**NHS Digital**

**Indicator Supporting Documentation**

**IAP00091 Mortality rate within 30 days of hospital admission for stroke**

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| FIELD | CONTENTS |
| IAP Code | IAP00091 |
| Title | Mortality within 30 days of hospital admission for stroke |
| Published by | Department of Health and Social Care |
| Reporting period | Annual |
| Geographical Coverage | England |
| Reporting level(s) | National |
| Based on data from | The Royal College of Physicians (RCP) Sentinel Stroke National Audit Programme (SSNAP) and Office for National Statistics (ONS) mortality data |
| Contact Author Name | Jonathan Trepczyk |
| Contact Author Email |  |
| Rating | Fit for use with caveats |
| Assurance date | 14/12/2015 |
| Review date | 14/12/2019 |
| Indicator set | CCG Outcomes Indicator Set (OIS) 1.5 |
| Brief Description  [This appears as a blurb in search results] | This indicator is the ratio of deaths in the 30 days following a hospital admission for a stroke to the number of deaths expected. |
| Purpose | Some (but not all) deaths within 30 days of admission to hospital may be avoidable through high-quality co-ordinated specialist stroke care. This indicator provides CCGs with a tool to monitor their standardised mortality ratio. Reductions in the ratio could be made by improving aspects of the services CCGs commission for patients. |
| Definition | The ratio of observed number of deaths within 30 days of being admitted to hospital with a known stroke type to the expected number of deaths within the same period following being admitted to hospital with a known stroke type.  Stroke is defined within this indicator as intracerebral haemorrhage, cerebral infarction and stroke, not specified as haemorrhage or infarction. |
| Data Source | RCP SSNAP and Office for National Statistics (ONS) mortality data, via record linkage. |
| Numerator | The observed number of deaths that occurred in the 30 days following an admission to hospital with a primary diagnosis of stroke. |
| Denominator | The number of deaths expected (casemix adjusted) to occur in the 30 days following an admission to hospital with a primary diagnosis of stroke. |
| Calculation | The indicator is calculated as a casemix adjusted standardised mortality ratio. |
| Interpretation Guidelines | A low casemix adjusted standardised mortality ratio is desirable.  Due to the construction of the SMR, it is inappropriate to compare across CCGs or rank different CCGs. A CCG’s SMR should be compared against the national figure of 1. CCGs with an SMR below 1 have fewer deaths within 30 days than the national level, whereas those with an SMR above 1 have more deaths than the national level.  Having a higher than expected mortality ratio should not necessarily be interpreted as being the result of poorer quality or unsafe care. Mortality data needs to be understood in the context of other stroke measures (such as the other CCG OIS indicators), SSNAP data and other factors. For example, mortality rates could be affected by the quality or accuracy of the data or by patient characteristics that were not taken into account when calculating the adjusted mortality rates, such as social deprivation. CCGs should use the data to help better understand mortality in their patients and should consider commissioning case reviews to identify opportunities to improve the quality of care that stroke patients receive.  It is not possible to draw conclusions about which CCG provides better or safer patient care solely using this indicator. Attempting to do so could result in incorrect conclusions being drawn, which in turn could have an adverse (and unwarranted) impact by stigmatising individual CCGs, lowering staff morale and public confidence, or jeopardising the safety of care by providing false reassurance.  This indicator is presented with 99.8% control limits, as opposed to the usual convention within CCG OIS of 95% confidence limits. This methodology aligns with the RCP output published on the SSNAP results portal. Control limits are used to indicate that a CCG is not operating predictably and therefore, when a CCG is identified as an outlier, their SMR will not fall within the lower and upper control limits. |
| Caveats | Control limits within the methodology to be reviewed in future applications to ensure it is not centred around 1 but is centred around the national average. |

Application Form

Indicator and Methodology Assurance Service

**Title:**

**Set or domain:** CCG OIS 1.5

**IAS Reference Code:** IAP00091

**Version History**

|  |  |  |  |
| --- | --- | --- | --- |
| Version | Date | Changed By | Change |
| V0.1 | 23/06/2017 | Andrew Besch | Initiated uplift onto latest version of the form |
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# Application Form

Section 1 Introduction / Overview

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| --- | --- |
| **1.1 Title** |  |
| **1.2 Set or domain** | CCG Outcomes Indicator Set (OIS) 1.5 |
| **1.3 Topic area** | Cardiovascular |
| **1.4 Definition** | The casemix adjusted standardised mortality ratio of people with known stroke type who die within 30 days of hospital admission.  Stroke is defined within this indicator as intracerebral haemorrhage (ICD-10 code: I61), cerebral infarction (I63) and stroke, not specified as haemorrhage or infarction (I64).  The indicator is published annually in December for each CCG in England. It was published for the first time in December 2014 (2013/14 data). |
| **1.5 Indicator owner & contact details** |  |
| **1.6 Publication status** | Currently in publication |

Section 2 Rationale

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| **2.1 Purpose** | Some (but not all) deaths within 30 days of admission to hospital may be avoidable through high-quality co-ordinated specialist stroke care. This indicator provides CCGs with a tool to monitor their standardised mortality ratio. Reductions in the ratio could be made by improving aspects of the services CCGs commission for patients. |
| **2.2 Sponsor** |  |
| **2.3 Endorsement** | The indicator was constructed following consultation with the following clinical and stroke data experts:   * Professor Anthony Rudd, Chair of the Intercollegiate Stroke Working Party, Associate Director for Stroke, Consultant Stroke Physician * James Campbell, Sentinel Stroke National Audit Programme (SSNAP) Intelligence Programme Manager, Royal College of Physicians (RCP) * Lizz Paley, Acting Stroke Programme Intelligence Manager – Data, RCP |
| **2.4 Evidence and Policy base**  Including related national incentives, critical business question, NICE quality standard and set or domain rationale, if appropriate | This indicator supports the NICE Quality Standard for stroke (QS2)[[1]](#footnote-1) which covers care provided to adult stroke patients during diagnosis and initial management, acute-phase care, rehabilitation and long-term management.  Over the last 20 years, a growing body of evidence has overturned the traditional perception that stroke is simply a consequence of ageing that inevitably results in death or severe disability. Evidence is accumulating for more effective primary and secondary prevention strategies, better recognition of people at highest risk who are most in need of active intervention, interventions that are effective soon after the onset of symptoms, and an understanding of the processes of care that contribute to a better outcome¹.  Stroke is a major health challenge, particularly for Western healthcare systems. Alongside death it generates serious long-term disability, placing a substantial burden on families and the wider community. Every year 5.5 million people die as a result of having a stroke, accounting for 10% of total deaths worldwide[[2]](#footnote-2).  Stroke is a medical emergency associated with a very high risk of death in the acute and sub-acute phases and with a continuous excess risk of death. Better prevention and management of strokes may improve the long-term survival rate[[3]](#footnote-3). |

