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A Systematic Review of Integrated Care Interventions Addressing Perinatal Depression Care in Ambulatory Obstetric Care Settings

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Abstract

This systematic review searched 4 databases (PubMed/MEDLINE, Scopus, CINAHL, and PsychINFO) and identified 21 articles eligible to evaluate the extent to which interventions that integrate depression care into outpatient obstetric practice are feasible, effective, acceptable, and sustainable. Despite limitations among the available studies including marked heterogeneity, there is evidence supporting feasibility, effectiveness, and acceptability. In general, this is an emerging field with promise that requires additional research. Critical to its real-world success will be consideration for practice workflow and logistics, and sustainability through novel reimbursement mechanisms.

Keywords

perinatal depression; integrated care; collaborative care; mental health; pregnancy; postpartum

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CONFLICTS OF INTEREST

For the remaining authors no conflicts were declared.

BACKGROUND

Depression occurring in pregnancy to within a year of delivery - perinatal depression - affects upwards of 1 in 7 women and is one of the most common pregnancy complications.¹ Perinatal depression is associated with negative maternal, obstetric, infant, and child outcomes.²⁻⁴ For example, maternal suicide exceeds hemorrhage and hypertensive disorders as an etiology of maternal mortality.^{1,5} While negative consequences can be ameliorated with evidence-based psychotherapy and/or psychopharmacologic treatment,⁶ perinatal depression is vastly under-diagnosed and under-treated.⁷

Given that detection is an important first step towards treatment, numerous professional organizations and policy makers recommend depression screening for pregnant and postpartum women using a validated tool.^{1,8,9} Screening is well accepted by women and providers,^{10,11} yet is a futile exercise when done in the absence of trained providers, mental health resources, and referrals.⁷ Barriers exist at the patient, provider, and systems-level that preclude women from getting needed mental health care.¹²⁻¹⁵ Without interventions in place to help obstetric practices respond appropriately to positive screens, less than 20% of women who screen positive initiate mental health care.⁷ Far fewer participate in adequate or sustained treatment.⁷ Identified barriers include: 1) inadequate/absent depression care training for obstetric providers; 2) lack of standardized processes for stepped depression care; 3) a dearth of mental health providers willing to treat pregnant and lactating women; 4) lack of referral resources; and, 5) inadequate care coordination and follow-up.¹⁶⁻²⁰

Recognizing the prevalence of perinatal depression, its association with preventable morbidity and mortality, and barriers preventing appropriate recognition and treatment, the Council on Patient Safety in Women's Health Care created a patient safety bundle for perinatal mood and anxiety disorders that provides direction for incorporating screening, intervention, referral, and follow-up across health care settings.⁸ Similarly, the American College of Obstetricians and Gynecologists, a significant and organizing partner in The Council, recommends screening in the context of systems ensuring effective diagnosis, treatment, and follow-up.¹ The American Medical Association,²¹ U.S. Preventive Services Task Force,⁹ and Center for Medicare and Medicaid Services²² also recommend screening for depression in obstetric settings.

In response to these recommendations, efforts have been made to integrate depression care into obstetric practice. It is well-established that integrated care models, such as stepped and collaborative care, and medical homes, effectively integrate depression treatment into primary care settings and improve quality of mental health care and depression outcomes. Recognizing that such approaches hold promise for addressing gaps in perinatal depression care, interventions focused on helping obstetric practices screen, assess and treat depression have been developed and evaluated.⁷ The objective of this systematic review is to evaluate the extent to which interventions that integrate depression care into outpatient obstetric practice are feasible, effective, acceptable, and sustainable.

METHODS

Database Search Strategy

This review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.²³ The study hypothesis was developed using the Population Intervention Comparison Outcome (PICO) method.²⁴ A health sciences librarian (L.L.L.) iteratively developed the search strategies and conducted unique searches in PubMed/MEDLINE, Scopus, CINAHL, and PsychINFO in 2017. Major searched concepts included, but were not limited to pregnancy, prenatal care, postpartum period, peripartum period, postpartum depression, depression, maternal health services, obstetrics, delivery of integrated health care, collaborative care, and program evaluation. These major concepts were used to develop the initial PubMed search algorithm from which the strategies for other databases were created and modified based on differing command languages and where applicable, controlled vocabularies specific to the source (MeSH, CINAHL Subject Headings, the Thesaurus of Psychological Index Terms, and Emtree). Additional free text terms were used as appropriate (Appendix 1). Recognized experts were queried, and bibliographic references were hand searched to identify additional studies.

Inclusion and Exclusion Criteria

Searches were limited to English language. Inclusion criteria were: 1) pregnant and/or postpartum (within 1 year of delivery) women as subjects; 2) non-adolescent focused populations (i.e., 18 years); 3) outpatient perinatal care setting with obstetric providers including obstetricians, family medicine and general practitioners, or midwives; 4) description of an intervention coordinating care between obstetric and mental health providers, and 5) at least one of four key outcomes, described below (Table 1). In addition to randomized controlled trials (RCTs), observational and quality improvement study designs were included to assess the range of evidence currently available. Exclusion criteria consisted of: 1) non-original research (e.g.; review article, meta-analysis, opinion, letter, case report, case series, or commentary), and 2) non-peer-reviewed articles.

