



**How does dysphagia assessment in acute stroke affect pneumonia?**

**Statistical Analysis Plan**

## Statistical Analysis Plan

### Research background

Stroke-associated pneumonia (SAP) is a common post stroke infection affecting 14% of patients (Kishore et al. 2015) and is associated with an increased risk of hospital mortality (Westendorp et al. 2011) and prolonged hospital stay (Finlayson et al. 2011). The combination of stroke-induced immune-deficiency and aspiration of oropharyngeal secretions and gastric contents into the lungs secondary to impaired consciousness and dysphagia predisposes patients to SAP in the first few days post stroke (Hannawi et al. 2013). Patients with dysphagia with confirmed aspiration have an 11-fold increased risk to SAP (Martino et al. 2005). However, up to half of patients with SAP do not aspirate (Westendorp et al.), which reflects SAP's multifactorial pathophysiology.

There is wide variation in the assessment and management of dysphagia in acute phase stroke and there is the potential for a range of medical interventions and clinical processes to be associated with risk of SAP (Eltringham et al. 2018, 2019). This research aims to find out how methods of dysphagia assessment and clinical management during the first 72 hours of admission to hospital affect the risk of stroke patients developing SAP and what care processes and interventions specific to patients with dysphagia affect the risk of stroke patients developing SAP during acute phase stroke.

### Research question

How does variation in assessment and management of dysphagia in acute stroke affect development of stroke-associated pneumonia?

## Hypotheses and rationale

**Hypothesis 1 - *There is no difference in incidence of pneumonia using a dysphagia screening protocol that uses 100% water compared to a dysphagia screening protocol that uses water and other consistencies (Null hypothesis)***

There are a range of dysphagia screening tools used and different methods of evaluation (Eltringham et al. 2018). Some hospitals used standardised screens; others use local dysphagia screening protocols (Eltringham et al. 2019). Some dysphagia screens evaluate patient characteristics and do not involve screening the patient with any water or food, some screens involve water only and others screen with water and different fluid and or diet consistencies. UK Clinical Guidelines state there is good evidence that a multi-item dysphagia screening protocol that includes at least a water intake test of 10 teaspoons and a lingual motor test is more accurate than screening protocols with only a single item (Intercollegiate Stroke Working Party, 2016). No single tool has achieved consensus as a standard screen (Daniels et al. 2012).

**Hypothesis 2 - *Using written guidelines for the first specialist clinical bedside swallow assessment will not be associated with incidence of pneumonia (Null hypothesis)***

Clinical bedside swallow assessments are undertaken by specialist trained healthcare professionals. A high degree of variability has been reported within the clinical bedside assessment process and in practice standardised assessments are less frequently used. Observation of practice has found that variability in reported practice is likely the result of a nuanced patient-centred assessment process characterised by iterative cycles of information gathering in order to generate and test clinical hypotheses and that there may be unintended negative consequences of

solely relying on data generated from standardised assessment tools (McAllister et al., 2020).

***Hypothesis 3 - Hospital Teams that insert Nasogastric Tubes (NGTs) overnight have increased risk of SAP compared to Hospital Teams that do not insert NGTs overnight.***

Evidence that nasogastric tube (NGT) placement increases risk of SAP is equivocal (Eltringham et al. 2019). Placement of NGT 'out of hours' has been the subject of a national patient safety alert advice. Nasogastric tubes should only be placed when senior support for placement and placement confirmation is readily available. The rationale for this was the greater risk of error by junior and less experienced staff confirming NGT placement in evenings and at night (NHS Improvement, 2016).

***Hypothesis 4 - Hospital Teams with a written oral care protocol will have reduced risk of incidence of SAP compared to those that do not have a written oral care protocol.***

Poor oral and dental hygiene have been identified as potential risk factors for SAP (Beavan, 2015) and lack of oral care has been identified as a significant issue by people affected by stroke (Eltringham et al. 2019). UK Clinical Guidelines recommend people with stroke, especially those who have difficulty swallowing or are tube fed, should have mouth care at least 3 times a day and staff should be trained in assessment of oral hygiene and selection of appropriate oral hygiene and cleaning agents, and provision of oral care routines. Latest European swallowing guidelines suggest oral health interventions should be considered in stroke patients.