Section 3 Data

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| **3.1 Data source** | RCP SSNAP and Office for National Statistics (ONS) mortality data, via record linkage.  The SSNAP is guided by the Intercollegiate Stroke Working Party (ICSWP) and delivered by the Stroke Programme within the Clinical Effectiveness and Evaluation Unit in the RCP. It is centrally funded by the Healthcare Quality Improvement Partnership (HQIP) on behalf of NHS England as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP).  <http://www.rcplondon.ac.uk/projects/sentinel-stroke-national-audit-programme>. |
| **3.2 Justification of source and others considered** | The SSNAP is the single source of data on stroke services, processes of care and outcomes. It provides the data for other statutory reporting mechanisms in England, including the NICE Quality Standard and the five other CCG OIS stroke measures; it is also due to be used for the NHS Outcomes Framework. SSNAP metrics are aligned with those in the Cardiovascular Disease Outcomes Strategy.  Hospital Episode Statistics (HES) was considered as a data source for this indicator, however HES does not contain stroke severity information or known history of atrial fibrillation prior to stroke, which are key parts of the mortality case mix adjustment model and would be a fundamental limitation to using HES data to measure mortality. Both of these factors are included in the SSNAP model because they are significantly associated with the risk of dying (as would be expected).  In the original MRG discussion in 2012, the RCP cited their view that there can be over-coding of stroke in HES compared to epidemiological studies and that clinicians have reported poor coding for stroke in some instances when they use HES as the sole means of identifying cases. |
| **3.3 Data availability** | CCG OIS indicators are published annually. SSNAP data for the full financial year is available to produce the indicator approximately 8 months after the financial year end; therefore the indicator is published each year in December.  CCG OIS indicators are official statistics and the publication date is pre-announced. There is no gap between the planned and actual publication date.  The RCP make this indicator, along with a number of others, accessible to the public via RCP reporting, including an Easy Access Version aimed at stroke survivors and carers. It is available via Excel spreadsheets and other formats including graphical representation. |
| **3.4 Data quality** | **i) What data quality checks are relevant to this indicator?**  **Coverage**  **Completeness**  **Validity**  **Default**  **Integrity**  **Timeliness**  **Other**  **If you included ‘Other’ as a data quality check, please describe the check, how it will be measured, and its reason for use below:**    **ii) What are the current values for the data quality checks selected?** The period of data the current values are calculated from should be stated. Current values should be recorded as a percentage and calculated as described below.  **Period of data:**  **Coverage:**  **Calculation:**  **Completeness:**  **Calculation:**  **Validity:**  **Calculation:**  **Default:**  **Calculation:**  **Integrity:**  **Calculation:**  **Timeliness:**  **Calculation:**  **Other:**  **Calculation:**  **iii) What are the thresholds for the data quality checks selected?**  **Coverage:**  **Completeness:**  **Validity:**  **Default:**  **Integrity:**  **Timeliness:**  **Other:**  **iv) What is the rationale for the selection of the data quality checks and thresholds selected above?**    **v) Describe how you would plan to improve data quality should it not meet, or subsequently fall below, the thresholds required for this indicator.**    **vi) Who will own the data quality risks and issues for this indicator?**  **Name:**  **Job Title:**  **Role:**  **Email:**  **Telephone:**  **vii) Describe how the data quality risks and issues will be managed for this indicator, including the escalation process.**    **viii) Describe any assumptions you have made about data quality for this indicator.**    **ix) Describe any data quality constraints you are aware of for this indicator.**    **x) Additional data quality information:** |
| **3.5 Quality assurance** | As SSNAP data is subject to strong built-in validation via the secure web tool, it means that it is not possible for providers to enter illogical timings; however, this is double checked during analysis and therefore the accuracy of the indicator is very high. No assumptions are made regarding the arrival and discharge times, apart from when a patient died in hospital. When calculating hospital discharges the indicator uses an assumed time component for time of death, for example 23:59. Firstly, this is due to information governance reasons as it was felt that it would be excessive to capture the exact time of death of patients. Secondly, clinicians need to feel confident that there will not be any negative consequences to providing the most suitable care when their patient is dying. Clinically, it may be best for the patient to be on another ward for their last few hours, which would negatively impact on some indicators if exact times were used.  When submitting SSNAP data, security and confidentiality are maintained through the use of passwords and a person-specific registration process. A dedicated helpdesk is in place to answer queries from SSNAP participants, helping to ensure questions are interpreted consistently (which informs updates to FAQs and data set help notes). Users can register for their team on the SSNAP web tool and input data for their team. Once records are complete and correct they can be ‘locked’ at different levels. Records can be ‘locked’ to 72 hours once this information is completed, they can then be locked to discharge once this is applicable. Locking confirms that all data have been clinically signed off and are ready for central analysis. The ‘Lead clinical contact’ role is responsible for ensuring that the overall system of data collection and entry onto the web tool is accurate, robust and functioning. The SSNAP encourage the lead to routinely check data. Only complete and locked to 72 hours records go into data analysis for the 72 hour section and complete and locked to discharge records go into data analysis for the post-72h section.  Eligibility criteria are applied to determine which records can be included in the audit. The criteria are: ICD-10 codes I61, I63, I64, but hospitals have means of checking for eligible patients other than their coding system and participants are encouraged to enter cases prospectively meaning the stroke team have more control over selecting records to be included and can also refer to their stroke register, should they have one. |
| **3.6 Data linkage** | SSNAP records are linked with mortality information from ONS. The SSNAP data are securely sent for linkage following each quarterly deadline, and the information on any death notifications is provided back monthly. This enables SSNAP to track mortality other than as reported on SSNAP (i.e. after patients have left care). As well as providing casemix adjusted mortality rates, this is also used for other purposes, such as to determine eligibility for receiving a six month assessment. |
| **3.7 Quality of data linkage** | The match rate between SSNAP and ONS data stood at over 98% for 2013/14 data; therefore the indicator is considered an accurate representation of mortality for stroke patients. The RCP are still awaiting 2014/15 mortality data but there are not expected to be concerns with the linkage. |
| **3.8 Data fields** | The data fields supplied by the RCP are as follows:  1. Number of records in SSNAP attributed to this CCG with a known stroke type  2. Case ascertainment band for admitted patients  3. Number of deaths expected (casemix adjusted)  4. Number of deaths reported  5. Standardised Mortality Ratio (SMR)  6. Lower 99.8% control limit  7. Upper 99.8% control limit |
| **3.9 Data filters** | SSNAP-derived records meeting all of the following requirements are valid for the denominator in this indicator.   * Primary Diagnosis is equal to ‘I61’ or ‘I63’ or ‘I64’   SSNAP-derived records meeting all of the following requirements are valid for the numerator in this indicator.  Date of Death within 30 days of Admission Date |
| **3.10 Justifications of inclusions and exclusions**  and how these adhere to standard definitions | Primary Diagnosis is equal to ‘I61’ or ‘I63’ or ‘I64’ - Selects primary diagnosis of stroke. The coding advice from the Clinical Classifications Service also includes I60 (Subarachnoid haemorrhage) and I62 (Other non-traumatic intracranial haemorrhage), however this advice would not be endorsed by the RCP as subarachnoid haemorrhage and other non-traumatic intracranial haemorrhage have a different care pathway and outcome.  Date of Death within 30 days of Admission Date - Selects only patients who died within 30 days of admission.  The SSNAP uses the following ICD-10 diagnosis codes to identify stroke patients:   * I61 - Intracerebral haemorrhage * I63 - Cerebral infarction * I64 - Stroke, not specified as haemorrhage or infarction   The coding advice from the Clinical Classifications Service also includes I60 (Subarachnoid haemorrhage) and I62 (Other nontraumatic intracranial haemorrhage), however this advice would not be endorsed by the RCP as subarachnoid haemorrhage and other non-traumatic intracranial haemorrhage have a different care pathway and outcome.  Subarachnoid haemorrhages and other non-traumatic intracranial haemorrhages are routinely and nearly always managed entirely outside of the stroke unit by neurosurgeons or by interventional neuroradiologists, which is what is recommended in national guidelines for these cases. The indicators need to reflect the care given on appropriate clinical pathways, not arbitrary groupings. |
| **3.11 Data processing** | The calculated CCG level indicator is provided by the RCP and includes the SMR, expected and reported deaths, control limits and contextual information. It is provided with any necessary data suppression. |