Study Selection and Abstractions

After duplicates were removed, all authors screened citations/abstracts derived from the initial literature search. Initial abstraction information was collected using Rayyan, a systematic review web application maintained by the Qatar Foundation and Qatar Computing Research Institute.²⁵ The citations/abstracts were equally divided with at least two abstractors independently reviewing each set of citations/abstracts for eligibility. Articles for which there was discordance resulted in review by the full team until 100% concordance was reached.

Studies that met all eligibility criteria were further abstracted and assessed using a standardized data abstraction form. The comprehensive abstraction form was created in REDCap,²⁶ a web-based data capture application, and included the following study categories: research question, design, sample size, inclusion/exclusion criteria, setting, population, intervention, outcomes and conclusions.

Definition of Intervention and Outcomes

Integrated care interventions were operationalized into eleven components (Table 1). The five components of collaborative care were examined: evidence-based care, population-based care, measurement-based treatment to target, patient-centered team care, and accountable care.²⁷

We included four outcomes of interest in our review (Table 1). **Feasibility** of implementing integrated care in the outpatient obstetric setting was evaluated by evidence of screening for depression using a validated tool, subsequent assessment to confirm a depression diagnosis, and referral for treatment which included yet was not limited to psychoeducation, psychotherapy, and psychopharmacology. Integrated care **effectiveness** was evaluated by evidence of treatment initiation, treatment sustainment, symptom improvement, and other maternal and birth outcomes. The **acceptability** of integrating mental health care into perinatal care was evaluated by evidence of patient, provider, staff, and practice satisfaction, efficacy, and/or utilization. Evidence of intervention **sustainability** was evaluated through costs and use of other resources.

Study Quality Assessment

Methodologic quality including validity, bias, power, and other study parameters was assessed using a modified Downs and Black checklist.²⁸ The original checklist was designed for RCTs with a maximum quality rating score of 32 based on 27 items, eight of which are specific to RCTs.²⁸ As recommended in prior methodologic reviews,²⁹ and as we have done previously,^{7,30,31} we modified the original scale²⁸ and excluded items that were not relevant to the specific design of each eligible study (Appendix 2). A percentage quality score was calculated by dividing the total score received by the maximum total score possible, with higher overall scores indicating better methodologic quality. The multi-component item regarding sample size and power was dichotomized into whether the study reported a priori sample size and power calculations or not.

Synthesis of Included Studies and Analyses

Data was synthesized, and commonalities were identified on the interventions and outcomes examining the integration of perinatal depression care in obstetric settings. Given the considerable heterogeneity between program descriptions and outcomes, a meta-analysis was not conducted.

RESULTS

The literature search yielded 1,115 articles with an additional 87 records identified through hand-searching and other means (Figure 1). After eliminating duplicates, a total of 1,069 references were identified with 1,022 removed after citation/abstract review for not meeting inclusion criteria, leaving 47 articles for full-text review. After full-text review, 26 were removed because they did not meet pre-defined inclusion criteria. We completed full abstraction on 21 articles. Some interventions were reported on in more than one article including the Perinatal Mental Health (PMH) model,³²⁻³⁴ the Massachusetts Child Psychiatry Access Program (MCPAP) for Moms,^{35,36} the PRogram In Support of Moms

(PRISM),^{36,37} Healthy Outcomes of Pregnancy Education (DC-HOPE),^{38,39} and the Perinatal Depression Management Program (PDMP);^{40,41} thus, this review includes 21 articles reporting on 15 unique integrated care models for addressing perinatal depression (Table 2).

A variety of study designs were employed including feasibility/pilot studies (n=5),^{34,37,40,42,43} quality improvement initiatives (n=2),^{44,45} retrospective cohort (n=2),^{46,47} prospective cohort (n=7),^{32,33,35,41,48–50} and randomized controlled trials (n=5)^{36,38,39,51,52} with randomization at the level of the patient (n=4)^{38,39,51,52} or practice (n= 1).³⁶ Quality rating, based on the modified Downs and Black criteria, ranged from 21% to 100%; the average score was 68%. In general, quality ratings were lowered for RCTs and cohort studies due to not reporting actual probability values (50%), poor reporting on the distributions of principal confounders (71%), and/or inadequate adjustment for confounding in the analyses (93%).

Most studies (n=18) took place in the United States;^{32–43,45,46,49–52} international studies included one each from Australia,⁴⁴ Canada,⁴⁷ and South Africa.⁴⁸ Sample size ranged from 30 to 7,630 overall, and 30 to 1,044 in the RCTs^{36,38,39,51,52} (Table 2). More than half of the studies did not include a comparison group (n=11);^{32–35,37,42,45,47–50} those with comparison groups (n=10) consisted of pre-intervention or historical controls,^{40,41,44} usual care,^{38,39,43,46,51,52} or active intervention.³⁶ Several studies noted intervening to benefit specific populations including Hispanic,^{32,34,40,41} African American,^{38,39} and socioeconomically disadvantaged^{34,40,48,51,52} women, as well as women veterans.⁴⁵

All studies included more than one integrated care intervention component. The majority of studies (57%) included 8 integrated care components as part of their described intervention (mean=7, range=2–10) (Figure 2, Table 3). Nearly all studies included systematic provision of resources to patients (n=20)^{32–37,39–52} and on-site face to face assessment (n=19).^{32–37,40–52} While twelve (57%) studies self-reported implementation of collaborative care,^{32–34,40,41,45–48,50–52} only one⁴⁶ included the five collaborative care components. Among all studies, the collaborative care intervention components were utilized by most: evidence-based care (n=16),^{32–34,38–46,48,50–52} population-based care (n=14),^{32–34,36,40,41,45–52} measurement-based treatment to target (n=12),^{32–34,40,41,45–50,52} and patient-centered team care (n=11).^{32–34,40,41,45,46,48,50–52} Only one study included accountable care.⁴⁶

