National Institute for Health and Care Excellence

Draft for consultation

Postnatal care

[R] Tools for predicting breastfeeding difficulties

NICE guideline <TBC>

Evidence review

October 2020

Draft for consultation

These evidence reviews were developed by the National Guideline Alliance part of the Royal College of Obstetricians and Gynaecologists

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The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or service users. The recommendations in this guideline are not mandatory and the guideline does not override the responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or their carer or guardian.

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Contents

Contents **4**
Tools for predicting breastfeeding difficulties **6**
Review question 6
Introduction 6
Summary of the protocol 6
Methods and process 6
Clinical evidence 7
Summary of clinical studies included in the evidence review 7
Quality assessment of clinical studies included in the evidence review 9
Economic evidence 9
Economic model 9
Evidence statements 10
The committee's discussion of the evidence 10
References 12
Appendices **14**
Appendix A – Review protocol 14
Review protocol for review question: What observations or clinical tools accurately predict breastfeeding difficulties? 14
Appendix B – Literature search strategies 19
Literature search strategies for review question: What observations or clinical tools accurately predict breastfeeding difficulties? 19
Appendix C – Clinical evidence study selection 24
Clinical study selection for: What observations or clinical tools accurately predict breastfeeding difficulties? 24
Appendix D – Clinical evidence tables 25
Clinical evidence tables for review question: What observations or clinical tools accurately predict breastfeeding difficulties? 25
Appendix E – Forest plots 34
Forest plots for review question: What observations or clinical tools accurately predict breastfeeding difficulties? 34
Appendix F – GRADE tables 35
GRADE tables for review question: What observations or clinical tools accurately predict breastfeeding difficulties? 35
Appendix G – Economic evidence study selection 37
Economic evidence study selection for review question: What observations or clinical tools accurately predict breastfeeding difficulties? 37
Appendix H – Economic evidence tables 38
Economic evidence tables for the review question: What observations or clinical tools accurately predict breastfeeding difficulties? 38
Appendix I – Health economic evidence profiles 39

Economic evidence profiles for the review question: What observations or clinical tools accurately predict breastfeeding difficulties? 39

Appendix J – Economic analysis 40

Economic analysis for the review question: What observations or clinical tools accurately predict breastfeeding difficulties? 40

Appendix K – Excluded studies 41

Excluded studies for review question: What observations or clinical tools accurately predict breastfeeding difficulties? 41

Clinical studies 41

Economic studies 47

Appendix L – Research recommendations 48

Research recommendations for review question: What observations or clinical tools accurately predict breastfeeding difficulties? 48

Tools for predicting breastfeeding difficulties

This evidence review supports recommendations 1.5.14, 1.5.15 and 1.5.16.

Review question

What observations or clinical tools accurately predict breastfeeding difficulties?

Introduction

Breastfeeding is known to have benefits on mothers and babies, when compared with formula feeding, including lower rates of infection in the babies and reduced risk of breast cancer in the mothers. Some mothers choose bottle feeding while others struggle to establish satisfactory breastfeeding. Part of the help that professionals can give is in reassuring mothers that the babies are being adequately fed. The aim of this review is to determine what observations or clinical tools accurately predict breastfeeding difficulties so that these difficulties could be avoided by early intervention.

Summary of the protocol

Please see Table 1 for a summary of the Population, Index test/prognostic factor, Confounding factors and Outcomes characteristics of this review.

Table 1: Summary of the protocol

Population	Women who have given birth to a healthy baby at term (singleton or multiple birth).
Index test/prognostic factor	A score of a validated breastfeeding assessment tool, using primary cut-offs provided by the papers
Confounding factors	• Age of the baby • Birth weight • BMI • Previous experiences of breastfeeding (or parity if this is not available) • Cultural and linguistic differences • Whether the mother has received a breastfeeding intervention as a result of applying the tool.
Outcomes	• Any breastfeeding at 4 to 8 weeks postpartum • Exclusive breastfeeding at 4 to 8 weeks postpartum • Sensitivity, specificity and likelihood ratios will be reported as well as odds ratios and risk ratios.

Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual 2014. Methods specific to this review question are described in the review protocol in appendix A.

Declarations of interest were recorded according to NICE's 2014 conflicts of interest policy until March 2018. From April 2018 until June 2019, declarations of interest

were recorded according to NICE's 2018 conflicts of interest policy. From July 2019 onwards, the declarations of interest were recorded according to NICE's 2019 conflicts of interest policy. Those interests declared before July 2019 were reclassified according to NICE's 2019 conflicts of interest policy (see Register of Interests).

Clinical evidence

Included studies

Two prospective cohort studies (Kumar 2006; Zobbi 2011) and 1 retrospective cohort study (Nanishi 2015) were included in this review. Two studies were multi-centred (Nanishi 2015; Zobbi 2011) and 1 was single-centred (Kumar 2006).

Each study assessed a different breastfeeding assessment tool. Kumar 2006 assessed the Latching, Audible swallowing, Type of nipple, Comfort, Help holding baby to breast (LATCH) scoring system. For this tool, lower scores indicated breastfeeding difficulties, with the cut-off of scores lower than 9 indicating breastfeeding difficulties. Nanishi 2015 assessed the Breastfeeding Self-Efficacy Scale – Short Form (BSES-SF). For this tool, lower scores also indicated breastfeeding difficulties, with the cut-off of scores lower than 50 indicating breastfeeding difficulties. Finally, Zobbi 2011 assessed the breastfeeding assessment scale (BAS). For this tool, lower scores indicated breastfeeding difficulties with the cut-off of scores lower than 8 indicating breastfeeding difficulties.

For the Kumar study data extracted relate to the most discriminate results (highest AUC), that is score measured at 16-24 hours postpartum with a cut-off score of 9 (see Table 2 below).

All studies included healthy women who were expected to have a singleton, healthy, term baby delivered vaginally or via caesarean section. All studies included women at low medical risk. All studies recruited both primiparous and multiparous women.

The included studies are summarised in **Error! Reference source not found.**.

See the literature search strategy in appendix B and study selection flow chart in appendix C.

Excluded studies

Studies not included in this review with reasons for their exclusion are provided in appendix K.

Summary of clinical studies included in the evidence review

Summaries of the studies that were included in this review are presented in **Error! Reference source not found.**.

Table 2: Summary of included studies.

Study	Population	Prognostic factor	Outcomes
Kumar 2006 Single-centre prospective cohort study	N=248 n=188 at 6 week follow-up	The Latching, Audible swallowing, Type of nipple, Comfort, Help holding baby to breast (LATCH) Scoring System	Score measured at 16-24 hours postpartum. Breastfeeding at 6 weeks

Study	Population	Prognostic factor	Outcomes
US	n=63 measured at 16-24 hours postpartum Total cohort: Age, years, mean (SD)= 27.7 (6.1) Primiparous, n=58 Mode of birth: Spontaneous vaginal n=184 Vaginal assisted n=3 Scheduled caesarean n=31 Emergent caesarean n=30	Cut-off score 9. Lower indicates breastfeeding difficulties. The LATCH tool provides for systematic documentation and standardised communication. The tool was modelled on the Apgar scoring system with a possible composite score of 0 to 10. Each letter of the acronym identifies an area of breastfeeding assessment.	Not breastfeeding at 6 weeks
Nanishi 2015 Multi-centre retrospective cohort study Japan	N=378 Age, years, mean (SD)= 30.8 (4.8) Primiparous, n=158 Mode of birth: Caesarean section, n= 50	Breastfeeding Self-Efficacy Scale – Short Form (BSES-SF) Cut-off score 50. Lower indicates breastfeeding difficulties. The BSES-SF comprises 14 items. Each item has 5 response choices on a Likert scale, from “not at all confident” (1 point) to “always confident” (5 points). All the items are presented positively and their scores are summed to produce a total score ranging from 14 to 70. Higher total scores indicate higher levels of breastfeeding self-efficacy. The study used scores on the Japanese version of the BSES-SF completed before discharge.	Score measured at discharge Exclusive breastfeeding at 4 weeks Not-exclusive breastfeeding at 4 weeks
Zobbi 2011 Multi-centre prospective cohort study Italy	N= 386 Maternal age, years, mean (SD)= 33.1 (4.3) Mode of birth: Vaginal delivery, n=332	Breastfeeding Assessment Scale (BAS) Cut-off score=8, lower indicates breastfeeding difficulties.	Score measured at 48hrs postpartum Exclusive/predominantly breastfeeding at 4 weeks

Study	Population	Prognostic factor	Outcomes
	Caesarean section, n=54 Attendance at prenatal course, n=184	The current study sought to validate a reduced BAS with only five items (hypertension induced by pregnancy, previous breast surgery and vacuum vaginal delivery were excluded). Every variable constituting the score was given a value from 0–2. An optimal BAS with a value of 10 represents the highest probability of continuing breastfeeding over a period of time, while decreasing values represent a progressive reduction of such probability.	Complimentary or stopped breastfeeding at 4 weeks

BAS: Breastfeeding assessment scale; BSES-SF: Breastfeeding Self-Efficacy Scale – Short Form; LATCH: The Latching, Audible swallowing, Type of nipple, Comfort, Help holding baby to breast; SD: standard deviation

See the full evidence tables in appendix D. No meta-analysis was conducted and so there are no forest plots in appendix E.

Quality assessment of clinical studies included in the evidence review

See the evidence profiles in appendix F.

Economic evidence

Included studies

A single economic search was undertaken for all topics included in the scope of this guideline but no economic studies were identified which were applicable to this review question. See the literature search strategy in appendix B and economic study selection flow chart in appendix G.

Excluded studies

No economic studies were reviewed at full text and excluded from this review.

Economic model

No economic modelling was undertaken for this review because the committee agreed that other topics were higher priorities for economic evaluation.

Evidence statements

Clinical evidence statements

No breastfeeding (versus any breastfeeding) at 4 to 8 weeks postpartum

- Very low quality evidence from 1 prospective cohort study (N=63) found that a score of less than 9 measured using the LATCH tool at 16-24 hours postpartum had a sensitivity of 0.63 (95% CI 0.38 to 0.84) and specificity of 0.75 (95% CI 0.60 to 0.87) to detect not breastfeeding (versus any breastfeeding) at 6 weeks postpartum. The evidence suggests that a LATCH score of less than 9 is not useful in identifying women not breastfeeding at 6 weeks.

Any formula feeding (versus exclusive breastfeeding) at 4 weeks postpartum

- Low to moderate quality evidence from 1 retrospective cohort study (N=330) found that a score of 50 or less measured using the BSES-SF tool at discharge, had a sensitivity of 0.79 (95% CI 0.74 to 0.84) and a specificity of 0.52 (95% CI 0.37 to 0.67) to detect any formula feeding (versus exclusive breastfeeding) at 4 weeks postpartum. The evidence suggests that a BSES-SF score of 50 or less is not useful in identifying women who are not exclusively breastfeeding at 4 weeks.

