.10%	£18,445

Age group	mRS	Unit cost* (weekly)	Proportion of patients who used the service [d]	Yearly cost (£)
	5		50.00%	£16,152

Abbreviations: SLSR: South London stroke registry; PSSRU: personal social services unit costs; mRS: Modified Rankin Scale*Unit costs from PSSRU 2014 Section 8.1 Community care packages - older people received either: a) 1 hour, b) 4 hours, c) 10 hours of home care per week, d) NGC model applied SLSR survey data 3 months after discharge (reference not reported)[28].

3.2.9. Stroke recurrence and mortality

For acute stroke patients discharged to own home or care home, survival and recurrence were modelled using an individual-level, continuous-time time-to-event framework. This approach builds on the structure of the original NGC model[28] but introduces updated parameterisation and estimation methods. In the original model, survival was estimated using Cox proportional hazards models with baseline survival derived from South London Stroke Register (SLSR) data, and recurrence was represented using discrete-time probabilities that depended only on stroke type.

For this analysis, estimates reported by Flach 2020[39] were used to model the risk of stroke recurrence and death after stroke. This analysis provided data on the cumulative proportion of patients who experienced either a recurrent stroke or death at 3 months and 1 year follow-up. These data were used to estimate the timing of recurrence and mortality events over the first 12 months for discharged patients in the incident population. Recurrence and death were modelled as competing outcomes, meaning that once one event occurred, the other could not occur first.

This analysis also used an age-dependent variation in both recurrence and mortality risk. Hazard ratios by age group were applied multiplicatively to the baseline hazards for recurrence and death, allowing risks to vary across patient subgroups (**Table 17** for details). This represents an important extension of the Patel et al (2020) model, in which recurrence was assumed to depend only on stroke type and was independent of patient characteristics. Despite this enhancement, recurrence remains independent of functional status at discharge and other clinical risk factors, reflecting limitations in the available data and maintaining consistency with simplifying assumptions in the original framework.

Consistent with the NGC model, patients who experience a recurrent stroke are assumed to re-enter the acute stroke pathway and proceed through the same sequence of health states, outcomes, and resource use as patients experiencing a first-ever stroke. The model therefore preserves the recursive pathway structure of the original analysis while updating the way in which event timing is generated.

Several assumptions underpin the current approach. The Weibull distribution is assumed to adequately represent time to recurrence and death based on calibration to two observed time points. The proportion of recurrence among composite events is assumed to be constant over time. Hazard ratios for age are assumed to act multiplicatively on baseline hazards and to apply independently to recurrence and death. Recurrence is assumed to be independent of functional status and other clinical risk factors beyond age. Finally, the clinical pathway following a recurrent stroke is assumed to be identical to that following an initial stroke.

Table 17: Mortality and recurrence estimate from Flach 2020[39]

Age group	Recurrence HR (95% CI, P Value)	Recurrence or Death HR (95% CI, P Value)
65–74 years vs <65 years	1.47 (1.06–2.04), 0.021	2.47 (2.10–2.90), <0.001
75–84 years vs <65 years	1.85 (1.32–2.60), <0.001	3.53 (3.01–4.16), <0.001
85 years+ vs <65 years	2.52 (1.62–3.93), <0.001	6.74 (5.59–8.13), <0.001

Table 18: Stroke recurrence and mortality assumptions

Assumptions	Explanation
Patient pathway is assumed to be the same for recurrent and first- stroke.	We found no evidence to suggest a different management strategy for patients.
The recurrence rate is not dependent on functional status.	Available evidence did not provide robust estimates of recurrence risk by functional status. Consistent with the original NGC model[25], recurrence risk was therefore assumed to be independent of functional status and other clinical risk factors beyond age.

3.2.10. Prevalent stroke population (stroke survivors)

Current total stroke population estimates were available for each country from their respective health authorities[20,56–59]. However, age- and sex-specific stroke rates were only available for Scotland and Wales. Accordingly, the age-and-sex breakdown of Scottish prevalence rates was rescaled using the total population data and prevalence estimates for England and Northern Ireland to avoid applying a constant prevalence rate across all patient groups for these countries. This approach avoided the application of a uniform prevalence rate across demographic groups where country-specific stratified data were unavailable. See **Table 19** for the population breakdown by age, sex and country.

Table 19: 2025 prevalent stroke population estimates by age, sex and country

Age	Females					Males				
	UK	England	Scotland	Wales	Northern Ireland	UK	England	Scotland	Wales	Northern Ireland
16-39	13,869	11,516	1,431	524	399	13,508	11,178	1,378	557	394
40-44	8,922	7,333	921	392	276	8,386	6,884	869	375	258
45-49	13,069	10,709	1,352	594	414	15,541	12,815	1,609	627	490
50-54	25,215	20,582	2,763	1,095	776	29,084	23,810	3,095	1,277	902
55-59	41,069	33,171	4,755	1,879	1,264	51,305	41,457	5,805	2,473	1,570
60-64	58,283	46,768	7,015	2,707	1,793	76,614	61,619	9,054	3,573	2,368
65-69	70,889	56,622	8,821	3,246	2,199	93,266	74,305	11,368	4,704	2,888
70-74	80,691	64,516	9,715	4,125	2,335	102,975	81,948	12,314	5,579	3,135
75-79	110,330	89,264	12,382	5,781	2,903	127,992	102,976	14,177	7,408	3,430
80-84	104,146	84,116	11,295	5,711	3,024	105,147	85,181	10,791	6,141	3,034
85-89	90,623	73,855	9,712	4,576	2,479	73,670	60,457	7,353	3,898	1,961
90-94	36,578	29,909	3,605	2,110	954	22,223	18,143	2,249	1,301	530
95-100	19,671	16,014	1,890	1,255	513	12,141	9,854	1,241	767	279
100+	682	553	68	44	17	427	341	47	29	10
Total	674,038	544,927	75,725	34,039	19,347	732,279	590,967	81,351	38,710	21,250

Abbreviations: UK: United Kingdom

Estimating long-term care home use among the prevalent stroke population presented a particular challenge owing to limited availability of prevalence data stratified simultaneously by age, sex and disability severity. Recent developments in SSNAP data collection have improved the availability of follow-up information and functional outcome measures, helping to address some of these evidence gaps. Nevertheless, nationally representative estimates of care home residence among prevalent stroke survivors remain limited, particularly when discriminating for only those who were newly institutionalised compared to prior care home residents. Accordingly, the model applied an overall care home prevalence estimate of 6.6%, based on the 10-year results of the Oxford Vascular Study[60] among individuals living with stroke in subsequent years. This estimate was applied uniformly across demographic and severity

groups because sufficiently granular epidemiological data were not available. The impact of this assumption was explored through sensitivity analyses.

Resource-use requirements for people living with stroke beyond the first-year post-event remain poorly characterised within the published literature, particularly by age, sex and disability severity. Consequently, annual resource-use estimates for individuals discharged to their own home or receiving domiciliary care during the first-year after stroke were assumed to apply to the prevalent stroke population in subsequent years.

All unit costs included in the pathway model are outlined in **Table 15** and **Table 16**. NHS costs were primarily based on UK 2024 National Cost Collection data[40] while social care costs were taken from the 2024 PSSRU Unit Costs of Health and Social Care report[61], unless otherwise specified.

At the time of model development, detailed long-term observational evidence describing post-stroke health and social care use beyond the first-year was limited. Ongoing work from the Stroke Longitudinal Research (SLR) programme, including a prospective observational study following stroke survivors for up to 15 years post-stroke (NCT05298436)[62], is expected to provide more robust evidence on long-term care requirements. However, these data were not available for inclusion in the current analysis.

The absence of severity-specific prevalence estimates also limited the ability to characterise the prevalent stroke population by functional status and to estimate long-term resource use separately by disability level. The exception to this was home care costs, which are assumed to not occur for those under 40 based on SLSR data (see **Table 16**).

Table 20: Assumptions applied to the stroke population post-12 months after a stroke

Assumptions	Explanation
Annual health and social care resource use among stroke survivor's post-12 months after a stroke was assumed to be equivalent to resource use observed during the first-year post-stroke for individuals discharged to own home or care home.	Limited data were identified on long-term resource use differences by patient categories. Long-term evidence describing changes in resource use beyond the first-year after stroke is limited. Sensitivity analyses were undertaken to examine the impact of alternative assumptions.
Average annual costs per person could not be differentiated across patient age, sex or severity. Aggregate costs were presented for these groups.	Nationally representative evidence on long-term resource use stratified jointly by demographic characteristics and functional status was not available. Aggregate per-person costs were therefore applied within model subgroups.
It was assumed that 6.6% of the stroke population lived in a care home post-12 months after a stroke.	Detailed age-, sex- and severity-specific estimates of care home residence among stroke survivors were unavailable. The estimate was derived from published evidence[60] and tested in sensitivity analyses.

3.3. Societal cost / broader value analyses

Societal costs were estimated separately from the stroke pathway discrete event simulation. The approach used a quality-of-life-based framework to quantify the wider impacts of stroke across three distinct components: paid productivity losses, unpaid production and informal care provided by family and friends. This approach is grounded in the Wider Societal Impacts (WSI) Framework described in Premji 2024[29] and focuses on estimating the current and future economic consequences of stroke-related to changes in quality of life, rather than solely measuring observed service use or care inputs.

Central to this approach is the use of EQ-5D quality-of-life instrument as a unifying measure to link to net production. Quality-of-life estimates were derived by mapping modified Rankin Scale (mRS) distributions, informed by 2024/25 SSNAP data, to EQ-5D (EuroQol 5-Dimension questionnaire) scores using an equation from Whynes 2013[63] that was previously used in the NGC model[28]. EQ-5D is a widely used measure of health-related quality of life that generates utility values reflecting the impact of health status on an individual's overall wellbeing[64].

The mRS distributions are applied across three key states: 'No stroke' (i.e. pre-stroke values used to reflect the same population assessed if they had never experienced a stroke), first-year post stroke and subsequent years following stroke. For people with stroke , mRS scores distributed by age and sex were available to estimate a weighted average EQ-5D of 0.49[38]. As mRS distribution data for people in the subsequent years post stroke was limited, the model uses the six-month post-stroke distribution as a proxy, resulting in an average EQ-5D score of 0.67 (see **Table 21** for details).

These EQ-5D scores, paired with age and sex were then used to estimate net levels of production and informal care consumption across the 'No Stroke', 'Incident Stroke' and 'Prevalent Stroke' populations over a 10-year time horizon (2025–2035) for individuals aged 16 years and above.

Table 21: Distribution of mRS scores before and after stroke

mRS score	EQ-5D-3L [63]	Before stroke (no stroke)	Six-month follow-up[a]
0	0.93	47%	12%
1	0.85	20%	29%
2	0.71	12%	24%
3	0.55	14%	21%
4	0.28	6%	10%
5	-0.15	1%	4%
Weighted average EQ-5D scores			
No Stroke	0.78		
Subsequent years post-stroke	0.67		
First-year post-stroke	0.49[b]		

a) Six-month mRS scores were assumed to be consistent over time and were applied to the post-stroke population in subsequent years.
b) mRS scores distributed by age and sex were available for incident stroke patients from SSNAP and were used to estimate the weighted average EQ-5D score[38].

Cost estimates for each component were estimated using methodology developed by the WSI framework, described below[29]:

- Productivity impacts were estimated by modelling the relationship between age, quality of life and labour market participation, drawing on evidence from the Understanding Society dataset developed by the School of Health and Related Research (ScHARR)[29]. Individual productivity was defined as the proportion of potential working time spent in employment, adjusted for stroke-related reductions in quality of life. This was combined with age- and sex-specific wage data from the Annual Survey of Hours and Earnings (ASHE)[65], with additional on-costs applied to reflect the full economic value of employment.