## **Primary Outcome**

The primary outcome is association with stroke-associated pneumonia

## **Overview of Study design**

A mixed mode survey design comprising of a self-administered electronic survey with a secondary option of a postal survey. The sample frame was

Routinely Admitting, and Non-Routinely Admitting Acute Stroke Hospital Teams registered on the Sentinel Stroke National Audit Programme (SSNAP) register. The survey population was Speech and Language Therapy (SLT) Clinical Leads for Acute Stroke in Hyper/Acute Hospital Stroke Units in England and Wales. The total survey population were surveyed. Survey participants were asked to respond about practice on behalf of the Stroke Unit rather than as an individual practitioner.

### **Sampling plan**

Hospital teams were included if they were registered on the SSNAP register for October-December 2019 and had sufficient records/data to report and were an active Hyper/Acute Stroke Unit. One hundred and sixty-six hospital teams were included after exclusions. The SLT Clinical Lead for Acute Stroke or the most appropriate person was identified in each team to complete the survey on behalf of their Stroke Unit. A distribution list with their name and email address was created.

### **Response rate**

The response rate will be calculated as the number of completed surveys (1 survey per Hospital Team) divided by the survey population (N=166) multiplied by 100 to express a percentage.

### **Recruitment Process and access to the questionnaire**

Participants were directly contacted by email with an invitation letter, participant information sheet and provided a web link to the survey. A paper-based survey to be returned by a pre-paid stamped address envelope was offered on the last email reminder for those who had not already completed the web-based survey. The survey was a closed survey in that the hyperlink to the survey was only sent to the identified SLT Clinical Lead for Acute Stroke as only one response was requested from each hospital team. No participants requested a paper copy of the survey.

### **Survey administration**

The electronic survey was created using Qualtrics survey software and responses were automatically captured on the Qualtrics platform. Completed survey responses were exported from Qualtrics to SPSS software for statistical analysis.

The survey was distributed on 2/9/2020. The closing date for the survey was 2/10/2020. The hyperlink remained active for a few days after the closing date to allow for any late responders due to the COVID pandemic.

## **Statistical analyses**

Only completed surveys will be analysed. The survey data will be analysed using descriptive and inferential statistics. Descriptive statistics will include analysis of categorical and continuous data. Descriptive statistics of categorical variables will be frequency analysis i.e., percentage of the different categories within each variable. For example, proportion of Hospital Teams that are Routinely Admitting Teams and Non-Routinely Admitting Acute Teams. Categorical data will be visualised with bar and pie charts. The evaluation method for continuous data (incidence of pneumonia) will be mean and standard deviation to evaluate the dispersion of pneumonia incidence across the hospital teams and visualised using histograms.

Inferential statistics (linear regression analysis) will be used to test the hypotheses and explore if there is an association between the dependent variable (incidence of stroke-associated pneumonia) and independent binary variables: 1. Hospital Teams that use Water only dysphagia screening protocols (DSP) versus Hospital Teams that use water and other consistencies DSPs, 2. Hospital teams that use written guidelines for the first specialist clinical bedside swallow assessment versus Hospital teams that do not use written guidelines for the first specialist swallow assessment, 3. Hospital Teams that insert Nasogastric Tubes (NGTs) overnight have increased risk of SAP compared to Hospital Teams that do not insert NGTs overnight and 4. Hospital Teams with a written oral care protocol versus those do not have a written oral care protocol. Linear regression analysis will be visualised using Model Summary tables with Coefficients and 95% Confidence Intervals.

The proposed analysis for each variable is given in Table 1.