Section 4 Construction

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| **4.1 Numerator** | The observed number of deaths that occurred in the 30 days following an admission to hospital with a primary diagnosis of stroke. |
| **4.2 Denominator** | The number of deaths expected (casemix adjusted) to occur in the 30 days following an admission to hospital with a primary diagnosis of stroke. |
| **4.3 Computation** | The indicator is calculated as a casemix adjusted standardised mortality ratio. |
| **4.4 Risk adjustment or standardisation type and methodology** | **Indirect Standardisation**  *Variables and methodology:*  **Formula for calculation of indirect standardisation**  Where:  O is the total observed number of events in the local or subject population  *E* is the total number of expected events in the local or subject population, given the standard rates λ*i* in the reference or standard population;  *Oi* is the observed numbers of events in the local or subject population in age group *i*;  *Ei* is the expected number of events in the local or subject population in age group *i*, given the standard rate λ*i* in the reference or standard population;  *ni* is the number of individuals in the local or subject population in age group *i*;  λ*i* is the crude age-specific rate in the reference or standard population in age group *i*;  The age and sex specific rates of the standard population (the relevant national population) are applied to the age and sex structure of the subject population to give an expected number of events. The observed number of events is then compared to that expected and expressed as a ratio (observed/expected).  Casemix Adjustment  To estimate the probability of 30 day mortality for a patient, the observed value of each variable in the model is multiplied by a corresponding coefficient and summed to give a value, ω. This is a data-driven model and the coefficients are created based on the strength the variable has on mortality according to the cohort of data.  The value ω is then used in the equation to give the predicted probability of 30 day mortality.  The RCP use two models for casemix adjustment, which are detailed in the published paper ‘Derivation and external validation of a casemix model for the standardized reporting of 30-day stroke mortality rates’. Bray BD, Campbell J, Cloud GC, Hoffman A, James M, Tyrrell PJ, Wolfe CD, Rudd AG; Intercollegiate Stroke Working Party Group (2014) <http://www.ncbi.nlm.nih.gov/pubmed/25293667> |

For 2013-14, the following coefficients were used:

Model A

|  |  |
| --- | --- |
| Variable | Coefficient |
| *Age* |  |
| <60 | 0.000 |
| 60-69 | 0.624 |
| 70-79 | 1.033 |
| 80-89 | 1.488 |
| 90+ | 1.781 |
| *NIHSS* | 0.137 |
| *Atrial fibrillation* | 0.425 |
| *Stroke Type* |  |
| Ischemic | 0.000 |
| ICH | 0.870 |
| Constant | -5.250 |

Model B

|  |  |
| --- | --- |
| Variable | Coefficient |
| *Age* |  |
| <60 | 0.000 |
| 60-69 | 0.657 |
| 70-79 | 1.252 |
| 80-89 | 1.613 |
| 90+ | 2.127 |
| *NIHSS Consciousness* |  |
| 0 - Alert | 0.000 |
| 1 – Verbal response | 1.585 |
| 2 – Pain response | 2.576 |
| 3 - Unconscious | 3.564 |
| *Atril fibrillation* | 0.467 |
| *Stroke Type* |  |
| Ischemic | 0.000 |
| ICH | 0.877 |
| Constant | -4.158 |

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| --- | --- |
|  | These coefficients were derived during the model fitting procedure that was written up in the peer-reviewed paper. The model above was derived and validated against the South London Stroke Register. A step-by-step explanation is below:  For Model A (where the National Institutes of Health Stroke Severity (NIHSS) is fully completed) the calculations are as follows:  Age is in 5 bands:  Less than 60 (coefficient of 0)  60-69 (coefficient of 0.624)  70-79 (coefficient of 1.033)  80-89 (coefficient of 1.488)  90+ (coefficient of 1.781)  The coefficient for NIHSS is the NIHSS score multiplied by 0.137  If the patient was known to be in atrial fibrillation before stroke, the coefficient is 0.425 (otherwise 0)  If the patient had a haemorrhagic stroke, the coefficient is 0.87 (otherwise 0)  The sum for the individual is the sum of the above 4 coefficients minus 5.25  The probability is then e(Model A)/(1+e(Model A))  Similarly for Model B (where NIHSS is only partially completed):  Age is in 5 bands:  Less than 60 (coefficient of 0)  60-69 (coefficient of 0.657)  70-79 (coefficient of 1.252)  80-89 (coefficient of 1.613)  90+ (coefficient of 2.127)  LOC categories:  LOC of 0 (coefficient is 0)  LOC of 1 (coefficient is 1.585)  LOC of 2 (coefficient is 2.576)  LOC of 3 (coefficient is 3.564)  If the patient was known to be in atrial fibrillation before stroke, the coefficient is 0.467 (otherwise 0)  If the patient had a haemorrhagic stroke, the coefficient is 0.877 (otherwise 0)  The sum for the individual is the sum of the above 4 coefficients minus 4.158  The probability is then e(Model B)/(1+e(Model B))  You then sum all the probabilities up (either Model A or Model B for each individual) and round to a whole number to get the expected number of deaths.  For the 2014/15 data, the logistic regression model will be re-run to obtain up-to-date coefficients for age, NIHSS, atrial fibrillation and stroke type for both Model A and Model B. The procedure for then calculating the expected number per team will be the same, except with the new coefficients. |
| **4.5 Justification of risk adjustment type and variables**  or why risk adjustment is not used | Case mix adjustment is required to allow valid comparison of outcomes across care providers. Due to a lack of externally validated models suitable for use in unselected stroke admissions, the Intercollegiate Stroke Working Party Group developed and externally validated prediction models to enable comparison of 30-day post-stroke mortality outcomes using routine clinical data.  Case mix adjustment is by age, stroke severity, known atrial fibrillation on admission and stroke type and does not encompass any other factors that could potentially influence the ratio.  The SSNAP annual report provides some overall demographic details of patients included in the SSNAP <https://www.strokeaudit.org/Documents/AnnualReport/2015-16-SSNAP-Annual-Report.aspx>  Along with a host of other detailed audit information, the quarterly SSNAP public report provides specific details on the casemix breakdowns, including patient numbers, gender, age, co-morbidities, stroke type, Modified Rankin Scales scores, NIHSS and the onset of symptoms (Section 2: Casemix, p43) <https://www.strokeaudit.org/Documents/National/Clinical/AugNov2016/AugNov2016-PublicReport.aspx> |
| **4.6 Confidence interval / control limit use and methodology** | Control Limits  *Methodology:*  The equation below is the standard binomial approximation which is the methodology used for 2013/14 data. For 2014/15, the RCP will update the methodology to use Byar’s approximation.  Control limits = mean SMR - *z*\*() |
| **4.7 Justification of confidence intervals / control limits used** | The SSNAP uses control limits for the purpose of outlier detection with regards to mortality. |

