Worksheet: PICO and Research Strategy

Clinical question	When should the ability to swallow be screened and assessed in stroke patients?
Population	Stroke patients
Intervention	Screening
Comparison	control
Outcome	Dysphagia
List of most important topics and search terms	Stroke; cerebrovascular accident; apoplexy; dysphagia; swallowing disorders; deglutition disorders; screening; assessment.
First search	Seven guidelines: Boulanger et al., 2018; Burgos et al., 2018; Hebert et al., 2016; Stroke Foundation, 2019.; National Collaborating Center for Chronic Conditions, 2019; Powers et al., 2019; Winstein et al., 2016. Two systematic reviews: Eltringham et al., 2019; Smith et al., 2018.
Second search for updated evidence	One observational study: Han et al., 2018

Clinical question	What tools are available to screen dysphagia in acute stroke patients?
Population	Stroke patients
Intervention	Screening
Comparison	Videofluoroscopy swallowing study or fiberoptic endoscopic evaluation of swallowing
Outcome	Dysphagia
List of most important topics and search terms	Stroke; cerebrovascular accident; apoplexy; dysphagia; swallowing disorders; screening; screening tool; validity; reliability; gold standard.
First search	Seven guidelines: Boulanger et al., 2018; Burgos et al., 2018; Hebert et al., 2016; Stroke Foundation, 2019.; National Collaborating Center for Chronic Conditions, 2019; Powers et al., 2019; Winstein et al., 2016. Two systematic reviews: Oliveira et al., 2019; Poorjavad & Jalaie, 2014.

Clinical question	Does the introduction of oral hygiene protocols, compared to standard oral hygiene care, decrease mortality and morbidity or improve health outcomes in stroke patients with dysphagia?
Population	Stroke patients with dysphagia
Intervention	Oral hygiene protocols
Comparison	Standard care
Outcome	Complications (adverse events), morbidity, mortality, length of stay, oral hygiene, oral health and quality of life
List of most important topics and search terms	Oral hygiene; oral care; oral health; stroke; cerebrovascular accident; apoplexy; dysphagia; swallowing disorders; pneumonia; length of stay; morbility; death; infectious complications; complications; poor outcome; oral hygiene; oral health; quality of life.
First search	Seven guidelines: Baijens et al., 2016; Boulanger et al., 2018; Hebert et al., 2016; Menella & Heering, 2018; Stroke Foundation, 2019; Powers et al., 2019; Winstein et al., 2016. One systematic review: Brady et al., 2006. Non-systematic reviews: Ajwani et al., 2017; Kwok et al., 2015; Lyons et al., 2018; Kelly, 2010.
Second search for updated evidence	13 studies retrieved (next table).

Author	Study design	Participants/Intervention	Outcome measurment	Results
Ab Malik et al., 2018	Experimental	86 participants in rehabilitation, diagnosed with moderate to severe stroke (Barthel Index < 70); Intervention group: instructions for oral hygiene with electric toothbrush and 1% chlorhexidine gel, for six months; Control group: instructions for oral hygiene with manual toothbrush and commercial toothpaste for six months.	Opportunistic pathogens in the oral cavity identified through culture	Statistically significant reduction of yeast in the oral cavity in the intervention group at six months ($p<0.05$) and *Staphylococcus aureus*, aerobic and gram-negative bacilli throughout the study ($p<0.01$), but not significant between groups. *Candida albicans* and *Klebsiella* pneumoniae were the prominent pathogens.
Chen et al., 2019	Experimental	66 participants in rehabilitation, dysphagic, after first stroke; Intervention group: standard oral hygiene care (brushing twice a day, morning and evening) plus oral hygiene care for 10 to 15 minutes, 30 minutes before swallowing training, three times a week, consisting of brushing according to the Bass technique, finishing with coating the teeth with a fluoride paste, for three weeks; Control group: standard oral hygiene care for three weeks.	Oral health assessed with the Oral Health Assessment Tool	Significant improvement in oral health in the intervention group $\chi2=29.02$, $p<0.001$.
Chipps et al., 2014	Experimental	51 participants in rehabilitation, dysphagic, diagnosed with stroke for less than 30 days; Intervention group: brushing the teeth and tongue with a brush and toothpaste, flossing and rinsing with a solution based on phenolic compounds, twice a day, for ten days;	Oral health assessed with Revised-THROAT oral assessment tool and nasal and oropharyngeal	All participants improved their oral health, with no significant differences between groups. Although not statistically significant, the prevalence of methicillin-resistant *Staphylococcus aureus* colonization and methicillin-sensitive *Staphylococcus aureus* colonization in the