- For informal care, linear regression coefficients were developed using data from the Health Outcomes Data Repository (HODaR)[66] to estimate days of informal care used as a function of the patient's age, gender, quality of life and health condition. An average net pay of £18.03 per hour was applied across all populations, based on tax and national insurance data from 2024 ASHE[65]. This approach represents a methodological departure from Patel (2020), which relied on clinical study evidence to estimate average costs per person, using assumptions about care intensity and relatively high imputed wage values for informal care (e.g. time providing personal care assumed to incur an hourly rate of £28 to reflect a professional home care worker[1]).
- Unpaid production is a new addition to societal costs compared to previous models, such as Patel et al (2020) and Xu et al (2018). This component includes time spent doing domestic labour, childcare and informal care provided to friends and family, estimated using data from the Time Use Survey65. Non-linear regression coefficients were used to calculate the number of hours per calendar month of general unpaid labour in full health, by age and gender, for completely healthy patients (those with an EQ-5D of 1), before adjusting downwards to reflect the quality of life of the three populations before multiplying by the same national average hourly cost as informal care.[4]

The societal costs presented in this analysis reflect an evolution in methodological approach relative to earlier models. While the previous framework focused on estimating the total societal burden of stroke, primarily capturing costs associated with morbidity and premature mortality using externally derived unit costs, the current analysis adopts a policy-aligned perspective to estimate the net economic burden. Specifically, this approach integrates health and economic outcomes within a unified framework based on quality of life, capturing how stroke influences individuals' capacity to participate in both paid and unpaid activities. By directly linking health states to economic consequences, the methodology reflects principles consistent with HM Treasury appraisal guidance and broader government evaluation practice[67]. This shift enables a more internally consistent valuation of impacts, avoids reliance on disparate external cost inputs, and supports a clearer interpretation of opportunity costs across the economy. As a result, the analysis provides a more comprehensive and comparable assessment of stroke's wider societal effects, particularly in the context of population health and cross-sector policy decision-making.

Table 22: Assumptions applied to societal analyses

Assumption	Explanation
The economic value of informal care was assumed to be £22.21 per hour.	2025 Annual Survey of Hours and Earnings (ASHE)[65]: average annual gross pay of £38,224, adjusted for income tax and National Insurance contributions to estimate take-home pay, assuming 33.1 hours worked per week.

Abbreviations: ASHE: Annual Survey of Hours and Earnings

3.4. Fiscal costs analysis

This study estimated the fiscal cost of stroke in the United Kingdom (UK), capturing welfare expenditure and forgone employment contributions attributable to stroke-related morbidity. The analysis considered both working-age (16–64 years) and pension-age (65+ years) populations for each UK nation and aggregated to the UK. The analysis generated estimates for a baseline year (2025) with projected fiscal costs to 2035. The total fiscal cost of stroke was calculated by estimating the number of individuals living with a stroke, eligible for welfare benefits, and applying a per-person, per-year fiscal cost.

Assumptions underpinning the fiscal analysis are presented in **Table 23** with further detail provided in subsequent sections.

Table 23: Assumptions applied in the fiscal analysis

Assumptions	Explanation
The cost of loss in income tax and national insurance contributions due to being out of the workforce is applied to 100% of the eligible working age stroke survivors.	This assumption was required as robust data were not available on pre-stroke employment rates, post-stroke labour market participation, return-to-work rates, or partial reductions in earnings among working-age stroke survivors. This is likely to overestimate lost tax and national insurance if some individuals were not employed pre-stroke, return to work, or remain in lower-paid work rather than exiting the workforce entirely.
Uptake rates were applied to the analysis for each welfare benefit type to reflect less than perfect uptake of benefits.	This reflects evidence that not all eligible individuals claim the benefits to which they are entitled, due to under-claiming, administrative barriers, lack of awareness, or delays in claiming.
The proportions applied for mRS distribution across the prevalent population are assumed to align with the disability groupings used in the Crichton et al publication, such that 'moderate disability' and 'severe disability' were assumed to align with mRS 4 and mRS 5 respectively.	This mapping was required because the source publication did not report disability directly in the same categories needed for the model. The mapping was judged to be the closest available approximation for estimating the prevalent cohort eligible under the analysis.
The Crichton et al population reports mRS distribution derived from a median age of stroke onset of 58 years old. This distribution is assumed to be applicable in the working age and pension age population for mRS 4 and 5 to estimate the eligible prevalent cohort.	This assumption was necessary because age-stratified prevalence data by mRS severity were not available in a form suitable for the model.
It is assumed that patient mRS status does not vary over time.	This simplifying assumption reflects the static structure of the model and the lack of longitudinal transition data within the current analysis framework.
For costs in the first-year following stroke, the proportion of patients with mRS scores of 4 and 5 are taken from the distribution in the pathway model.	This assumption was necessary because severity distributions for the younger adult population were not available from the same data source.
A conservative approach was adopted of assuming 100% of those with mRS 4 and 5 would be eligible to claim. The analysis did not consider those with an mRS score of 3.	It is acknowledged that a proportion of those with mRS 3 may be eligible to claim welfare benefit, given level of disability. However, data did not permit the identification of patients with mRS 3 whose disability would make them eligible to claim welfare benefits.

Abbreviation: mRS: modified rankin scale

3.4.1. Population estimation

To estimate the eligible stroke population for the analysis, estimates of stroke prevalence and incidence in each UK nation were derived from national audit datasets (see section **3.2.4**). These data were then used to construct projections of both incident and prevalent cases per year across the study period. The projections incorporated anticipated changes in the population impact of stroke over time, reflecting both overall population growth trends and evidence of increasing stroke prevalence (**Table 25**).

To identify individuals likely to require welfare support, the modified Rankin Scale (mRS) was used to determine functional impairment status and mapped to welfare benefit disability claimant descriptions. Consistent with established clinical thresholds, individuals with mRS scores of 4 or 5 were assumed to have moderate-to-severe disability and thus an assumed alignment with the eligibility criteria for claiming disability-related benefits (assumptions outlined in **Table 24).** The distribution of individuals with an mRS score of 4 and 5 was sourced from Crichton et al (2016)[66]. The distribution was applied to the population estimates and provided a total estimate of the population eligible for welfare support as a consequence of stroke.

Incident stroke cases were modelled using the same eligibility approach but treated separately to prevalent cases to avoid double counting. This is due to the inability to disentangle the new stroke cases

(incident cases) each year, from the existing stroke cases (prevalent cases), as the estimates of stroke prevalence capture both the inflows and outflows to the total prevalent stroke population over time (assumptions outlined in **Table 25**). The distribution of individuals with an mRS score of 4 and 5 was sourced from 2024/25 SSNAP[37] for the incident population (see **Table 24**), versus published literature for the prevalent population.

Table 24 Distribution of mRS scores among working age and pension age

mRS	Working age	Pension age
4	10.2%	16.8%
5	3.68%	8.37%

Abbreviation: mRS: modified rankin scale

3.4.2. Benefit eligibility and uptake

The analysis distinguished between eligibility for benefits and actual receipt. Eligibility is determined by functional impairment (as proxied by mRS), while receipt is governed by behavioural and administrative factors. To account for this, uptake rates were applied to the eligible population to estimate the number of claimants receiving benefits. Equally, to account for variation in time to start claiming, a 50% proportional adjustment was applied to first-year post-stroke cases only.

Baseline uptake assumptions were specified separately by benefit type and age group. For the working-age population, uptake was assumed to be 75% for incapacity-related benefits and 50% for disability-related benefits. For the pension-age population, a 50% uptake rate was applied. These assumptions were informed by administrative data and were reviewed through expert consultation; in particular, advisory input emphasised the importance of recognising incomplete take-up of benefits even among clinically eligible individuals. Sensitivity analyses were undertaken to assess the impact of alternative uptake scenarios.

3.4.3. Fiscal cost estimation

Fiscal costs for the working-age population were estimated using a per-person, per-year cost published by the Office for Budget Responsibility (OBR)[68]. The per-person cost captured both direct welfare payments and indirect fiscal costs associated with reduced labour market participation.

The per-person OBR estimates comprised three elements:

- An employment effect to reflect forgone income tax and national insurance contributions for those individuals who exit the workforce due to stroke-related disability.
- An estimate of incapacity benefits to capture financial support provided to individuals unable to work.
- An estimate of disability benefits to capture additional support associated with limitations in daily living due to disability.

The per-person, per-year unit cost was weighted by the assumed benefit uptake rates to derive an average annual fiscal cost per working-age claimant.

For the pension-age population, fiscal costs were limited to direct welfare expenditure. The analysis focused on Attendance Allowance as the primary benefit associated with disability in older age. Attendance allowance payments are administered at a high and low payment level rate, reflecting variable disability levels of the eligible claimants[69]. The approach aligned with the working-age analysis and applied the high rate was applicable to those with an mRS of 5, and the low rate applied to those with an mRS of 4. The distribution of those individuals with an mRS score of 4 and 5 was sourced from 2024/25 SSNAP[37] (see **Table 23**).

A weighted annual cost per claimant was estimated by taking the per-person high-rate and low-rate attendance allowance payments and applying the estimated distribution percentages. No employment-related fiscal effects were included for this population, consistent with labour market inactivity at pension age[67].

Fiscal costs were not considered additive to the other components of stroke costs because they are classified as transfer payments, meaning they reflect a redistribution of money rather than an additional economic cost.

3.4.4. Aggregation and projection of fiscal costs

The estimated number of claimants and corresponding unit costs were combined to derive total fiscal costs. Calculations were undertaken separately for each UK nation (England, Wales, Scotland, and Northern Ireland), and aggregated to produce national UK estimates. The analysis was implemented annually over the period 2025–2035 to generate projections of fiscal costs over time.

3.5. Future costs of stroke

The estimation of future stroke-related costs was underpinned by projections of both first-year and subsequent-year stroke populations across the United Kingdom over the period 2025–2035. These projections combined observed administrative data on stroke activity with demographic forecasts and evidence-based assumptions on age-specific disease patterns.

3.5.1. Projection of incident stroke population

Base-year incident stroke rates by age, sex, country, stroke type and NIHSS score were derived from the most recent SSNAP and SSCA datasets[20,37,38] as described in **Section 3.2.4**. Projected numbers of people in their first-year post-stroke were then obtained by applying age- and sex-specific incidence rates to population projections from the Office for National Statistics (ONS). These projections cover the period 2022–2035 and provide detailed population estimates by age, sex, country, and year [44]. This approach ensures that growth in incident stroke cases is driven primarily by demographic changes, particularly population ageing, rather than assumed increases in disease risk.

Unlike earlier modelling approaches that incorporated projected changes in incidence rates over time (e.g. using King 2020[70] as described in the prevalent stroke projections section below), the current methodology adopts a more conservative assumption of stable underlying incidence rates within age–sex strata. This decision reflects recent evidence suggesting relative stability in incidence trends when controlling for demographic change, alongside uncertainty introduced by structural shifts such as the COVID-19 pandemic[71].

3.5.2. Projection of prevalent stroke population

Similar to incidence projections, prevalent stroke projections were calculated by adjusting the base-year estimates (**Section 3.2.10**) to ONS population projections[44]. However, these figures were also adjusted using King et al 2020 projection patterns (**Table 25**), which estimated changes in stroke prevalence over time using age-specific annual growth rates. These growth rates varied by age group, with higher increases assumed among older populations (e.g. 2.5–3.0% per annum among those aged 75+), reflecting improved survival following stroke and the accumulation of prevalent cases over time.