Table 1 – Proposed analysis for each variable

Variable	Data Source (s)	Values	Type of variable	Analysis approach	Methods for summarising data
<b>Hospital Team</b>	Survey Question #3 Please type the name of your hospital and select from the drop-down menu. SSNAP 2019 Team Centred 72-hour cohort data	1 = Routinely Admitting Team 2 = Non-Routinely Admitting Team	Categorical – Nominal - dichotomous	Descriptive statistics (frequencies) - Proportion of completed surveys for Routinely Admitting Team and Non-Routinely Admitting Acute Teams by SCN Region	Table
<b>Written Dysphagia Screening Protocol</b>	Survey Question #4 Does your stroke unit use a written dysphagia screening protocol (DSP)?	1 = Yes 2 = No	Categorical – Nominal - dichotomous	Descriptive statistics (frequencies) - Proportion answering yes or no	Bar chart
<b>Standardised Dysphagia Screen</b>	Survey Question # 5 Is the dysphagia screen a screen that was developed by your hospital or a standardised dysphagia?	1= Hospital Dysphagia Screen 2= Published Dysphagia Screen	Categorical – Nominal - dichotomous	Descriptive statistics (frequencies) - Proportion by selected choice	Bar chart
	Survey Question #7 Which published dysphagia screen is used?	Free text	Categorical - Nominal	Descriptive statistics (frequencies) – Proportion by named screen	Bar Chart
<b>Person completing the screen</b>	Survey Question #6 Is it mandatory that the person carrying out the dysphagia screen has been trained to use the dysphagia screening protocol?	1= Yes 2= No	Categorical - Nominal - dichotomous	Descriptive statistics (frequencies) - Proportion answering yes or no	Bar chart

	Survey Question #13 Which healthcare professional typically carries out the dysphagia screen? Please specify if more than one healthcare professional group is involved.	1= Stroke Nurse Specialist 2= Registered Nurse 3= Nursing Associate/Apprentice 4= Non-registered staff 5 = Other	Categorical - Nominal	Descriptive statistics (frequencies) – Proportion by selected choice	Pie chart/Free text
<b>Components of the screen</b>	Survey Question #8 Are the following involved in the dysphagia screening protocol?	1= Indirect Swallow Test 2= Oro-motor test 3= Indirect Swallow Test AND Oro-motor test 4 = Neither of the above	Categorical - Nominal	Descriptive statistics (frequencies) – Proportion by selected choice	Bar chart
	Survey Question #9 Does the dysphagia screening protocol only use water (Level 0 Thin Fluids) i.e., 100% water? SSNAP 2019 Patient Centred Post 72hr cohort data prescription of antibiotics for a newly diagnosed pneumonia	1= Yes 2= No  SPSS Recoded (dummy variables) 0=Yes 1=No	Categorical – Nominal - dichotomous  Dependent variable – outcome - incidence of SAP Independent variable – predictor – Water only DSPs versus water and other consistencies DSPs	Descriptive statistics (frequencies) - Proportion answering yes or no AND Inferential statistics (Linear Regression) Null hypothesis – There is no difference in incidence of pneumonia using a dysphagia screen that uses 100% water compared to water and other consistencies	Bar chart  Model Summary Table with coefficients and 95% Confidence Intervals
	Survey Question #10 What is the maximum amount of water given? Please indicate the maximum amount in millilitres (mls).	1=5, 2=10, 3=15, 4=20, 5=25, 6=50, 7=100, 8=150, 9=200	Categorical Ordinal	Descriptive statistics (frequencies)- proportion by selected choice	Bar chart

	Survey Question #11 Which International Dysphagia Diet Standardisation Initiative (IDDSI) levels are included in the dysphagia screening protocol?	1= Level 0 Thin, 2= Level 1 Slightly Thick, 3=Level 2 Mildly Thick, 4=Level 3 Moderately Thick, 5=Level 4 Puree, 6=Level 5 Minced and Moist, 7=Level 6 Soft & Bite Size, 8=Level 7 Regular Easy to Chew, 9=Level 7 Regular	Categorical – Ordinal	Descriptive statistics (frequencies) - Proportion by selected choice	Bar chart
	Survey Question #12 Which IDDSI level consistency do you screen with first?	1= Level 0 Thin, 2= Level 1 Slightly Thick, 3=Level 2 Mildly Thick, 4=Level 3 Moderately Thick, 5=Level 4 Puree, 6=Level 5 Minced and Moist, 7=Level 6 Soft & Bite Size, 8=Level 7 Regular Easy to Chew, 9=Level 7 Regular	Categorical – Ordinal	Descriptive statistics (frequencies) - Proportion by selected choice	Bar chart
<b>Delays in dysphagia screening</b>	Survey Question #14 Below is a list of reasons for delays in stroke patients being screened for dysphagia. How applicable are each of these reasons for delays in stroke patients being screened for dysphagia in your stroke unit?	1=Strongly applicable 2=Somewhat applicable 3=Somewhat less applicable 4=Strongly not applicable	Categorical – Nominal	Descriptive statistics - Likert Scale	Bar chart/Free text
<b>Referral for a specialist swallow assessment</b>	Survey Question #15 If the dysphagia screen identifies a dysphagia, is the patient referred for a clinical (bedside) swallowing assessment carried out by an appropriately trained healthcare professional?	1=Yes 2=No	Categorical – Nominal - dichotomous	Descriptive statistics (frequencies) - Proportion answering yes or no	Bar chart
	Survey Question #16 If the patient is not referred for a	1= Stroke Nurse 2= Registered Nurse	Categorical – Nominal	Descriptive statistics (frequencies) –	Pie chart/Free text