Feasibility

All studies implemented screening using one of three validated screening instruments (Figure 3); the Edinburgh Postnatal Depression Scale (EPDS) cut-offs scores ranged from 9–13. Thirteen studies (62%) assessed depression following a positive screen using a variety of approaches. Depression diagnosis following assessment after positive screen ranged from 19–65%.^{32,41,45,49} Among all studies, reported mental health services referral rates for patients identified with non-emergency needs ranged from 11–100%.^{32–35,40–43,46–48,50} Miller et al. reported rates of clinician performed interviews after positive screens increased from 10% pre-intervention to 85% during the intervention; clinicians in this study were family physicians and midwives at a federally qualified health center.⁴¹ Wood et al. reported that all patients who screened positive were offered referral to a family physician or mental

health therapist with approximately half (46.7%) accepting referral.⁴⁷ Byatt et al. reported that telephone consultation with providers in MCPAP for Moms resulted in a variety of outcomes.³⁵ In the majority of calls, the calling provider continued to manage the patient (78%), which was followed by referral for therapy (38%), care coordination (36%), referral to a new psychiatrist (18%) and other dispositions including referral to emergency services (1%).³⁵ Venkatesh et al. reported that 79% of screen positive patients were referred for mental health treatment.⁵⁰

Effectiveness

Fifteen studies^{32,33,38,39,41–51} reported evidence of treatment initiation with rates ranging from 12–98% (Figure 3). Few studies (n = 5)^{32,46,47,51,52} reported evidence of treatment sustainment with an overall range of 55–100% (Figure 3). Baker-Ericzen et al. reported that 55% of subjects completed the treatment plan.³² Grote et al. reported that 93% and 84% respectively completed 4 and 8 interpersonal psychotherapy or medication management sessions, and 79% had 1 maintenance session through 18-month follow-up.⁵¹ Katon et al. reported that 74% and 81% of patients with commercial and no/public insurance respectively attended 4 mental health visits.⁵² Truitt et al. reported that their collaborative care group had a mean of 13 mental health related visits, and that 100% had 3 follow-up contacts.⁴⁶ Wood et al. reported that 41% withdrew before their therapist considered treatment complete, thus indicating that 59% had complete treatment.⁴⁷

Few studies (n=4) assessed effectiveness of symptom improvement over time^{36,44,51,52} and/or symptom remission,^{46,51} and those that did used differing approaches with varying results that all indicated improvement even in the context of small sample sizes. For example, Byatt et al. reported statistically significant declines over time in mean EPDS scores and EPDS scores ≥ 10 in both study groups (n=30).³⁶ Truitt et al. reported that 46.7% of subjects in the collaborative care group (n=15) experienced clinical remission as compared to 6.3% receiving routine care (n=63, p <0.01).⁴⁶ There was very limited data on other depression-related outcomes; Rowan et al. noted that there were no tragic outcomes including maternal suicide or newborn neglect.⁴² No studies reported on additional maternal or child outcomes, such as preterm birth, low birth weight neonate, or others (Figure 3).

Acceptability

Ten studies reported patient satisfaction, although the metrics were highly variable, spanning both qualitative and quantitative data, and often limited to a subset of study participants.^{32–34,36,39,40,42,43,51,52} All studies reported that the majority of women were accepting of the various interventions and had positive experiences. Representative examples of patient satisfaction included that women felt comfortable talking about mood and/or found discussions supportive,^{33,36,43} patients were satisfied with or felt positively about intervention staff and/or found them helpful^{32–34,39,43} and were satisfied with care and/or the intervention^{33,43,51,52} (Figure 3).

Evidence of intervention acceptability to providers was reported in 7 studies.^{33,35–37,40,43,49} Examples included improved provider self-efficacy was reported with increased certainty in ability to effectively treat perinatal depression,³⁶ increased use of validated screening tools,

³³ high rates of provider-initiated depression discussions after notice of a positive screen,⁴⁹ and increased referral to community resources³³ (Figure 3). Considering utilization as evidence of provider acceptability, the MCPAP for Moms program enrolled 100 obstetric practices, trained 350 obstetric providers, and served 1,123 women in the first 18 months.³⁵

Acceptability was reported in 6 studies^{33,35–37,43,47} with representative examples including staff demonstrating improvement in the knowledge and skills to address perinatal depression,³⁶ increased screening and use of validated screening tools,^{33,37} familiarity with programs,^{33,36} and high intervention utilization³⁵ (Figure 3). One study noted varying levels of support and interest among providers and staff with several office practice providers refusing to participate due to concerns over productivity targets and extra time needed for intervention.⁴⁶ Another study reported that space, scheduling issues, wait times, and staff support negatively affected implementation.⁴³

Sustainability

Only 3 studies (14%) provided any results regarding the costs of their integrated interventions.^{35,44,51} Two studies^{35,51} provided a per woman cost that ranged widely. Based on a total program operating cost for the Massachusetts state-wide program MCPAP for Moms of \$600,000 for ~72,000 deliveries/year, Byatt et al. calculated the cost at \$8.38 per perinatal woman per year (\$0.70/month) and noted that there were additional start-up administrative expenses and community capacity building.³⁵ Utilizing \$80 per depression care specialist visit and \$31 per phone visit, Grote et al. estimated the per patient cost at \$1,117.⁵¹ Harvey et al. did not provide a cost per patient; however, it was noted that the program funded a senior level-experienced mental health nurse position (1.4 FTE) and an administrative staff person (0.6 FTE).⁴⁴