		Control group: standard oral hygiene care (not specified) for ten days.	colonization assessed by culture	control group almost doubled (from 4.8% to 9.5%), while in the intervention group it decreased (from 20 .8% to 16.7%).
Dai et al., 2017a	Experimental	74 participants in rehabilitation, diagnosed with moderate to severe stroke (Barthel Index < 70), evaluated at three months and 57 evaluated at six months; Intervention group: instructions for oral hygiene with electric toothbrush, commercial toothpaste and 0.2% chlorhexidine oral solution for rinsing, for three months and reassessed three months after the end of the study; Control group: instructions for oral hygiene with manual toothbrush and commercial toothpaste, for three months and reassessed three months after the end of the study.	Oral hygiene status, assessed by the Silness and Loe Plaque Index, and gingival bleeding, assessed by the Gingival Bleeding Index	Significant reduction in the percentage of areas with moderate to abundant plaque ($p < 0.001$) and with gingival bleeding ($p < 0.05$). In the intervention group, there was significantly less plaque and gingival bleeding than in the control group, controlling for other factors at the end of the study period (both $p < 0.001$) and in the observation period (plaque: $p < 0.05$, gingival bleeding: $p<0.01$).
Dai et al., 2017b	Experimental	74 participants in rehabilitation, diagnosed with moderate to severe stroke (Barthel Index < 70), evaluated at three months and 57 evaluated at six months; Intervention group: instructions for oral hygiene with electric toothbrush, commercial toothpaste and 0.2% chlorhexidine oral solution for rinsing, for three months and reassessed three months after the end of the study; Control group: instructions for oral hygiene with manual toothbrush and commercial toothpaste, for three months and reassessed three months after the end of the study.	Health-related quality of life and oral health assessed with SF-12, Oral Health Impact Profle-14, General Oral Health Assessment Index and Oral Health	Significant improvement in the oral health-related quality of life intervention group ($p<0.01$) than the control group participants and significant improvement in health-related quality of life ($p<0.05$) in the group intervention.

			Transitional Scale	
Dai et al., 2019	Experimental	74 participants in rehabilitation, diagnosed with moderate to severe stroke (Barthel Index < 70), evaluated at three months and 57 evaluated at six months; Intervention group: instructions for oral hygiene with electric toothbrush, commercial toothpaste and 0.2% chlorhexidine oral solution for rinsing, for three months and reassessed three months after the end of the study; Control group: instructions for oral hygiene with manual toothbrush and commercial toothpaste, for three months and reassessed three months after the end of the study.	Opportunistic pathogens in the oral cavity identified through culture	No significant differences in the prevalence of opportunistic pathogens throughout the study. Significant reduction in viable *Staphylococcus aureus* count ($p<0.05$) at the end of the study in the intervention group. No statistically significant differences between groups in counting and viability of yeasts and anaerobic gram-negative bacilli.
Lam et al., 2013	Experimental	102 participants in rehabilitation, diagnosed with moderate to severe stroke (Barthel Index < 70); Group I: instructions for performing oral hygiene; Group II: instructions for performing oral hygiene and use of 0.2% chlorhexidine, oral solution, for rinsing twice a day for three weeks; Group III: instructions for performing oral hygiene; use of 0.2% chlorhexidine, oral solution, for rinsing twice a day for three weeks and assistance in oral hygiene by a health professional twice a week for three weeks.	Oral functional status assessed with questions about ability to brush teeth and place dentures, dental plaque by the Silness and Loe Plaque Index, and gingival bleeding by the Ainamo and Bay	Poor oral hygiene and negligence in oral hygiene practices were observed at baseline. Significant reduction in bacterial plaque in the 2 groups that received chlorhexidine compared to group I ($p<0.001$) and reduction in gingival bleeding score 3 to 4 times greater in the groups that received chlorhexidine.