No exclusive or predominant breastfeeding (versus exclusive breastfeeding) at 4 weeks postpartum

- Low to moderate quality evidence from 1 prospective cohort study (N=380) found that a score of less than 9 measured using the reduced BAS scoring system at 48 hours postpartum had a sensitivity of 0.78 (95% CI 0.70 to 0.85) and a specificity of 0.57 (95% CI 0.51 to 0.63) to detect no exclusive or predominant breastfeeding (versus exclusive breastfeeding) at 4 weeks postpartum. The evidence suggests that a reduced BAS score of less than 9 is not useful in identifying women who will not exclusively or predominantly breastfeed at 4 weeks.

Economic evidence statements

No economic evidence was identified which was applicable to this review question.

The committee's discussion of the evidence

Interpreting the evidence

The outcomes that matter most

Breastfeeding status at 4 to 8 weeks was considered to be a critical outcome, indicating if a tool or a score was useful in identifying women with breastfeeding difficulties. Sensitivity and specificity of a tool score for predicting breastfeeding difficulties were also prioritised as outcomes. A highly sensitive test is one that correctly identifies people with the target condition (breastfeeding difficulties) and the specificity of a test refers to how well a test identifies people who will not experience breastfeeding difficulties. The decision thresholds for sensitivity and specificity were 90% and 80%. Results between those two points represent uncertainty and results above the upper threshold would suggest the index tests may be useful for predicting breastfeeding difficulties.

The quality of the evidence

The evidence was assessed using a modified GRADE for diagnostic test accuracy. The overall confidence in the review findings ranged from very low to moderate.

There were very serious to serious concerns with the risk of bias for the included studies primarily because the reference standard (breastfeeding status at follow-up) relied on self-reported breastfeeding and that the reference standard would have unlikely been interpreted without knowledge of the results of the index test. In addition, there were also issues with studies failing to report recruitment techniques, using inappropriate exclusions and convenience sampling, and poor participant attainment.

There were no concerns with inconsistency or the indirectness of the evidence.

For some outcomes there was serious concerns with imprecision. Imprecision was identified if the 95% confidence intervals crossed either the upper threshold of 0.9 or the lower threshold of 0.8

Only diagnostic test accuracy data was available from the included studies. No studies which met the inclusion reported relative risks or odds ratios.

Benefits and harms

The committee recognised that assessing breastfeeding is an important part of postnatal contacts. However, as none of the index tests examined in the 3 studies were found to be useful in predicting breastfeeding difficulties. The committee agreed not to base the recommendations on the evidence but instead to draw on their own expertise and knowledge of current best practice.

The committee recognised that the healthcare professional assessing breastfeeding should have appropriate knowledge in breastfeeding management. This would enable the healthcare professional to identify and address any concerns the woman may have with establishing and maintaining breastfeeding and to give appropriate support to parents with breastfeeding.

The committee agreed that it would be important to recommend the components that should make up each breastfeeding assessment carried out by the healthcare professionals, in line with the principles in the UNICEF BFI breastfeeding assessment tool which is a widely used tool in current practice.

These components consisted of asking the woman about any concerns she has about her baby's feeding, how often and how long the feeds are, whether there is rhythmic sucking and audible swallowing, whether the baby is content after their feed, whether the baby is waking for feeds, whether the baby's weight has changed (either gained or lost), the number of wet and dirty nappies, and the condition of the woman's breasts and nipples. The committee also felt that it was important that the woman has a feed observed within the first 24 hours after birth and also at least one other feed within the first week. Through observing a breastfeed, healthcare professionals would be better able to identify if there are any concerns with feeding. The committee acknowledged that observing at least two feeds within the first week does not always happen in current practice but it is part of the UNICEF Baby Friendly Initiative standards which all maternity services in the UK are expected to follow according to the NHS Long term plan.

Finally, the committee agreed that should there be any further concerns with breastfeeding, observing additional feeds and other actions such as positioning of the baby, the baby's attachment to the breast, giving expressed milk, or assessing for

tongue-tie should be considered. The committee made a recommendation to reflect this.

The committee did not consider breastfeeding prediction tools an area to prioritise for further research. The committee were aware that the UNICEF BFI approach has been widely adopted within the UK. The committee considered that maternity services that have BFI accreditation would already be meeting the minimum standards to promote and assess breastfeeding. The committee also acknowledged that all maternity services in the UK are expected to achieve BFI accreditation.

In addition, the committee were aware of the complexities of designing ethically appropriate research studies in this area. It is difficult to collect accurate test accuracy data in this area, since once breastfeeding difficulties have been identified, it would be unethical to not provide additional support to the woman. This additional support, particularly if successful, is likely to skew the reference standard (breastfeeding status) and therefore impact the validity of the test accuracy data.

Cost-effectiveness and resource use

No economic evidence is available for this review question. The committee agreed that spending time at postnatal contacts to assess breastfeeding in order to identify breastfeeding difficulties has relatively small resource implications (health professional time). However, identifying and resolving breastfeeding difficulties is likely to lead to improved breastfeeding practices and increased breastfeeding rates, which, in turn, has the potential for benefits to both women and their babies and related cost-savings in the future. This is because evidence suggests that breastfeeding is associated with a wide range of benefits such as lower mortality and lower rates of gastrointestinal and respiratory tract infections for the baby, and lower rates of breast cancer for the woman, all of which are costly to manage. Some benefits for babies and related cost-savings (for example those associated with prevention of infections) are anticipated to be realised in the shorter term, but, overall, clinical benefits and cost-savings associated with breastfeeding are realised over the lifetime of women and their babies. Therefore, the committee agreed that the recommendations ensure efficient use of healthcare resources.

Other factors the committee took into account

The committee noted during protocol development that certain subgroups of women and health care professionals may require special consideration:

- young women (19 years or under)
- women with physical and cognitive disabilities
- women with severe mental health illness
- women who had difficulty accessing postnatal care services.

A stratified analysis was therefore predefined in the protocol based on these subgroups. However, considering the lack of evidence for these sub-groups, the committee agreed not to make separate recommendations and that the recommendations they did make should apply universally.

References

Kumar 2006

Kumar, S. P., Mooney, R., Wieser, L. J., Havstad, S., The LATCH scoring system and prediction of breastfeeding duration, Journal of Human Lactation, 22, 391-397, 2006

Nanishi 2015

Nanishi, K., Green, J., Taguri, M., Jimba, M., Determining a Cut-Off Point for Scores of the Breastfeeding Self-Efficacy Scale-Short Form: Secondary Data Analysis of an Intervention Study in Japan, PLOS One, 10, e0129698, 2015

Zobbi 2011

Zobbi, V. F., Calistri, D., Consonni, D., Nordio, F., Costantini, W., Mauri, P. A., Breastfeeding: Validation of a reduced Breastfeeding Assessment Score in a group of Italian women, Journal of clinical nursing, 20, 2509-2518, 2011

Appendices

Appendix A – Review protocol

Review protocol for review question: What observations or clinical tools accurately predict breastfeeding difficulties?

Table 3: Review protocol

Field (based on PRISMA-P)	Content
Review question	What observations or clinical tools accurately predict breastfeeding difficulties?
Type of review question	Prognostic review
Objective of the review	This review aims to determine what clinical tools accurately predict breastfeeding difficulties.
Eligibility criteria – population/disease/condition/issue/domain	Women who have given birth to a healthy baby at term (singleton or multiple birth). Exclude papers with main focus on tongue-tie (but include papers where some babies are diagnosed with tongue-tie thanks to the assessment tool).
Eligibility criteria – index tests or prognostic factors	A score of a validated breastfeeding assessment tools, using the primary cut-offs provided by the papers.
Confounding factors	• Age of the baby • Birth weight • BMI • Previous experiences of breastfeeding (or parity if this is not available) • Cultural and linguistic differences • Whether the mother has received a breastfeeding intervention as a result of applying the tool.
Outcomes	Critical outcomes • Any breastfeeding at 4 to 8 weeks postpartum • Exclusive breastfeeding at 4 to 8 weeks postpartum • Sensitivity, specificity and likelihood ratios will be reported as well as odds ratios and risk ratios.
Eligibility criteria – study design	Include published full text papers:

Field (based on PRISMA-P)	Content
	• Systematic reviews • Prospective or retrospective comparative cohort studies • Only if cohort studies unavailable to inform decision-making: case-control studies • Prospective study design will be prioritised over retrospective study designs • Multivariate analysis will be prioritised over univariate analysis Exclude: • Conference abstracts • Follow-up of RCTs • Studies with a sample size <100 Population-based studies and multicentre studies will be prioritised
Other inclusion exclusion criteria	• Studies from low- and middle-income countries, as classified by the World Bank, will be excluded. • Exclude studies conducted before the 1990s – when BFI started.
Proposed sensitivity/sub-group analysis, or meta-regression	Groups that will be reviewed and analysed separately: • young women (19 years or under) • women with physical or cognitive disabilities • women with severe mental illness • women who have difficulty accessing postnatal care services In the presence of heterogeneity, the following subgroups will be considered for sensitivity analysis: • instrumental versus non-instrumental vaginal birth versus caesarean section • cultural differences
Selection process – duplicate screening/selection/analysis	Review questions selected as high priorities for health economic analysis (and those selected as medium priorities and where health economic analysis could influence recommendations) will be subject to dual weeding and study selection; any discrepancies above 10% of the dual weeded resources will be resolved

Field (based on PRISMA-P)	Content
	through discussion between the first and second reviewers or by reference to a third person. This review question was not prioritised for health economic modelling and so no formal dual weeding, study selection (inclusion/exclusion) or data extraction into evidence tables will be undertaken. (However, internal (NGA) quality assurance processes will include consideration of the outcomes of weeding, study selection and data extraction and the committee will review the results of study selection and data extraction).
Data management (software)	NGA STAR software will be used for study sifting, data extraction, recording quality assessment using checklists and generating bibliographies/citations.
Information sources – databases and dates	The following databases will be searched: • CINAHL • Embase • EMCare • HTA Database • MEDLINE and MEDLINE IN-PROCESS Searches will be restricted by: • date limitations: 1990 to 4th February 2019 • English language • human studies Other searches: • inclusion lists of systematic reviews
Identify if an update	This is an update. However the review and drafting of recommendations are being completed afresh. The 2006 version of the postnatal care guideline included these recommendations: 1.3.21 Women should be advised of the indicators of good attachment, positioning and successful feeding. These are given in box1. [2006] Box 1. Breastfeeding Indicators of good attachment and positioning:

Field (based on PRISMA-P)	Content
	• mouth wide open • less areola visible underneath the chin than above the nipple • chin touching the breast, lower lip rolled down, and nose free • no pain. Indicators of successful feeding in babies: • audible and visible swallowing • sustained rhythmic suck • relaxed arms and hands • moist mouth • regular soaked/heavy nappies. Indicators of successful breastfeeding in women: • breast softening • no compression of the nipple at the end of the feed • woman feels relaxed and sleepy.
Author contacts	National Guideline Alliance https://www.nice.org.uk/guidance/indevelopment/gid-ng10070
Highlight if amendment to previous protocol	For details please see section 4.5 of Developing NICE guidelines: the manual 2014
Search strategy – for one database	For details please see appendix B.
Data collection process – forms/duplicate	A standardised evidence table format will be used, and published as appendix D (clinical evidence tables) or H (economic evidence tables).
Data items – define all variables to be collected	For details please see evidence tables in appendix D (clinical evidence tables) or H (economic evidence tables).
Methods for assessing bias at outcome/study level	Standard study checklists were used to critically appraise individual studies. For details please see section 6.2 of Developing NICE guidelines: the manual 2014. Appraisal of methodological quality: The methodological quality of each study will be assessed using an appropriate checklist: • ROBIS for systematic reviews • Quality in prognostic studies (QUIPS) tool

Field (based on PRISMA-P)	Content
Criteria for quantitative synthesis (where suitable)	Meta-analyses will be conducted for this prognostic review only if the same confounders are accounted for in the analyses, the same analytical methods are adapted, and the populations assessed are suitably similar for example similar gestational age. In all other cases, the results will reported separately.
Methods for analysis – combining studies and exploring (in)consistency	The adjusted Risk Ratio or Odds Ratio and 95% confidence intervals will be plotted in RevMan, however pooled results will usually not be calculated due to the heterogeneity between studies (for example different confounders accounted for in analyses, different populations). If a meta-analysis is conducted the forest plots will be used to visually see the studies alongside each other and to explore similarities and differences between studies.
Meta-bias assessment – publication bias, selective reporting bias	For details please see section 6.2 of Developing NICE guidelines: the manual 2014.
Assessment of confidence in cumulative evidence	For details please see sections 6.4 and 9.1 of Developing NICE guidelines: the manual 2014
Rationale/context – Current management	For details please see the introduction to the evidence review.
Describe contributions of authors and guarantor	A multidisciplinary committee developed the guideline. The committee was convened by The National Guideline Alliance and chaired by Dr David Jewell in line with section 3 of Developing NICE guidelines: the manual.
Sources of funding/support	Staff from The National Guideline Alliance undertook systematic literature searches, appraised the evidence, conducted meta-analysis and cost-effectiveness analysis where appropriate, and drafted the guideline in collaboration with the committee. For a full description of the methods see Supplement 1.
Name of sponsor	The National Guideline Alliance is funded by NICE and hosted by the Royal College of Obstetricians and Gynaecologists
Roles of sponsor	NICE funds The National Guideline Alliance to develop guidelines for those working in the NHS, public health, and social care in England
PROSPERO registration number	Not registered

BFI: Baby friendly initiative; BMI: body mass index; NGA: National Guideline Alliance; QUIPS: Quality in Prognostic Studies; NICE: National Institute for Health and Care Excellence; RCT: randomised controlled trial

Appendix B – Literature search strategies

Literature search strategies for review question: What observations or clinical tools accurately predict breastfeeding difficulties?

Clinical search

The search for this topic was last run on 4th February 2019.

Database: Emcare, Embase, Medline, Medline Ahead of Print and In-Process & Other Non-Indexed Citations – OVID [Multifile]

#	Search
1	breast feeding/ or breast feeding education/ or lactation/
2	1 use emczd, emcr
3	exp breast feeding/ or lactation/
4	3 use ppez
5	(breastfeed* or breast feed* or breastfed* or breastfeed* or breast fed or breastmilk or breast milk or expressed milk* or lactat* or (nursing adj (baby or infant* or mother* or neonate* or newborn*))).ti,ab.
6	or/2,4-5
7	((assess* or evaluat* or observation*) and (checklist* or check list* or interview* or inventory or instrument* or questionnaire* or indicator* or scale* or test or tests or tool*)).hw.
8	((assess* or evaluat* or observation*) adj3 (checklist* or check list* or interview* or inventory or instrument* or questionnaire* or indicator* or scale* or test or tests or tool*)).tw.
9	or/7-8
10	(latch scoring system or mother baby assessment tool).sh. or (baby friendly breast* or bapt or breastfeeding assessment tool or breastfeeding attrition prediction tool or breastfeeding charting system or hazelbacker assessment or ibfat or (latch adj5 (assess* or checklist* or tool*)) or mbfes or maternal breastfeeding evaluation scale or (mba adj (assess* or checklist* or tool*)) or mother baby assessment or pebpt or potential early breastfeeding problem tool or riordan* tool or (systematic assessment adj3 infant adj3 breast) or via christi).ti,ab.
11	exp disease course/ or methodology/ or ep.fs.
12	decision support techniques/ use ppez
13	(cohort* or course* or develop or index or model* or outcome* or scor* or validat*).tw. or (diagnos* or follow up* or observ* or predict* or risk* or rule*).tw,hw.
14	or/11-13
15	"area under the curve"/ or instrument validation/ or predictive validity/ or predictive value/ or receiver operating characteristic/ or reliability/ or reproducibility/ or "sensitivity and specificity"/ or test retest reliability/ or validity/
16	15 use emczd, emcr
17	"area under curve"/ or "predictive value of tests"/ or "reproducibility of results"/ or roc curve/ or "sensitivity and specificity"/ or validation studies/
18	17 use ppez
19	(accurac* or accurat* or area under curve or auc value* or (likelihood adj3 ratio*) or (diagnostic adj2 odds ratio*) or ((pretest or pre test or posttest or post test) adj2 probabilit*) or (predict* adj3 value*) or receiver operating characteristic or (roc adj2 curv*) or reliabil* or sensititiv* or specificit* or valid*).tw.

#	Search
20	or/16,18-19
21	(6 and 9 and (or/14,20)) or 10
22	((breastfeed* or breast feed* or breastfed* or breastfeed* or breast fed or breastmilk or breast milk or expressed milk* or lactat* or (nursing adj (baby or infant* or mother* or neonate* or newborn*))) and (checklist* or check list* or interview* or inventory or instrument* or questionnaire* or indicator* or scale* or test or tests or tool*) and (assess* or evaluat* or observation*)).ti.
23	or/21-22
24	limit 23 to english language
25	limit 24 to yr="1990 -current"
26	(animal/ not human/) or nonhuman/ or exp animal experiment/ or exp experimental animal/ or animal model/ or exp rodent/
27	26 use emczd, emcr
28	(animals/ not humans/) or exp animals, laboratory/ or exp animal experimentation/ or exp models, animal/ or exp rodentia/
29	28 use ppez
30	(rat or rats or mouse or mice).ti.
31	or/27,29-30
32	25 not 31

1 **Database:** CINAHL [Proquest]

#	Search
s22	s20 or s21 published date: 19900101-20190204
s21	ti ((breastfeed* or “breast feed*” or breastfed* or breastfeed* or “breast fed” or breastmilk or “breast milk” or “expressed milk*” or lactat* or (nursing n1 (baby or infant* or mother* or neonate* or newborn*))) and (checklist* or “check list*” or interview* or inventory or instrument* or questionnaire* or indicator* or scale* or test or tests or tool*) and (assess* or evaluat* or observation*))
s20	(s3 and s6 and (s11 or s19)) or s7
s19	s12 or s13 or s14 or s15 or s16 or s17 or s18
s18	tx (accurac* or accurat* or “area under curve” or “auc value*” or (likelihood n3 ratio*) or (diagnostic n2 odds ratio*) or ((pretest or “pre test” or posttest or “post test”) adj2 probabilit*) or (predict* adj3 value*) or “receiver operating characteristic” or (roc n2 curv*) or reliabil* or sensititiv* or specificit* or valid*)
s17	(mh "validation studies")
s16	(mh "sensitivity and specificity")
s15	(mh "roc curve")
s14	(mh "reproducibility of results")
s13	(mh "predictive value of tests")
s12	(mh "roc curve")
s11	s8 or s9 or s10
s10	tx ((diagnos* or follow up* or observ* or predict* or risk* or rule*)) or mw ((diagnos* or follow up* or observ* or predict* or risk* or rule*))
s9	tx (cohort* or course* or develop or index or model* or outcome* or scor* or validat*)
s8	(mh "decision support techniques")
s7	tx (latch scoring system or mother baby assessment tool).sh. or (“baby friendly breast*” or bapt or “breastfeeding assessment tool” or “breastfeeding attrition prediction tool” or “breastfeeding charting system” or “hazelbacker assessment” or ibfat or (latch n5 (assess*

#	Search
	or checklist* or tool*)) or mbfes or "maternal breastfeeding evaluation scale" or (mba adj (assess* or checklist* or tool*)) or "mother baby assessment" or pebpt or "potential early breastfeeding problem tool" or "riordan* tool" or ("systematic assessment" n3 infant adj3 breast) or via christi)
s6	s4 or s5
s5	tx ((assess* or evaluat* or observation*) n3 (checklist* or check list* or interview* or inventory or instrument* or questionnaire* or indicator* or scale* or test or tests or tool*))
s4	mw ((assess* or evaluat* or observation*) and (checklist* or check list* or interview* or inventory or instrument* or questionnaire* or indicator* or scale* or test or tests or tool*))
s3	s1 or s2
s2	tx (breastfeed* or "breast feed*" or breastfed* or breastfeed* or "breast fed" or breastmilk or "breast milk" or "expressed milk*" or lactat* or (nursing adj (baby or infant* or mother* or neonate* or newborn*)))
s1	mh "breast feeding+) or (mh "lactation")

1 Health economic search

2 The search for this topic was last run on 5th December 2019.

3 **Database:** Emcare, Embase, Medline, Medline Ahead of Print and In-Process & Other Non-
4 Indexed Citations (global) – OVID [Multifile]

#	Search
1	puerperium/ or perinatal period/ or postnatal care/
2	1 use emczd, emcr
3	postpartum period/ or peripartum period/ or postnatal care/
4	3 use ppez
5	(nullipara* or peri natal* or perinatal* or postbirth or post birth or postdelivery or post delivery or postnatal* or post natal* or postpartum* or post partum* or primipara* or puerpera* or puerperium* or ((after or follow*) adj2 birth*)).ti,ab.
6	or/2,4-5
7	breast feeding/ or breast feeding education/ or lactation/
8	7 use emczd, emcr
9	exp breast feeding/ or lactation/
10	9 use ppez
11	(breastfeed* or breast feed* or breastfed* or breastfeed* or breast fed or breastmilk or breast milk or expressed milk* or lactat* or (nursing adj (baby or infant* or mother* or neonate* or newborn*))).ti,ab.
12	or/8,10-11
13	artificial food/ or bottle feeding/ or infant feeding/
14	13 use emczd, emcr
15	bottle feeding/ or infant formula/
16	15 use ppez
17	(((bottle or formula or synthetic) adj2 (artificial or fed or feed* or infant* or milk*)) or (artificial adj (formula or milk)) or bottlefed or bottlefeed or cup feeding or (milk adj2 (substitut* or supplement*)) or ((infant or milk or water or glucose or dextrose or formula) adj supplement) or formula supplement* or supplement feed or milk feed or ((baby or babies or infant* or neonate* or newborn*) adj (formula* or milk)) or formulafeed or formulated or (milk adj2 powder*) or hydrolyzed formula* or (((feeding or baby or infant) adj bottle*) or infant feeding or bottle nipple* or milk pump*)).ti,ab.
18	or/14,16-17
19	or/6,12,18