DISCUSSION

Gaps in perinatal depression care persist because getting pregnant or postpartum women needed mental health care is a complex process hindered by patient, provider and systems-level barriers.^{12–15} As a result, clinical resolution of depression symptoms is uncommon in obstetric settings.¹¹ Known barriers to perinatal depression treatment include lack of standardized processes for depression care in obstetric settings,^{19,20} inadequate referral resources,^{16–20} and inadequate care coordination and follow-up.^{16–20} While the existing evidence is limited in both the total number of studies and study participants, interventions presented, and outcomes evaluated, our review suggests that integrating depression care into obstetric practice is feasible, effective, and acceptable.

Although all the included studies focused on adult pregnant and postpartum women receiving care in outpatient obstetric settings, described an intervention coordinating obstetric and mental health care, and evaluated feasibility, effectiveness, acceptability, and/or sustainability, there existed substantial heterogeneity. Studies differed regarding: 1) intervention components deployed, 2) specifics of outcomes and outcome assessments, and 3) study design. Aligned with the Agency for Healthcare Research Quality's recommendations, future research would benefit from consensus on core measures that are standardly reported and compared across studies.⁵³ The heterogeneity of the current studies

made it challenging to evaluate which of the 11 integrated care components was associated with greatest improvements in outcomes. Multi-component interventions were common and associated with feasibility, effectiveness, and acceptability (Table 3, Figure 3). This is consistent with a previous systematic review by Byatt et al. which found that intervention type and intensity is associated with differential engagement in mental health care for pregnant and postpartum women with depression.⁷ More research utilizing standardized definitions and outcomes is needed to more completely understand the potential and promise of integrating mental health and obstetric care, and to discern which components are most impactful.

The sustainability of these interventions is largely unknown. Only three included articles directly addressed financial and resource expenditures of integrated care interventions^{35,44,51} and the two that provided per woman costs ranged broadly from \$8.38³⁵ to \$1,117.⁵¹

Despite treatment success, collaborative care models depend on care management facets that are not reliably reimbursed and therefore their broad implementation, dissemination, and associated treatment improvement are often not realized outside of the research environment.⁵⁴ The term “voltage drop” has been used to describe the less robust results found when collaborative care approaches are implemented in low resource real-world settings.⁵⁵ Recognizing the effectiveness of and improved outcomes of integrating mental health services within primary care, while acknowledging limited uptake given the absence of clear business models for incorporating these services into practice, the Center for Medicare and Medicaid Services has recently begun paying clinicians separately for mental health services provided to Medicare beneficiaries.⁵⁶ Although relatively few perinatal women are Medicare beneficiaries, these types of changed financial compensation systems, including value-based and outcomes-based incentive programs, offer hope for the future reimbursement and thus sustainability of such interventions.

Health care reform presents unprecedented opportunities to design and test new integrated care models and unique service delivery models that leverage limited mental health providers and resources. Thus, it is important to consider the full breadth of integrated care interventions. Hence, our systematic review focused not on just collaborative care as the gold-standard, but rather we expanded our scope to include an array of integrated care interventions with the potential for lower cost such as MCPAP for Moms (\$8.38/woman)³⁵ contrasted with standard collaborative care (\$1,117/woman).⁵¹ Of note, healthcare provider feedback loop and accountable care were the two integrated care components utilized by the least number of included studies (Figure 2, Table 3) and yet are likely critical when considering value-based care payment models.

Our review was limited by the available studies. First, heterogeneity among the studies precluded meta-analysis. Many of the included studies were not randomized controlled trials. Overall study quality was low, averaging 68%. It is notable that those with the highest scores were of less robust study designs and thus not eligible for full points utilizing the modified Downs and Black checklist. The 5 randomized controlled trials quality scores ranged from 33–63%. Finally, as the studies varied widely in interventions and outcomes,

generalization is difficult. Further research is needed to understand how to delineate essential components and optimize its impact and sustainability.

Despite limitations among the available studies, there is evidence to support the feasibility, effectiveness, and acceptability of integrating mental health and obstetric care for pregnant and postpartum women in ambulatory obstetric settings. The included studies demonstrated feasibility of screening with validated tools, of performing a subsequent diagnostic assessment, and referring women to mental health care. Studies demonstrated effectiveness via treatment initiation, and in some cases treatment sustainment and efficacy via symptom improvement and remission. Interventions were overall acceptable to patients, providers, and practice staff.

In general, integrating mental health care into obstetric settings is an emerging field with promise that requires additional research. Critical to its real-world success will be adoption with consideration for practice workflow and logistics, and sustainability through novel reimbursement mechanisms. However, given that untreated perinatal depression is estimated to cost ~\$22,000 per maternal-child dyad,⁵⁷ is one of the most common pregnancy complications,¹ and is associated with negative maternal, obstetric, infant, and child outcomes²⁻⁴ including high health care utilization,^{58,59} there is reason to hypothesize that if effective, integrated care interventions can result in long-term cost-savings for the health care system and improved intergenerational maternal-child outcomes.