			Gingival Bleeding Index	
Lam et al., 2013	Experimental	102 participants in rehabilitation, diagnosed with moderate to severe stroke (Barthel Index < 70); Group I: instructions for performing oral hygiene; Group II: instructions for performing oral hygiene and use of 0.2% chlorhexidine, oral solution, for rinsing twice a day for three weeks; Group III: instructions for performing oral hygiene; use of 0.2% chlorhexidine, oral solution, for rinsing twice a day for three weeks and assistance in oral hygiene by a health professional twice a week for three weeks.	Opportunistic pathogens in the oral cavity identified through culture	No significant differences between groups in the count of opportunistic pathogens in the oral cavity.
Lam et al., 2014	Experimental	102 participants in rehabilitation, diagnosed with moderate to severe stroke (Barthel Index < 70); Group I: instructions for performing oral hygiene Group II: instructions for performing oral hygiene and use of 0.2% chlorhexidine, oral solution, for rinsing twice a day for three weeks; Group III: instructions for performing oral hygiene; use of 0.2% chlorhexidine, oral solution, for rinsing twice a day for three weeks and assistance in oral hygiene by a health professional twice a week for three weeks.	Oral health-related quality of life assessed with Oral Health Impact Profile-14 and Oral Health Transition Scale	Significant improvement ($p<0.05$) in relation to oral health-related quality of life in all groups throughout the study, with no statistically significant differences between groups.
Murray & Scholten, 2018	Quasi-experimental time-series	89 participants, with and without dysphagia, (n=12 and n=77 respectively) in stroke rehabilitation; Intervention: oral hygiene protocol with brushing the teeth or dentures twice a day with toothpaste (after breakfast and at bedtime) and rinsing the oral cavity	Oral health assessed with the Oral Health Assessment Tool	At the beginning of the study, the difference in the oral health score was statistically significant, with worse results for the dysphagic participants ($p<0.27$) and which remained at the end of the study

		after lunch. The care before consisted of brushing the teeth once a day in the morning. Evaluation before protocol implementation and seven days later.		($p<0.23$). At the end of the study, participants with dysphagia showed a statistically significant improvement in their oral health score ($p<0.24$). There was no difference in non-dysphagic patients.
Seedat & Penn, 2016	Quasi-experimental with comparison group by retrospective document analysis	32 participants with stroke and 14 with traumatic brain injury, dysphagia, in rehabilitation, equally distributed by intervention group and comparison group; Intervention: brushing teeth with toothpaste before and after breakfast and after lunch, snack and dinner, followed by rinsing the oral cavity with an oral solution (not specified).	Aspiration pneumonia	Of the participants, seven had aspiration pneumonia, all of them in the comparison group.
Sørensen et al., 2013	Quasi-experimental with an internal control group by retrospective document analysis and an external control group (neighboring institution)	146 participants with moderate to severe dysphagia, diagnosed with acute-phase stroke; Intervention group: tooth brushing (frequency not identified), oral protection and hydration and rinsing with 0.12% chlorhexidine oral solution, which in the case of patients with severe dysphagia was performed twice a day; use of synthetic saliva in patients not fed orally; Internal control group: unsystematic and arbitrary oral care; External control group: unsystematic and arbitrary oral hygiene care.	Rx verified pneumonia	The incidence of Rx-checked pneumonia was 4 out of 58 (7%) in the intervention group, compared with 16 out of 58 (28%) in the internal control group ($p<0.01$) and 8 out of 30 (27 %) in the external control group ($p<0.05$).