Section 5 Presentation and Interpretation

Presentation

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| **5.1 Presentation of indicator** | The indicator is presented on the NHS Digital Indicator Portal in a consistent format to other CCG OIS indicators. It is accompanied by indicator specification and quality statement documents, which provide details of indicator construction, data quality, statistical methods and interpretation considerations <https://indicators.hscic.gov.uk/webview/> .  The data is presented with a detailed header including information on the statistic presented, the reporting period, level of coverage, publication date, data source, and any further notes to be aware of. The customer is also able to make use of drop-down filtering. |

Table showing headers for data for indicator

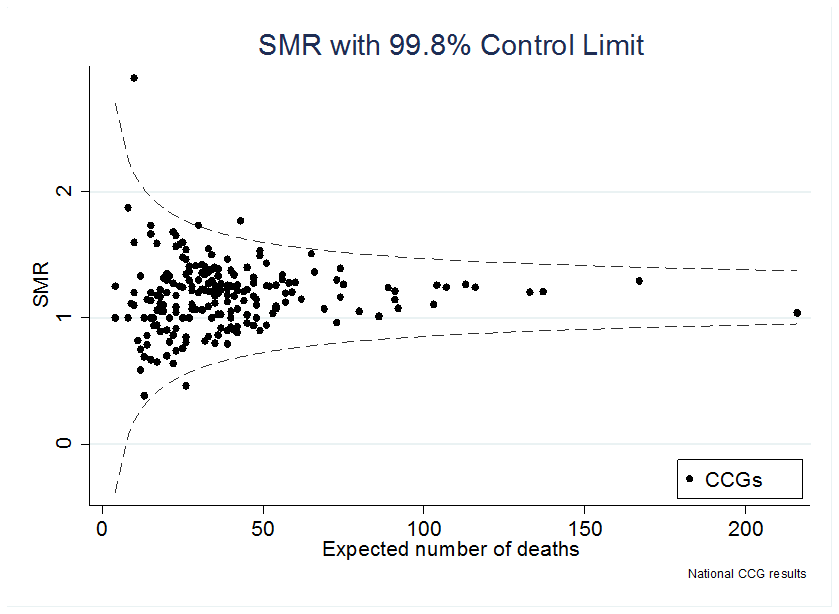
|  |  |
| --- | --- |
| **Column name** | **Output** |
| Reporting Period | Financial year |
| Breakdown | CCG |
| Level | CCG Code |
| Level description | CCG Name |
| SMR | The casemix adjusted standardised mortality ratio |
| CL lower | Lower 99.8% control limits |
| CL upper | Upper 99.8% control limits |
| Number of deaths reported | The observed number of deaths that occurred in the 30 days following an admission to hospital for stroke |
| Number of deaths expected (casemix adjusted) | The number of deaths expected (casemix adjusted) to occur in the 30 days following an admission to hospital for stroke |
| Number of records in SSNAP with a known stroke type (patient outcomes) | The number of cases in SSNAP |
| Case ascertainment band | Case ascertainment between SSNAP and HES |

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| **5.2 Contextual information provided alongside indicator**  with justification | Alongside the numerator, denominator and SMR, the number of records in SSNAP attributed to the CCG with a known stroke type is provided as contextual information.  The indicator is published in the context of case ascertainment between SSNAP and HES. The ‘Estimated expected number of patients from HES’ figure is the number of patients who have been coded as a primary diagnosis of stroke during their admission in a year’s worth of HES, split by the patient’s CCG recorded in the HES record. Case ascertainment is reported alongside the indicator for all CCGs to highlight audit coverage against HES. MRG requested this further analysis in the original assurance process.  The ‘Case ascertainment band’ column in the published output uses the following bandings:   * Less than 50% * 50-69% * 70-79% * 80-89% * 90%+   The indicator is not reported for any CCGs with lower than 50% case ascertainment or for those with fewer than 20 patients. |
| **5.3 Calculation and data source of contextual information** | The contextual information is sourced from the SSNAP and provided by the RCP. |
| **5.4 Use of bandings, benchmarks or targets**  with justification | None. A CCG’s SMR should be compared against the national figure of 1. |
| **5.5 Banding, benchmark or target methodology**  if appropriate | N/A |

Interpretation

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| --- | --- |
| **5.6 Interpretation guidelines** | A low casemix adjusted standardised mortality ratio is desirable.  Due to the construction of the SMR, it is inappropriate to compare across CCGs or rank different CCGs. A CCG’s SMR should be compared against the national figure of 1. CCGs with an SMR below 1 have fewer deaths within 30 days than the national level, whereas those with an SMR above 1 have more deaths than the national level.  Having a higher than expected mortality ratio should not necessarily be interpreted as being the result of poorer quality or unsafe care. Mortality data needs to be understood in the context of other stroke measures (such as the other CCG OIS indicators), SSNAP data and other factors. For example, mortality rates could be affected by the quality or accuracy of the data or by patient characteristics that were not taken into account when calculating the adjusted mortality rates, such as social deprivation. CCGs should use the data to help better understand mortality in their patients and should consider commissioning case reviews to identify opportunities to improve the quality of care that stroke patients receive.  It is not possible to draw conclusions about which CCG provides better or safer patient care solely using this indicator. Attempting to do so could result in incorrect conclusions being drawn, which in turn could have an adverse (and unwarranted) impact by stigmatising individual CCGs, lowering staff morale and public confidence, or jeopardising the safety of care by providing false reassurance.  This indicator is presented with 99.8% control limits, as opposed to the usual convention within CCG OIS of 95% confidence limits. This methodology aligns with the RCP output published on the SSNAP results portal. Control limits are used to indicate that a CCG is not operating predictably and therefore, when a CCG is identified as an outlier, their SMR will not fall within the lower and upper control limits. |
| **5.7 Limitations and potential bias** | Differences in casemix (beyond that accounted for by standardisation), comorbidities, socio-economic mix of local populations and other potential factors may contribute to variation. |
| **5.8 Improvement actions** | It is expected that CCGs will use this indicator to identify improvements in care and how they can be delivered to improve stroke mortality.  Improvements could be made by enhancing aspects of the services CCGs commission for patients. This could come in the form of more effective primary and secondary prevention strategies, better recognition of people at highest risk who are most in need of active intervention, interventions that are effective soon after the onset of symptoms or an understanding of the processes of care that contribute to a better outcome. |
| **5.9 Evidence of variability** | The data within this section is taken from the December 2014 CCG OIS publication.  The data below shows the ten CCGs with the lowest and the ten CCGs with the highest SMRs in 2013/14. Five CCGs have been suppressed due to insufficient case ascertainment between SSNAP and HES, they are not included within the data below |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **CCG** | **SMR** | **LCL** | **UCL** | **Den** | **Num** | **No. of records in SSNAP known stroke type** | **Case Ascertainment band** |
| **CCG1** | 0.38 | 0.30 | 2.02 | 13 | 5 | 163 | 70-79% |
| **CCG2** | 0.46 | 0.56 | 1.77 | 26 | 12 | 288 | 90%+ |
| **CCG3** | 0.58 | 0.27 | 2.05 | 12 | 7 | 179 | 50-69% |
| **CCG4** | 0.64 | 0.50 | 1.82 | 22 | 14 | 203 | 80-89% |
| **CCG5** | 0.65 | 0.41 | 1.91 | 17 | 11 | 154 | 50-69% |
| **CCG6** | 0.67 | 0.36 | 1.96 | 15 | 10 | 123 | 90%+ |
| **CCG7** | 0.69 | 0.30 | 2.02 | 13 | 9 | 154 | 50-69% |
| **CCG8** | 0.69 | 0.30 | 2.02 | 13 | 9 | 187 | 50-69% |
| **CCG9** | 0.70 | 0.47 | 1.85 | 20 | 14 | 227 | 50-69% |
| **CCG10** | 0.74 | 0.52 | 1.81 | 23 | 17 | 255 | 50-69% |
|  |  |  |  |  |  |  |  |
| **CCG** | **SMR** | **LCL** | **UCL** | **Den** | **Num** | **No. of records in SSNAP known stroke type** | **Case Ascertainment band** |
| **CCG197** | 1.60 | 0.54 | 1.78 | 25 | 40 | 235 | 90%+ |
| **CCG198** | 1.60 | 0.18 | 2.14 | 10 | 16 | 94 | 50-69% |
| **CCG199** | 1.65 | 0.52 | 1.81 | 23 | 38 | 223 | 90%+ |
| **CCG200** | 1.67 | 0.36 | 1.96 | 15 | 25 | 172 | 70-79% |
| **CCG201** | 1.68 | 0.50 | 1.82 | 22 | 37 | 260 | 90%+ |
| **CCG202** | 1.73 | 0.36 | 1.96 | 15 | 26 | 156 | 80-89% |
| **CCG203** | 1.73 | 0.60 | 1.73 | 30 | 52 | 212 | 90%+ |
| **CCG204** | 1.77 | 0.69 | 1.63 | 43 | 76 | 394 | 70-79% |
| **CCG205** | 1.88 | 0.07 | 2.25 | 8 | 15 | 99 | 70-79% |
| **CCG206** | 2.90 | 0.18 | 2.14 | 10 | 29 | 167 | 80-89% |



