Appendix 1: Original search strategy run June 5, 2013. Update search using same terms conducted June 9, 2014.

Ovid

Database(s): Embase 1988 to 2013 Week 22, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946 to Present, EBM Reviews - Cochrane Central Register of Controlled Trials May 2013, EBM Reviews - Cochrane Database of Systematic Reviews 2005 to April 2013
Search Strategy:

|  |  |  |
| --- | --- | --- |
| **#** | **Searches** | **Results** |
| 1 | exp screening test/ | 43105 |
| 2 | (bedside or "bed side").mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, nm, kf, ps, rs, ui, tx, ct] | 36745 |
| 3 | 1 and 2 | 171 |
| 4 | ((bedside or "bed side") adj5 (screening\* or swallow\*)).mp. | 550 |
| 5 | exp questionnaire/ | 645078 |
| 6 | clinical observation/ | 16913 |
| 7 | exp esophagus manometry/ | 2401 |
| 8 | exp manometry/ | 28195 |
| 9 | (questionnaire\* or observation\* or desaturat\* or manometr\* or esophagomanometr\* or tonometr\*).mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, nm, kf, ps, rs, ui, tx, ct] | 2088013 |
| 10 | "Iowa oral performance instrument".mp. | 43 |
| 11 | 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 | 2094124 |
| 12 | exp Pneumonia/ | 220341 |
| 13 | exp dysphagia/ | 74015 |
| 14 | exp Deglutition Disorders/ | 74015 |
| 15 | (pneumonia\* or pneumonitis or pneumonolipoidosis or aspiration or "mendelson syndrome" or "mendelsons syndrome" or "pulmonary inflammation\*" or "lung inflammation\*" or pneumonitides or "inflamatory lung disease\*" or lobitis or peripneumonia\* or pleuropneumonia\* or pleuropneumonitis or pneumonic or "pulmonal inflammation\*" or "pulmonic inflammation\*" or dysphagia or "deglutition disorder\*" or "paterson kelly syndrome" or "plummer syndrome" or "plummer vinson" or "swallowing disorder\*" or "oculopharyngeal muscular dystrophy" or odynophagia or "Wallenberg syndrome").mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, nm, kf, ps, rs, ui, tx, ct] | 558925 |
| 16 | or/12-15 | 600280 |
| 17 | exp Fluoroscopy/ | 36084 |
| 18 | exp bronchoscopy/ | 47471 |
| 19 | (fluoroscop\* or videofluoroscop\* or "fluorescence radiation" or "fluorescence scan\*" or "fluorescent scan\*" or fluorophotograph\* or photofluoroscop\* or radiofluoroscop\* or "roentgen fluoroscop\*" or roentgenfluoroscop\* or bronchoscop\* or "bronchial endoscop\*" or laryngotracheobronchoscop\* or tracheobronchoscop\*).mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, nm, kf, ps, rs, ui, tx, ct] | 118455 |
| 20 | or/17-19 | 118776 |
| 21 | 11 and 16 and 20 | 1663 |
| 22 | exp controlled study/ | 4129413 |
| 23 | exp randomized controlled trial/ | 679180 |
| 24 | ((control$ or randomized) adj2 (study or studies or trial or trials)).mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, nm, kf, ps, rs, ui, tx, ct] | 5288921 |
| 25 | meta analysis/ | 111857 |
| 26 | meta-analys$.mp. | 182028 |
| 27 | exp "systematic review"/ | 60732 |
| 28 | (systematic\* adj review$).mp. | 141736 |
| 29 | exp Cohort Studies/ | 1509035 |
| 30 | exp longitudinal study/ | 971223 |
| 31 | exp retrospective study/ | 764560 |
| 32 | exp prospective study/ | 631179 |
| 33 | exp comparative study/ | 2392157 |
| 34 | exp clinical trial/ | 1644345 |
| 35 | exp cross-sectional study/ | 254224 |
| 36 | crossover procedure/ | 36984 |
| 37 | exp cross-over studies/ | 92612 |
| 38 | multivariate analysis/ | 170964 |