Wagner et al., 2016	Quasi-experimental time-series	1656 participants diagnosed with acute-phase stroke (n=949 in the intervention group); Intervention: oral hygiene protocol using a kit consisting of oral solutions containing 0.05% cetylpyridinium chloride and 1.5% hydrogen peroxide, a suction toothbrush, sponge and oropharyngeal suction probe.	Hospital acquired-pneumonia	The unadjusted incidence of hospital-acquired pneumonia was lower in the intervention group compared to the control (14 vs. 10.33%; p=0.022) with an unadjusted odds ratio of 0.68 (95% CI 0, 48-0.95; p=0.022). After adjusting for confounding factors, the odds ratio of hospital-acquired pneumonia in the intervention group continued to be significantly lower at 0.71 (95% CI 0.51-0.98; p=0.041).

Clinical question	Does systematic screening for nutritional risk, compared to standard care, in stroke patients with dysphagia decrease mortality and morbidity or improve health outcomes in stroke patients?
Population	Stroke patients with dysphagia
Intervention	screening for nutritional risk
Comparison	Standard care
Outcome	Morbidity, mortality, quality of life, functional outcome, length of stay, nutritional status.
List of most important topics and search terms	Stroke; cerebrovascular accident; apoplexy; dysphagia; swallowing disorders; screening; nutrition disorders; nutrition; length of stay; morbility; death; poor outcome.
First search	Seven guidelines: Boulanger et al., 2018; Burgos et al., 2018; Direção-Geral da Saúde, 2019; Hebert et al., 2016; Stroke Foundation, 2019.; National Collaborating Center for Chronic Conditions, 2019; Powers et al., 2019 Two systematic reviews: Feinberg et al., 2017; Geeganage et al., 2012

Clinical question	Does NGT feeding in patients with severe dysphagia, compared to other enteric feeding strategies, decrease mortality and morbidity or improve health outcomes in stroke patients?
Population	Stroke patients with dysphagia
Intervention	NGT feeding
Comparison	Standard or other feeding strategies
Outcome	Complications (adverse events), morbidity, mortality, quality of life, functional outcome, length of stay, nutritional status.
List of most important topics and search terms	Stroke; cerebrovascular accident; apoplexy; nutrition disorders; nutrition; nutrition therapy; feeding methods; enteral nutrition; tube feeding; gastrostomy; enterostomy; length of stay; morbility; death; poor outcome.
First search	Seven guidelines: Boulanger et al., 2018; Burgos et al., 2018; Hebert et al., 2016; Stroke Foundation, 2019.; National Collaborating Center for Chronic Conditions, 2019; Powers et al., 2019; Winstein et al., 2016. Two systematic reviews: Geeganage et al., 2012; Gomes et al., 2015
Second search for updated evidence	Four non-randomized studies: Joundi et al., 2018; Kim et al., 2018; Kwak et al., 2018; Wang et al., 2019

Clinical question	Which therapeutic interventions have the most significant results in the recovery of swallowing function and airway safety?
Population	Stroke patients with dysphagia
Intervention	Therapeutic intervention for the treatment/rehabilitation of dysphagia
Comparison	Standard care
Outcome	Swallow ability, functional outcome, complications (adverse events); morbidity; mortality; quality of life; respiratory complications/aspiration pneumonia
List of most important topics and search terms	stroke; cerebrovascular accident; apoplexy; dysphagia; swallowing disorders; swallowing function; rehabilitation; therapies; treatment; death; lenght of stay; morbility; aspiration; functional outcome
First search	Three guidelines: Burgos et al., 2018; Hebert et al., 2016; Stroke Foundation, 2019.; National Collaborating Center for Chronic Conditions, 2019; Winstein et al, 2016 One systematic review: Bath et al., 2018; Chiang et al., 2019; Tian et al., 2019
Second search for updated evidence	Nine studies retrieved (next table).