#	Search
20	budget/ or exp economic evaluation/ or exp fee/ or funding/ or exp health care cost/ or health economics/
21	20 use emczd, emcr
22	exp budgets/ or exp "costs and cost analysis"/ or economics/ or exp economics, hospital/ or exp economics, medical/ or economics, nursing/ or economics, pharmaceutical/ or exp "fees and charges"/ or value of life/
23	22 use ppez
24	budget*.ti,ab. or cost*.ti. or (economic* or pharmaco?economic*).ti. or (price* or pricing*).ti,ab. or (cost* adj2 (effective* or utilit* or benefit* or minimi* or unit* or estimat* or variable*)).ab. or (financ* or fee or fees).ti,ab. or (value adj2 (money or monetary)).ti,ab.
25	or/21,23-24
26	economic model/ or quality adjusted life year/ or "quality of life index"/
27	(cost-benefit analysis.sh. and (cost-effectiveness ratio* and (perspective* or life expectanc*)).tw.)
28	((quality of life or qol).tw. and cost benefit analysis.sh.)
29	or/26-28 use emczd, emcr
30	models, economic/ or quality-adjusted life years/
31	(cost-benefit analysis.sh. and (cost-effectiveness ratio* and (perspective* or life expectanc*)).tw.)
32	((quality of life or qol).tw. and cost-benefit analysis.sh.)
33	or/30-32 use ppez
34	(eq-5d* or eq5d* or eq-5* or eq5* or euroqual* or euro qual* or euroqual 5d* or euro qual 5d* or euro qol* or euroqol*or euro quol* or euroquol* or euro quol5d* or euroquol5d* or eur qol* or eurqol* or eur qol5d* or eurqol5d* or eur?qul* or eur?qul5d* or euro* quality of life or european qol).tw.
35	(euro* adj3 (5 d* or 5d* or 5 dimension* or 5dimension* or 5 domain* or 5domain*)).tw.
36	(hui or hui2 or hui3).tw.
37	(illness state* or health state*).tw.
38	(multiattibute* or multi attribute*).tw.
39	(qaly* or qal or qald* or qale* or qtime* or qwb* or daly).tw.
40	(quality adjusted or quality adjusted life year*).tw.
41	(sf36 or sf 36 or sf thirty six or sf thirtysix).tw.
42	sickness impact profile.sh.
43	(time trade off*1 or time tradeoff*1 or tto or timetradeoff*1).tw.
44	(utilit* adj3 (score*1 or valu* or health* or cost* or measur* or disease* or mean or gain or gains or index*)).tw.
45	utilities.tw.
46	((qol or hrqol or quality of life).tw. or *quality of life/) and ((qol or hrqol* or quality of life) adj2 (change*1 or declin* or decreas* or deteriorat* or effect or effects or high* or impact*1 or impacted or improve* or increas* or low* or reduc* or score or scores or worse)).ab.
47	quality of life.sh. and ((health-related quality of life or (health adj3 status) or ((quality of life or qol) adj3 (chang* or improv*)) or ((quality of life or qol) adj (measure*1 or score*1))).tw. or (quality of life or qol).ti. or ec.fs.)
48	or/29,33-47
49	or/25,48
50	19 and 50
51	limit 50 to english language

#	Search
52	(animals/ not humans/) or exp animals, laboratory/ or exp animal experimentation/ or exp models, animal/ or exp rodentia/
53	52 use ppez
54	(animal/ not human/) or nonhuman/ or exp animal experiment/ or exp experimental animal/ or animal model/ or exp rodent/
55	54 use emczd, emcr
56	(rat or rats or mouse or mice).ti.
57	or/53,55-56
58	51 not 57

1 **Database:** HTA, NHS EED (global) [CRD Web]

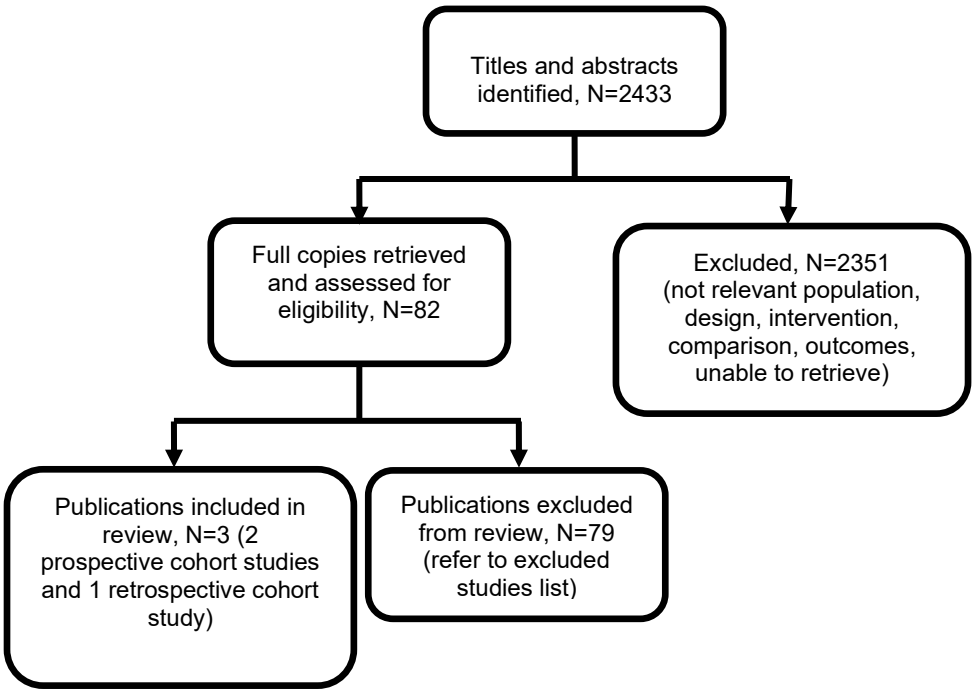
	Search
1	mesh descriptor postpartum period in hta, nhs eed
2	mesh descriptor peripartum period in hta, nhs eed
3	mesh descriptor postnatal care in hta, nhs eed
4	(nullipara* or peri natal* or perinatal* or postbirth or post birth or postdelivery or post delivery or postnatal* or post natal* or postpartum* or post partum* or primipara* or puerpera* or puerperium* or ((after or follow*) near2 birth*)) in hta, nhs eed
5	#1 or #2 or #3 or #4
6	mesh descriptor breast feeding explode all trees in hta, nhs eed
7	mesh descriptor lactation in hta, nhs eed
8	(breastfeed* or breast feed* or breastfed* or breastfeed* or breast fed or breastmilk or breast milk or expressed milk* or lactat* or (nursing next (baby or infant* or mother* or neonate* or newborn*))) in hta, nhs eed
9	#6 or #7 or #8
10	mesh descriptor bottle feeding in hta, nhs eed
11	mesh descriptor infant formula in hta, nhs eed
12	(((bottle or formula or synthetic) near2 (artificial or fed or feed* or infant* or milk*)) or (artificial next (formula or milk)) or bottlefed or bottlefeed or cup feeding or (milk near2 (substitut* or supplement*)) or ((infant or milk or water or glucose or dextrose or formula) next supplement) or formula supplement* or supplement feed or milk feed or ((baby or babies or infant* or neonate* or newborn*) next (formula* or milk)) or formula feed or formulated or (milk near2 powder*) or hydrolyzed formula* or (((feeding or baby or infant) next bottle*) or infant feeding or bottle nipple* or milk pump*)) in hta, nhs eed
13	#10 or #11 or #12
14	#5 or #9 or #13

2
3

Appendix C – Clinical evidence study selection

Clinical study selection for: What observations or clinical tools accurately predict breastfeeding difficulties?

Figure 1: Flow diagram of clinical article selection for what observations or clinical tools accurately predict breastfeeding difficulties review



1 Appendix D – Clinical evidence tables

2 Clinical evidence tables for review question: What observations or clinical tools accurately predict breastfeeding difficulties?

3 Table 4 Clinical evidence table

<table>
<tr><th>Study details</th><th>Participants</th><th>Interventions</th><th>Methods</th><th>Outcomes and Results</th><th>Comments</th></tr>
<tr>
<td>Full citation
Kumar, S. P., Mooney, R., Wieser, L. J., Havstad, S., The LATCH scoring system and prediction of breastfeeding duration, Journal of Human Lactation, 22, 391-397, 2006
Ref Id
806489
Country/ies where the study was carried out
USA
Study type
Single-centre prospective cohort study</td>
<td>Sample size
n = 248

Characteristics
Age, years, mean (SD)= 27.7 (6.1)
Delivery method, n
Spontaneous vaginal= 184
Vaginal assisted= 3
Scheduled caesarean= 31
Emergent caesarean= 30
Primigravidas, n= 58

Inclusion criteria
Spoke English; were 18 years of age or older; delivered a singleton,</td>
<td>Interventions
The LATCH Scoring System was designed by Jensen, Wallace, and Kelsay in 1994 to assist the health care provider in evaluating the breastfeeding techniques of mother/infant dyads. The LATCH tool provides for systematic documentation and standardised communication. The tool was modelled on the Apgar scoring system with a possible composite score of 0 to 10. Each letter of the</td>
<td>Details
Data collection: "On arrival to the labour, delivery, and recovery suite (LDR), expectant mothers where asked whether they planned to breastfeed, and their response was documented in the records. Duration of anticipated breastfeeding was not asked. After giving birth, mother and baby stayed for 2 hours in the LDR suite following a vaginal delivery, or in the postoperative recovery room following a caesarean delivery. During this 2-hour period, breastfeeding and skin-to-skin contact were attempted whenever possible. Mother and baby were then transferred to the Family Centered Maternity Care unit, where couplet care is practiced. An international board-certified lactation consultant trained all LDR and postpartum nurses in the use of the LATCH tool and assessed their competency with this tool. The LATCH scoring system was incorporated into the</td>
<td>Results
Breastfeeding at 6 weeks, score at 16-24 hours postpartum, cut-off of 9
Sensitivity= 0.63
Specificity= 0.75
<table>
<tr><th></th><th>No breastfeeding</th><th>Breastfeeding</th></tr>
<tr><td>Low risk (≥ 9)</td><td>12</td><td>11</td></tr>
<tr><td>High risk (< 9)</td><td>7</td><td>33</td></tr>
</table>
</td>
<td>Limitations
Risk of bias assessed with QUADAS-2 for primary diagnostic accuracy data (high/ low/ unclear)
1. Patient selection: high
2. Index tests: low
3. Reference standard: high
4. Flow and timing (of index & ref standard): high</td>
</tr>
</table>