Table 25: Assumptions regarding the annual increase in the prevalent stroke population

Age group	2024-2025	2026-2035
16-45	0.0%	0.0%
45-64	1.0%	1.0%
65-74	1.5%	1.5%
75-84	2.0%	2.5%
85+	2.5%	3.0%

3.6. Sensitivity analyses

Sensitivity analyses are used to understand the impact on this analysis's cost estimates if parameter values or assumptions are changed. The analyses explored uncertainty in key assumptions relating to epidemiology (incidence and prevalence projections), treatment pathways, length of stay, unit costs,

social care cost assumptions, and fiscal assumptions. In the absence of robust evidence to support alternative parameter distributions, one-way sensitivity analyses were conducted using values ±10% of the base-case estimate for most parameters. Exceptions were the cost applied to combined ESD/CRT (based on the Byrne 2022 cost estimates[42]), incidence and prevalence projection assumptions, and care home admission assumptions, for which alternative values were informed by available data. A summary of parameters and corresponding values used in the one-way analyses is included in **Table 26.**

Table 26: Sensitivity analyses conducted

Core model assumptions	**Base case**	**Lower**	**Upper**
Epidemiology			
Prevalence projection assumptions removed/increased by 10%*	Varies depending on age		
Adjustment to include non-admitted stroke cases	105,490	94,941	125,473
Treatment units and discharges	**Base case (%)**	**Lower (%)**	**Upper (%)**
Proportion of the prevalent population in a care home	6.6%	5%	8%
Proportion of SU inpatients discharged to care home	3.4%	3.1%	3.9%
Proportion of combined ESD/CRT patients discharged to care home	4.1%	3.7%	4.5%
Length of stay (Days)	**Base case (days)**	**Lower (days)**	**Upper (days)**
Length of stay (days) SU - no procedure	17.10	15.39	18.81
Length of stay (days) SU - thrombolysis	17.40	15.66	19.14
Length of stay (days) SU - thrombectomy	27.70	24.93	30.47
Unit costs	**Base case (£)**	**Lower (£)**	**Upper (£)**
ASU cost per day	£1,075	£968	£1,183
General ward cost per day	£301	£271	£331
Thrombolysis cost	£1,757	£1,581	£1,933
Thrombectomy cost	£4,982	£4,484	£5,481
Stoke unit cost per day	£346	£312	£381
ESD cost per day	£2,281	£2,053	£2,509
CRT cost per day	£1,511	£1,360	£1,662
Combined ESD/CRT cost per day**	£10,575	£1,347	£11,632
Care home cost per day	£289	£260	£318
Six month follow up cost	£204	£183	£224
Social service day visit annual cost	£153	£137	£168
GP visit cost	£172	£155	£189
Home care cost per year: aged 40-64; mRS 1	£333	£299	£366
Home care cost per year: aged 40-64; mRS 2	£1,848	£1,663	£2,033
Home care cost per year: aged 40-64; mRS 3	£6,461	£5,815	£7,107
Home care cost per year: aged 40-64; mRS 4	£14,343	£12,908	£15,777
Home care cost per year: aged 40-64; mRS 5	£14,343	£12,908	£15,777
Home care cost per year: aged 65-74; mRS 1	£333	£299	£366
Home care cost per year: aged 65-74; mRS 2	£1,848	£1,663	£2,033
Home care cost per year: aged 65-74; mRS 3	£6,461	£5,815	£7,107
Home care cost per year: aged 65-74; mRS 4	£14,343	£12,908	£15,777
Home care cost per year: aged 65-74; mRS 5	£14,343	£12,908	£15,777
Home care cost per year: aged 75-84; mRS 1	£808	£727	£888
Home care cost per year: aged 75-84; mRS 2	£2,584	£2,326	£2,843
Home care cost per year: aged 75-84; mRS 3	£18,833	£16,950	£20,716
Home care cost per year: aged 75-84; mRS 4	£18,445	£16,601	£20,290
Home care cost per year: aged 75-84; mRS 5	£16,152	£14,536	£17,767
Home care cost per year: aged 85-109; mRS 1	£808	£727	£888
Home care cost per year: aged 85-109; mRS 2	£2,584	£2,326	£2,843
Home care cost per year: aged 85-109; mRS 3	£18,833	£16,950	£20,716
Home care cost per year: aged 85-109; mRS 4	£18,445	£16,601	£20,290
Home care cost per year: aged 85-109; mRS 5	£16,152	£14,536	£17,767
Societal cost assumptions			
Informal care - EQ-5D score associated with new stroke cases	0.49	0.44	0.54
Informal care - EQ-5D score associated with prevalent stroke cases	0.67	0.60	0.74
Fiscal assumptions			
Welfare benefit uptake rates: incapacity benefits	75%	67.5%	82.5%
Welfare benefit uptake rates: disability benefits	50%	45%	55%
Welfare benefit uptake rates: Attendance allowance	50%	45%	55%

Note: Upper and lower values are +/-10% unless otherwise stated.

Lower bound assumes no increase in prevalence estimates over time (i.e. estimates reported in **Table 25 are not applied) while upper bound assumes a 10% increase to the projected prevalence rates.
**Applies estimates from Byrne 2022, which was used to estimate unit costs for ESD and CRT in the base case analysis.

3.7. Model validation

Internal validation was conducted by a senior modeller, who undertook quality assurance checks to ensure that the model was correctly programmed and produced logical, unbiased outputs. In addition, the model structure, inputs, key clinical assumptions, and results were reviewed by an advisory group of clinical experts, providing external validation. The advisory group provided expert input, oversight, and strategic direction throughout the validation process. This process aimed to enhance the model's validity and robustness for policy consideration, while also supporting confidence in the model results among relevant stakeholders and health authorities.

4. Results

4.1. Summary of NHS and Personal Social Services costs and wider societal costs

The total annual cost of stroke in the UK in 2025 was £25.71 billion. This total cost can be broken down into three components: 1) NHS and PSS costs associated with stroke diagnosis and treatment in the first-year post-stroke, 2) ongoing NHS and PSS costs after stroke (post-12 months) and 3) wider societal costs. The annual costs of diagnosing and treating patients during their first-year post-stroke in the UK were £2.43 billion, of which £1.93 billion was associated with NHS care and £500 million with social care (**Table 27**). The annual NHS and PSS costs associated with the ongoing (post-12-month) care and support needs of the stroke survivor population were £16.63 billion, comprising £3.41 billion in NHS costs and £13.22 billion in social care costs. Wider societal costs were £6.65 billion, including £5.07 billion from unpaid productivity losses, £954 million from paid productivity losses, and £620 million from informal care. In addition, fiscal costs were estimated at £2.36 billion, including £1.6 billion for the working-age population and £741.6 million for the pension-age population.

Table 27: Annual costs (in £ billions) of care across the NHS, Personal Social Services, and wider societal costs, projected for 2025–2035.

Year	1) NHS and PSS costs in the first-year following a stroke (£)			2) Ongoing NHS and PSS costs after stroke (£)			1) and 2) Total NHS and PSS costs (£)			3) Wider societal costs				Total cost (£)
	NHS	PSS	Total	NHS	PSS	Total	NHS	PSS	Total	Lost productivity	Unpaid Labour	Informal care	Total Wider societal cost	Total
2025	1.93	0.50	2.43	3.41	13.22	16.63	5.34	13.72	19.06	0.95	5.07	0.62	6.65	25.71
2026	1.95	0.50	2.45	3.53	13.67	17.20	5.47	14.17	19.65	0.98	5.23	0.64	6.86	26.50
2027	1.99	0.50	2.49	3.66	14.13	17.79	5.65	14.63	20.28	1.02	5.43	0.66	7.11	27.39
2028	2.05	0.51	2.55	3.80	14.68	18.48	5.84	15.19	21.03	1.06	5.62	0.69	7.37	28.40
2029	2.07	0.51	2.58	3.94	15.25	19.19	6.01	15.76	21.77	1.10	5.83	0.71	7.63	29.41
2030	2.12	0.56	2.67	4.08	15.87	19.95	6.20	16.42	22.63	1.13	6.03	0.74	7.90	30.53
2031	2.15	0.56	2.70	4.23	16.40	20.63	6.38	16.95	23.33	1.17	6.24	0.76	8.18	31.51
2032	2.18	0.56	2.74	4.39	16.96	21.35	6.57	17.52	24.09	1.22	6.47	0.79	8.48	32.57
2033	2.23	0.57	2.80	4.55	17.66	22.22	6.78	18.23	25.02	1.26	6.71	0.82	8.80	33.81
2034	2.26	0.57	2.83	4.71	18.13	22.85	6.97	18.70	25.67	1.30	6.93	0.85	9.08	34.75
2035	2.28	0.58	2.86	4.88	18.75	23.62	7.16	19.33	26.48	1.35	7.16	0.88	9.38	35.86

Abbreviations: PSS: Personal Social Services; NHS: National Health Service

4.2. NHS and Personal Social Services costs in the first-year post-stroke

Of the total £25.71 billion costs of stroke in 2025, £2.43 billion are represented by NHS and PSS costs in the first-year after a stroke. This comprised £1.93 billion in NHS costs and £499.9 million in social care (PSS) costs. This is equivalent to an average cost per patient of £23,031, including £18,292 for NHS care and £4,739 for social care.

People aged 75–84 represented the largest age group (33,575 people). Consequently, the NHS and social care costs associated with meeting the needs of people affected by stroke in this age group were highest (£852 million annually). Average costs per person were also highest among those aged 75-84 (£25,380), reflecting greater health and social care needs following stroke. Males experienced a higher number of strokes (56,860), which translated into higher aggregate annual NHS and social care costs (£1.3 billion). However, average costs per person were higher for females compared to males (£23,187 versus £22,898, respectively).

This difference is predominantly driven by the longer average LOS that females experience in ASU, while higher social care costs could potentially reflect a severity of stroke at discharge or a higher proportion discharged to a care home. See Sections **3.2.4** and **3.2.6** for key methods and assumptions for estimating first-year costs.

Table 28: Total aggregate and average per person NHS and Personal Social Services costs (£, 2025 prices) in the first year post-stroke, by patient group

Category	New stroke cases	Aggregate annual cost (£)			Average per person (£)		
		NHS	PSS	NHS + PSS	NHS	PSS	NHS + PSS
2025 results	105,490	1.93 bn	499.9 mn	2.43 bn	18,292	4,739	23,031
Age group							
16-39	1,705	19.3 mn	7.1 mn	26.4 mn	11,309	4,183	15,492
40-64	22,830	0.34 bn	95.9 mn	0.44 bn	14,940	4,200	19,140
65-74	22,190	0.39 bn	92.5 mn	0.48 bn	17,444	4,168	21,612
75-84	33,575	0.65 bn	0.20 bn	0.85 bn	19,353	6,027	25,380
85-109	25,190	0.53 bn	0.10 bn	0.63 bn	21,134	4,053	25,187
Sex							
Female	48,630	0.90 bn	0.23 bn	1.13 bn	18,484	4,703	23,187
Male	56,860	1.03 bn	0.27 bn	1.30 bn	18,128	4,770	22,898
Stroke type							
Haemorrhagic	14,145	0.32 bn	83.8 mn	0.40 bn	22,489	5,927	28,415
Ischaemic	91,345	1.61 bn	0.42 bn	2.03 bn	17,642	4,555	22,197
Severity*							
Mild	53,370	0.65 bn	0.14 bn	0.80 bn	12,274	2,704	14,979
Moderate	36,355	0.82 bn	0.21 bn	1.03 bn	22,469	5,738	28,207
Severe	15,765	0.46 bn	0.15 bn	0.60 bn	29,030	9,325	38,355

Abbreviations: PSS: Personal Social Service; NHS: National Health Service
*Note: stroke severity was classified as either mild (NIHSS 0–4) moderate (NIHSS 5–15) or severe (NIHSS 16–42).

Most strokes were ischaemic in nature (91,345 cases) resulting in the largest aggregate NHS and social care costs (£2.03 billion). However, average costs per person were higher for haemorrhagic stroke (£28,415) than for ischaemic stroke (£22,197), reflecting the greater health and social care support often required following haemorrhagic stroke. Moderate stroke severity (NIHSS 5–15) represented the largest patient group (36,355 people), resulting in the highest aggregate NHS and social care costs (£1.03 billion). Average costs per person were highest among people who experienced severe stroke (NIHSS 16–42), at approximately £38,355, reflecting higher treatment, rehabilitation and ongoing care and support needs.