	specialist clinical (bedside) swallowing assessment which health professional group continues to review the patient's swallowing problem after the dysphagia screen?	3= Nursing Associate/Apprentice 4= Non-registered staff 5= Other		Proportion by selected choice	
<b>Person completing the specialist swallow assessment</b>	Survey Question #17 Which healthcare professional typically carries out the clinical (bedside) swallowing assessment?	1= Speech and Language Therapist 2= Not a SLT but an autonomous Health Professional trained at Specialist Level (as defined by the Inter-Professional Dysphagia Framework)	Categorical - Nominal	Descriptive statistics (frequencies) - Proportion by selected choice	Pie chart
<b>Specialist swallow assessment</b>	Survey Question #18 Does the stroke unit use a published dysphagia assessment for the clinical (bedside) swallowing assessment?	1=Yes 2=No	Categorical – Nominal - dichotomous	Descriptive statistics (frequencies) – Proportion answering yes or no	Bar chart
	Survey Question #19 Please state what published assessment is used e.g. The MANN Assessment of Swallowing Ability (MASA).	Free text		Free text	
	Survey Question #20 Do you use written guidelines about what should be included in a clinical (bedside) swallowing swallow assessment?	1=Yes – The Mann Assessment of Swallowing Ability 2 = Yes – Not the MANN but other written guidelines 3=No	Categorical – Nominal  AND Dependent variable –	Descriptive statistics (frequencies) – Proportion by selected choice AND Inferential statistics (Linear Regression)	Bar chart  Model Summary Table with

	SSNAP 2019 Patient Centred Post 72hr cohort data prescription of antibiotics for a newly diagnosed pneumonia	SPSS Recoded (dummy) variables 0=Yes 1=No	outcome - incidence of SAP Independent variable – predictor – Written guidelines (versus clinical reasoning and hypothesis generation)	Null hypothesis – Using written guidelines for the first specialist swallow assessment will not be associated with incidence of pneumonia	coefficients and 95% Confidence Intervals
<b>Components of the specialist swallow assessment</b>	Survey Question #21 In your Stroke Unit, what does the first clinical (bedside) swallow assessment typically involve?	1= PMH, 2= HPC, 3= Assessment of cognitive-communication status, 4= Assessment of respiratory status, 5= Cranial Nerve examination, 6=Cough reflex testing, 7= Assessment with oral intake 8= Assessment with postural strategies, 9= Assessment with swallowing manoeuvres, 10= Other	Categorical – Nominal	Descriptive statistics (frequencies) – Proportion by selected choice	Bar chart/Free text
	Survey Question #22 What International Dysphagia Diet Standardisation Initiative (IDDSI) levels are typically included in the first clinical (bedside) swallow assessment?	1=Level 0 Thin, 2= Level 1 Slightly Thick, 3= Level 2 Mildly Thick, 4=Level 3 Moderately Thick, 5= Level 4 Puree, 6=Level 5 Minced and Moist, 7=Level 6 Soft & Bite Sized, 8= Level 7 Easy to Chew, 9=Level 7 Regular	Categorical – Ordinal	Descriptive statistics (frequencies) - Proportion by selected choice	Bar chart
	Survey Question #23 Please describe what postural techniques are assessed? Examples include chin-down posture, chin-up posture, head	Free text		Free text	