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Aim of the study To determine whether LATCH scores assessed by professional staff during in-hospital stays are predictive of breastfeeding at 6 weeks. Study dates January - October 2003 Source of funding Not reported	healthy term newborn; and were planning to breastfeed Exclusion criteria Received magnesium sulphate post delivery, if the newborn was admitted to the neonatal intensive care unit, or if the newborn was separated from the mother for observation for longer than 2 hours.	acronym identifies an area of breastfeeding assessment	newborn flow sheet for easy documentation. LATCH scoring was performed at least once per 8-hour shift during the mother's hospital stay. Mother's and baby's charts were reviewed and data collected. Post discharge phone calls were made on day 4 and at week 6. Each participant was asked if she was still breastfeeding at the time of the phone call. If yes, it was determined whether it was exclusive, partial, or token breastfeeding." Prognostic factors controlled for (from protocol age of baby, birth weight, BMI, previous experiences of breastfeeding, cultural and linguistic differences, breastfeeding interventions): no factors controlled for Outcomes: Breastfeeding (exclusive or partial breastfeeding) or not breastfeeding (token or none) at 6 weeks post delivery Follow-up: day 4 and week 6 post delivery Data analysis: Receiver operating characteristic (ROC) analysis was used to evaluate the sensitivity and specificity of all possible LATCH score thresholds for predicting breastfeeding at 6 weeks. Sensitivity is the ability of a LATCH score at or above the		

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
			threshold to predict whether a subject will be breastfeeding at 6 weeks. Specificity, in this study, is the ability of a low LATCH score to predict that a participant will no longer be breastfeeding at 6 weeks. Each time point (for example at 0 to 8 hours and at 8 to 16 hours, etc) was considered separately; however, due to early discharge and some missing data, the sample size decreased to 23 for the final time period of 48 to 72 hours. The overall accuracy of each LATCH score time period in detecting breastfeeding at 6 weeks was summarised using the area under the ROC curve (AUC). In addition to the ROC curves, we calculated the Youden's J, which is the sum of the sensitivity plus the specificity. Using the highest AUC among the 5 different time periods and then the highest Youden's J within that time period, we selected the "best" cutoff point for our data set. The relative risk (RR) of LATCH score cutoffs to breastfeeding at 6 weeks, along with accompanying 95% confidence intervals, was then computed for that cutoff point.		
Full citation Nanishi, K., Green, J.,	Sample size N= 378	Interventions "We used scores on the Japanese	Details Data collection: "This was a secondary analysis of data	Results Exclusive breastfeeding at 4th week postpartum, BSES-SF cut-off score 50	Limitations Risk of bias assessed with

<table>
<tr><th>Study details</th><th>Participants</th><th>Interventions</th><th>Methods</th><th>Outcomes and Results</th><th>Comments</th></tr>
<tr>
<td>Taguri, M., Jimba, M., Determining a Cut-Off Point for Scores of the Breastfeeding Self-Efficacy Scale-Short Form: Secondary Data Analysis of an Intervention Study in Japan, 10, e0129698, 2015
Ref Id
684752
Country/ies where the study was carried out
Japan
Study type
Multi-centre retrospective cohort study

Aim of the study
“To assess the overall accuracy of BSES-SF</td>
<td>Characteristics
N=378
Primiparous, n=158
Age, years, mean (SD)= 30.8 (4.8)
Caesarean section, n= 50

Inclusion criteria
Pregnant women in their third trimester who were 16 years of age or older, were able to read and write Japanese, were expected to have a singleton birth, and had completed the BSES-SF before discharge.

Exclusion criteria
(a) an intention to formula-feed or a contraindication to breastfeeding, (b) a pregnancy</td>
<td>version of the BSES-SF completed before discharge. The BSES-SF comprises 14 items. Each item has 5 response choices on a Likert-type scale, from “not at all confident” (1 point) to “always confident” (5 points). All the items are presented positively and their scores are summed to produce a total score ranging from 14 to 70. Higher total scores indicate higher levels of breastfeeding self-efficacy.”</td>
<td>collected in a self-efficacy intervention study. Those data were collected between August 2010 and January 2011 in Japan. A total of 781 women participated in that intervention study, of whom 574 completed the BSES-SF before discharge. Of those 574 women, 196 were in Baby-Friendly Hospitals (BFHs) and 378 were in non-BFHs. For the present study we used data collected from the 378 women at nBFHs. Data from the 196 women at BFHs was not used to avoid influence from the self-efficacy intervention."
Prognostic factors controlled for (from protocol age of baby, birth weight, BMI, previous experiences of breastfeeding, cultural and linguistic differences, breastfeeding interventions): not controlled
Outcomes: Exclusive breastfeeding (not giving infants any foods or liquids other than breast milk after discharge from the hospital) at 4 weeks and 12 weeks postpartum, post-discharge.
Follow-up: 4 weeks and 12 weeks postpartum, post-discharge
Data analysis: “Receiver operating characteristic (ROC) curves were used to determine the utility of</td>
<td>Sensitivity= 0.79
Specificity= 0.52
<table>
<tr><th></th><th>Not exclusive breastfeeding</th><th>Exclusive breastfeeding</th></tr>
<tr><td>High risk/ low score (< 50)</td><td>224</td><td>23</td></tr>
<tr><td>Low risk/ high score (≥ 50)</td><td>58</td><td>25</td></tr>
</table>
</td>
<td>QUADAS-2 for primary diagnostic accuracy data (high/ low/ unclear)
1. Patient selection: unclear
2. Index tests: low
3. Reference standard: high
4. Flow and timing (of index & ref standard): low</td>
</tr>
</table>

<table>
<tr><th>Study details</th><th>Participants</th><th>Interventions</th><th>Methods</th><th>Outcomes and Results</th><th>Comments</th></tr>
<tr><td>scores as predictors of not practicing post-discharge exclusive breastfeeding, and to choose an appropriate cut-off score for making that prediction.”

Study dates
August 2010 to January 2011

Source of funding
Not reported</td><td>that ended in either miscarriage or stillbirth, and (c) a medical condition of the women and/or the infant that could significantly interfere with breastfeeding.</td><td></td><td>BSES-SF scores for differentiating between mothers who were at risk to not breastfeed exclusively after discharge from those who were likely to breastfeed exclusively, and to aid in the decision on a cut-off point. With the goal of identifying mothers who are not likely to breastfeed exclusively after discharge, we considered a high sensitivity to be more desirable than a high specificity. For the cut-off point we decided to choose a BSES-SF score corresponding to a sensitivity higher than the sensitivity at the point with the greatest Youden’s J (J= sensitivity + specificity -1)."</td><td></td><td></td></tr>
<tr><td>Full citation
Zobbi, V. F., Calistri, D., Consonni, D., Nordio, F., Costantini, W., Mauri, P. A., Breastfeeding: Validation of a reduced Breastfeeding Assessment Score in a group of Italian women, Journal</td><td>Sample size
n= 386

Characteristics
n= 386
Maternal age, years, mean (SD)= 33.1 (4.3)
Mode of birth:
Vaginal delivery, n= 332
Caesarean section, n= 54</td><td>Interventions
"The Breastfeeding Assessment Score (BAS) (Hall 2002)*, developed in Kansas, America, consists of eight items and was proven valid for this purpose. This study is to evaluate the</td><td>Details
Data collection: "A convenience sample was used, as women were recruited only when a researcher was present. The women included in the study received the same professional qualified assistance given to all recovered mothers. All the women included could withdraw from the study at any given point without notice. Before hospital discharge all women included in the study were administered a reduced BAS. Every variable constituting the</td><td>Results
Breastfeeding at 1 month post delivery, reduced BAS cut-off score of 9
Sensitivity = 0.78
Specificity = 0.57

<table><tr><th></th><th>Not exclusive breastfeeding</th><th>Exclusive breastfeeding</th></tr><tr><td>High risk/ low score (< 9)</td><td>99</td><td>109</td></tr></table></td><td>Limitations (assessed with QUADAS-2 for primary diagnostic accuracy data)
1. Patient selection: high
2. Index tests: low
3. Reference standard: high
4. Flow and timing (of index &</td></tr>
</table>

Study details	Participants	Interventions	Methods	Outcomes and Results			Comments
of clinical nursing, 20, 2509-2518, 2011 Ref Id 969417 Country/ies where the study was carried out Italy Study type Multi-centre prospective cohort study Aim of the study "To assess the accuracy of a reduced Breastfeeding Assessment Score in a group of Italian women; the reduced Breastfeeding Assessment Score considers only five of the eight	Attendance at prenatal course, n= 184 Inclusion criteria Healthy Italian mothers who declared to have an Italian partner, who intended to breastfeed, with single pregnancies, between the 36th and 42nd week of gestation, with spontaneous birth or caesarean section, with a current personal and obstetric history that did not indicate any pathology, with a newborn weighing between 2500–4000 g, with a newborn who did not need to be admitted to neonatal	sensitivity and specificity of the BAS reduced to five items instead of eight. The three dichotomous variables of the original BAS that indicate pathology (hypertension induced by pregnancy, previous breast surgery and vacuum vaginal delivery) were excluded as the reduced BAS is applied only to healthy Italian mothers...We decided to consider only a population of healthy women with a regular pregnancy; and for this reason our reduced BAS consists of five items instead of the original eight."	score was given a value from 0–2. An optimal BAS with a value of 10 represents the highest probability of continuing breastfeeding over a period of time, while decreasing values represent a progressive reduction of such probability. Discharge happened not before the second day after birth and, any case, within the fifth day after birth. The birth day was considered day zero. In addition to the calculation of the reduced BAS, the researchers filled-in a data form for each mother involved in the study. The information obtained concerned social and clinical aspects pertaining to pregnancy and birth. Subsequently, 1 month after discharge, each woman was contacted by phone and the follow-up data form filled in. The data collection was carried out between 1 August 2008–15 February 2009. During follow-up, feeding modality (exclusive, predominant, complementary or artificial) was questioned. In the case of interruption of exclusive/predominant breastfeeding, the reason and day of interruption were indicated." Prognostic factors controlled for (from protocol age of baby, birth weight, BMI, previous experiences	Low risk/ high score (≥ 9)	28	144	ref standard): high

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
original Breastfeeding Assessment Score items studied, those not indicating a pathology...to assess the validity of the reduced BAS by identifying those healthy Italian mothers who will stop breastfeeding." Study dates 7 July 2008–15 January 2009 Source of funding Not reported	intensive-care units during the days following birth, with discharge scheduled within 5 days after birth. Exclusion criteria Were younger than 18 (minors), who had a postpartum haemorrhage, with a blood loss ≥ 1000 ml, with haemoglobin after 48 hours from birth ≤ 7.5 mg/dl.	"Before hospital discharge all women included in the study were administered a reduced BAS as in Table 1. Every variable constituting the score was given a value from 0–2. An optimal BAS with a value of 10 represents the highest probability of continuing breastfeeding over a period of time, while decreasing values represent a progressive reduction of such probability. According to the original article (Hall 2002) a score less than eight detects those mothers at higher risk of breastfeeding cessation. In Hall's original study, the	of breastfeeding, cultural and linguistic differences, breastfeeding interventions): maternal age, length of breastfeeding intervals, use of a dummy previous successful breastfeeding experience, experiencing breastfeeding for the first time, latching difficulty, breastfeeding interval, no. of bottles of formula, attendance of antenatal course Outcomes: Exclusive/predominant breastfeeding Follow-up: 4 weeks Data analysis: "Assessed the reduced BAS performance by calculating the area under the Receiver Operating Characteristic (ROC) curve, Sensitivity and Specificity. Evaluated both the association of the modified BAS and other variables with breastfeeding cessation by using the chi-square test and the pattern of breastfeeding cessation over time with the Kaplan–Meier method. The variables associated with breastfeeding cessation in univariate analyses and those of interest a priori were then analysed simultaneously in a multiple logistic regression model"		

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
		hypertension induced by the pregnancy variable was not defined in terms of severity and management and the breast surgery variable does not have useful elements for a clear interpretation; thus we decided not to take these two dichotomous variables into account, as well as a third variable, vacuum vaginal delivery, as it very rarely occurs in the two hospitals where the study was carried out. We decided to consider only a population of healthy women with a regular pregnancy; and for this reason our reduced BAS consists of five items instead of			

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
		the original eight."			