Table 29: Annual NHS and Personal Social Services costs (£, 2025 prices) in the first-year post-stroke, by cost component, UK

Service	Total cost	NHS proportion	PSS proportion	NHS + PSS proportion
NHS costs				
Ambulance	22.4 mn	1%	-	1%
Brain scan	24.8 mn	1%		1%
GMW	7.8 mn	0%		0%
ASU	1.43 bn	74%		59%
Thrombectomy	20.6 mn	1%		1%
Thrombolysis	21.7 mn	1%		1%
Stroke Unit	20.6 mn	1%		1%
ESD	68.3 mn	4%		3%
Combined ESD/CRT	177.1 mn	9%		7%
CRT	26.0 mn	1%		1%
GP visits post-discharge	111.9 mn	6%		5%
6m Follow-up	2.7 mn	0%		0%
Total NHS cost	1.93 bn	100%		
Social care costs				
Home care	261.7 mn	-	52%	11%
Care homes	231.4 mn		46%	10%
SSDV	6.9 mn		1%	0%
Social total	500 mn		100%	
NHS + PSS	2.43 bn			100%

Abbreviations: NHS: National Health service; PSS: Personal Social Services; ASU: Acute Stroke Unit; GMW: General Medical Ward; CRT: Community Rehabilitation Team; GP: General Practitioner; ESD: Early Supported Discharge; SSDV: Social Service Day Visit

Costs of diagnosing and caring for patients in their first-year post-stroke are heavily concentrated within a small number of services. The largest cost component was the ASU at £1.43 billion, accounting for 74% of NHS costs and 59% of total NHS and PSS costs, making it the dominant driver across both metrics. The next largest contributors to total costs were combined ESD/CRT (£177.1 million, 9% of NHS costs, 7% of total), GP visits post-discharge (£111.9 million, 6% of NHS costs 5% of total), ESD (£68.3 million, 4% of NHS costs, 3% of total), and CRT (£26.0 million, 1% of NHS costs, 1% of total). Other components such as ambulance services (£22.4 million, 1% NHS), thrombolysis (£21.7 million, 1% NHS), stroke unit care (£20.6 million, 1% NHS), thrombectomy (£20.6 million, 1% NHS) and brain scans (£24.8 million, 1% NHS) made relatively small contributions individually.

Comparing NHS and social care totals for costs in the first-year post-stroke, NHS costs (£1.93 billion) are higher than social care costs (£500 million). Within social care, costs are mainly driven by home care (£261.70 million, 52% of social care costs and 11% of total) and care homes (£231.4 million, 46% of social care costs and 10% of total), with SSDV contributing only £6.9 million (1%).

4.2.1. NHS and Personal Social Services costs in the first-year post-stroke: 2025 costs by country

Across the UK, aggregate NHS and PSS costs associated with first-year post-stroke care varied by nation, largely reflecting differences in population size and the number of incident strokes. England incurred the highest annual costs (£1.95 billion), followed by Scotland (£270 million), Wales (£140 million) and Northern Ireland (£80 million). Consistent with demographic expectations, aggregate costs increased with age across all constituent nations, reaching their highest levels among individuals aged 75-84 years before declining in the oldest age group (85+ years). This pattern likely reflects the high incidence of stroke and substantial care needs among those aged 75-84 years, combined with the smaller population size of the oldest age group. In England, NHS and PSS costs for those aged 75-84 years were £0.52 billion and £0.16 billion, respectively, compared with £70 million and £20 million in Scotland, £40 million and £10 million in Wales, and £21 million and £6 million in Northern Ireland.

By sex, aggregate costs were higher among males than females across all nations, reflecting the greater number of incident strokes in males. In England, NHS and PSS costs for males were £0.83 billion and £0.22 billion, respectively, compared with £0.72 billion and £0.18 billion for females. Corresponding NHS and PSS costs for males were £112 million and £30 million in Scotland, £60 million and £16 million in Wales, and £33 million and £9 million in Northern Ireland.

Table 30: Absolute number of cases and annual cost (£, 2025 prices) of first-year post-stroke care to the NHS and Personal Social Services, by country (UK, England, Scotland, Wales, and Northern Ireland) and patient category, with breakdowns by age and sex

Country	Category	Incident (new stroke) population	Aggregate annual cost (£, billions) *		
			NHS	PSS	Total
UK*	**Total**	**105,490**	**1.93**	**0.5**	**2.43**
	Age group				
	16-39	1,705	0.02	0.01	0.03
	40-64	22,830	0.34	0.10	0.44
	65-74	22,190	0.39	0.09	0.48
	75-84	33,575	0.65	0.20	0.85
	85-109	25,190	0.53	0.10	0.63
	Sex				
	Female	48,630	0.90	0.23	1.13
	Male	56,860	1.03	0.27	1.30
	Severity				
	Mild	53,370	0.66	0.14	0.80
	Moderate	36,355	0.82	0.21	1.03
	Severe	15,765	0.46	0.15	0.60
	Stroke Type				
	Haemorrhagic	14,145	0.32	0.08	0.40
	Ischaemic	91,345	1.61	0.42	2.03
England	**Total**	**84,522**	**1.55**	**0.40**	**1.95**
	Age group				
	16-39	1,366	0.02	0.01	0.02
	40-64	18,292	0.27	0.08	0.35
	65-74	17,779	0.31	0.07	0.38
	75-84	26,901	0.52	0.16	0.68
	85-109	20,183	0.43	0.08	0.51
	Sex				
	Female	38,964	0.72	0.18	0.90
	Male	45,558	0.83	0.22	1.04

	Severity				
	Mild	42,762	0.52	0.12	0.64
	Moderate	29,129	0.65	0.17	0.82
	Severe	12,631	0.37	0.12	0.48
	Stroke Type				
	Haemorrhagic	11,333	0.25	0.07	0.32
	Ischaemic	73,189	1.29	0.33	1.62
Scotland	**Total**	**11,512**	**0.21**	**0.05**	**0.27**
	Age group				
	16-39	186	0.00	0.00	0.00
	40-64	2,492	0.04	0.01	0.05
	65-74	2,422	0.04	0.01	0.05
	75-84	3,664	0.07	0.02	0.09
	85-109	2,749	0.06	0.01	0.07
	Sex				
	Female	5,307	0.10	0.02	0.12
	Male	6,205	0.11	0.03	0.14
	Severity				
	Mild	5,824	0.07	0.02	0.09
	Moderate	3,968	0.09	0.02	0.11
	Severe	1,720	0.05	0.02	0.07
	Stroke Type				
	Haemorrhagic	1,544	0.03	0.01	0.04
	Ischaemic	9,969	0.18	0.05	0.22
Wales	**Total**	**6,072**	**0.11**	**0.03**	**0.14**
	Age group				
	16-39	98	0.00	0.00	0.00
	40-64	1,314	0.02	0.01	0.03
	65-74	1,277	0.02	0.01	0.03
	75-84	1,932	0.04	0.01	0.05
	85-109	1,450	0.03	0.01	0.04
	Sex				
	Female	2,799	0.05	0.01	0.06
	Male	3,273	0.06	0.02	0.07
	Severity				
	Mild	3,072	0.04	0.01	0.05
	Moderate	2,092	0.05	0.01	0.06
	Severe	907	0.03	0.01	0.03
	Stroke Type				
	Haemorrhagic	814	0.02	0.00	0.02
	Ischaemic	5,257	0.09	0.02	0.12
Northern Ireland	**Total**	**3,384**	**0.06**	**0.02**	**0.08**
	Age group				
	16-39	55	0.00	0.00	0.00
	40-64	732	0.01	0.00	0.01
	65-74	712	0.01	0.00	0.02
	75-84	1,077	0.02	0.01	0.03
	85-109	808	0.02	0.00	0.02

	Sex				
	Female	1,560	0.03	0.01	0.04
	Male	1,824	0.03	0.01	0.04
	Severity				
	Mild	1,712	0.02	0.00	0.03
	Moderate	1,166	0.03	0.01	0.03
	Severe	506	0.01	0.00	0.02
	Stroke Type				
	Haemorrhagic	454	0.01	0.00	0.01
	Ischaemic	2,930	0.05	0.01	0.07

Abbreviations: NHS: National Health Service; PSS: Personal Social Services
*Aggregate annual costs are presented to two decimal places (or more, where appropriate). Totals may not sum exactly due to rounding.

4.2.2. Ongoing annual NHS and Personal Social Services costs after stroke (£, 2025 prices), by category

The total stroke survivor (prevalent) population is estimated to be over 1.4 million in 2025, 48% higher than the number reported in 2015 (950,200). Out of the total £25.71 billion, the ongoing costs of living with stroke occurring beyond the first-year are estimated to be £16.63 billion per year, across both NHS (£3.41 billion) and social care (£13.22 billion) settings (see columns 5-7 in **Table 27**). Social care costs in this population are higher compared to the 2015 estimates due to the increase in the total size of the population living with the long-term impacts of stroke, paired with increased annual unit costs for care homes (+82%), home care (+68%) and social service day visits (+79%). See Section **3.2.10** for key methods and assumptions for estimating long-term costs.

Table 31: Ongoing aggregate and per-person annual NHS and Personal Social Services costs after stroke (£, 2025 prices), by age and sex

Category	Prevalent stroke population	Aggregate annual cost (£)			Average per person (£)		
		NHS	PSS	NHS + PSS	NHS	PSS	NHS + PSS
2025 results	1,406,317	3.41 bn	13.22 bn	16.63 bn	2,428	9,400	11,827
Age group							
16-39	27,377	0.07 bn	0.19 bn	0.26 bn	2,428	7,083	9,510
40-64	327,489	0.80 bn	3.09 bn	3.89 bn	2,428	9,446	11,873
65-74	347,821	0.84 bn	3.29 bn	4.13 bn	2,428	9,446	11,873
75-84	447,614	1.09 bn	4.23 bn	5.31 bn	2,428	9,446	11,873
85-109	256,016	0.62 bn	2.42 bn	3.04 bn	2,428	9,446	11,873
Sex							
Female	674,038	1.64 bn	6.34 bn	7.97 bn	2,428	9,400	11,827
Male	732,279	1.78 bn	6.88 bn	8.66 bn	2,428	9,400	11,827

Abbreviations: PSS: Personal Social Services; NHS: National Health Service

The patient population and associated costs were highest in the 75–84 age group (447,614 patients), where aggregate annual costs were £5.31 billion. Average costs per person were similar across older age groups (£11,827–£11,873) but lower among younger stroke survivors aged 16–39 years (£9,510), primarily due to lower social care costs as home care was not assumed to be provided for this age group.

Owing to a lack of evidence on how support needs and associated resource use changes in the years following stroke, the ongoing costs associated with longer-term stroke survivorship were estimated using constant annual resource-use assumptions. See **Table 20** for assumptions applied to long-term care costs. The impact of this assumption on the results is assessed through sensitivity analyses.

4.2.3. Ongoing annual NHS and Personal Social Services costs after stroke: UK aggregate costs in 2025, by country and category

The annual ongoing (post-12 month) NHS and PSS costs in the UK in 2025 were £16.63 billion, reflecting the needs of 1,406,317 people living with stroke. This comprised £3.41 billion in NHS costs and £13.22 billion in social care costs.

Most of the post-stroke population and associated costs are based in England, with annual post-stroke costs reaching £13.43 billion, including £2.76 billion attributable to NHS care and £10.68 billion to social care. In comparison, costs in Scotland are substantially lower, with aggregate annual costs of £1.86 billion, comprising £0.38 billion in NHS costs and £1.48 billion in social care costs. In Wales total annual costs were £0.86 billion, including £0.18 billion for NHS care and £0.68 billion for social care. Finally, Northern Ireland was associated with the smallest overall costs, with total annual costs of £0.48 billion, comprising £0.10 billion in NHS costs and £0.38 billion in social care costs.