	rotation (turn to side) and head tilt. These examples are not exhaustive.				
	Survey Question #24 Please describe what swallowing manoeuvres are assessed? Examples of include effortful swallow, Mendelsohn manoeuvre, supraglottic swallow and super-supraglottic swallow. These examples are not exhaustive.	Free text		Free text	
<b>Delays in specialist assessment</b>	Survey Question #25 Below is a list of reasons for delays in stroke patients receiving a clinical (bedside) swallowing assessment. How applicable are each of these reasons for delays in stroke patients receiving a clinical swallowing assessment in your stroke unit?	1=Strongly applicable 2=Somewhat applicable 3=Somewhat less applicable 4=Strongly not applicable	Categorical – Nominal	Descriptive statistics - Likert Scale	Bar chart/Free text
<b>Instrumental Swallowing Assessments</b>	Survey Question #26 Does your stroke unit have access to the following instrumental assessments of swallowing?	1= Videofluoroscopy (VFS) 2= Fiberoptic Endoscopic Evaluation of Swallowing (FEES) 3=Neither VFS or FEES 4=Both VFS and FEES	Categorical – Nominal	Descriptive statistics (frequencies) – Proportion by selected choice	Pie Chart
	Survey Question #27 For those patients where it is clinically indicated, would your stroke unit routinely use Videofluoroscopy	1=Yes 2=No	Categorical – Nominal - dichotomous	Descriptive statistics (frequencies) - Proportion answering yes or no	Bar Chart



Manchester  
Metropolitan  
University



	<p>within the first 7 days of a patient's admission? Survey Question #28 For those patients where it is clinically indicated, would your stroke unit routinely use FEES within the first 7 days of a patient's admission? Survey Question #29 For those patients where it is clinically indicated, would your stroke unit routinely use these assessments within the first 7 days of a patient's admission?</p>				
<b>Management</b>	<p>Survey Question #30 During the first 7 days of a stroke patient's admission, what treatment options are typically recommended on your Stroke Unit?</p>	<p>1= Diet and fluids modification, 2= Frazier Water Protocol, 3= Swallowing Manoeuvres, 4= Postural Techniques, 5= Sensory stimulation, 6= Tube feeding, 7=Oro-motor exercises, 8 =Pharmacological Management, 9=Electrical stimulation, 10= Biofeedback, 11= Other</p>	<p>Categorical - Nominal</p>	<p>Descriptive statistics (frequencies) – Proportion by selected choice</p>	<p>Bar chart/Free text</p>
<b>NGT Protocol</b>	<p>Survey Question #31 Does your stroke unit have a written nasogastric tube (NGT) feeding protocol?</p>	<p>1=Yes 2=No</p>	<p>Categorical – Nominal - dichotomous</p>	<p>Descriptive statistics (frequencies) - Proportion answering yes or no</p>	<p>Bar chart</p>

	Survey Question #35 Does your stroke unit have a written protocol for the maximum number of times the NGT can be inserted?	1=Yes 2=No	Categorical – Nominal - dichotomous	Descriptive statistics (frequencies) - Proportion answering yes or no	Bar chart
<b>Time from decision to non-orally feed and feeding by NGT</b>	Survey Question #32 In patients who are unable to maintain adequate nutrition and fluids orally, please indicate typically the number of hours from when the decision is taken to non-orally feed and the beginning of feeding by an NGT?	1=< 6 hours 2>= 6 - < 12 hours 3>= 12 - < 24 hours 4>= 24 - < 48 hours	Categorical - Nominal	Descriptive statistics (frequencies) - Proportion by selected choice	Bar chart
<b>Confirmation of position of NGT</b>	Survey Question #33 How does your stroke unit check the position of the NGT before starting feeding?	1= pH testing of NGT aspirate, 2= Chest radiography if no aspirate obtained or pH above recommended level, 3= Routinely perform chest radiography, 4= Other	Categorical - Nominal	Descriptive statistics (frequencies) - Proportion by selected choice	Pie Chart/Free text
<b>Management strategies</b>	Survey Question #34 In cases of inadvertent NGT removal, does your stroke unit typically use any of the following management strategies?	1= Mittens, 2= Nasal retention device, 3= 1:1 staff: patient supervision, 4=Other	Categorical - Nominal	Descriptive statistics (frequencies) - Proportion by selected choice	Pie Chart/Free text