| 39 | ((clinical or comparative or cohort or longitudinal or retrospective or prospective or concurrent or "cross- sectional" or crossover or "cross-over") adj (study or studies or survey or surveys or analysis or analyses or trial or trials)).mp. | 6851093 |
| 40 | ("crossover procedure" or "cross-over procedure" or "multivariate analys\*").mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, nm, kf, ps, rs, ui, tx, ct] | 350994 |
| 41 | compar\*.tw. | 7178513 |
| 42 | or/22-41 | 14037466 |
| 43 | 21 and 42 | 918 |
| 44 | from 21 keep 933-1612 | 680 |
| 45 | limit 44 to (clinical trial, all or clinical trial, phase i or clinical trial, phase ii or clinical trial, phase iii or clinical trial, phase iv or clinical trial or comparative study or controlled clinical trial or evaluation studies or meta analysis or multicenter study or randomized controlled trial or systematic reviews or validation studies) [Limit not valid in Embase,CCTR,CDSR; records were retained] | 154 |
| 46 | 43 or 45 | 924 |
| 47 | limit 46 to (book or book series or editorial or erratum or letter or addresses or autobiography or bibliography or biography or comment or dictionary or directory or interactive tutorial or interview or lectures or legislation or news or newspaper article or patient education handout or periodical index or portraits or published erratum or video-audio media or webcasts) [Limit not valid in Embase,Ovid MEDLINE(R),Ovid MEDLINE(R) In-Process,CCTR,CDSR; records were retained] | 31 |
| 48 | 46 not 47 | 893 |
| 49 | from 21 keep 1613-1663 | 51 |
| 50 | 48 or 49 | 923 |
| 51 | remove duplicates from 50 | 668 |

Scopus

1. TITLE-ABS-KEY((bedside W/5 swallow\*) or ("bed side" W/5 swallow\*) or (bedside W/5 screening\*) or ("bed side" W/5 screening\*) or questionnaire\* or observation\* or desaturat\* or manometr\* or esophagomanometr\* or tonometr\* or "Iowa oral performance instrument")
2. TITLE-ABS-KEY(pneumonia\* or pneumonitis or pneumonolipoidosis or aspiration or "mendelson syndrome" or "mendelsons syndrome" or "pulmonary inflammation\*" or "lung inflammation\*" or pneumonitides or "inflamatory lung disease\*" or lobitis or peripneumonia\* or pleuropneumonia\* or pleuropneumonitis or pneumonic or "pulmonal inflammation\*" or "pulmonic inflammation\*" or dysphagia or "deglutition disorder\*" or "paterson kelly syndrome" or "plummer syndrome" or "plummer vinson" or "swallowing disorder\*" or "oculopharyngeal muscular dystrophy" or odynophagia or "Wallenberg syndrome")
3. TITLE-ABS-KEY(fluoroscop\* or videofluoroscop\* or "fluorescence radiation" or "fluorescence scan\*" or "fluorescent scan\*" or fluorophotograph\* or photofluoroscop\* or radiofluoroscop\* or "roentgen fluoroscop\*" or roentgenfluoroscop\* or bronchoscop\* or "bronchial endoscop\*" or laryngotracheobronchoscop\* or tracheobronchoscop\*)
4. TITLE-ABS-KEY((meta W/1 analys\*) OR (systematic\* W/2 review\*) OR (control\* W/2 stud\*) OR (control\* W/2 trial\*) OR (randomized W/2 stud\*) OR (randomized W/2 trial\*) or "comparative stud\*" OR "comparative survey\*" OR "comparative analys\*" OR "cohort stud\*" OR "cohort survey\*" OR "cohort analys\*" OR "longitudinal stud\*" OR "longitudinal survey\*" OR "longitudinal analys\*" OR "retrospective stud\*" OR "retrospective survey\*" OR "retrospective analys\*" or "prospective stud\*" OR "prospective survey\*" OR "prospective analys\*" or "concurrent stud\*" OR "concurrent survey\*" OR "concurrent analys\*" or "clinical stud\*" OR "clinical trial\*" or "cross-sectional stud\*" or "cross-sectional analys\*" or "cross-over stud\*" or "cross-over analys\*" or "cross-over procedure" or "crossover stud\*" or "crossover analys\*" or "crossover procedure" or "multivariate analys\*" or compar\*)