Please note, the national SMR is not centred at 1.0 as overall mortality and casemix variables have changed since the start of SSNAP when the model was first derived. The validated model was applied in 2013/14 without any adjustments but in response to feedback, the RCP are considering re-centring the baseline each year to take account for national trends in mortality and casemix.

Section 6 Risks

|  |  |
| --- | --- |
| **6.1 Similar existing indicators** | This indicator, along with a number of other measures relating to stroke, is published in different formats at CCG, trust and stroke team level on the SSNAP results portal <http://www.strokeaudit.org/results/Clinical-audit/National-Results.aspx>  A similar indicator exists in the NHS Digital Compendium of Population Health Indicators (Deaths within 30 days of emergency admission to hospital: stroke, portal identifier: P00811). The indicator is presented on the NHS Digital Indicator Portal with a number of different age, sex and statistical breakdowns <https://indicators.hscic.gov.uk/webview/> |
| **6.2 Coherence and comparability** | The methodology and results for this indicator are consistent with the same indicator published on the SSNAP results portal.  The Compendium indicator differs in that it is sourced from HES and provides an indirectly age and sex standardised rate per 100,000 population at national, regional and local authority level (not CCG). Furthermore, as well as ICD-10 codes I61, I63 and I64, it also includes the extra code I62 (Other non-traumatic intracranial haemorrhage) which is not included in this indicator, as this diagnosis has a different care pathway and outcomes. |
| **6.3 Undesired behaviours and/or gaming** | The indicator is produced using linkage with the relevant mortality statistics and therefore not subject to interference by providers.  The RCP has wide experience of monitoring the impact of performance indicators, working closely with stroke and cardiac networks, and consider its standard methods to be sufficient to minimise risks of gaming and perverse incentives. |
| **6.4 Approach to indicator review** | The Indicator Governance Board (IGB) set a review period of one year when the indicator was previously assured, in order to revisit the presentation and interpretation of this indicator. The time period for the next review will again be set by IGB.  User feedback and comments on this indicator are welcomed via NHS Digital Enquires [enquiries@hscic.gov.uk](mailto:enquiries@hscic.gov.uk) or the CCG OIS mailbox [ccgois@hscic.gov.uk](mailto:ccgois@hscic.gov.uk) |
| **6.5 Disclosure control** | Case ascertainment used is the proportion of patients per CCG with primary ICD-10 codes I61, I63 and I64 in HES data who are included in SSNAP for the same time period.  Case ascertainment is reported alongside the indicator for all CCGs. The indicator is not reported for any CCGs with lower than 50% case ascertainment or for those with fewer than 20 patients, instead replacing the SMR with ‘\*’.  Ratios are rounded to two decimal places before publication. |
| **6.6 Copyright** | There are no restrictions on the use of these data. Any subsequent use or publishing of these data should reference the RCP SSNAP. |

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| --- |
| logo for indicator assurance board |
| Indicator Assurance Report |
| Mortality rate within 30 days of hospital admission for stroke |
| **IAP00091** |



**Final Assurance Rating from the Indicator Governance Board**

|  |  |
| --- | --- |
| **Clarity** | **Fit for use** |
| **Rationale** | **Fit for use** |
| **Data** | **Fit for use with caveats** |
| **Construction** | **Fit for use with caveats** |
| **Presentation and Interpretation** | **Fit for use with caveats** |
| **Risks and Usefulness** | **Fit for use with caveats** |
| **Final Assurance Rating** | **Fit for use with caveats** |

|  |
| --- |
| **This indicator has been approved for inclusion in the National Library of Quality Assured Indicators** |

|  |
| --- |
| **Key findings from Assurance** |
| * IGB members accepted the conclusions reached by MRG, identifying the indicator should be reviewed in 1 year to revisit the presentation of the indicator and how it should be interpreted. IGB would expect that the model is re-calibrated as identified in MRG discussions and that in future results will be centred around 1. |

|  |  |
| --- | --- |
| **Approval date** | 14/12/2015 |
| **Review date** | 14/12/2016 |

**MRG Assessment Summary (26/11/2015)**

|  |  |
| --- | --- |
| **Methodology appraisal body** | HSCIC's Indicator & Methodology Assurance Service |
| **Reason for assessment** | Scheduled review (review date reached) |
| **Iteration** | 2nd MRG meeting |

**Suggested Assurance Rating by Methodology Appraisal Body**

|  |  |
| --- | --- |
| **Clarity** | **Fit for use** |
| **Rationale** | **Fit for use** |
| **Data** | **Fit for use with caveats** |
| **Construction** | **Fit for use with caveats** |
| **Presentation and Interpretation** | **Fit for use with caveats** |
| **Risks and Usefulness** | **Fit for use with caveats** |
| **Suggested assurance rating** | Fit for use with caveats |

**Summary Recommendation to Applicant:**

MRG noted that the indicator has been previously assured (with caveats) as suitable for inclusion in the Library of Quality Assured Indicators, however this was under an earlier iteration of the assurance process. Members thanked the applicant again for the “uplift” in documentation which has allowed the indicator to be assessed against the standard criteria assessment and “levels of assurance”. The indicator is now recommended for consideration by the IGB, although the developer is recommended to strengthen the description of how the results are presented (particularly with regards to the control limits shown in the table results) to aid the users interpretation.

**Summary Recommendation to IGB:**

After further consideration and acceptance of the updated information provided in regards to the construction of the indicator, MRG recommend the indicator for inclusion in the Library of Quality Assured Indicators. The MRG however noted the following caveats – that within the methodology presented the control limits are not centred around 1 but are centred around the national average which is not 1. Although this is not ideal MRG accept that the model is re-calibrated each year and it is anticipated that future results will be centred around 1. In addition MRG recommend that the presentation of results are clearly labelled and described to inform users on what is being presented – i.e. control limits that apply to the rate.