<b>Maximum number of NGTs</b>	Survey Question #36 In case of inadvertent NGT removal, what is the maximum number of times reinsertion of the NGT is attempted in any patient?	1=Once, 2= Twice, 3= Three times, 4= If more than three, please state how many	Categorical – Ordinal	Descriptive statistics (frequencies) - Proportion by selected choice	Pie Chart/Free text
<b>Overnight NGT insertion</b>	Survey Question #37 Are NGTs inserted overnight? SSNAP 2019 Patient Centred Post 72hr cohort data prescription of antibiotics for a newly diagnosed pneumonia	1=Yes 2=No  SPSS Recoded (dummy) variables  0=Yes 1=No	Categorical – Nominal – dichotomous  Dependent variable – outcome - incidence of SAP Independent variable – predictor – Insertion of NGT overnight	Descriptive statistics (frequencies) - Proportion answering yes or no AND Inferential statistics (Linear Regression) Hypothesis – Hospital Teams that insert NGTs overnight have increased risk of SAP compared to Hospital Teams that do not insert NGTs overnight.	Bar chart  Model Summary Table with coefficients and 95% Confidence Intervals
<b>Positioning during NGT feeding</b>	Survey Question #38 Where 0 degrees is lying flat and 45 degrees is sat upright, what is the standard position in which the patient is positioned during NGT feeding?	1=0 degrees 2= > 0 - < 30 degrees 3= ≥ 30 - < 45 degrees 4= 45 degrees 5= Other (please state)	Categorical - Ordinal	Descriptive statistics (frequencies) - Proportion by selected choice	Bar chart/Free text

<b>Oral Care Protocol</b>	Survey Question #39 Does your stroke unit have a written oral care protocol?	1=Yes 2=No  SPSS Recoded (dummy) variables  0=Yes 1=No	Categorical – Nominal – dichotomous  Dependent variable – outcome - incidence of SAP Independent variable – predictor – written oral care protocol	Descriptive statistics (frequencies) - Proportion answering yes or no AND Inferential statistics (Regression) Hypothesis - Hospital Teams with a written oral care protocol will have reduced rates of incidence of SAP compared to those that do not have a written oral care protocol	Bar chart  Model Summary Table with coefficients and 95% Confidence Intervals
	Survey question #40 Is this protocol a hospital oral care protocol or a specific protocol written for the oral care of stroke patients on your unit?	1=Hospital oral care protocol, 2= Stroke oral care protocol	Categorical – Nominal - dichotomous	Descriptive statistics (frequencies) – Proportion by selected choice	Bar chart
<b>Oral care provision in H/ASU</b>	Survey question #41 Are there differences in oral care provision for patients in the hyper/acute stroke unit compared to those patients in other parts of the stroke pathway?	1=Yes 2=No	Categorical – Nominal - dichotomous	Descriptive statistics (frequencies) – Proportion answering yes or no	Bar chart

	Survey question #42 How is oral care provision in the hyper/acute stroke unit different to that provided post-acute phase stroke?	Free text		Free text	
<b>Oral care provision for dysphagic patients</b>	Survey question #43 Are there differences in oral care provision for patients with dysphagia?	1=Yes 2=No	Categorical – Nominal – dichotomous	Descriptive statistics (frequencies) – Proportion answering yes or no	Bar chart
	Survey question #44 If yes, please describe what differences there are in oral care provision for people with dysphagia compared to the provision for those people without dysphagia.	Free text		Free text	
<b>Frequency of oral care for dysphagia patients</b>	Survey question #45 How often each day is mouth care typically provided to people with dysphagia on the stroke unit?	1=Once, 2= Twice, 3= Three times, 4= Other please state	Categorical – Ordinal	Descriptive statistics (frequencies) - Proportion by selected choice	Pie Chart/Free text

<b>Staff responsible for oral care</b>	Survey question #46 Which staff group typically provide oral care? Please indicate if more than one group provide oral care.	1=Registered Nurse, 2= Nursing Associate or Nursing Apprentice, 3= Nonregistered staff e.g., clinical support worker and healthcare assistants, 4= SLT, 5= Occupational Therapist 6= Other - please state	Categorical – Nominal	Descriptive statistics (frequencies) – Proportion by selected choice	Pie chart/Free text
<b>Training</b>	Survey question #47 Do staff receive training in oral care?	1=Yes, 2=No	Categorical – Nominal – dichotomous	Descriptive statistics (frequencies) – Proportion answering yes or no	Bar chart
	Survey question #48 What type of training do staff receive?	1= Ward based training, 2= Classroom based training, 3= Online training, 4= Other - please describe	Categorical – Nominal	Descriptive statistics (frequencies) – Proportion by selected choice	Pie chart/Free text
	Survey question #49 Is the training staff receive specific to the oral care of stroke patients?	1=Yes, 2=No	Categorical – Nominal – dichotomous	Descriptive statistics (frequencies) – Proportion answering yes or no	Bar chart
<b>Components of oral care</b>	Survey question #50 What does oral care typically involve on the stroke unit?	1=Brushing of teeth and cleaning of gums with toothpaste 2= Brushing of teeth and cleaning of gums with chlorhexidine dental gel	Categorical – Nominal	Descriptive statistics (frequencies) – Proportion answering yes or no	Bar chart/Free text