Table 32: Ongoing NHS and Personal Social Services costs (£ billions, 2025 prices) after stroke, by country and patient category (UK, England, Scotland, Wales, and Northern Ireland)

Country	Category	Prevalent stroke population	NHS costs (£)	PSS costs (£)	Total costs (£)
UK	**Total**	1,406,317	3.41	13.22	16.63
	Age group				
	16-39	27,377	0.07	0.19	0.26
	40-64	327,489	0.80	3.09	3.89
	65-74	347,821	0.84	3.29	4.13
	75-84	447,614	1.09	4.23	5.31
	85-109	256,016	0.62	2.42	3.04
	Sex				
	Female	674,038	1.64	6.34	7.97
	Male	732,279	1.78	6.88	8.66
England	**Total**	1,135,894	2.76	10.68	13.43
	Age group				
	16-39	22,693	0.06	0.16	0.22
	40-64	265,147	0.64	2.50	3.15
	65-74	277,391	0.67	2.62	3.29
	75-84	361,537	0.88	3.41	4.29
	85-109	209,126	0.51	1.98	2.48
	Sex				
	Female	544,927	1.32	5.12	6.45
	Male	590,967	1.43	5.55	6.99
Scotland	**Total**	157,077	0.38	1.48	1.86
	Age group				
	16-39	2,809	0.01	0.02	0.03
	40-64	37,239	0.09	0.35	0.44
	65-74	42,219	0.10	0.40	0.50
	75-84	48,645	0.12	0.46	0.58
	85-109	26,166	0.06	0.25	0.31
	Sex				
	Female	75,725	0.18	0.71	0.90
	Male	81,351	0.20	0.76	0.96
Wales	**Total**	72,749	0.18	0.68	0.86
	Age group				
	16-39	1,081	0.00	0.01	0.01
	40-64	14,993	0.04	0.14	0.18
	65-74	17,653	0.04	0.17	0.21

	75-84	25,041	0.06	0.24	0.30
	85-109	13,981	0.03	0.13	0.17
	Sex				
	Female	34,039	0.08	0.32	0.40
	Male	38,710	0.09	0.36	0.46
Northern Ireland	**Total**	40,597	0.10	0.38	0.48
	Age group				
	16-39	794	0.00	0.01	0.01
	40-64	10,110	0.02	0.10	0.12
	65-74	10,558	0.03	0.10	0.13
	75-84	12,392	0.03	0.12	0.15
	85-109	6,744	0.02	0.06	0.08
	Sex				
	Female	19,347	0.05	0.13	0.18
	Male	21,250	0.05	0.15	0.20

Abbreviations: NHS: National Health Service; PSS: Personal Social Services; UK: United Kingdom

4.3. Societal results

Total societal costs of stroke are estimated to be £6.65 billion in 2025, rising to £9.38 billion by 2035, reflecting the increasing number of people living with the impacts of stroke and the long-term impacts on quality of life. Most societal costs are driven by unpaid labour (approximately £5.1 billion, ~75% of total costs), with smaller contributions from paid productivity losses (~£1.0 billion) and informal care (~£0.6 billion). These costs are derived from reductions in health-related quality of life (measured using EQ-5D), highlighting the substantial long-term impact of stroke on individuals' ability to work and carry out daily activities. All components of societal costs are expected to increase steadily over time, with unpaid labour remaining the dominant cost driver, reflecting the growing need for (unpaid) support as the number of people living with the impacts of stroke increases.

Table 33: Wider societal costs (£ billions, 2025 prices) by age band, including paid productivity, unpaid productivity and informal care

Age-band	Paid productivity (£)	Unpaid productivity (£)	Informal care consumption (£)	Total (£ billions)
UK total	0.95	5.07	0.62	6.65
16-39	0.14	0.33	0.12	0.58
40-64	0.62	1.31	0.27	2.20
65-74	0.20	1.36	0.17	1.73
75-84	0.00	1.68	0.05	1.74
85-100	0.00	0.38	0.01	0.40

Abbreviations: UK: United Kingdom

Total costs are highest among individuals aged 40–64 (£2.2 billion), reflecting the substantial paid and unpaid productivity impact losses stroke inflicts on working people. Costs remain high in older age bands, driven predominantly by unpaid productivity losses, particularly among those aged 65–74 (£1.73 billion) and 75–84 (£1.74 billion). Paid productivity costs are concentrated in younger and working age groups, while informal care costs increase with age, though they remain smaller than productivity impacts across all age bands.

Table 34: Annual societal stroke costs (2025) across the UK including England, Scotland, Wales and Northern Ireland by aggregate annual and average per person cost components

Country	Aggregate annual cost (£)				Average per person (£)			
	Productivity		Informal care	Total	Productivity		Informal care	Total
	Paid	Unpaid			Paid	Unpaid		
UK	0.95 bn	5.07 bn	0.62 bn	6.65 bn	631	3,355	410	4,396
England	0.77 bn	4.09 bn	0.50 bn	5.36 bn	631	3,352	411	4,394
Scotland	0.11 bn	0.57 bn	0.07 bn	0.75 bn	641	3,383	414	4,437
Wales	0.05 bn	0.26 bn	0.03 bn	0.34 bn	590	3,350	389	4,330
Northern Ireland	0.03 bn	0.15 bn	0.02 bn	0.20 bn	677	3,441	434	4,552

Abbreviations: UK: United Kingdom

Total annual societal costs of the impact of stroke in 2025 vary substantially across the UK, driven largely by differences in stroke population size, with England accounting for £5.36 billion of the £6.65 billion UK total. Across all UK nations, unpaid productivity losses represent the largest cost component, amounting to £5.07 billion at the UK level, followed by paid productivity costs of £0.95 billion and informal care costs of £620 million. In contrast, average per person costs are highly consistent across countries, ranging from approximately £4,552 to £4,330 per person, with Northern Ireland exhibiting the marginally highest average per person total cost. These per person totals include £3,350–£3,383 in unpaid productivity losses and £389–£434 in informal care costs, indicating only small variations in per patient costs across countries.

4.4. Fiscal costs results

The impacts of stroke are associated with high current fiscal costs in the UK and across each respective nation. In 2025, stroke resulted in a total fiscal cost of £1.62 billion in the working-age population, and £741.6 million in the pension-age population. This gave a total estimated fiscal cost of stroke in the UK of £2.36 billion in 2025.

The annual fiscal cost per person, per year, for the working age population affected by stroke was £15,556, an uptake-weighted estimate using the published OBR report per-person, per-year cost [68]. The annual claimed amount per person, per year, for the pension age population was £4,814, an uptake-weighted estimate using the published high- and low-rate attendance allowance payments.

Table 35: Estimated fiscal costs for the working age and pension age stroke populations in 2025

Country	Estimated number of working age claimants	Total fiscal cost for working age population (£)	Estimated number of pension age claimants	Total fiscal cost for pension age population (£)	Total fiscal cost of stroke in 2025 (£)
UK	103,976	1.62 bn	154,038	741.6 mn	2.36 bn
England	84,337	1.31 bn	124,240	598.1 mn	1.91 bn
Wales	4,710	73.3 mn	8,303	40.0 mn	113.2 mn
Scotland	11,734	182.5 mn	17,145	82.5 mn	265.1 mn
Northern Ireland	3,195	49.7 mn	4,350	20.9 mn	70.6 mn

Abbreviations: UK: United Kingdom

The estimated fiscal costs of stroke for the working age population included the cost of foregone income tax and national insurance contributions, as well as the total cost of incapacity and disability benefits. The estimated fiscal costs of stroke for the pension age population comprised only the cost of attendance allowance and was the weighted claim amount (£4,814) applied to the total claimant numbers each year.

In 2025, the total employment effect costs in the UK were £543 million. The total costs of claimed incapacity benefits were estimated as £805.9 million, and £268.6 million for disability benefits. For those of pension age, the total welfare cost in 2025 was estimated to be £741.6mn in the UK. Given the age of the population, there was no assumed employment effect, and only direct welfare payments were considered.

Table 36: Disaggregated estimated number of claimants and cost (£, 2025 prices) of being out of work due to stroke, by country (UK, England, Scotland, Wales and Northern Ireland)

Country	Estimated number of claimants	Total employment effect* (£)	Total cost of incapacity benefits* (£)	Total cost of disability benefits* (£)
UK	103,976	543 mn	805.9 mn	268.6 mn
England	84,337	440.4 mn	653.7 mn	217.9 mn
Wales	4,710	24.6 mn	36.5 mn	12.2 mn
Scotland	11,734	61.3 mn	90.9 mn	30.3 mn
Northern Ireland	3,195	16.7 mn	24.7 mn	8.3 mn

Abbreviations: UK: United Kingdom

The analysis also captured the estimated total fiscal cost of stroke for the first-year post-stroke working-age and pension-age population. These results are captured in the Appendix and are independent of the results presented above.

4.5. Future Costs

4.5.1. Average per person NHS and Personal Social Services costs in the first-year post-stroke, UK 2025-2035

The annual number of new stroke cases is projected to increase from 105,490 in 2025 to 115,483 in 2030 and 125,473 in 2035 (see **Table 38**). These projections are driven by ONS population projections and changes in the size and age profile of the population, while age- and sex-specific stroke incidence rates are assumed to remain constant. Consequently, aggregate NHS and social care costs are estimated to rise from £2.43 billion in 2025 to £2.67 billion in 2030 and £2.86 billion in 2035. The growth in aggregate costs is therefore driven primarily by demographic change and the resulting increase in the number of new stroke cases, rather than changes in the cost of care per patient. Growth is faster between 2025 and 2030 and then moderates between 2030 and 2035, reflecting the projected pattern of population growth and ageing over time.

Average NHS and social care costs per person remain broadly stable throughout the projection period, increasing from £23,031 in 2025 to £23,161 in 2030 before decreasing slightly to £22,785 in 2035. This reflects the fact that the base-case analysis does not assume any changes to treatment pathways, service delivery, or resource use over time that would materially alter the average cost of care per patient. All future costs are reported in 2025 prices and were not inflated over the projection period. Consequently, changes in projected costs reflect changes in the number and characteristics of stroke cases rather than price inflation.

Table 37: Aggregate and average per person cost (£, 2025 prices) of first-year post-stroke population in the UK to the NHS and Personal Social Services, UK, 2025–2035

	Aggregate annual cost (£)			Average per person (£)		
Year	NHS	PSS	Total	NHS	PSS	Total
2025	1.93 bn	499.9 mn	2.43 bn	18,292	4,739	23,031
2026	1.95 bn	499.8 mn	2.45 bn	18,178	4,663	22,841
2027	1.99 bn	503.7 mn	2.49 bn	18,203	4,604	22,807
2028	2.05 bn	505.1 mn	2.55 bn	18,340	4,529	22,869
2029	2.07 bn	510.6 mn	2.58 bn	18,247	4,496	22,744
2030	2.12 bn	556.2 mn	2.67 bn	18,344	4,816	23,161
2031	2.15 bn	555.8 mn	2.70 bn	18,282	4,737	23,019
2032	2.18 bn	559.7 mn	2.74 bn	18,205	4,681	22,886
2033	2.23 bn	572.00 mn	2.80 bn	18,320	4,701	23,021
2034	2.26 bn	568.3 mn	2.83 bn	18,263	4,596	22,858
2035	2.28 bn	578.4 mn	2.86 bn	18,175	4,610	22,785

Abbreviations: NHS: National Health Service; PSS: Personal Social Services

4.5.2. NHS and Personal Social Services costs in the first-year post-stroke for the UK and by country, 2025-2035

The number of new stroke cases is projected to increase from 105,490 in 2025 to 125,473 in 2035, reflecting substantial growth over the modelled period. Correspondingly, total annual aggregate costs (in 2025 prices) are projected to rise over time, increasing from approximately £2.43 billion in 2025 to around £2.86 billion by 2035, representing an absolute increase of approximately £430 million over the period.

Across the UK nations, England accounts for highest number of new stroke cases and associated costs per year, reflecting its larger population, with total costs increasing from £1.95 billion in 2025 to £2.29 billion in 2035, representing an increase of approximately £340 million. Scotland accounts for a smaller share, with costs rising from approximately £265.1 million in 2025 to £311.8 million in 2035, an increase of around £46.7 million. Costs in Wales are estimated to increase from around £139.8 million to £163.7 million over the same period, representing an increase of approximately £23.9 million. Northern Ireland accounts for the smallest share of costs, rising from approximately £77.9 million in 2025 to £94.4 million in 2035, an increase of around £16.5 million.

Table 38: Number of new stroke cases and aggregate NHS and Personal Social Services costs (£, 2025 prices) in the first-year post-stroke, 2025–2035, by country (UK, England, Wales, Scotland and Northern Ireland)

Year	Number of new stroke cases					Total annual aggregate costs (£, 2025 prices)				
	UK	England	Wales	Scotland	Northern Ireland	UK	England	Wales	Scotland	Northern Ireland
2025	**105,490**	84,522	6,072	11,512	3,384	2.43 bn	1.95 bn	139.8 mn	265.1 mn	77.9 mn
2026	107,189	85,887	6,166	11,683	3,454	2.45 bn	1.96 bn	140.8 mn	266.8 mn	78.9 mn
2027	109,387	87,658	6,290	11,911	3,528	2.49 bn	2.00 bn	143.5 mn	271.7 mn	80.5 mn
2028	111,519	89,365	6,412	12,135	3,608	2.55 bn	2.04 bn	146.6 mn	277.5 mn	82.5 mn
2029	113,575	91,012	6,527	12,352	3,683	2.58 bn	2.07 bn	148.44 mn	280.9 mn	83.8 mn
2030	115,483	92,538	6,633	12,554	3,758	2.67 bn	2.14 bn	153.6 mn	290.7 mn	87.1 mn
2031	117,335	94,011	6,734	12,756	3,834	2.70 bn	2.16 bn	155.02 mn	293.6 mn	88.3 mn
2032	119,569	95,790	6,861	13,005	3,913	2.74 bn	2.19 bn	157.03 mn	297.6 mn	89.6 mn
2033	121,674	97,454	6,980	13,247	3,993	2.80 bn	2.24 bn	160.0 mn	304.9 mn	91.9 mn
2034	123,654	99,021	7,088	13,476	4,070	2.83 bn	2.26 bn	162.0 mn	308.0 mn	93.02 mn
2035	**125,473**	100,459	7,185	13,685	4,144	2.86 bn	2.29 bn	163.7 mn	311.8 mn	94.4 mn

Abbreviations: UK: United Kingdom.