**MRG Assessment Summary (10/09/2015)**

|  |  |
| --- | --- |
| **Methodology appraisal body** | HSCIC's Indicator & Methodology Assurance Service |
| **Reason for assessment** | Scheduled review (review date reached) |
| **Iteration** | 1st MRG meeting |

**Suggested Assurance Rating by Methodology Appraisal Body**

|  |  |
| --- | --- |
| **Clarity** | **Fit for use** |
| **Rationale** | **Fit for use with caveats** |
| **Data** | **Fit for use with caveats** |
| **Construction** | **Not fit for use** |
| **Presentation and Interpretation** | **Not fit for use** |
| **Risks and Usefulness** | **Fit for use with caveats** |
| **Suggested assurance rating** | Not fit for use |

**Summary Recommendation to Applicant:**

MRG noted that the indicator has been previously assured (with caveats) as suitable for inclusion in the Library of Quality Assured Indicators, however this was under an earlier iteration of the assurance process. Members thanked the applicant for the “uplift” in documentation which has allowed the indicator to be assessed against the standard criteria assessment and “levels of assurance”.   
  
Upon review the indicator has been rated as “not fit for purpose” against the ‘Construction’ and “Interpretation” assessment criterion, which in turn mean that the indicator would not at present be suitable for inclusion in the Library of Quality Assured Indicators. The rating is primarily due to concerns relating to the method of calculating the confidence intervals which are detailed in the appraisal log (comment 4d). However as the model used to construct the indicator has not been presented as part of the application, MRG members have also concluded that they do not have the necessary level of information to come to a final conclusion on the robustness of the methodology, regardless of the points regarding the confidence intervals (comment 4c).   
  
As such MRG strongly recommend the indicator returns to MRG for reconsideration following further investigation of the points raised in the appraisal log (see below).

**Summary Recommendation to IGB:**

Upon review, MRG currently do not endorse the indicator for inclusion in the Library as per the comments provided to the applicant.  
  
Members also raised concern that a HES-based indicator is also currently live (part of the Compendium) and have recommended that this indicator be put forward for assurance such that the methodology for the indicator could also be assessed.

**Please find a detailed description of recommendations and actions in the appraisal log at the end of the document.**

**What do the Assurance Ratings mean?**

|  |  |
| --- | --- |
| **Rating** | **Description** |
| **Fit for use** | This indicator can be used with confidence that it is constructed in a sound manner that is fit for purpose. |
| **Fit for use with caveats** | The indicator is fit for use, however users should be aware of caveats and/or recommendations for improvement that have been identified during the assurance process. |
| **Use with caution** | The indicator is based on a sound methodology for which the assurance process endorse the use, however issues have been identified with the national data source which have implications for its use as an indicator. |
| **Not fit for use** | Issues have been identified with the indicator which have resulted in the assurance process currently not endorsing its use as a quality indicator. |
| **Not enough information provided** | There has not been enough information supplied to the assurance process to be able to accurately give the indicator a level of assurance. |

**Appraisal Log**

**Clarity**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Rec. no*** | ***Issue or recommendation*** | ***Raised by / Date*** | ***Response or Action taken by applicant*** | ***Response date*** | ***Resolved*** | ***Sign off by / Date*** |
| 1a | No issues raised |  |  |  |  |  |

**Rationale**

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| --- | --- | --- | --- | --- | --- | --- |
| ***Rec. no*** | ***Issue or recommendation*** | ***Raised by / Date*** | ***Response or Action taken by applicant*** | ***Response date*** | ***Resolved*** | ***Sign off by / Date*** |
| 2a | A sponsor for the indicator needs to be identified. | MRG  10/09/15 | The sponsor of the CCG OIS is Richard Owen, Outcomes Strategy Lead, NHS Medical Directorate, NHS England. | 26/11/15 |  | MRG – 26/11/2015 |
| 2b | The definition should be clear as to the types of stroke included in the indicator. | MRG  10/09/15 | A sentence is included in the definition section of the IAS application form and Indicator Quality Statement, stating: Stroke is defined within this indicator as intracerebral haemorrhage (ICD-10 code: I61), cerebral infarction (I63) and stroke, not specified as haemorrhage or infarction (I64). | 26/11/15 |  | MRG – 26/11/2015 |

**Data**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Rec. no*** | ***Issue or recommendation*** | ***Raised by / Date*** | ***Response or Action taken by applicant*** | ***Response date*** | ***Resolved*** | ***Sign off by / Date*** |
| 3a | Further analysis is recommended to compare improvements in the audit data quality with HES as part of review process. | IGB 30/11/12 | The indicator is published in the context of case ascertainment between SSNAP and HES. This is the percentage of patients with primary ICD-10 codes I61, I63 and I64 in HES who are included in SSNAP for the same time period.  The SSNAP is a mandatory collection and overall case ascertainment increased from 72% in Quarter 1 to 95% in Quarter 4, 2013/14 (Quarter 2: 83%, Quarter 3: 90%). It has further improved to 97% by Quarter 4, 2014/15. Case ascertainment is reported alongside the indicator for all CCGs in the published CCG OIS data files. Only five CCGs (2.4%) had their standardised mortality ratios suppressed in the published 2013/14 data due to less than 50% case ascertainment with HES.  Patient records are only included in audit analyses if they include the minimum requirements of completion of mandatory fields. The minimum includes all of the fields required to calculate this indicator. Case ascertainment is reported publicly at hospital level and therefore there is a strong incentive for hospitals to ensure they have submitted all of their patients to the audit and completed the mandatory fields. The data is received via a secure web tool which has strong built-in validation meaning that data is fully complete. | 13/08/15 |  | MRG  10/09/15 |
| 3b | MRG recommended that information on the quality of the linkage between the audit and ONS mortality data should be included. | MRG - During initial appraisal | SSNAP records are linked with mortality information from ONS. The SSNAP data are securely sent for linkage following each quarterly deadline, and the information on any death notifications is provided back monthly. This enables SSNAP to track mortality other than as reported on SSNAP (i.e. after patients have left care). As well as providing casemix adjusted mortality rates, this is also used for other purposes, such as to determine eligibility for receiving a six month assessment.  The match rate between SSNAP and ONS data stood at over 98% for 2013/14 data; therefore the indicator is considered an accurate representation of mortality for stroke patients. The RCP are still awaiting 2014/15 mortality data but there are not expected to be concerns with the linkage. | During initial appraisal |  | MRG  10/09/15 |
| 3c | The rationale for selecting the ICD-10 codes used to identify stroke patients should be clearly stated in the documentation for each indicator.  Update:  There is a discrepancy between what SSNAP and the clinical classifications service consider a stroke, therefore further justification for the codes used is required and the definition should be updated (as stated in recommendation 2b). | MRG - During initial appraisal  MRG  10/09/15 | The SSNAP uses the following ICD-10 diagnosis codes to identify stroke patients:   * I61 - Intracerebral haemorrhage * I63 - Cerebral infarction * I64 - Stroke, not specified as haemorrhage or infarction   The coding advice from the Clinical Classifications Service also includes I60 (Subarachnoid haemorrhage) and I62 (Other nontraumatic intracranial haemorrhage), however this advice would not be endorsed by the RCP as subarachnoid haemorrhage and other non-traumatic intracranial haemorrhage have a different care pathway and outcome.  Update:  Subarachnoid haemorrhages and other non-traumatic intracranial haemorrhages are routinely and nearly always managed entirely outside of the stroke unit by neurosurgeons or by interventional neuroradiologists, which is what is recommended in national guidelines for these cases. The indicators need to reflect the care given on appropriate clinical pathways, not arbitrary groupings. | During initial appraisal |  | MRG – 26/11/2015 |
| 3d | The narrative around why SSNAP is being used as opposed to HES should be strengthened. The application states that over-coding occurs in HES, however the results in section 5.9 show that case “ascertainment” against HES is over 100%. | MRG  10/09/15 | The application stated that the RCP view at the original MRG meeting in 2012 was that over-coding of stroke can occur in HES compared to epidemiological studies and that clinicians had reported poor coding for stroke in some instances when they used HES as the sole means of identifying cases.  HES does not contain stroke severity information or known history of atrial fibrillation prior to stroke, which are key parts of the mortality case mix adjustment model and would be a fundamental limitation to using HES data to measure mortality. Both of these factors are included in the SSNAP model because they are significantly associated with the risk of dying (as would be expected). | 26/11/15 |  | MRG – 26/11/2015 |
| 3e | The applicant should consider how useful it is to provide case ascertainment against HES data, since it is recognised that over-coding occurs in HES, making the figure hard to interpret. If the figure is to be presented, MRG recommend changing the name from “case ascertainment” to “case comparison” and to present bands above 90+%. | MRG  10/09/15 | This contextual case ascertainment information aligns to the information and bandings presented in the RCP SSNAP publication.The RCP view is that it is not case comparison as it is not comparing the same year’s HES with SSNAP. Since the purpose of including case ascertainment is to highlight CCGs with low case ascertainment indicating that hospitals within the CCG have not been entering in all their patients onto SSNAP (and the results may therefore not reflect the care that all the CCGs patients received), having bands above 100% would not be useful. HES is not the ‘gold standard’, but it is a useful indication of case selection.  The HES case ascertainment figure (‘Estimated expected number of patients from HES’) is the number of patients who have been coded as a primary diagnosis of stroke during their admission in a year’s worth of HES, split by the patient’s CCG recorded in the HES record. The indicator is not reported for CCGs with less than 50% case ascertainment. | 26/11/15 |  | MRG – 26/11/2015 |