5. 1 and 2 and 3 and 4
6. PMID(0\*) OR PMID(1\*) OR PMID(2\*) OR PMID(3\*) OR PMID(4\*) OR PMID(5\*) OR PMID(6\*) OR PMID(7\*) OR PMID(8\*) OR PMID(9\*)
7. 5 and not 6
8. DOCTYPE(le) OR DOCTYPE(ed) OR DOCTYPE(bk) OR DOCTYPE(er) OR DOCTYPE(no) OR DOCTYPE(sh)
9. 7 and not 8

Appendix 2: Abstracted variables and operational definitions used in abstraction

|  |  |
| --- | --- |
| **Variable** | **Instruction** |
| Study | Study name, i.e. Author *et al.*  |
| Abstractor initials | Person doing data abstraction to allow for later calculation of kappa coefficients |
| Include? Yes/No | Whether you believe the study meets criteria |
| Year | Year of publication |
| Corresponding author e-mail address | Address to contact for further information if needed |
| Design  | Classify study as RCT, observational, prospective cohort, retrospective cohort, case control |
| Age | Classify patient population as adult, children or mixed. For mixed study, insert the breakdown of adult (age >18) vs non-adult as a percentage |
| Setting  | Primary setting from which patients were drawn, i.e. ICU, floor, outpatient or mixed |
| Reason for dysphagia | Diagnosis leading to dysphagia in included patients in study, i.e. stroke. If more than one diagnosis included, abstract percentage of each, i.e. “Stroke (52%), Parkinsons (28%), unknown (30%) |
| Gender  | Report as % male |
| Inclusion Criteria | Specific inclusion criteria other than the setting, reason for dysphagia and age limits specified above |
| Exclusion criteria | Specific exclusion criteria beyond inclusion criteria |
| Index test | Test used to evaluate swallowing, i.e. tongue pressure, bedside swallow, specific questionnaire name |
| Reference test | Gold standard used, i.e. FEEST, VFSS |
| Performing provider  | Provider performing INDEX test, i.e. nurse, SLP, radiologist, mixed |
| N for dysphagia detection  | Sum of the four values below (for calculation purposes) |
| Kappa score? | If reported, kappa between reference and index test |
| n with Dysphagia detected (TP) | Number in whom screening test and gold standard are both positive for the presence of dysphagia |
| n with dysphagia not detected (FN) | Number in whom screening test is negative, but gold standard positive for the presence of dysphagia |
| n with no dysphagia/screen positive (FP) | Number in whom the screening test was positive and the gold standard was negative for the presence of dysphagia |
| n with no dysphagia/screen negative (TN) | Number in whom the screening test was negative and the gold standard was negative for the presence of dysphagia |
| Included multiple grades of dysphagia? (Y/N) | Choose yes if study graded severity either numerically or qualitatively (mild, moderate, severe) and fill out following 6 fields |
| Definition of "severe dysphagia" | Definition used to classify as severe, whether a numeric cutoff of a scale, or simple grading.  |
| Kappa score? | If reported, kappa between reference and index test |