4.5.3. Ongoing annual NHS and Personal Social Services costs after stroke by country, 2025-2035

Across all nations, the same upward trend is observed between 2025 and 2035, with increases in both the total number of people living with stroke and in the associated costs of care. Overall, total UK NHS and PSS costs are projected to increase from £16.63 billion in 2025 to £23.62 billion in 2035, representing an absolute increase of approximately £7.0 billion.

Across the UK nations, England accounts for largest prevalent stroke population and associated costs per year, reflecting its larger population, with total costs increasing from £13.43 billion in 2025 to £19.08 billion in 2035, representing an increase of approximately £5.65 billion. Scotland accounts for a smaller share, with costs rising from £1.86 billion in 2025 to £2.62 billion in 2035, an increase of around £760 million. In Wales, costs are projected to rise from £0.86 billion to £1.23 billion, representing an increase of approximately £370 million. Northern Ireland accounts for the smallest share of costs, rising from £480 million in 2025 to £695 million in 2035, an increase of around £215 million.

Table 39: Size of the prevalent stroke population and associated aggregate NHS and Personal Social Services costs (in billions) (£, 2025 prices), 2025–2035, by country (UK, England, Wales, Scotland and Northern Ireland)

Year	Prevalent stroke population					Total annual aggregate costs (£ billions, 2025 prices)				
	UK	England	Wales	Scotland	Northern Ireland	UK	England	Wales	Scotland	Northern Ireland
2025	1,406,317	1,135,894	72,749	157,077	40,597	16.63	13.43	0.86	1.86	0.48
2026	1,452,359	1,173,103	75,144	162,038	42,075	17.20	13.89	0.89	1.92	0.50
2027	1,508,021	1,218,156	78,108	168,037	43,721	17.79	14.37	0.92	1.98	0.52
2028	1,564,834	1,264,053	81,131	174,182	45,468	18.48	14.93	0.96	2.06	0.54
2029	1,623,223	1,311,264	84,213	180,490	47,257	19.19	15.50	1.00	2.13	0.56
2030	1,682,300	1,359,063	87,304	186,833	49,100	19.95	16.12	1.04	2.22	0.58
2031	1,743,681	1,408,748	90,454	193,462	51,017	20.63	16.67	1.07	2.29	0.60
2032	1,810,101	1,462,622	93,876	200,634	52,969	21.35	17.25	1.11	2.37	0.62
2033	1,875,751	1,515,618	97,319	207,858	54,955	22.22	17.95	1.15	2.46	0.65
2034	1,941,434	1,568,497	100,798	215,155	56,984	22.85	18.46	1.19	2.53	0.67
2035	2,008,213	1,622,274	104,294	222,562	59,083	23.62	19.08	1.23	2.62	0.69

Abbreviations: UK: United Kingdom

4.5.4. Societal costs by component and country, 2025-2035

Stroke-related societal costs are projected to steadily increase between 2025 and 2035 across all components (**Table 40)**. The largest contributor throughout the projection period is unpaid productivity, which rises from £5.07 billion in 2025 to £7.16 billion by 2035, followed by paid productivity losses, increasing from £0.95 billion to £1.35 billion, and informal care costs, which grow from £0.62 billion to £0.88 billion over the same period. Overall, the projections highlight that the growth in total societal costs is primarily driven by increases in productivity losses rather than informal care, reflecting the growing number of stroke survivors and the sustained impact of stroke on both labour market participation and unpaid economic activity over time.

Table 40: Societal costs (in billions) (£, 2025 prices) by component and country, 2025-2035

Year	UK-Wide				England				Scotland				Wales				Northern Ireland			
	Paid product-ivity	Unpaid	Informal care	Total	Paid product-ivity	Unpaid	Informal care	Total	Paid product-ivity	Unpaid	Informal care	Total	Paid product-ivity	Unpaid	Informal care	Total	Paid product-ivity	Unpaid	Informal care	Total
2025	0.95	5.07	0.62	6.65	0.77	4.09	0.50	5.36	0.11	0.57	0.07	0.75	0.05	0.26	0.03	0.34	0.03	0.15	0.02	0.20
2026	0.98	5.23	0.64	6.86	0.79	4.22	0.52	5.53	0.11	0.59	0.07	0.77	0.05	0.27	0.03	0.35	0.03	0.15	0.02	0.20
2027	1.02	5.43	0.66	7.11	0.82	4.38	0.54	5.74	0.12	0.61	0.07	0.80	0.05	0.28	0.03	0.37	0.03	0.16	0.02	0.21
2028	1.06	5.62	0.69	7.37	0.85	4.54	0.56	5.95	0.12	0.63	0.08	0.83	0.05	0.29	0.03	0.38	0.03	0.16	0.02	0.22
2029	1.10	5.83	0.71	7.63	0.89	4.70	0.58	6.16	0.12	0.65	0.08	0.86	0.05	0.30	0.04	0.39	0.03	0.17	0.02	0.22
2030	1.13	6.03	0.74	7.90	0.92	4.87	0.60	6.38	0.13	0.67	0.08	0.88	0.06	0.31	0.04	0.41	0.03	0.18	0.02	0.23
2031	1.17	6.24	0.76	8.18	0.95	5.04	0.62	6.60	0.13	0.70	0.09	0.92	0.06	0.33	0.04	0.42	0.04	0.18	0.02	0.24
2032	1.22	6.47	0.79	8.48	0.98	5.22	0.64	6.85	0.14	0.72	0.09	0.95	0.06	0.34	0.04	0.44	0.04	0.19	0.02	0.25
2033	1.26	6.71	0.82	8.80	1.02	5.41	0.66	7.09	0.14	0.75	0.09	0.98	0.06	0.36	0.04	0.47	0.04	0.20	0.02	0.26
2034	1.30	6.93	0.85	9.08	1.05	5.59	0.69	7.33	0.15	0.77	0.09	1.01	0.06	0.36	0.04	0.47	0.04	0.20	0.03	0.27
2035	1.35	7.16	0.88	9.38	1.09	5.77	0.71	7.57	0.15	0.80	0.10	1.05	0.07	0.37	0.04	0.48	0.04	0.21	0.03	0.28

Abbreviations: UK: United Kingdom

4.5.5. Fiscal costs by component, 2025-2035

The total fiscal cost of stroke in the UK is estimated to grow to £2.88 billion by 2035, with fiscal costs in the working age population rising to £1.73 billion, and fiscal costs in the pension age population rising to £1.15 billion. This is an anticipated 23% increase. The growth in fiscal cost is driven by an increase in the number of people living with a stroke over the next 10 years. The rising number of stroke survivors increases the need for welfare support as well as losses attributable to reduced labour market participation (tax revenue and national insurance contributions) to the government.

Table 41: Projected fiscal cost (£, 2025 prices) of stroke to the public finances, by working-age and pension-age populations, 2025–2035

Projected fiscal costs					
Year	Total estimated number of working age claimants	Working age fiscal cost (£)	Total estimated number of pension age claimants	Pension age fiscal cost (£)	Total fiscal cost (£)
2025	103,976	1.62 bn	154,038	741.6 mn	2.36 bn
2026	105,300	1.64 bn	160,121	770.9 mn	2.41 bn
2027	106,251	1.65 bn	167,799	807.9 mn	2.46 bn
2028	106,932	1.66 bn	175,782	846.3 mn	2.51 bn
2029	107,496	1.67 bn	184,054	886.1 mn	2.56 bn
2030	107,984	1.68 bn	192,465	926.6 mn	2.61 bn
2031	108,605	1.69 bn	201,147	968.4 mn	2.66 bn
2032	109,082	1.70 bn	210,639	1.01 bn	2.70 bn
2033	109,609	1.71 bn	219,993	1.06 bn	2.76 bn
2034	110,209	1.71 bn	229,316	1.10 bn	2.82 bn
2035	111,158	1.73 bn	238,624	1.15 bn	2.88 bn

4.6. Sensitivity analyses

The results of the sensitivity analyses reflect the impact of each input tested on the total annual cost of stroke in both 2025 and 2035 (£25.71 - £35.86 billion). These analyses demonstrated that the largest variation in projected societal costs was observed when assumptions regarding the prevalent stroke population were altered. **Table 42** below presents all sensitivity analyses conducted.

Within the epidemiology analyses, assumptions regarding future stroke prevalence had the greatest influence on total costs, with alternative prevalence projections changing costs by £26.7-£267.0 million in 2025 and £518.0-£4,587.4 million in 2035, while changes to incident case numbers, discharge destination, and care home prevalence produced comparatively smaller impacts.

Similarly, varying the quality-of-life decrement associated with prevalent stroke had a substantial impact on results, changing total costs by £366–£507 million in 2025 and £516–£715 million in 2035. In contrast, changes to healthcare resource use and unit cost assumptions had comparatively modest effects. The most influential cost parameter was the acute stroke unit daily cost, which altered total costs by £142.8 million in 2025 and £168.3 million in 2035. Changes to care home costs (£23.1–£26.8 million), home care costs (£26.2–£30.3 million), GP visit costs (£11.0–£13.1 million), and ESD/CRT costs (£17.7–£21.0 million) resulted in relatively small changes to overall cost estimates. Variations in discharge destination assumptions and length of stay parameters had minimal effects on model outputs, with impacts generally below £15 million. Overall, these findings indicate that projected societal costs are driven primarily by assumptions regarding the future prevalence of stroke and the valuation of long-term quality-of-life losses, rather than by uncertainty in individual healthcare and social care resource use parameters.

Table 42: Sensitivity analysis results

	Total cost (2025 £, billions)				Change from base case (£, millions)			
	2025		2035		2025		2035	
Base case	25.71		35.86					
Sensitivity analyses	**Lower**	**Upper**	**Lower**	**Upper**	**Lower**	**Upper**	**Lower**	**Upper**
Epidemiology								
Prevalent care home population	24.76	26.66	34.5	37.22	-951.62	+951.62	-1,359.81	+1,359.81
Prevalence projections*	25.44	25.73	31.27	36.38	-266.99	+26.70	-4,587.36	+518.04
Number of incident cases	25.47	25.95	35.58	36.15	-242.95	+242.95	-285.90	+285.90
ESD/CRT > Care home	25.7	25.72	35.85	35.87	-12.27	+9.54	-13.65	-13.71
SU > Care home	25.7	25.71	35.86	35.87	-6.48	+4.19	-4.00	-6.56
Length of stay (+/- 10%)								
No procedure	25.71	25.71	35.86	35.86	+0.29	-0.51	+0.25	-0.12
Thrombectomy	25.71	25.71	35.86	35.86	+0.01	-0.01	+0.14	-0.05
Thrombolysis	25.71	25.71	35.86	35.86	+0.05	-0.06	+0.11	-0.11
Unit costs (+/- 10 %)								
Acute stroke unit	25.57	25.85	35.69	36.03	-142.81	+142.81	-168.33	+168.33
Care home	25.69	25.73	35.83	35.89	-23.14	+23.14	-26.76	+26.76
CRT	25.71	25.71	35.86	35.86	-2.60	+2.60	-3.17	+3.17
ESD	25.70	25.72	35.85	35.87	-6.83	+6.83	-7.98	+7.98
Combined ESD/CRT**	25.69	25.73	35.84	35.88	-17.71	+17.71	-21.03	+21.03
GMW	25.71	25.71	35.86	35.86	-0.78	+0.78	-0.92	+0.92
GP visit	25.70	25.72	35.85	35.87	-10.96	+10.96	-13.06	+13.06
Home care	25.68	25.73	35.83	35.89	-26.17	+26.17	-30.26	+30.26
6m follow-up	25.71	25.71	35.86	35.86	-0.27	+0.27	-0.32	+0.32
SSDV	25.71	25.71	35.86	35.86	-0.69	+0.69	-0.82	+0.64
Stroke Unit	25.71	25.71	35.86	35.86	-2.06	+2.06	-2.64	+2.64
Thrombectomy	25.71	25.71	35.85	35.86	-2.06	+2.06	-2.5	-2.5
Thrombolysis	25.71	25.71	35.86	35.86	-2.17	+2.17	-2.5	-2.5
Societal (+/-10%)								
Incident EQ-5D applied	25.73	25.68	35.89	35.83	+23.95	-23.52	+33.81	-33.20
Prevalent EQ-5D applied	26.22	25.34	36.58	35.34	+507.08	-365.73	+715.66	-516.18

*Lower bound removed prevalence projections while the upper bound applied a 10% increase to the projection estimates from King (See **Table 20** for details).
**Applies estimates from Byrne 2022, which was used to estimate unit costs for ESD and CRT in the base case analysis.