* *Hall R.T., McPherson D.M., Meyers B.M. A breast-feeding assessment score to evaluate the risk for cessation of breast-feeding by 7 to 10 days of age, The Journal of Pediatrics, 141, 659–664, 2002*

AUC: area under the curve; BAS: Breastfeeding assessment scale; BMI: Body mass index; BSES-SF: Breastfeeding Self-Efficacy Scale – Short Form; LATCH: The Latching, Audible swallowing, Type of nipple, Comfort, Help holding baby to breast; LDR: labour, delivery, and recovery suite; QUDAS: Quality Assessment of Diagnostic Accuracy Studies; ROC: receiver operating characteristic curve; SD: standard deviation

Appendix E – Forest plots

Forest plots for review question: What observations or clinical tools accurately predict breastfeeding difficulties?

No meta-analysis was undertaken for this review and so there are no forest plots.

Appendix F – GRADE tables

GRADE tables for review question: What observations or clinical tools accurately predict breastfeeding difficulties?

Table 5: Clinical evidence profile (using modified GRADE for diagnostic test accuracy data) for no breastfeeding (versus any breastfeeding) at 4 to 8 weeks postpartum

Studies	N	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Effect size (95% CI)	Quality of the evidence (GRADE)	Importance
LATCH measured at 16-24 hours postpartum; cut-off of 9; lower indicates breastfeeding difficulties									
1 (Kumar 2006)	63	very serious risk of bias[1]	no serious inconsistency	no serious indirectness	serious imprecision[2]	no serious publication bias	Sensitivity=0.63 (0.38 to 0.84)	VERY LOW	CRITICAL
		very serious risk of bias[1]	no serious inconsistency	no serious indirectness	serious imprecision[2]	no serious publication bias	Specificity=0.75 (0.60 to 0.87)	VERY LOW	CRITICAL

CI: confidence interval; LATCH: The Latching, Audible swallowing, Type of nipple, Comfort, Help holding baby to breast
1 The quality of the evidence was downgraded by 2 due to serious risk of bias because non-English speakers were excluded, reference standard is a proxy for breastfeeding difficulties, reference standard results were unlikely to be interpreted without knowledge of the results of the index test, reference standard missing for a considerable number of women in the original cohort.
2 The quality of the evidence was downgraded by 1 due to serious imprecision as 95% CI crosses one threshold (sensitivity and specificity upper threshold= 0.90, lower threshold= 0.80).

Table 6: Clinical evidence profile (using modified GRADE for diagnostic test accuracy data) for any formula feeding (versus exclusive breastfeeding) at 4 to 8 weeks postpartum

Studies	N	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Effect size (95% CI)	Quality	Importance
BSES-SF measured at discharge; cut-off of 50; lower indicates breastfeeding difficulties									
1 (Nanishi 2015)	330	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	no serious publication bias	Sensitivity= 0.79 (0.74 to 0.84)	LOW	CRITICAL
		serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	no serious publication bias	Specificity= 0.52 (0.37 to 0.67)	MODERATE	CRITICAL

CI: confidence interval; BAS: Breastfeeding assessment scale; BSES-SF: Breastfeeding Self-Efficacy Scale – Short Form;

1 The quality of the evidence was downgraded by 1 due to lack of reporting of recruitment technique for the original study (from which participants for the current study were identified), the fact that the reference standard relies on self-reports of breastfeeding and the reference standard is unlikely to have been interpreted without knowledge of the results of the index test.
2 The quality the evidence was downgraded by 1 due to serious imprecision as 95% CI crosses one threshold (sensitivity and specificity upper threshold= 0.90, lower threshold= 0.80).

Table 7: Clinical evidence profile (using modified GRADE for diagnostic test accuracy data) for no exclusive or predominant breastfeeding (versus exclusive breastfeeding) at 4 to 8 weeks postpartum

Studies	N	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Effect size (95% CI)	Quality	Importance
BAS (reduced); cut-off 9; lower indicates breastfeeding difficulties[3]									
1 (Zobbi 2011)	380	very serious risk of bias[1]	no serious inconsistency	no serious indirectness	serious imprecision[2]	no serious publication bias	Sensitivity=0.78 (0.70 to 0.85)	LOW	CRITICAL
		very serious risk of bias[1]	no serious inconsistency	no serious indirectness	no serious imprecision	no serious publication bias	Specificity=0.57 (0.51 to 0.63)	MODERATE	CRITICAL

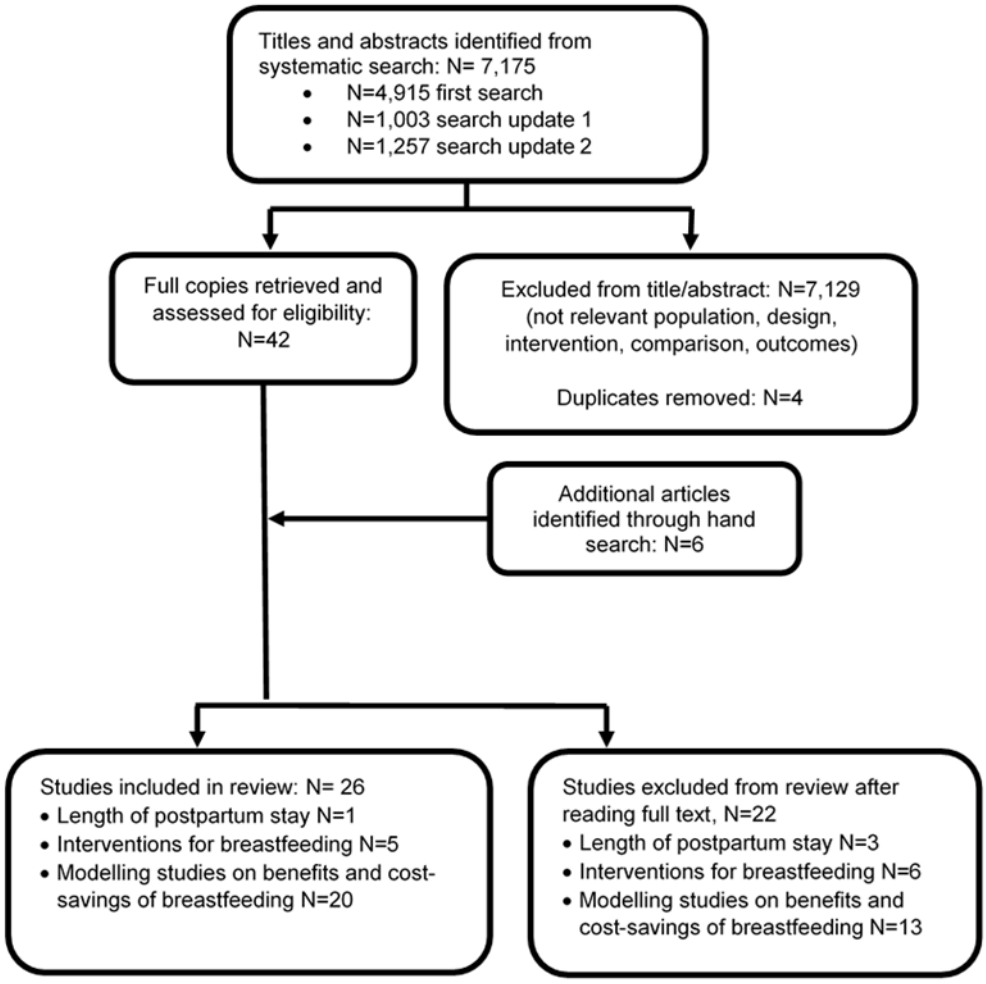
CI: confidence interval; BAS: Breastfeeding assessment scale; BSES-SF: Breastfeeding Self-Efficacy Scale – Short Form;
1 The quality of the evidence was downgraded by 2 due to inappropriate exclusions and convenience sampling, the 'reference standard' relying on self-reports of breastfeeding and not all participants receiving the reference standard.
2 The quality of the evidence was downgraded by 1 due to serious imprecision as 95% CI crosses one threshold (sensitivity upper threshold= 0.90, lower threshold= 0.80)

Appendix G – Economic evidence study selection

Economic evidence study selection for review question: What observations or clinical tools accurately predict breastfeeding difficulties?

A global health economics search was undertaken for all areas covered in the guideline. Figure 2 shows the flow diagram of the selection process for economic evaluations of postnatal care interventions, including modelling studies on the benefits and cost-savings of breastfeeding.

Figure 2. Flow diagram of selection process for economic evaluations of postnatal care interventions and modelling studies on the benefits and cost-savings of breastfeeding



Appendix H – Economic evidence tables

Economic evidence tables for the review question: What observations or clinical tools accurately predict breastfeeding difficulties?

No economic evidence was identified that was applicable to this review question.

Appendix I – Health economic evidence profiles

Economic evidence profiles for the review question: What observations or clinical tools accurately predict breastfeeding difficulties?

No economic evidence was identified that was applicable to this review question.

Appendix J – Economic analysis

Economic analysis for the review question: What observations or clinical tools accurately predict breastfeeding difficulties?

No economic analysis was conducted for this review question

Appendix K – Excluded studies

Excluded studies for review question: What observations or clinical tools accurately predict breastfeeding difficulties?