Autor	Objective/particpants/intervention	Outcome measurements	Results
Kim & Park, 2019	Using a computer application, 30 participants were randomly divided into two groups, with the aim of investigating the effect of a head flexion resistance exercise in participants with dysphagia, with the aid of a device. Intervention (n=15): head flexion resistance exercises with device support + standard care five days a week for six weeks; Control (n=15): standard care five days a week for six weeks.	Use of the Functional Oral Intake Scale to assess swallowing function and assess penetration/aspiration using videofluoroscopy.	Compared with the control group, the intervention group showed statistically significant improvement in penetration/aspiration and the Functional Oral Intake Scale ($p<0.001$, both). NGT removal rates were 25% and 15% in the intervention and control groups, respectively.
Krajczy et al., 2019	Aiming to evaluate the effectiveness of a therapeutic program consisting of orofacial muscle strengthening exercises, breathing exercises and strengthening and re-education and, when appropriate, thermal stimulation and mobilization of the laryngo-hyoid complex, 60 participants were randomly allocated into two groups, by closed envelope technique. Intervention (n=30): daily therapeutic program for 15 days; Control (n=30): standard care during the same period.	The following parameters were evaluated at the beginning and end of the program: vocal quality before and after ingesting 50 ml of water; swallowing time (in seconds); number of swallows and peripheral oxygen saturation assessed by pulse oximetry.	Statistically significant difference between groups at the end of the intervention, in favor of the intervention group, for the parameters: swallowing reflex ($p=0.00001$), cough reflex ($p=0.0009$), vocal quality ($p=0\ .00001$), reduction in swallowing time ($p=0.02$) and reduction in the number of swallows ($p=0.02$).
Moon et al., 2018	Nineteen participants were randomly allocated through a computer application into two groups in order to assess the effects of precision training and	Iowa Oral Performance Instrument for the assessment of maximum isometric tongue	There were statistically significant improvements before and after treatment in both groups for all measured variables. No differences between groups, except for the

	tongue pressure strength on swallowing function and quality of life. Intervention (n=8): tongue press force and precision training + standard care 5 times a week for eight weeks; Control (n=8): standard care 5 times a week for eight weeks.	pressure, the Mann Assessment of Swallowing Ability to Assess Dysphagia and Swallowing-Quality of Life for Quality of Life.	maximum posterior isometric pressure of the tongue, which showed no statistically significant improvement in the control group and in the item "tongue movement" in the evaluation performed using the Mann Assessment of Swallowing Ability with a statistically significant difference in favor of the group intervention.
Park et al., 2019	24 participants were randomly allocated to evaluate the effect of forced swallowing training on tongue strength and ability to swallow. Intervention (n=12): forced swallowing training five times a week for four weeks; Control (n=12): standard care 5 times a week for four weeks	Iowa Oral Performance Instrument for assessment of maximum isometric tongue pressure and swallowing function was assessed by videofluoroscopy using the Videofluoroscopic Dysphagia Scale.	Statistically significant differences in the two groups before and after the intervention and at the end of the intervention there was a statistically significant difference in the measurement of anterior and posterior tongue strength ($p<0.046$ and $p<0.042$ respectively) in favor of the intervention group. As for the swallowing function, both groups showed significant improvements in the oral and pharyngeal phase before and after treatment, and at the end of the intervention there was a statistically significant difference ($p<0.017$) between groups in the oral phase in favor of the intervention group .
Ploumis et al., 2018	With the aim of evaluating the effectiveness of isometric exercises for strengthening the cervical spine in post-stroke dysphagic adults, 70	Penetration/aspiration evaluation using videofluoroscopy.	Statistically significant differences between groups in penetration/aspiration ($p<0.001$) in favor of the intervention group.