4.7. Sensitivity analyses for the fiscal costs analysis: ±10% benefit uptake rates

Sensitivity analysis was conducted for the fiscal costs analysis by varying the benefit uptake rates by ±10%. Relative to the base case estimate of £2.36 billion for the UK in 2025, total fiscal costs ranged from £2.18 billion (-10% analysis) to £2.54 billion (+10% analysis).

A similar trend in results was observed when varying the benefit uptake rates. In England, estimated fiscal costs ranged from £1.76 billion to £2.06 billion, compared with a base case estimate of £1.90 billion. Corresponding ranges were £104.4 million to £122.1 million in Wales compared to the base case of £113.2 million, £244.7 million to £285.5 million in Scotland compared to the base case of £265.1 million, and £65.2 million to £76.0 million in Northern Ireland compared to the base case of £70.6 million.

Across the sensitivity analyses, fiscal costs were substantially higher among the working-age population than the pension-age population, despite pension-age people accounting for a larger share of people

living with stroke. At the UK level, fiscal costs in the working-age population ranged from £1.51 billion to £1.72 billion, compared with £667.4 million to £815.8 million among pension-age claimants. This pattern was consistent across all UK nations and reflects the considerably higher fiscal cost per person among working-age claimants.

Table 43: Sensitivity analyses for the fiscal costs analysis: +10% benefit uptake rates

Country	Estimated Number of working age claimants	Total fiscal cost for working age population (£)	Estimated Number of pension age claimants	Total fiscal cost for pension age population (£)	Total fiscal cost of stroke in 2025 (£)
UK	103,976	1.72 bn	169,441	815.8 mn	2.54 bn
England	84,337	1.40 bn	136,664	658.0 mn	2.06 bn
Wales	4,710	78.1 mn	9,133	44.0 mn	122.1 mn
Scotland	11,734	194.7 mn	18,859	90.8 mn	285.5 mn
Northern Ireland	3,195	53.0 mn	4,785	23.0 mn	76.0 mn

Abbreviations: UK: United Kingdom

Table 44: Sensitivity analyses for the fiscal costs analysis: -10% benefit uptake rates

Country	Estimated number of working age claimants	Total fiscal cost for working age population (£)	Estimated umber of pension age claimants	Total fiscal cost for pension age population (£)	Total fiscal cost of stroke in 2025 (£)
UK	103,976	1.51 bn	138,634	667.4 mn	2.18 bn
England	84,337	1.22 bn	111,816	538.3 mn	1.76 bn
Wales	4,710	68.4 mn	7,473	36.0 mn	104.4 mn
Scotland	11,734	170.4 mn	15,430	74.3 mn	244.7 mn
Northern Ireland	3,195	46.4 mn	3,915	18.8 mn	65.2 mn

Abbreviations: UK: United Kingdom

Looking at projected costs, total fiscal costs were projected to range from £2.65 billion under the −10% uptake assumption to £3.11 billion under the +10% uptake assumption, compared with a base case estimate of £2.88 billion. Fiscal costs among the working-age population are projected to range from £1.61 billion to £1.84 billion, while costs among the pension-age population are projected to range from £1.03 billion to £1.26 billion. Consistent with the base case results, projected fiscal costs remain higher among the working-age population despite the larger number of pension-age claimants.

Varying benefit uptake assumptions by ±10% affected the absolute estimates of fiscal costs but did not alter the direction or magnitude of results and corresponding conclusions regarding the fiscal cost of stroke.

Table 45: Sensitivity analyses for the fiscal costs analysis: +10% benefit uptake rates

Projected fiscal costs in working and pension age populations					
Year	Total estimated number of working age claimants	Working age fiscal cost (£)	Total estimated number of pension age claimants	Pension age fiscal cost (£)	Total fiscal cost (£)
2025	103,976	1.72 bn	169,441	815.8 mn	2.54 bn
2026	105,300	1.75 bn	176,133	848.0 mn	2.59 bn
2027	106,251	1.76 bn	184,579	888.7 mn	2.65 bn
2028	106,932	1.77 bn	193,361	930.9 mn	2.70 bn
2029	107,496	1.78 bn	202,459	974.7 mn	2.76 bn
2030	107,984	1.79 bn	211,712	1.02 bn	2.81 bn
2031	108,605	1.80 bn	221,261	1.07 bn	2.87 bn
2032	109,082	1.81 bn	231,703	1.12 bn	2.93 bn
2033	109,609	1.82 bn	241,992	1.17 bn	3.00 bn
2034	110,209	1.83 bn	252,247	1.21 bn	3.04 bn
2035	111,158	1.84 bn	262,487	1.26 bn	3.11 bn

Table 46: Sensitivity analyses for the fiscal costs analysis: -10% benefit uptake rates

Projected fiscal costs in working and pension age populations					
Year	Total estimated number of working age claimants	Working age fiscal cost (£)	Total estimated number of pension age claimants	Pension age fiscal cost (£)	Total fiscal cost (£)
2025	103,976	1.51 bn	138,634	667.4 mn	2.18 bn
2026	105,300	1.53 bn	144,108	693.8 mn	2.22 bn
2027	106,251	1.54 bn	151,020	727.1 mn	2.27 bn
2028	106,932	1.55 bn	158,204	761.7 mn	2.31 bn
2029	107,496	1.56 bn	165,649	797.5 mn	2.36 bn
2030	107,984	1.57 bn	173,219	834.0 mn	2.40 bn
2031	108,605	1.58 bn	181,032	871.6 mn	2.45 bn
2032	109,082	1.58 bn	189,575	912.7 mn	2.50 bn
2033	109,609	1.59 bn	197,993	953.2 mn	2.55 bn
2034	110,209	1.60 bn	206,384	993.6 mn	2.59 bn
2035	111,158	1.61 bn	214,762	1.03 bn	2.65 bn

5. Discussion

This analysis shows that stroke continues to impose a very substantial economic burden on the UK economy, and that this burden is expected to grow significantly over time. In 2025, the economic burden of stroke was estimated to cost the UK £25.71 billion per year across health care, social care and wider societal impacts, with costs projected to rise to £35.86 billion by 2035. A key finding is that the economic burden of stroke is driven less by costs during the first-year post-stroke than by the care and rehabilitation needs of a large and growing number of people living long-term with stroke, where ongoing health, social care and informal support needs can be high.

The study provides an updated view of stroke economic burden based on a modelling framework that is updated to reflect the current stroke pathway and service context. The model incorporates important developments in stroke care and service delivery, including changes in first-year post-stroke treatment, post-discharge rehabilitation and integrated community support.

The study also introduces a novel quality-of-life-based approach to estimating wider societal impacts. By linking stroke-related reductions in quality of life to changes in paid productivity, unpaid activity and informal care, the analysis adopts a broader and more integrated perspective on the economic consequences of stroke than has typically been used in earlier UK studies.

These findings emphasise that the impact of stroke on survivors extends far beyond the hospital setting. This discussion considers the main strengths of the analysis, the key limitations and uncertainties, and how the findings compare with previous literature on the economic burden of stroke in the UK[1,26].

The sensitivity analyses found that the largest effects on costs were observed when varying assumptions relating to the prevalent stroke population and quality-of-life losses associated with prevalent stroke. In contrast, variations in treatment pathways, lengths of stay, discharge destinations and individual unit costs had comparatively small impacts on projected costs. Across all scenarios, projected societal costs remained within a relatively narrow range around the base case, suggesting that estimates are primarily driven by the projected number of people living with stroke and associated quality-of-life decrements rather than short-term healthcare resource utilisation assumptions.

Analysis of the total fiscal cost of stroke is a new contribution to the evidence base in evaluating the economic burden of stroke in the UK. This analysis has estimated that total fiscal cost of stroke was £2.36 billion in 2025, comprising impacts of £1.62 billion in the working age population, and impacts of £741.6 million in the pension age population. The estimated fiscal costs for the working age population are greater than the pension age population, despite smaller claimant numbers, as the total cost per person in the working age population is much larger, £15,556 versus £4,815. This reflects not only the cost of the welfare claim itself, but also the value of tax effects and national insurance contributions lost due to claimants being unable to work. Total fiscal costs are estimated to increase from £2.36 billion to £2.88 billion by 2035, an increase of 23%. This rise in costs is anticipated to be attributable to the forecasted increase in the size of the stroke survivor (prevalent) population across the next decade. Sensitivity analysis was conducted varying benefit uptake rates by ±10%, while holding all other assumptions constant. In these scenarios, total fiscal cost of stroke in the UK in 2025 ranged between £2.18 billion and £2.54 billion. Projected future costs ranged from £2.65 billion to £3.11 billion in 2035.

The findings should be considered in the context of wider pressures facing the NHS and social care system. The projected growth in stroke-related demand occurs alongside increasing demand from an ageing population, workforce constraints and ongoing financial pressures. Since most NHS and PSS costs arise from the large and growing population of stroke survivors rather than acute events alone, interventions that reduce stroke incidence, improve recovery, reduce disability or support independence may generate benefits beyond individual health outcomes by reducing future demand for health and social care services.

5.1. Strengths

A key strength of the analysis is the breadth of perspective adopted. The study looks beyond first-year post-stroke hospital activity and NHS expenditure, considering also the ongoing costs associated with meeting the needs of the stroke survivor population, as well as wider societal impacts and fiscal costs. This provides a more comprehensive assessment of the burden of stroke across the UK than a narrower health service costing exercise alone. The analysis distinguishes between the costs associated with

new stroke events and the much larger ongoing care impact associated with the total stroke population in subsequent years.

The analysis of first-year post-stroke care is underpinned by an individual-level pathway model using a discrete event simulation framework. This approach is appropriate in capturing stroke care, where patient pathways are heterogeneous and resource use depends on the timing and sequencing of clinically important events, including admission, treatment, discharge, recurrence and death. By modelling individual trajectories over time, the analysis reflects variation in LOS, treatment receipt, discharge destination and first-year post-stroke care in a way that is more flexible and clinically realistic than approaches based on fixed cycles or average-cost assumptions. The use of patient characteristics such as age, sex, stroke type and severity to determine pathways and outcomes further allows for the model to capture a heterogeneous population.

The model structure builds on a long-standing programme of stroke economic modelling research that has been developed, peer reviewed and refined over time, with inputs and assumptions reviewed through an expert advisory process, providing confidence in the robustness of the methodology and findings.

The analysis also makes extensive use of national data sources. The model is informed primarily by recent SSNAP and SSCA data, supplemented by bespoke analyses of more granular patient-level information where additional detail was required. This is an important strength given the substantial changes in stroke care pathways, treatment provision and service organisation over recent years. Drawing on up-to-date evidence on treatment rates, discharge destinations, stroke severity and rehabilitation pathways helps to ensure that the estimates are more closely aligned with current clinical practice than previous stroke cost-of-illness studies, such as Patel et al (2020) and Xu et al (2018).

Another strength is the explicit representation of the stroke pathway beyond the first-year post-stroke hospital phase alone. The model includes acute stroke unit care, stroke unit rehabilitation, thrombolysis, thrombectomy, early supported discharge, community rehabilitation, combined ESD/CRT pathways, discharge to home or care home, and subsequent recurrence and mortality. This broader pathway structure improves the ability of the analysis to identify the main drivers of cost and provides insight into the implications of potential service changes across different parts of the system. The inclusion of newer service approaches, including integrated community-based rehabilitation, is particularly relevant in the context of current stroke policy and service transformation.