		<p>3= Brushing of teeth and cleaning of gums using an electric toothbrush</p> <p>4= Brushing of teeth and cleaning of gums using a suction toothbrush</p> <p>5= Brushing of teeth and cleaning of gums with a manual toothbrush</p> <p>6= Removal of excess secretions</p> <p>7= Removal of dentures overnight</p> <p>8= Brushing of dentures with water</p> <p>9= Brushing of dentures and cleaning with soap</p> <p>10= Brushing of dentures and cleaning with toothpaste</p> <p>11= Brushing of dentures and cleaning with chlorhexidine dental gel</p> <p>12= Soaking of dentures overnight in dental cleaning solution</p> <p>13= Soaking of dentures overnight in water</p> <p>14= Application of lip balm</p> <p>15= Other - please describe</p>			
<b>Variations in practice</b>	<p>Survey question #51</p> <p>The following question gives you the opportunity to tell us about any other variations in dysphagia screening, assessment and management during the</p>	Free text		Free text	



Manchester  
Metropolitan  
University

Stroke  
Association

	first 7 days of a patient's admission to your stroke unit.				
<b>Sharing of protocols</b>	Survey question #52 Please let us know if you would be happy to share your Trust protocols relating to the screening, assessment and management of stroke patients with dysphagia.	1= Yes 2= No	Categorical – Nominal – dichotomous	Descriptive statistics (frequencies) – Proportion answering yes or no	Bar chart

## Data sets

Data from the Sentinel Stroke National Audit Programme registry will be used ([www.strokeaudit.org](http://www.strokeaudit.org)). Data will include administration of antibiotics for a new clinical diagnosis of pneumonia in the first 7 days after admission (Patient Centred Post 72-hour data) and Key indicators 4.5 Percentage of applicable patients who were given a swallow screen within 4h of clock start and 4.6 Percentage of applicable patients who were given a formal swallow assessment within 72h of clock start (Team Centred results). 2019 quarterly data will be used to create an annual 2019 data set.

## Method for analysing the data for incidence of stroke-associated pneumonia

Stroke-associated pneumonia (SAP) will be defined as the administration of antibiotics for a new clinical diagnosis of pneumonia in the first 7 days after admission as determined by the treating physician. SSNAP Patient Centred Post 72-hour quarterly data for Antibiotics for newly acquired pneumonia in the first 7 days from clock start will be used to calculate an annual 2019 pneumonia percentage for each team to measure the dispersion of the of pneumonia incidence across the teams.

## Missing data methodology

A forced response was used to avoid participants skipping questions to prevent missing data.

A set of rules were agreed with how to deal with the possibility than one survey was completed on behalf of more than one team e.g., the Routinely Admitting Team (RAT) and Non-Routinely Admitting Team (N-RAT) in the same NHS Trust, or more than one response was submitted for the same team.

Participants were asked to complete 2 separate surveys if they were responsible for more than one team. If only one survey was completed the researcher would confirm that the person completing the survey was the most appropriate person for both teams and ask if the responses would be

the same or different for both teams. If the person was not the most appropriate person, the researcher would request the survey be forwarded to the most appropriate person for the other team. If the person confirmed they were the most appropriate person and that their responses would be the same for both team the researcher would impute the missing data for the second team and record as two responses.

The potential for more than one response to be submitted for a hospital team had been minimised by only sending the link to the named person. However, there was the possibility than the role of SLT Clinical Lead may be shared within a team.

Firstly, only completed screens were to be included. Secondly the researcher would confirm the person completing the survey was the correct person to do so. Finally, the first submission would be included.

## **Sensitivity analysis**

Sensitivity analysis will be undertaken to understand how certain values contribute to the overall uncertainty of the model. For example, the impact of a lower-than-average response rate from a particular SCN region or the latest SSNAP annual data which includes data for the Covid-19 period compared to 2019 data (pre Covid-19).