	participants were randomly distributed into two groups, per sealed envelope. Intervention (n=37): isometric cervical strengthening exercises + standard care for 12 weeks; Control (n=33): standard care for 12 weeks.		
Simonelli et al., 2019	Researchers compared the use of NMES with standard care in a group of 31 participants randomly distributed into two groups with a randomization table. Intervention (n=16): neuromuscular electrical stimulation + standard care five days a week for five days; Control (n=15): standard care five days a week for five days.	Use of the Functional Oral Intake Scale to assess swallowing function and assess penetration/aspiration using videofluoroscopy.	Statistically significant differences in both groups in the assessment before and after treatment, however the intervention group achieved better scores on the Functional Oral Intake Scale and on the penetration/aspiration assessment.
Tarameshlu et al., 2019	Aiming to evaluate the effect of RTMS on swallowing, 18 participants were randomly distributed into three groups, by a sealed envelope. Intervention 1 (n=6): transcranial magnetic stimulation five consecutive days + standard care three times a week for six weeks; Intervention 2(n=6): transcranial magnetic stimulation for five consecutive days; Control(n=6): standard care three times a week for six weeks;	Use of the Functional Oral Intake Scale to assess swallowing function and the Mann Assessment of Swallowing Ability to assess dysphagia.	All groups had statistically significant improvements between the beginning and the end of the study, however, these were significantly greater in the intervention group 1.
Ünlüer et al., 2019	28 participants were randomly distributed into two groups, by closed envelope, to identify whether the	The swallowing function was evaluated by videofluoroscopy	No differences between groups in the assessment of swallowing function. A

	application of low-frequency transcranial magnetic stimulation can increase the effect of the conventional treatment of swallowing and the quality of life. Intervention (n=15): low frequency transcranial magnetic stimulation in the unaffected hemisphere in the last week of treatment + standard care three times a week for four weeks; Control (n=13): standard care three times a week for four weeks.	based on the measurement of oral transit time of different volumes and consistency and penetration and aspiration. The Swallowing-Quality of Life was used to assess the Quality of Life.	significant improvement was seen in the parameters of appetite, fear of eating and mental health of the quality of life assessment in the intervention group compared to the control group ($p < 0.05$).
Wu et al., 2019	Aiming to assess the effectiveness of acupuncture in the treatment of dysphagia, 128 participants were randomly distributed using a table of random numbers, in two groups. Intervention (n=63): acupuncture + standard care five times a week for three weeks; Control (n=65): standard care five times a week for three weeks.	Swallowing capacity assessed with an instrument developed by Fujishima Ichiro.	Statistically significant differences were observed between groups at the end of treatment for cortical and internal capsule/basal ganglia/diencephalon infarcts patients. No group differences for brainstem and cerebellum infarcts patients.

Clinical question	Does modifying food and liquids consistency, compared to standard feeding, decrease mortality and morbidity, or improve health outcomes in stroke patients?
Population	Stroke patients with dysphagia
Intervention	Modification of food consistencies and liquid viscosity
Comparison	Standard or non-modified feeding
Outcome	Efficacy (swallowing ability) and safety (respiratory complications) of swallowing and quality of life
List of most important topics and search terms	Stroke; cerebrovascular accident; apoplexy; dysphagia; swallowing disorders; liquid; food; texture; consistency; thick*; viscosity
First search	Three guidelines: Burgos et al., 2018; Stroke Foundation, 2019; Wirth et al., 2016.. Four systematic reviews:Beck et al., 2018; Newman et al., 2016; Steele et al., 2015; Swan et al., 2015
Second search for updated evidence	Five observational studies: Bolivar-Prados et al., 2019; Crary et al., 2015; McCurtin et al., 2018; Miles et al., 2018; Vilardell et al., 2015.

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