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Appendix 1. Database Search Methods

PubMed

((("Pregnancy"[Mesh] OR "Postpartum Period"[Mesh] OR "Peripartum Period"[Mesh] OR "Pregnancy Trimesters"[Mesh] OR "Depression, Postpartum"[Mesh] OR ("depression"[All Fields] AND "postpartum"[All Fields]) OR "postpartum depression"[All Fields] OR "depression, postpartum"[All Fields]) AND ("Maternal Health Services"[Mesh] OR "Obstetrics"[Mesh]) AND ("Delivery of Health Care, Integrated"[Mesh] OR "Comprehensive Health Care"[Mesh] OR ("collaborative care"[All Fields] OR collaborate[tiab] OR collaborated[tiab] OR collaborates[tiab] OR collaborating[tiab] OR collaboration[tiab] OR collaborative[tiab] OR collaborationist[tiab] OR collaborationists[tiab] OR collaborations[tiab] OR collaborative[tiab] OR collaboratively[tiab] OR collaborativeness[tiab] OR collaboratives[tiab] OR collaborator[tiab] OR collaborator[tiab] OR laboratories[tiab] OR collaborators[tiab] OR laboratory[tiab])) AND ("Feasibility Studies"[Mesh] OR "Patient Acceptance of Health Care"[Mesh] OR "Treatment Outcome"[Mesh] OR "Program Evaluation"[Mesh])) NOT (Case Reports[ptyp] OR Letter[ptyp] OR Comment[sb] OR commentary[ti] OR opinion[ti] OR Meta-Analysis[ptyp])) AND English[lang]) Filters: English

SCOPUS

(TITLE-ABS-KEY (*pregnancy* OR *Postpartum Period* OR *Peripartum Period* OR *Pregnancy Trimesters* OR *Depression, Postpartum* OR (*depression* AND *postpartum*)) OR *postpartum depression* OR *depression, postpartum*) AND (TITLE-ABS-KEY (*Feasibility Studies* OR *Patient Acceptance of Health Care* OR *Treatment Outcome* OR *Program Evaluation*)) AND ((TITLE-ABS-KEY (*Delivery of Health Care, Integrated* OR *Comprehensive Health Care* OR (*collaborative care* OR *collaborate* OR *collaborated* OR *collaborates* OR *collaborating* OR *collaboration* OR *collaborational* OR *collaborationist* OR *collaborationists* OR *collaborations*))) OR (TITLE-ABS-KEY ((*collaborationship* OR *collaborative* OR *collaboratively* OR *collaborativeness* OR *collaboratives* OR *collaborator* OR *collaborators*)))) AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp")) AND (LIMIT-TO (LANGUAGE, "English"))

CINAHL

((MH "Pregnancy") OR (MH "Postnatal Period") OR (MH "Pregnancy Trimesters") OR (MH "Depression, Postpartum") OR (MH "Depression") OR "peripartum period") AND ((MH "Maternal Health Services") OR (MH "Obstetrics")) AND ((MH "Health Care Delivery, Integrated") OR ("comprehensive health care") OR ("collaborative care")) AND ((MH "Pilot Studies") OR ("patient acceptance") OR (MH "Program Evaluation") OR ((MH "Treatment Outcomes") OR (MH "Outcome Assessment"))

PsycINFO

(exp Pregnancy OR (exp Postnatal Period/ OR exp Major Depression/ OR exp Postpartum Depression)) AND ((exp Health Care Services/ OR maternal health services.mp) OR exp

Obstetrics) AND ((exp Integrated Services/ OR comprehensive care.mp OR (exp Collaboration/ OR collaborative care.mp)) AND (exp Treatment Outcomes/ OR patient acceptance.mp OR exp Program Evaluation/))

Appendix 2. Modified Downs & Black Criteria for Quality Scoring

	RCT	Prospective Observational	Retrospective Observational	Pilot	Feasibility	Quality Improvement
1. Is the hypothesis/aim/objective of the study clearly described?	✓	✓	✓	✓	✓	✓
2. Are the main outcomes to be measured clearly described in the Introduction or Methods section?	✓	✓	✓	✓	✓	✓
3. Are the characteristics of the patients included in the study clearly described?	✓	✓	✓	✓	✓	✓
4. Are the interventions of interest clearly described?	✓	✓	✓	✓	✓	✓
5. Are the distributions of principal confounders in each group of subjects to be compared clearly described?	✓	✓	✓			
6. Are the main findings of the study clearly described?	✓	✓	✓	✓	✓	✓
7. Does the study provide estimates of the random variability in the data for the main outcomes?	✓	✓	✓			
8. Have all important adverse events that may be a consequence of the intervention been reported?	✓					
9. Have the characteristics of patients lost to follow-up been described?	✓					
10. Have actual probability values been reported?	✓	✓	✓			
11. Were the subjects asked to participate in the study representative of the entire population from which they were recruited?	✓	✓				
12. Were those subjects who were prepared to participate representative of the entire population from which they were recruited?	✓	✓				
13. Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients receive?	✓	✓				
14. Was an attempt made to blind study subjects to the intervention they have received?	✓					