**Construction**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Rec. no*** | ***Issue or recommendation*** | ***Raised by / Date*** | ***Response or Action taken by applicant*** | ***Response date*** | ***Resolved*** | ***Sign off by / Date*** |
| 4a | Clarification sought from RCP on what standardisation will be used in the indicator | MRG  - During initial appraisal | **Standardised Mortality Ratio**  The standardised mortality ratio (indirectly standardised ratio) is given by:  **formula to calculate standardised mortality ratio**  Where:  O is the total observed number of events in the local or subject population  *E* is the total number of expected events in the local or subject population, given the standard rates λ*i* in the reference or standard population;  *Oi* is the observed numbers of events in the local or subject population in age group *i*;  *Ei* is the expected number of events in the local or subject population in age group *i*, given the standard rate λ*i* in the reference or standard population;  *ni* is the number of individuals in the local or subject population in age group *i*;  λ*i* is the crude age-specific rate in the reference or standard population in age group *i*;  **Casemix Adjustment**  To estimate the probability of 30 day mortality for a patient, the observed value of each variable in the model is multiplied by a corresponding coefficient and summed to give a value, ω. This is a data-driven model and the coefficients are created based on the strength the variable has on mortality according to the cohort of data.  The value ω is then used in the equation to give the predicted probability of 30 day mortality.  The RCP use two models for casemix adjustment, which are detailed in the published paper ‘Derivation and external validation of a casemix model for the standardized reporting of 30-day stroke mortality rates’: <http://www.ncbi.nlm.nih.gov/pubmed/25293667>.  Model A includes age (<60, 60-69, 70-79, 80-89, and ≥90 years), National Institutes of Health Stroke Severity (NIHSS) Score on admission, presence of atrial fibrillation on admission, and stroke type (ischemic versus primary intracerebral haemorrhage). It is used when the record has a fully completed NIHSS score. Model B includes only the consciousness component of the NIHSS and is used when the NIHSS score is not fully completed in the record. | During initial appraisal |  | MRG  10/09/15 |
| 4b | Investigation undertaken on breakdowns on age and sex shown to be comparable with published literature and not felt to represent a selection bias.  RCP annual report will provide detailed information on the demographics of the patients included in SSNAP. | MRG - During initial appraisal | The SSNAP annual report provides some overall demographic details of patients included in the SSNAP <https://www.strokeaudit.org/Documents/Newspress/SSNAP-Annual-Report-(April-2013-March-2014).pdf>  Along with a host of other detailed audit information, the quarterly SSNAP public report provides specific details on the casemix breakdowns, including patient numbers, gender, age, co-morbidities, stroke type, Modified Rankin Scales scores, NIHSS and the onset of symptoms (Section 2: Casemix, p48) <https://www.strokeaudit.org/Documents/Results/National/OctDec2014/OctDec2014-PublicReport.aspx> | During initial appraisal |  | MRG  10/09/15 |
| 4c | Currently, the indicator is not replicable and the model needs to be provided for a full assessment to be possible. More information needs to be provided as to how the ‘expected’ figure is calculated, referencing the data period used in the model. | MRG  10/09/15 | To estimate the probability of 30 day mortality for a patient, the observed value of each variable in the model is multiplied by a corresponding coefficient and summed to give a value, ω. This is a data-driven model and the coefficients are created based on the strength the variable has on mortality according to the cohort of data.  The value ω is then used in the equation to give the predicted probability of 30 day mortality.  The RCP use two models for casemix adjustment, which are detailed in the published paper ‘Derivation and external validation of a casemix model for the standardized reporting of 30-day stroke mortality rates’. Bray BD, Campbell J, Cloud GC, Hoffman A, James M, Tyrrell PJ, Wolfe CD, Rudd AG; Intercollegiate Stroke Working Party Group (2014) <http://www.ncbi.nlm.nih.gov/pubmed/25293667>  See tables below for details. | 26/11/15 |  | MRG – 26/11/2015 |

For 2013-14, the following coefficients were used:

Model A

|  |  |
| --- | --- |
| Variable | Coefficient |
| *Age* |  |
| <60 | 0.000 |
| 60-69 | 0.624 |
| 70-79 | 1.033 |
| 80-89 | 1.488 |
| 90+ | 1.781 |
| *NIHSS* | 0.137 |
| *Atrial fibrillation* | 0.425 |
| *Stroke Type* |  |
| Ischemic | 0.000 |
| ICH | 0.870 |
| Constant | -5.250 |

Model B

|  |  |
| --- | --- |
| Variable | Coefficient |
| *Age* |  |
| <60 | 0.000 |
| 60-69 | 0.657 |
| 70-79 | 1.252 |
| 80-89 | 1.613 |
| 90+ | 2.127 |
| *NIHSS Consciousness* |  |
| 0 - Alert | 0.000 |
| 1 – Verbal response | 1.585 |
| 2 – Pain response | 2.576 |
| 3 - Unconscious | 3.564 |
| *Atril fibrillation* | 0.467 |
| *Stroke Type* |  |
| Ischemic | 0.000 |
| ICH | 0.877 |
| Constant | -4.158 |