The costing framework is transparent and grounded in recent national unit cost sources, including the National Cost Collection and PSSRU sources, supplemented where necessary by published micro-costing studies. This supports comparability and transparency across model components and strengthens the applicability of the resulting estimates for UK decision-making.

The inclusion of the wider societal and fiscal analyses extends the analyses beyond formal health and social care costs. Societal costs are estimated using a quality-of-life-based framework that captures paid productivity loss and unpaid production, leveraging methods initially established by the Department for Health and Social Care and NICE. The fiscal analysis adds a public finance perspective by incorporating both direct welfare expenditure and, for the working-age population, the effects of reduced labour market participation. The methodology accounted for the dynamics of the UK economy over the medium term by utilising published estimates of both the direct welfare payments attributable to someone living with a stroke, but also the effect of workforce exit due to stroke impairment through foregone tax and national insurance contributions. Considering the economy over the medium term allowed for a broader estimate of the total fiscal cost to the Exchequer of someone being out of work and therefore a clearer indication of the potential savings attributable to the UK economy of focused stroke care investment.

Finally, the analysis is explicitly forward looking, incorporating future incidence and prevalence projections to estimate costs. Future cases of stroke were estimated using ONS population projections combined with age-specific assumptions on stroke incidence and prevalence. This enabled the study to examine not only the current economic burden of stroke, but also how that burden may evolve over the next decade under plausible demographic and epidemiological assumptions.

5.2. Limitations

Important limitations should be noted in relation to the underlying data and the modelling assumptions required to operationalise the analytical framework. The analysis depended substantially on SSNAP data, which, while comprehensive, do not provide complete coverage for all required model inputs. For some parameters, such as acute stroke unit LOS, estimates of which were derived from older evidence and adjusted to reflect current practice, supplementary assumptions were required. Other dimensions, including SU LOS by age or functional status and rehabilitation intensity stratified by patient characteristics, are not directly observed and instead rely on simplified representations such as median values. In addition, the absence of robust evidence on costs beyond six months following stroke necessitated the use of modelling assumptions to project outcomes over the long term. These features collectively introduce uncertainty to the analysis while not being uncommon in analyses of this nature. This uncertainty is an inherent consequence of limitations in the available evidence base and was addressed through sensitivity analyses where appropriate.

Constraints also reflect the broader scope and purpose of SSNAP itself, in which the data collected do not capture the entirety of stroke care pathways or outcomes. While it provides strong coverage of first-year and early subsequent years of post-stroke care, it is less well suited in representing long-term trajectories, community-based care, and the differences in patient experiences over time. As a result, some aspects of stroke-related resource use and outcomes are only partially reflected, and the dataset cannot fully characterise the complete system-wide burden of stroke or patient outcomes.

Further uncertainty arises from limitations in the evidence available to characterise outcomes beyond the first year after stroke and the way outcomes vary by disability severity and rehabilitation pathways. Advisory Group members highlighted the importance of understanding long-term outcomes for people receiving community stroke rehabilitation and newer interventions such as thrombectomy. The challenge is especially relevant for the population living beyond the first-year post stroke, for whom detailed epidemiological data that are simultaneously stratified by age, sex and disability severity remain limited. For example, while prevalence estimates are available by age and sex, the distribution of disability severity within these populations is less well characterised. This constrains the extent to which long-term health and social care costs can be linked to functional status and limits the ability to quantify how improvements in disability outcomes may translate into changes into future service use.

Emerging evidence and developments in national audit datasets are beginning to address some of these limitations. In particular, more recent SSNAP community rehabilitation datasets and linked observational analyses have provided new insights into rehabilitation outcomes, functional independence and long-term survival following specialist community stroke rehabilitation[62,73]. These developments represent an important step towards a better understanding of how community rehabilitation services contribute to long-term recovery following stroke. However, incorporating such evidence into economic modelling remains challenging. Estimating the long-term impact of rehabilitation services or reperfusion therapies requires not only evidence that outcomes improve, but also evidence describing how improvements in disability severity translate into future resource use changes, care needs and population-level prevalence over time. While the current evidence base is evolving, substantial uncertainty remains regarding how these relationships should be represented within a modelling framework.

This consideration is particularly relevant when assessing the long-term effects of thrombectomy. Although there is strong evidence that reperfusion therapies improve functional outcomes after stroke[74], there is no evidence available to extrapolate these benefits to alter the disability profile of the wider population living with the effects of stroke. To do so robustly would require data describing both the current distribution of disability severity within the prevalent stroke population and how increasing access to thrombectomy and thrombolysis would be expected to shift that distribution over time. While access to thrombectomy has expanded substantially since its introduction, the cumulative number of procedures remains small relative to the wider population living with the effects of stroke, making these long-term population impacts difficult to quantify reliably[75]. As more comprehensive longitudinal datasets become available, future iterations of the model may be able to better characterise disability trajectories, rehabilitation outcomes and care requirements over time. This would strengthen the evidence base for assessing the long-term impact of both community rehabilitation services and advances in first-year post-stroke care.

Finally, the fiscal analysis relied on methodological assumptions to conduct estimations of total fiscal cost. Notably, the Crichton et al (2016)[66] publication used to inform the prevalent mRS score distribution reports mRS distribution derived from a median age of stroke onset of 58 years old. This distribution

was assumed to be applicable to both the working age and pension age populations. Equally, for the estimation of the eligible incident stroke population presented in the Appendix, the proportion of patients who scored mRS 4 and 5 were taken from the distribution in the pathway model. It is assumed, due to data availability, that the proportion of patients who have mRS 4 and 5 in those aged 40-64, can also be applied to those aged 16-39. This means that fiscal costs may be overestimated if mRS scores are lower, on average, in the younger population. Similarly, fiscal costs may be underestimated if mRS scores are higher in the younger population.

5.3. Comparison with previous literature and approaches

The 2025 approach adopted for the societal results represents a methodological development from both Patel (2020) and Saka (2009)[76], while remaining grounded in the strengths of earlier analyses. Saka (2009) provided an important early estimate of the economic burden of stroke using the evidence and modelling conventions available at the time, with a strong emphasis on direct costs and informal care. Patel (2020) extended this analysis by updating the evidence base and building on the estimation of resource-use components. The present study builds on the foundations of these prior analyses. However, this analysis deviates by shifting the analytical focus from a service-cost perspective toward a broader assessment of the wider societal economic impact of stroke through a unified quality-of-life framework.

The 2025 approach is designed to capture not only health service use and informal care, but also the broader economic consequences to paid employment and unpaid production. In this framework, stroke is modelled as impacting quality of life, which in turn influences participation in the labour market, unpaid domestic activity, and informal caring roles. This allowed the analysis to comprehensively reflect more of the societal consequences of stroke and utilised methods aligned with current industry consensus, where the link between broader societal consequences and quality-of-life impacts are becoming increasingly central.

The methodological differences outlined above are reflected in the estimated cost profile compared with previous studies, such as Patel et al (2020). This analysis estimates lower NHS costs than were previously projected to 2025 in the Patel 2020 model (£5.34 billion vs £5.9 billion) (**Table 27).** However, social care cost projections in Patel et al (2020) were lower compared to the 2025 model update (£10.1 billion versus £13.72 billion) (**Table 27**). Additionally, the prevalent (stroke survivor) population is estimated to be over 1.4 million in 2025 in this analysis, 48% higher than the number reported by Patel in 2015.

Furthermore, the present analysis estimated NHS costs of £3.41 billion for the prevalent stroke population in the UK in 2025, with social care costs of £13.22 billion, and an average combined NHS and social care cost per person of £11,827 (**Table 31**). In comparison, Patel (2020) estimated a total annual cost of care for stroke survivors of £6.46 billion, based on a population of 950,200, including £1.84 billion in NHS costs and £4.62 billion in social care costs, with an average cost per person of £6,799.

As an important model comparison note, Patel et al (2020) did not report 2025 projections by incident and prevalent stroke status, however the 2015 estimates provided indicate that current model cost profile differences are potentially due to a reduction in post-inpatient care home admissions. As a further cause for variation, social costs in 2025 are less than those reported in 2020. This reduction in social cost between 2020 and 2025 is likely due to the fall in care-home admissions. SLSR research has reported a fall in the number of post-stroke care-home discharges from 24% to 5% between 1995-2018[54]. Additionally, 2024/25 SSNAP data used in this analysis support this downward trend, where 5.3% of first-year post-stroke patients were discharged to a care home. Importantly, this analysis estimates higher social care costs than in the 2015 analysis, reflecting the increased number of people requiring ongoing care and support, alongside increases in annual unit costs for care homes (+82%), home care (+68%) and social service day visits (+79%).

Differences are also observed in the societal results, reflecting methodological developments between the current model and previous analyses, such as Patel et al (2020) and Xu et al (2018). Within this context unpaid productivity represents a new addition to the costing model, while informal care costs decreased significantly due to updated methodology. This analysis estimated that stroke-related reduced quality-of-life results in societal costs of £6.65 billion in 2025, rising to £9.38 billion in 2035

6. Conclusion

This analysis demonstrates that stroke already imposes a substantial economic burden on the UK and that this burden is likely to grow considerably over the next decade. Stroke was estimated to cost the UK £25.71 billion in 2025 alone, with the impact of stroke extending well beyond hospital care costs. The largest share of the burden arises from the long-term care needs of people living with the ongoing impacts of stroke, particularly social care and wider societal impacts. This highlights the importance of viewing stroke as a whole-pathway challenge rather than focusing on the cost of the acute event alone.

The projected growth of the size of the stroke population, paired with the profound cognitive, physical, and emotional impacts experienced by those affected and their families, has important implications for health and care planning. Over the next ten years, stroke is expected to increase demand for rehabilitation services, community support, social care provision and unpaid care, placing further strain on already stretched resources. These findings highlight the need for increased investment in rehabilitation and support services to meet growing demand, improve outcomes for stroke survivors, and deliver wider productivity and fiscal benefits. Failure to invest in prevention, recovery and long-term support is likely to lead to increasing downstream costs across multiple parts of the system.

In addition to demonstrating the need for continued investment in stroke prevention, recovery and long-term support, the results highlight a clear need for cross-sector responses from key stakeholders across policy, research and service delivery providers. While the long-term consequences of stroke are felt most acutely by survivors and their families, the care, support and resources required to address these impacts create substantial costs for the NHS, local authorities, welfare system and the wider economy. Investment in prevention, first-year post-stroke treatment, rehabilitation, and research has the potential to improve outcomes for stroke survivors while generating benefits that extend far beyond the health sector. Coupling the benefits of investment with the far-reaching impacts of stroke across families, public services and the wider economy highlighted throughout this report, these findings present a compelling case for cross-sector collaboration that addresses the growing burden of stroke. Overall, the findings point to a strong case for sustained policy and funding priority for stroke, with a particular focus on reducing long-term disability and supporting recovery across the full care pathway.

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8. Appendix

8.1. Additional fiscal cost results

An additional analysis was conducted looking exclusively at the fiscal costs for new stroke cases. For these cases, a 50% weighting was applied to the population. This assumes the population in their first-year post-stroke occur evenly throughout the year, such that individuals accrue, on average, half of a full year's fiscal costs in the first-year.

8.1.1. Total fiscal cost associated with new stroke cases in 2025

In 2025, the total fiscal cost of new stroke cases in the UK working age population was £26.7 mn, and £22.7 mn for the pension age population. This gave a total estimated fiscal cost of incident stroke in the UK of £49.5 million in 2025.

Table 47 Fiscal cost for the incident working age and pension age population in 2025

Country	Number of working age claimants	Total fiscal cost for working age population (£)	Number of pension age claimants	Total fiscal cost for pension age population (£)	Total fiscal cost of incident stroke (£)
England	1,379	21.4 mn	4,069	18 mn	39.6 mn
Wales	99	1.5 mn	292	1.3 mn	2.9 mn
Scotland	187	2.9 mn	555	2.4 mn	5.4 mn
Northern Ireland	55	853,000	163	730,000	1.6 mn
UK	1,719	26.7 mn	5,079	22.7 mn	49.5 mn

Abbreviations: UK: United Kingdom

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