## **Appendix**

Published electronic version of the survey “Dysphagia Screening, Assessment and Management in Acute Stroke” 2/9/2020.



## **References**

1. Kishore AK, Vail A, Chamorro A, Garau J, Hopkins SJ, Di Napoli M, Kalra L, Langhorne P, Montaner J, Roffe C, Rudd AG, Tyrrell PJ, van de Beek D, Woodhead M, Meisel A, Smith CJ. How is pneumonia

- diagnosed in clinical stroke research? A systematic review and meta-analysis. **Stroke**. 2015 May;46(5):1202-9. doi: 10.1161/STROKEAHA.114.007843. Epub 2015 Apr 9. PMID: 25858238.
2. Westendorp, W.F., Nederkoorn, P.J., Vermeij, J.D. *et al*. Post-stroke infection: A systematic review and meta-analysis. **BMC Neurol** 11, 110 (2011). <https://doi.org/10.1186/1471-2377-11-110>
  3. Finlayson O, Kapral M, Hall R, Asllani E, Selchen D, Saposnik G; Canadian Stroke Network; Stroke Outcome Research Canada (SORCan) Working Group. Risk factors, inpatient care, and outcomes of pneumonia after ischemic stroke. **Neurology**. 2011; 77:1338–1345. doi: 10.1212/WNL.0b013e31823152b1.
  4. Hannawi Y, Hannawi B, Rao CP, Suarez JI, Bershad EM. Stroke-associated pneumonia: major advances and obstacles. **Cerebrovasc Dis**. 2013; 35:430–443. doi: 10.1159/000350199.
  5. Martino R, Foley N, Bhogal S, Diamant N, Speechley M, Teasell R. Dysphagia after stroke: incidence, diagnosis, and pulmonary complications. **Stroke**. 2005 Dec;36(12):2756-63. doi: 10.1161/01.STR.0000190056.76543.eb. Epub 2005 Nov 3. PMID: 16269630.
  6. Eltringham S, Kilner K, Gee M, Sage K, Bray B, Pownall S, Smith C. Impact of dysphagia assessment and management on risk of stroke-associated pneumonia: a systematic review. **Cerebrovasc Dis**. 2018;46(3–4):99–107. doi: 10.1159/000492730.
  7. Eltringham SA, Kilner K, Gee M, Sage K, Bray BD, Smith CJ, Pownall S. Factors Associated with Risk of Stroke-Associated Pneumonia in Patients with Dysphagia: A Systematic Review. **Dysphagia**. 2020 Oct;35(5):735-744. doi: 10.1007/s00455-019-10061-6. Epub 2019 Sep 6. PMID: 31493069; PMCID: PMC7522065.
  8. Intercollegiate Stroke Working Party. National Clinical Guidelines for Stroke. 5<sup>th</sup> edition. 2016. London Royal College of Physicians.
  9. Daniels SK, Anderson JA, Willson PC: Valid items for screening dysphagia risk in patients with stroke: a systematic review. **Stroke** 2012; 43; 892–897.
  10. McAllister, S., Tedesco, H., Kruger, S., Ward, E.C., Marsh, C. and Doeltgen, S.H. (2020), Clinical reasoning and hypothesis generation in expert clinical swallowing examinations. **International Journal of**

**Language & Communication Disorders**, 55: 480-492. <https://doi.org/10.1111/1460-6984.12531>

11. NHS improvement (2016), Patient Safety Alert. Nasogastric tube misplacement: continuing risk of death and severe harm. [https://improvement.nhs.uk/documents/194/Patient\\_Safety\\_Alert\\_Stage\\_2 - NG tube resource set.pdf](https://improvement.nhs.uk/documents/194/Patient_Safety_Alert_Stage_2_-_NG_tube_resource_set.pdf) (Accessed 29.12.2020)
12. Beavan, J. (2015) Update on management options for dysphagia after stroke. **British Journal of Neuroscience Nursing**, 11, No. Sup 2. Published Online:27 Apr 2015  
<https://doi.org/10.12968/bjnn.2015.11.Sup2.10>
13. Eltringham, S.A.; Pownall, S.; Bray, B.; Smith, C.J.; Piercy, L.; Sage, K. Experiences of Dysphagia after Stroke: An Interview Study of Stroke Survivors and Their Informal Caregivers. **Geriatrics** 2019, 4, 67.