These coefficients were derived during the model fitting procedure that was written up in the peer-reviewed paper. The model above was derived and validated against the South London Stroke Register. A step-by-step explanation is below:

For Model A (where the National Institutes of Health Stroke Severity (NIHSS) is fully completed) the calculations are as follows:

Age is in 5 bands:

Less than 60 (coefficient of 0)

60-69 (coefficient of 0.624)

70-79 (coefficient of 1.033)

80-89 (coefficient of 1.488)

90+ (coefficient of 1.781)

The coefficient for NIHSS is the NIHSS score multiplied by 0.137

If the patient was known to be in atrial fibrillation before stroke, the coefficient is 0.425 (otherwise 0)

If the patient had a haemorrhagic stroke, the coefficient is 0.87 (otherwise 0)

The sum for the individual is the sum of the above 4 coefficients minus 5.25

The probability is then e(Model A)/(1+e(Model A))

Similarly for Model B (where NIHSS is only partially completed):

Age is in 5 bands:

Less than 60 (coefficient of 0)

60-69 (coefficient of 0.657)

70-79 (coefficient of 1.252)

80-89 (coefficient of 1.613)

90+ (coefficient of 2.127)

LOC categories:

LOC of 0 (coefficient is 0)

LOC of 1 (coefficient is 1.585)

LOC of 2 (coefficient is 2.576)

LOC of 3 (coefficient is 3.564)

If the patient was known to be in atrial fibrillation before stroke, the coefficient is 0.467 (otherwise 0)

If the patient had a haemorrhagic stroke, the coefficient is 0.877 (otherwise 0)

The sum for the individual is the sum of the above 4 coefficients minus 4.158

The probability is then e(Model B)/(1+e(Model B))

You then sum all the probabilities up (either Model A or Model B for each individual) and round to a whole number to get the expected number of deaths.

For the 2014/15 data, the logistic regression model will be re-run to obtain up-to-date coefficients for age, NIHSS, atrial fibrillation and stroke type for both Model A and Model B. The procedure for then calculating the expected number per team will be the same, except with the new coefficients.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 4d | The confidence interval methodology chosen is not standard. Currently, the confidence intervals are calculated around the observed figures, however what users will be wanting to determine is whether the indicator value is significantly higher or lower than the expected value. MRG recommend Byar’s method. |  | The control limits currently given are calculated around the expected figures, not the observed figures. The equation below is the standard binomial approximation which is the methodology used for 2013/14 data. For 2014/15, the RCP will update the methodology to use Byar’s approximation. | 26/11/15 |  | MRG – 26/11/2015 |

**Presentation and Interpretation**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Rec. no*** | ***Issue or recommendation*** | ***Raised by / Date*** | ***Response or Action taken by applicant*** | ***Response date*** | ***Resolved*** | ***Sign off by / Date*** |
| 5a | There was a discrepany in the application form in section 5.9. For the 10 lowest CCGs, Confidence Limits were given, whereas for the highest 10 CCGs, confidence intervals were calculated. MRG would like clarity around which are to be presented.  Furthermore, the confidence limits presented did not use the methodology stated in the form. | MRG  10/09/15 | The discrepancy mentioned is simply a typographical error in the field names for the second table. The calculations do not differ in the application form between the bottom and top 10 CCG outputs. | 26/11/15 |  | MRG – 26/11/2015 |
| 5b | MRG members noted that aspects of the presentation of the indicator were unusual.  In this instance the control limits are not centred around 1 but are centred around the national average which is not 1. Although this is not ideal it was accepted that the model is re-calibrated each year and it is anticpated that future results will be centred around 1.  MRG drew attention to the way the control limits were presented in the results table and suggested at present they may be open to confusion on the basis that it is more commonly understood to present confidence intervals round the rate rather than slightly more “abstract” control limits that apply to the rate.  Noting that this wasn’t necessarily wrong, MRG members feel the table needs to be clearly labeled (including a description to help interpretation) to avoid confusion. | MRG  26/11/15 | An explanation is included in the Indicator Quality Statement and also the Excel data file to draw users’ attention to the presentation of control limits for this indicator.  This indicator is presented with 99.8% control limits, as opposed to the usual convention within CCG OIS of 95% confidence limits. This methodology aligns with the RCP output published on the SSNAP results portal.  Control limits are used to indicate that a CCG is not operating predictably and therefore, when a CCG is identified as an outlier, their SMR will not fall within the lower and upper control limits. |  |  |  |

**Risks and Usefulness**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Rec. no*** | ***Issue or recommendation*** | ***Raised by / Date*** | ***Response or Action taken by applicant*** | ***Response date*** | ***Resolved*** | ***Sign off by / Date*** |
| 6a | The indicator proposed is similar to an existing NCHOD indicator, based on HES. Clarification was sought on why this indicator would be better than the HES indicator. | MRG - During initial appraisal | The Compendium of Population Health indicator (Deaths within 30 days of emergency admission to hospital: stroke, portal identifier: P00811 [http://indicators.ic.nhs.uk/webview/](http://indicators.ic.nhs.uk/webview/index.jsp?v=2&submode=ddi&study=http%3A%2F%2Fhg-l-app-472.ic.green.net%3A80%2Fobj%2FfStudy%2FP00811&mode=documentation&top=yes)) differs from this indicator in that it is sourced from HES and provides an indirectly age and sex standardised rate per 100,000 population at national, regional and local authority level (not CCG). Furthermore, as well as ICD-10 codes I61, I63 and I64, it also includes I62 which, as explained in section 3c, is not included in this indicator.  HES was considered as a data source for this indicator, however, in the original MRG discussion, the RCP cited their view that there can be over-coding of stroke in HES compared to epidemiological studies and that clinicians have reported poor coding for stroke in some instances when they use HES as the sole means of identifying cases.  Using SSNAP data will also remain consistent with the five other CCG OIS stroke measures which use it as the data source. It is the single source of data on stroke services, processes of care and outcomes and provides the data for other statutory data collections in England. | During initial appraisal |  | MRG  10/09/15 |

**Any complaints or appeals against the decisions made during the assurance process should be made to the Indicator & Methodology Assurance Service (IMAS) Team at HSCIC. Likewise, if you are unclear regarding any of the recommendations in this report, or have any queries about the assurance process in general, please contact the IMAS team.**

**Indicator and Methodology Assurance Service**

**Health and Social Care Information Centre**

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**LS1 6AE.**

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**Website:** [**http://www.hscic.gov.uk/article/1674/Indicator-Assurance-Service**](http://www.hscic.gov.uk/article/1674/Indicator-Assurance-Service)

1. [Quality Standard for Stroke (QS2), NICE, June 2010, Updated 2016](https://www.nice.org.uk/guidance/qs2/chapter/Introduction) [↑](#footnote-ref-1)
2. [Sun et al. (2013) A systematic review and meta-analysis of acute stroke unit care: What’s beyond the statistical significance?](http://bmcmedresmethodol.biomedcentral.com/articles/10.1186/1471-2288-13-132) [↑](#footnote-ref-2)
3. [American Heart Association, American Stroke Association, Long-Term Survival and Causes of Death After Stroke, May 2001](http://stroke.ahajournals.org/content/32/9/2131.full) [↑](#footnote-ref-3)