	RCT	Prospective Observational	Retrospective Observational	Pilot	Feasibility	Quality Improvement
15. Was an attempt made to blind those measuring the main outcomes of the intervention?	✓					
16. If any of the results of the study were based on “data dredging”, was this made clear?	✓	✓	✓			
17. In trials and cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case-control studies, is the time period between the intervention and outcome the same for cases and controls?	✓	✓	✓			
18. Were the statistical tests used to assess the main outcomes appropriate?	✓	✓	✓	✓		
19. Was compliance with the intervention/s reliable?	✓					
20. Were the main outcome measures used accurate (valid and reliable)?	✓	✓	✓	✓		
21. Were the patients in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited from the same population?	✓	✓	✓	✓		
22. Were study subjects in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited over the same period of time?	✓	✓	✓	✓		
23. Were study subjects randomised to intervention groups?	✓					
24. Was the randomised intervention assignment concealed from both patients and health care staff until recruitment was complete and irrevocable?	✓					
25. Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?	✓	✓	✓			
26. Were losses of patients to follow-up taken into account?	✓	✓	✓			
27. Did the study report a priori power analysis?	✓	✓	✓			

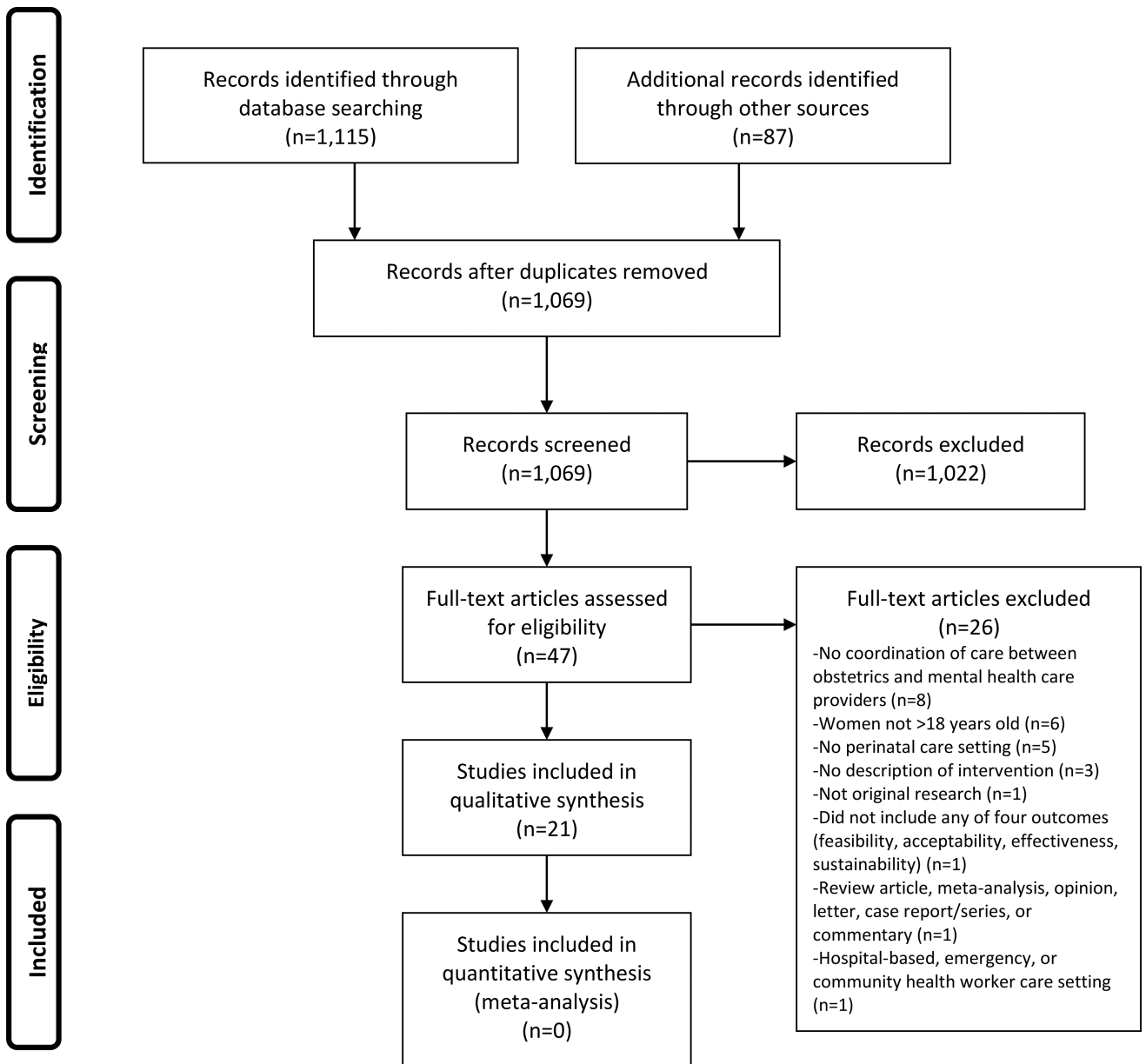


Figure 1. Article Selection Process

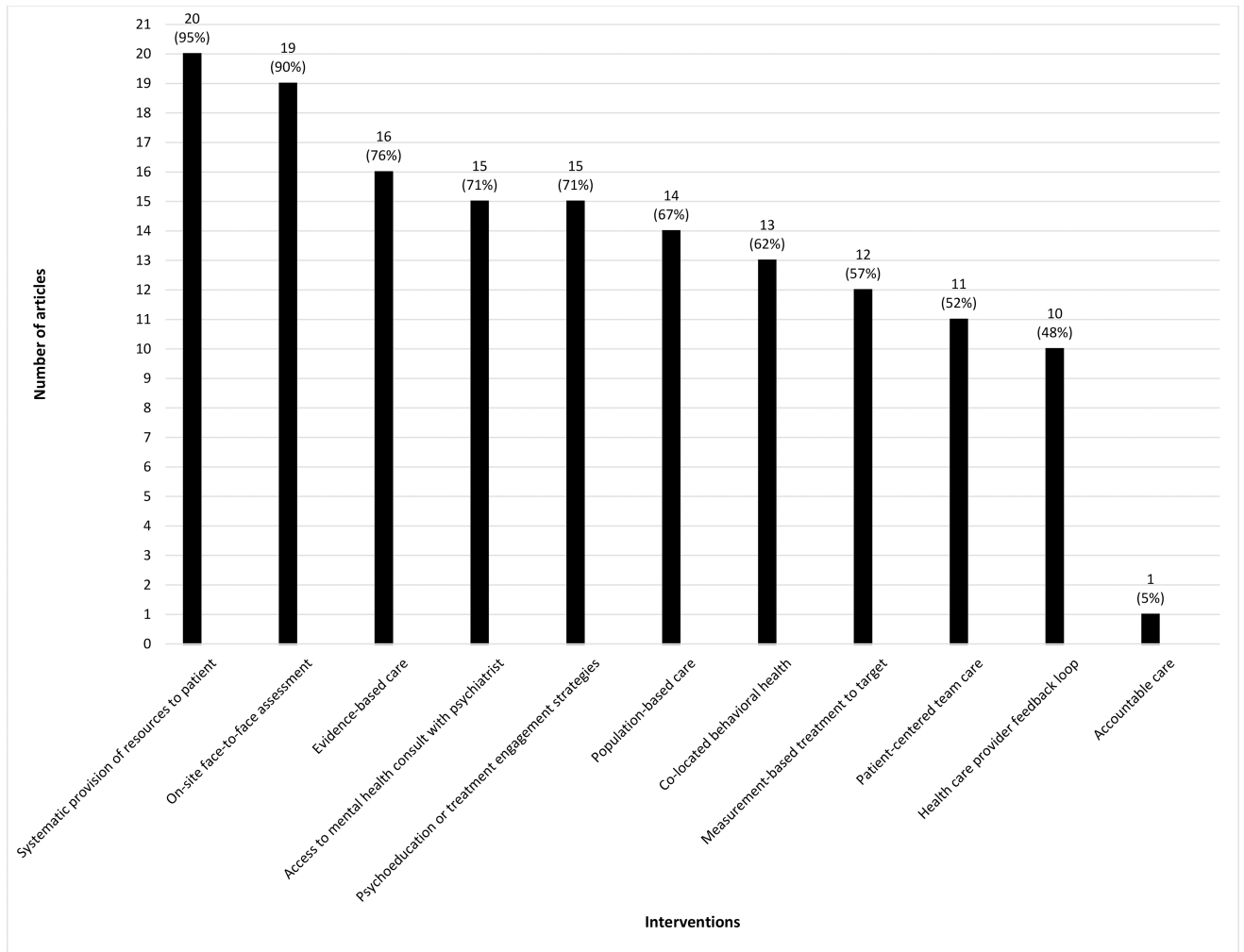


Figure 2. Numbers and Percentages of Studies Containing Each Integrated Care Intervention Component