| N for severe dysphagia analysis (calculated, do not enter N) | Sum of the four values below (for calculation purposes) |
| n with severe dysphagia detected (TP) | Number in whom screening test and gold standard are both positive for the presence of severe dysphagia |
| n with Severe dysphagia not detected (FN) | Number in whom screening test is negative, but gold standard positive for the presence of severe dysphagia |
| n without severe dysphagia/screen positive (FP) | Number in whom the screening test was positive and the gold standard was negative for the presence of severe dysphagia |
| n without severe dysphagia/screen negative (TN) | Number in whom the screening test was negative and the gold standard was negative for the presence of severe dysphagia |
| Aspiration pneumonia reported as outcome? | If study included subsequent development of aspiration pneumonia, select yes and fill out following six fields |
| Definition of aspiration pneumonia | What definition was used for aspiration pneumonia, and what time interval existed to follow up |
| Kappa score? | If reported, kappa between reference and index test |
| N for pneumonia analysis  | Sum of the following four values |
| n pneumonia positive/screen positive (TP) | Number of subjects who screened positive for dysphagia and subsequently developed aspiration pneumonia |
| n pneumonia positive/screen negative (FN) | Number of patients who screened negative and subsequently developed aspiration pneumonia |
| n pneumonia negative/screen positive (FP) | Number of patients who screened positive for dysphagia and did not develop aspiration pneumonia |
| n pneumonia negative/screen negative (TN) | Number of patients who screened negative and did not develop aspiration pneumonia |
| Comments | Any other information from study, such as unusual conclusions |

Appendix 3: Expanded legend to Figure 4

|  |  |  |  |
| --- | --- | --- | --- |
|  | studyid | class | manuver |
| 1 | Rosenbek et al., 2004 | Apraxia | Oral apraxia |
| 2 | McCullough et al., 2001 | Apraxia | Oral apraxia |
| 3 | McCullough et al., 2001 | Attends | Attends |
| 4 | Rosenbek et al., 2004 | Attends | Attends |
| 5 | Smith Hammond et al., 2009 | Cough Quality | Cough volume acceleration |
| 6 | McCullough et al., 2001 | Cough Quality | Voilitional cough quality (wet vs. dry) |
| 7 | Smith Hammond et al., 2009 | Cough Quality | Cough expiratory phase rise time |
| 8 | Pitts et al., 2010 | Cough Quality | Accoustic analysis- Post Swallow Apnea |
| 9 | Rosenbek et al., 2004 | Cough Quality | Voilitional cough quality (wet vs. dry) |
| 10 | Horner et al., 1992 | Cough Quality | Voluntary cough |
| 11 | Steel et al., 2011 (SLP) | Cough Quality | Baseline voluntary cough |
| 12 | Steel et al., 2011 (RN) | Cough Quality | Baseline voluntary cough |
| 13 | Smith Hammond et al., 2009 | Cough Quality | Cough expiratory phase peak flow |
| 14 | Daniels et al., 1998 | Cough Quality | Abnormal volitional cough |
| 15 | Daniels et al., 1997 | Cough Quality | Cough quality |
| 16 | Daniels et al., 1997 | Cough Quality | Cough after swallow |
| 17 | McCullough et al., 2001 | Cough Strength | Voilitional cough strength |
| 18 | Rosenbek et al., 2004 | Cough Strength | Voilitional cough strength |
| 19 | Smith et al., 2000 | Desaturation | Desaturation |
| 20 | Collins et al., 1997 | Desaturation | Desaturation |