Clinical studies

Table 8: Excluded studies and reasons for their exclusion

Study	Reason for exclusion
AlKusayer, N. M., Midodzi, W. K., Newhook, L. A., Gill, N., Halfyard, B., Twells, L. K., Determining Clinically Relevant Cutoff Scores for the Iowa Infant Feeding Attitude Scales Among Prenatal Women in Canada, Journal of human lactation : official journal of International Lactation Consultant Association, 34, 691-698, 2018	Insufficient data available for 2 X 2 table
Altuntas, N., Kocak, M., Akkurt, S., Razi, H. C., Kislal, M. F., LATCH scores and milk intake in preterm and term infants: A prospective comparative study, Breastfeeding Medicine, 10, 96-101, 2015	Study conducted in Turkey
Altuntas, N., Turkyilmaz, C., Yildiz, H., Kulali, F., Hirfanoglu, I., Onal, E., Ergenekon, E., Koc, E., Atalay, Y., Validity and reliability of the infant breastfeeding assessment tool, the mother baby assessment tool, and the LATCH scoring system, Breastfeeding Medicine, 9, 191-195, 2014	Study conducted in Turkey
Barbosa, G. E. F., Da Silva, V. B., Pereira, J. M., Soares, M. S., Filho, R. D. A. M., Pereira, L. B., De Pinho, L., Caldeira, A. P., Initial breastfeeding difficulties and association with breast disorders among postpartum women, Revista Paulista de Pediatria, 35, 265-272, 2017	Study conducted in Brazil
Cato, K., Sylven, S. M., Lindback, J., Skalkidou, A., Rubertsson, C., Risk factors for exclusive breastfeeding lasting less than two months-Identifying women in need of targeted breastfeeding support, PLoS ONE [Electronic Resource], 12, e0179402, 2017	No validated breastfeeding assessment tool used
Cernadas,J.M., Noceda,G., Barrera,L., Martinez,A.M., Garsd,A., Maternal and perinatal factors influencing the duration of exclusive breastfeeding during the first 6 months of life, Journal of Human Lactation, 19, 136-144, 2003	No validated breastfeeding assessment tool used
Chambers, J. A., McInnes, R. J., Hoddinott, P., Alder, E. M., A systematic review of measures assessing mothers' knowledge, attitudes, confidence and satisfaction towards breastfeeding, Breastfeeding Review, 15, 17-25, 2007	Systematic review - studies assessed individually
Chapman, D. J., Kuhnly, J. E., Lactation Assessment Tools: A Qualitative Analysis of Registered Nurses' Perceptions of Tool Limitations and Suggested Improvements, Journal of human lactation : official journal of International Lactation Consultant Association, 34, 682-690, 2018	Qualitative study design
Chittleborough, C. R., Lawlor, D. A., Lynch, J. W., Prenatal prediction of poor maternal and offspring outcomes: implications for selection into intensive parent support programs, Maternal and Child Health Journal, 16, 909-920, 2012	No validated breastfeeding assessment tool used
Creedy, D. K., Dennis, C. L., Blyth, R., Moyle, W., Pratt, J., De Vries, S. M., Psychometric characteristics of the breastfeeding	Insufficient data available for 2 X 2 table

Study	Reason for exclusion
self-efficacy scale: data from an Australian sample, Research in nursing & health, 26, 143-152, 2003	
De Lathouwer,S., Lionet,C., Lansac,J., Body,G., Perrotin,F., Predictive factors of early cessation of breastfeeding. A prospective study in a university hospital, European Journal of Obstetrics, Gynecology, and Reproductive Biology, 117, 169-173, 2004	No validated breastfeeding assessment tool used
Dennis, C. L., The breastfeeding self-efficacy scale: psychometric assessment of the short form, Journal of obstetric, gynecologic, and neonatal nursing : JOGNN / NAACOG, 32, 734-744, 2003	Insufficient data available for 2 X 2 table
Dennis, C. L., Brennenstuhl, S., Abbass-Dick, J., Measuring paternal breastfeeding self-efficacy: A psychometric evaluation of the Breastfeeding Self-Efficacy Scale-Short Form among fathers, Midwifery, 64, 17-22, 2018	Study design not relevant
Dennis, C. L., Faux, S., Development and psychometric testing of the Breastfeeding Self-Efficacy Scale, Research in nursing & health, 22, 399-409, 1999	Insufficient data available for 2 X 2 table
Dennis, C. L., Gagnon, A., Van Hulst, A., Dougherty, G., Predictors of breastfeeding exclusivity among migrant and Canadian-born women: results from a multi-centre study, Maternal & Child NutritionMatern Child Nutr, 10, 527-44, 2014	No validated breastfeeding assessment tool used
Dennis, C. L., Heaman, M., Mossman, M., Psychometric testing of the breastfeeding self-efficacy scale-short form among adolescents, Journal of Adolescent Health, 49, 265-271, 2011	Insufficient data available for 2 X 2 table
Dick, M. J., Evans, M. L., Arthurs, J. B., Barnes, J. K., Caldwell, R. S., Hutchins, S. S., Johnson, L. K., Predicting early breastfeeding attrition, Journal of Human Lactation, 18, 21-8, 2002	Study did not use cut-off scores
D'Souza, G. L., D'Souza, S. R. B., Kamath, P., Lewis, L. E., Nurse-led early initiation of breastfeeding on the LATCH scoring system, Indian Journal of Public Health Research and Development, 9, 417-421, 2018	Unavailable from the British Library
Dungy, C. I., McInnes, R. J., Tappin, D. M., Wallis, A. B., Oprescu, F., Infant feeding attitudes and knowledge among socioeconomically disadvantaged women in Glasgow, Maternal and Child Health Journal, 12, 313-322, 2008	n < 100
Furman, L., Minich, N. M., Evaluation of breastfeeding of very low birth weight infants: Can we use the Infant Breastfeeding Assessment Tool?, Journal of Human Lactation, 22, 175-181, 2006	Population not relevant
Gercek, E., Sarikaya Karabudak, S., Ardic Celik, N., Saruhan, A., The relationship between breastfeeding self-efficacy and LATCH scores and affecting factors, Journal of Clinical Nursing, 26, 994-1004, 2017	Study conducted in Turkey
Gill, S. L., Reifsnider, E., Lucke, J. F., Mann, A. R., Predicting breast-feeding attrition: Adapting the breast-feeding attrition prediction tool, Journal of Perinatal and Neonatal Nursing, 21, 216-224, 2007	Outcomes not relevant
Gregory, A., Penrose, K., Morrison, C., Dennis, C. L., MacArthur, C., Psychometric properties of the breastfeeding self-efficacy scale- short form in an ethnically diverse U.K. sample, Public Health Nursing, 25, 278-284, 2008	Insufficient data available for 2 X 2 table
Ho, Y. J., McGrath, J. M., A review of the psychometric properties of breastfeeding assessment tools, JOGNN - Journal of Obstetric, Gynecologic, & Neonatal Nursing, 39, 386-400, 2010	Systematic review - studies assessed individually

Study	Reason for exclusion
Hongo, H., Green, J., Nanishi, K., Jimba, M., Development of the revised Japanese Maternal Breastfeeding Evaluation Scale, short version, Asia Pacific journal of clinical nutrition, 26, 392-395, 2017	Study assessed the validity of the Maternal Breastfeeding Evaluation Scale (MBFES) in Japan
Hongo, H., Green, J., Otsuka, K., Jimba, M., Development and psychometric testing of the Japanese version of the maternal breastfeeding evaluation scale, Journal of human lactation : official journal of International Lactation Consultant Association, 29, 611-619, 2013	Study assessed the validity of the Maternal Breastfeeding Evaluation Scale (MBFES) in Japan
Howe, T. H., Lin, K. C., Fu, C. P., Su, C. T., Hsieh, C. L., A review of psychometric properties of feeding assessment tools used in neonates, JOGNN - Journal of Obstetric, Gynecologic, and Neonatal Nursing, 37, 338-349, 2008	Systematic review - studies assessed individually
Humphreys, A. S., Thompson, N. J., Miner, K. R., Assessment of breastfeeding intention using the transtheoretical model and the theory of reasoned action, Health Education Research, 13, 331-341, 1998	No validated breastfeeding assessment tool used
Ingram, J., Johnson, D., Copeland, M., Churchill, C., Taylor, H., The development of a new breast feeding assessment tool and the relationship with breast feeding self-efficacy, Midwifery, 31, 132-137, 2015	Insufficient data available for 2 X 2 table
Janke, J. R., Development of the Breast-Feeding Attrition Prediction Tool, Nursing Research, 43, 100-104, 1994	Insufficient data available for 2 X 2 table
Jensen, D., Wallace, S., Kelsay, P., LATCH: a breastfeeding charting system and documentation tool, Journal of obstetric, gynecologic, and neonatal nursing : JOGNN / NAACOG, 23, 27-32, 1994	Description of tool
Jessri, M., Farmer, A. P., Maximova, K., Willows, N. D., Bell, R. C., Predictors of exclusive breastfeeding: Observations from the Alberta pregnancy outcomes and nutrition (APrON) study, BMC Pediatrics, 13 (1) (no pagination), 2013	Outcome not relevant
Johnson, T. S., Mulder, P. J., Strube, K., Mother-infant breastfeeding progress tool: A guide for education and support of the breastfeeding dyad, JOGNN - Journal of Obstetric, Gynecologic, and Neonatal Nursing, 36, 319-327, 2007	Outcome not relevant
Kelley, M. A., Kviz, F. J., Richman, J. A., Kim, J. H., Short, C., Development of a scale to measure gender-role attitudes toward breast-feeding among primiparas, Women & Health, 20, 47-68, 1993	No validated breastfeeding assessment tool used
Kingston, D., Dennis, C. L., Sword, W., Exploring breast-feeding self-efficacy, Journal of Perinatal and Neonatal Nursing, 21, 207-215, 2007	n < 100
Kools, E. J., Thijs, C., Kester, A. D. M., de Vries, H., The motivational determinants of breast-feeding: Predictors for the continuation of breast-feeding, Preventive Medicine, 43, 394-401, 2006	No validated breastfeeding assessment tool used
Kronborg, H., Vaeth, M., Olsen, J., Iversen, L., Harder, I., Early breastfeeding cessation: Validation of a prognostic breastfeeding score, Acta Paediatrica, International Journal of Paediatrics, 96, 688-692, 2007	Outcome not relevant
Lathouwer,S.D., Lionet,C., Lansac,J., Body,G., Perrotin,F., Predictive factors of early cessation of breastfeeding: A prospective study in a university hospital, European Journal of	Duplicate study of De Lathouwer 2004