| 21 | Chong et al., 2003 | Desaturation | Desaturation |
| 22 | Wang et al., 2005 | Desaturation | Desaturation |
| 23 | Daniels et al., 1997 | Dysarthria | Dysarthria |
| 24 | McCullough et al., 2001 | Dysarthria | Dysarthria |
| 25 | Rosenbek et al., 2004 | Dysarthria | Dysarthria |
| 26 | Daniels et al., 1998 | Dysarthria | Dysarthria |
| 27 | Mari et al., 1997 | Dysphagia | Complains of dysphagia |
| 28 | McCullough et al., 2001 | Dysphonia | Dysphonia |
| 29 | Daniels et al., 1998 | Dysphonia | Voice Change with Swallow |
| 30 | Horner et al., 1992 | Dysphonia | Voice quality |
| 31 | Daniels et al., 1998 | Dysphonia | Dysphonia |
| 32 | Nishiwaki et al., 2005 | Gag | Gag reflex |
| 33 | McCullough et al., 2001 | Gag | Gag (pharyngeal) |
| 34 | Horner et al., 1992 | Gag | Gag reflex |
| 35 | Logemann et al., 1999 | Gag | Asymmetric/poor pharyngeal wall contraction on gag |
| 36 | McCullough et al., 2001 | Gag | Gag (palatal) |
| 37 | Addington et al., 1999 | Gag | Reflex Cough |
| 38 | Daniels et al., 1998 | Gag | Abnormal gag |
| 39 | Daniels et al., 1997 | Gag | Gag |
| 40 | Rosenbek et al., 2004 | Gag | Pharyngeal gag |
| 41 | McCullough et al., 2001 | Intelligibility | Intelligibility |
| 42 | Rosenbek et al., 2004 | Intelligibility | Intelligibility |
| 43 | McCullough et al., 2001 | Jaw ROM | Jaw lateral range of motion |
| 44 | Rosenbek et al., 2004 | Jaw ROM | Jaw lateral range of motion |
| 45 | McCullough et al., 2001 | Lip ROM | Lip ROM (Puckering) |
| 46 | McCullough et al., 2001 | Lip ROM | Lip ROM (Retract) |
| 47 | Rosenbek et al., 2004 | Lip ROM | Lip ROM |
| 48 | Nishiwaki et al., 2005 | Lip Strength | Lip closure |
| 49 | Rosenbek et al., 2004 | Lip Strength | Lip strength |
| 50 | McCullough et al., 2001 | Lip Strength | Lip strength |
| 51 | Warms et al., 2000 | Other | Wet voice |
| 52 | McCullough et al., 2001 | Other | Spontaneous cough |
| 53 | Belafsky et al, 2003 | Other | Modified Evans Blue Dye Test (MEBDT) |
| 54 | Steele et al, 2013 | Other | Dual axis accelerometry |
| 55 | McCullough et al., 2001 | Other | Tongue Strength |
| 56 | Kidd et al., 1993 | Other | Abnormal Pharyngeal sensation |
| 57 | Shaw et al., 1994 | Other | Bronchial auscultation |
| 58 | Ryu et al, 2004 | Other | Acoustic Analysis- Shimmer Percentage |
| 59 | Mari et al., 1997 | Other | Cough with swallow |
| 60 | Logemann et al., 1999 | Other | Multiple swallows per bolus |
| 61 | Rosenbek et al., 2004 | Other | Secretions |
| 62 | Logemann et al., 1999 | Other | Cough on trial swallows |
| 63 | Kidd et al., 1993 | Other | Facial Weakness |
| 64 | Logemann et al., 1999 | Other | Laryngeal elevation on trial swallows |
| 65 | Ryu et al, 2004 | Other | Acoustic Analysis- Relative Average Perturbation |
| 66 | McCullough et al., 2001 | Other | Delayed Swallow |
| 67 | McCullough et al., 2001 | Other | Secretions |
| 68 | Tohara et al., 2003 | Other | Food Swallow |
| 69 | Rosenbek et al., 2004 | Other | Tongue Strength |
| 70 | Kagaya et al., 2010 | Other | SSPT |
| 71 | Nishiwaki et al., 2005 | Other | Saliva swallowing test |
| 72 | Ryu et al, 2004 | Other | Acoustic Analysis- Noise to Harmonic Ratio |
| 73 | Nishiwaki et al., 2005 | Other | Motor speech function |
| 74 | Ryu et al, 2004 | Other | Acoustic Analysis- Voice Turbulence Index |
| 75 | Daniels et al., 1998 | Other | Cough with swallow |
| 76 | Rosenbek et al., 2004 | Palate ROM | Soft palate ROM |
| 77 | McCullough et al., 2001 | Palate ROM | Soft palate ROM |
| 78 | Nishiwaki et al., 2005 | Palate strength | Palatal elevation |
| 79 | Rosenbek et al., 2004 | Palate strength | Soft palate strength |
| 80 | McCullough et al., 2001 | Palate strength | Soft palate symmetry |
| 81 | Rosenbek et al., 2004 | Tongue movement | Tongue ROM |
| 82 | Steel et al., 2011 (SLP) | Tongue movement | Baseling tongue lateralization |
| 83 | Steel et al., 2011 (RN) | Tongue movement | Baseling tongue lateralization |
| 84 | Kidd et al., 1993 | Tongue movement | Abnormal tongue movement |
| 85 | McCullough et al., 2001 | Tongue movement | Tongue ROM |
| 86 | Nishiwaki et al., 2005 | Tongue movement | Tongue movement |
| 87 | Rosenbek et al., 2004 | Voice Quality | Wet voice |
| 88 | McCullough et al., 2001 | Voice Quality | Harsh voice (AH) |
| 89 | McCullough et al., 2001 | Voice Quality | Strained Voice (AH) |
| 90 | McCullough et al., 2001 | Voice Quality | Wet voice (AH) |
| 91 | McCullough et al., 2001 | Voice Quality | Breathy voice |
| 92 | Logemann et al., 1999 | Voice Quality | Wet voice |
| 93 | Rosenbek et al., 2004 | Voice Quality | Resonant voice |
| 94 | Rosenbek et al., 2004 | Voice Quality | Breathy voice |
| 95 | Steel et al., 2011 (SLP) | Voice Quality | Vaseline voice quality |
| 96 | McCullough et al., 2001 | Voice Quality | Dysphonia (AH) |
| 97 | Rosen et al., 2001 | Voice Quality | Wet voice |
| 98 | Daniels et al., 1997 | Voice Quality | Dysphonia |
| 99 | McCullough et al., 2001 | Voice Quality | Wet voice |
| 100 | McCullough et al., 2001 | Voice Quality | Resonant voice (AH) |
| 101 | McCullough et al., 2001 | Voice Quality | Resonant voice |
| 102 | Daniels et al., 1997 | Voice Quality | Voice quality |
| 103 | Wakasugi et al., 2008 | Voice Quality | Accoustic analysis |
| 104 | Steel et al., 2011 (RN) | Voice Quality | Vaseline voice quality |
| 105 | McCullough et al., 2001 | Voice Quality | Breathy voice (AH) |
| 106 | Rosenbek et al., 2004 | Voice Quality | Dysphonia |
| 107 | McCullough et al., 2001 | Voice Quality | Harsh voice |
| 108 | Rosenbek et al., 2004 | Voice Quality | Harsh voice |
| 109 | McCullough et al., 2001 | Voice Quality | Strained Voice |
| 110 | Wu et al., 2004 | Water Swallow | 100 mL Swallow Test |
| 111 | Tohara et al., 2003 | Water Swallow | Water Swallow |
| 112 | Lim et al., 2002 | Water Swallow | Water Swallow Test |
| 113 | Steel et al., 2011 (SLP) | Water Swallow | Post swallow cough, throat clear or voice change |
| 114 | Trapl et al., 2007 | Water Swallow | Gugging Swallow Screen |
| 115 | McCullough et al., 2001 | Water Swallow | 3 oz test |
| 116 | Steel et al., 2011 (RN) | Water Swallow | Post swallow cough, throat clear or voice change |
| 117 | Nishiwaki et al., 2005 | Water Swallow | Oral phase in the WST |
| 118 | Suiter and Leder, 2008 | Water Swallow | 3 oz water swallow test |
| 119 | Kidd et al., 1993 | Water Swallow | Water Swallow Test |
| 120 | Chong et al., 2003 | Water Swallow | Water Swallow Test |
| 121 | DePippo et al, 1992 | Water Swallow | 3 oz swallow test |
| 122 | DePippo et al., 1992 | Water Swallow | 3 oz swallow test |
| 123 | Mari et al., 1997 | Water Swallow | 3 oz test |
| 124 | Nishiwaki et al., 2005 | Water Swallow | Cough/Voice change in the WST |
| 125 | Lim et al., 2001 | Water Swallow | Water Swallow Test |