Study	Reason for exclusion
Obstetrics Gynecology and Reproductive Biology, 117, 169-173, 2004	
Lau, Y., Htun, T. P., Lim, P. I., Ho-Lim, S., Klainin-Yobas, P., Psychometric Evaluation of 5- and 4-Item Versions of the LATCH Breastfeeding Assessment Tool during the Initial Postpartum Period among a Multiethnic Population, PLoS ONE, 11 (5) (no pagination), 2016	Outcome not relevant
Leff, E. W., Jefferis, S. C., Gagne, M. P., The development of the Maternal Breastfeeding Evaluation Scale, Journal of human lactation : official journal of International Lactation Consultant Association, 10, 105-111, 1994	Outcomes not relevant
Lewallen, L. P., Dick, M. J., Wall, Y., Zickefoose, K. T., Hannah, S. H., Flowers, J., Powell, W., Toward a clinically useful method of predicting early breast-feeding attrition, Applied Nursing Research, 19, 144-148, 2006	Study did not use thresholds or cut-off scores
Lindau, J. F., Mastroeni, S., Gaddini, A., Di Lallo, D., Fiori Nastro, P., Patane, M., Girardi, P., Fortes, C., Determinants of exclusive breastfeeding cessation: identifying an "at risk population" for special support, European Journal of Pediatrics, 174, 533-40, 2015	No validated breastfeeding assessment tool used
Maastrup, R., Hansen, B. M., Kronborg, H., Bojesen, S. N., Hallum, K., Frandsen, A., Kyhnaeb, A., Svarer, I., Hallstrom, I., Factors associated with exclusive breastfeeding of preterm infants. Results from a prospective national cohort study, PLoS ONE, 9 (2) (no pagination), 2014	Population not relevant
McCarter-Spaulding, D. E., Dennis, C. L., Psychometric testing of the Breastfeeding Self-Efficacy Scale-Short Form in a sample of Black women in the United States, Research in nursing & health, 33, 111-119, 2010	Insufficient data available for 2 X 2 table
McDonald, S. D., Pullenayegum, E., Chapman, B., Vera, C., Giglia, L., Fusch, C., Foster, G., Prevalence and predictors of exclusive breastfeeding at hospital discharge, Obstetrics & Gynecology, 119, 1171-9, 2012	No validated breastfeeding assessment tool used
Mercer, A. M., Teasley, S. L., Hopkinson, J., McPherson, D. M., Simon, S. D., Hall, R. T., Evaluation of a breastfeeding assessment score in a diverse population, Journal of human lactation : official journal of International Lactation Consultant Association, 26, 42-48, 2010	Outcomes not relevant
Moran, V. H., Dinwoodie, K., Bramwell, R., Dykes, F., A critical analysis of the content of the tools that measure breast-feeding interaction, Midwifery, 16, 260-268, 2000	Literature review
Mulford, C., The Mother-Baby Assessment (MBA): an "Apgar score" for breastfeeding, Journal of human lactation : official journal of International Lactation Consultant Association, 8, 79-82, 1992	Description of the tool
Nagulesapillai, T., McDonald, S. W., Fenton, T. R., Mercader, H. F. G., Tough, S. C., Breastfeeding difficulties and exclusivity among late preterm and term infants: Results from the all our babies study, Canadian Journal of Public Health, 104, e351-e356, 2013	No validated breastfeeding assessment tool used
Pados, B. F., Park, J., Estrem, H., Awotwi, A., Assessment Tools for Evaluation of Oral Feeding in Infants Younger Than 6 Months, Advances in neonatal care : official journal of the National Association of Neonatal Nurses, 16, 143-150, 2016	Systematic review- studies assessed individually

Study	Reason for exclusion
Phares,T.M., Morrow,B., Lansky,A., Barfield,W.D., Prince,C.B., Marchi,K.S., Braveman,P.A., Williams,L.M., Kinniburgh,B., Surveillance for disparities in maternal health-related behaviors--selected states, Pregnancy Risk Assessment Monitoring System (PRAMS), 2000-2001, Morbidity and Mortality Weekly Report, Surveillance Summaries. 53, 1-13, 2004	No validated breastfeeding scale used
Puapornpong, P., Raungrongmorakot, K., Suksamarnwong, M., Ketsuwan, S., Wongin, S., The validity and reliability of the breastfeed observation aid in the exclusive breastfeeding predictions at six weeks postpartum, Journal of the Medical Association of Thailand, 101, 919-924, 2018	Study conducted in Thailand
Riordan, J., Predicting breastfeeding problems. These tools may--or may not--help assess high-risk mother-baby couples, AWHONN Lifelines, 2, 31-3, 1998	Description of tools
Riordan, J. M., Koehn, M., Reliability and validity testing of three breastfeeding assessment tools, Journal of obstetric, gynecologic, and neonatal nursing : JOGNN / NAACOG, 26, 181-187, 1997	Outcomes not relevant - reliability testing
Riordan, J. M., Woodley, G., Heaton, K., Testing validity and reliability of an instrument which measures maternal evaluation of breastfeeding, Journal of human lactation : official journal of International Lactation Consultant Association, 10, 231-235, 1994	n < 100
Riordan, J., Bibb, D., Miller, M., Rawlins, T., Predicting breastfeeding duration using the LATCH breastfeeding assessment tool, Journal of human lactation : official journal of International Lactation Consultant Association, 17, 20-23, 2001	Study did not use thresholds or cut-off scores
Ryser, F. G., Breastfeeding attitudes, intention, and initiation in low-income women: the effect of the best start program, Journal of Human Lactation, 20, 300-5, 2004	n < 100
Schlomer, J. A., Kemmerer, J., Twiss, J. J., Evaluating the association of two breastfeeding assessment tools with breastfeeding problems and breastfeeding satisfaction, Journal of human lactation : official journal of International Lactation Consultant Association, 15, 35-39, 1999	n < 100
Scott, J. A., Binns, C. W., Oddy, W. H., Graham, K. I., Predictors of breastfeeding duration: Evidence from a cohort study, Pediatrics, 117, e646-e655, 2006	No validated breastfeeding assessment tool used
Scott, J. A., Shaker, I., & Reid, M. , The Iowa Infant Feeding Attitude Scale: Analysis of Reliability and Validity, Journal of Applied Social Psychology, 29, 2362-2380, 2006	Outcomes not relevant
Scott,J.A., Shaker,I., Reid,M., Parental attitudes toward breastfeeding: Their association with feeding outcome at hospital discharge, Birth, 31, 125-131, 2004	Outcome not relevant
Sharma, S. D., Jayaraj, S., Tongue-tie division to treat breastfeeding difficulties: Our experience, Journal of Laryngology and Otology, 129, 986-989, 2015	Main focus of study was tongue-tie
Sowjanya, S. V. N. S., Venugopalan, L., LATCH score as a predictor of exclusive breastfeeding at 6 weeks postpartum: A prospective cohort study, Breastfeeding Medicine, 13, 444-449, 2018	Study conducted in India
Stockdale, J., Sinclair, M., Kernohan, G., McCrum-Gardner, E., Keller, J., Sensitivity of the breastfeeding motivational measurement scale: A known group analysis of first time mothers, PLoS ONE, 8 (12) (no pagination), 2013	Outcomes not relevant

Study	Reason for exclusion
Suellentrop, K., Morrow, B., Williams, L., D'Angelo, D., Centers for Disease, Control, Prevention,, Monitoring progress toward achieving Maternal and Infant Healthy People 2010 objectives--19 states, Pregnancy Risk Assessment Monitoring System (PRAMS), 2000-2003, Morbidity & Mortality Weekly Report. Surveillance Summaries, 55, 1-11, 2006	Population not relevant
Todd, D. A., Hogan, M. J., Tongue-tie in the newborn: early diagnosis and division prevents poor breastfeeding outcomes, Breastfeeding Review, 23, 11-6, 2015	Population not relevant - study focuses on tongue tie
Tornese, G., Ronfani, L., Pavan, C., Demarini, S., Monasta, L., Davanzo, R., Does the LATCH score assessed in the first 24 hours after delivery predict non-exclusive breastfeeding at hospital discharge?, Breastfeeding Medicine: The Official Journal of the Academy of Breastfeeding MedicineBreastfeed Med, 7, 423-30, 2012	Insufficient data available for 2 X 2 table
Tuthill, E. L., McGrath, J. M., Graber, M., Cusson, R. M., Young, S. L., Breastfeeding Self-efficacy: A Critical Review of Available Instruments, Journal of human lactation : official journal of International Lactation Consultant Association, 32, 35-45, 2016	Systematic review - studies assessed individually
Twells, L. K., Midodzi, W. K., Ludlow, V., Murphy-Goodridge, J., Burrage, L., Gill, N., Halfyard, B., Schiff, R., Newhook, L. A., Assessing Infant Feeding Attitudes of Expectant Women in a Provincial Population in Canada: Validation of the Iowa Infant Feeding Attitude Scale, Journal of human lactation : official journal of International Lactation Consultant Association, 32, NP9-NP18, 2016	Outcomes not relevant
Wallis, A. B., Brinzaniuc, A., Chereches, R., Oprescu, F., Sirlincan, E., David, I., Dirle, I. A., Dungy, C. I., Reliability and validity of the Romanian version of a scale to measure infant feeding attitudes and knowledge, Acta Paediatrica, International Journal of Paediatrics, 97, 1194-1199, 2008	Study conducted in Romania
Wambach, K. A., Breastfeeding intention and outcome: a test of the theory of planned behavior, Research in nursing & health, 20, 51-9, 1997	Insufficient data available for 2 X 2 table
Webb, A. N., Hao, W., Hong, P., The effect of tongue-tie division on breastfeeding and speech articulation: a systematic review, International Journal of Pediatric Otorhinolaryngology, 77, 635-46, 2013	Systematic review - studies assessed individually
Wheeler, B. J., Dennis, C. L., Psychometric Testing of the Modified Breastfeeding Self-Efficacy Scale (Short Form) Among Mothers of Ill or Preterm Infants, JOGNN - Journal of Obstetric, Gynecologic, and Neonatal Nursing, 42, 70-80, 2013	Population not relevant
Winterburn, S., Fraser, R., Does the duration of postnatal stay influence breast-feeding rates at one month in women giving birth for the first time? A randomized control trial, Journal of Advanced Nursing, 32, 1152-1157, 2000	No validated breastfeeding assessment tool used
Ystrom,E., Niegel,S., Klepp,K.I., Vollrath,M.E., The impact of maternal negative affectivity and general self-efficacy on breastfeeding: the Norwegian Mother and Child Cohort Study, Journal of Pediatrics, 152, 68-72, 2008	No validated breastfeeding assessment tool used
Yu, X., Sun, H., Lin, X., Liu, X., Breastfeeding Evaluation Indicators System is a Promising Evaluation Tool for Preterm Infants in Neonatal Intensive Care Units (NICU), Medical Science Monitor, 22, 4009-4016, 2016	Population not relevant

Study	Reason for exclusion
Yun, S., Liu, Q., Mertzlufft, K., Kruse, C., White, M., Fuller, P., Zhu, B. P., Evaluation of the Missouri WIC (Special Supplemental Nutrition Program for Women, Infants, and Children) breast-feeding peer counselling programme, Public health nutrition, 13, 229-37, 2010	No validated breastfeeding assessment tool used
Zhu, Y., Hernandez, L. M., Mueller, P., Dong, Y., Hirschfeld, S., Forman, M. R., Predictive Models for Characterizing Disparities in Exclusive Breastfeeding Performance in a Multi-ethnic Population in the US, Maternal and child health journal, 20, 398-407, 2016	No validated breastfeeding assessment tool used
Zubaran, C., Foresti, K., Schumacher, M., Thorell, M. R., Amoretti, A., Muller, L., Dennis, C. L., The Portuguese version of the Breastfeeding Self-Efficacy Scale-Short Form, Journal of Human Lactation, 26, 297-303, 2010	Study conducted in Brazil

Economic studies

No economic evidence was identified for this review.

Appendix L – Research recommendations

Research recommendations for review question: What observations or clinical tools accurately predict breastfeeding difficulties?

No research recommendations were made for this review.