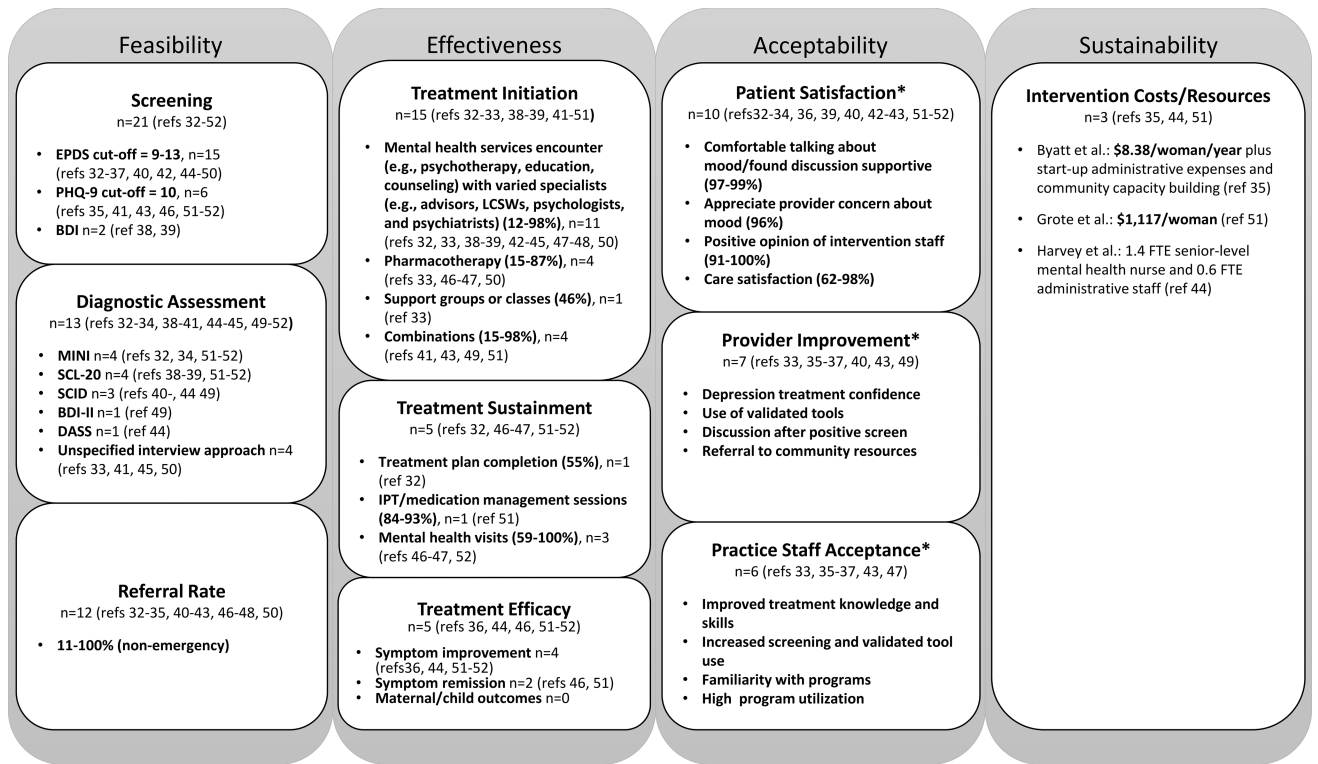


Figure 3. Outcome Results of the 21 Studies Included in the Systematic Review of Integrating Depression Care for Pregnant and Postpartum Adult Women in Obstetric Settings
For Sustainability as indicated by (*), representative examples are included. Abbreviations: BDI, Beck Depression Inventory; EPDS, Edinburgh Postnatal Depression Scale; DASS, Depression Anxiety Stress Scales; FTE, full-time equivalent; IPT, interpersonal psychotherapy; LCSW, licensed clinical social worker; MINI, Mini International Neuropsychiatric Interview; PHQ-9, Patient Health Questionnaire; ref, reference; SCID, Structured Clinical Interview for Diagnosis; SCL-20, Symptom Checklist Depression Scale

Table 1

Outcome Questions and Integrated Care Intervention Component Definitions

Outcome Questions	Feasibility	Was depression screening performed using a validated tool?
		Was an assessment performed to confirm the diagnosis of depression?
		Was a referral for depression treatment made?
	Effectiveness	Was depression treatment initiated?
		Was depression treatment sustained?
		Was there evidence of improved symptoms?
		Were any other obstetric or maternal-child outcomes improved?
	Acceptability	Were patients satisfied with the intervention?
		Were provider and/or practice satisfaction, efficacy, and/or utilization measured?
	Sustainability	Were costs of intervention measured?
		Were other resources measured?
	Integrated Care Intervention Component Definitions	Patient-centered team care
Measurement-based treatment to target		Treatment plan clearly articulates personal goals and clinical outcomes that are routinely measured by evidence-based tools. Treatments are actively changed if patients not improving as expected until goals are achieved.
Evidence-based care		Patients are offered evidence-based treatments of target condition.
Accountable care		Providers are accountable and reimbursed for quality of care and clinical outcomes, not just the volume.
Co-located behavioral health		Mental health evaluation and/or treatment by a mental health provider on-site within obstetric setting
On-site face-to-face assessment with patient by obstetric team		Mental health care assessment by an on-site case manager, social worker, or perinatal care provider (e.g., obstetrician or midwife) in the perinatal care setting
Access to mental health consultation		Mental health consultation with either perinatal or general psychiatrist made available to provider and/or patient either via face-to-face, virtual face-to-face (telepsychiatry), telephone, or on-line (e.g., email)
Systematic provision of resources to patients		Perinatal care team or research team provides mental health resources or referrals to depressed women.
Population-based care		Care team shares a defined group of patients tracked/followed in a registry to ensure no one falls through the cracks.
Healthcare provider feedback loop		Provided feedback to health care providers on their screening, treatment rates, or both
Psychoeducation or treatment engagement strategies	Perinatal care or research team discusses screening results or resources for treatment, provides educational material about perinatal depression, or use of tools to facilitate depression discussion in the perinatal care setting.	

Table 2

Characteristics of the 21 Studies Included in the Systematic Review of Integrating Depression Care for Pregnant and Postpartum Adult Women in Obstetric Settings

Author, Year	Study Type, Provider Setting, and Geography	Sample Size, Comparison Groups	Intervention	Quality Score*
Baker-Ericzen et al., 2008	Prospective Cohort; 3 OB, 3 pedi practices (17 providers, 40 staff); California, USA	n=718 pp; no comparison group	PWH and the 4As; screening in clinical setting; practice referral of positive screen to MHA; MHA telephonically assesses and provides direct support and referral to existing treatment resources	42% (8/19)
Baker-Ericzen et al., 2012	Prospective Cohort embedded in RCT; 10 OB practices; California, USA	n=79 preg or pp (up to 6 wks); no comparison group	PMH and the 4As; screening in clinical setting; practice referral of positive screen to bilingual, bicultural MHA; MHA telephonically assesses and provides direct support, psychoeducation, and referral to existing treatment resources	53% (10/19)
Baron et al., 2015	Prospective Cohort; 1 OB/MW practice; Cape Town, South Africa	n=3,311 preg; no comparison group	Screening in clinical setting; referral to free on-site individual counselor (psychiatrist if severe)	79% (15/19)
Byatt et al., 2016	Prospective Cohort; 100 OB practices (47% of state, 350 providers, 2,583 LIPs); Massachusetts, USA	n=1,123 preg and pp; no comparison group	MCPAP for Moms program with 1) trainings and toolkits, 2) perinatal psychiatric consultation via phone for providers, and 3) care coordination to link women with individual psychotherapy and support groups	21% (4/19)
Byatt et al., 2016	Feasibility; 1 OB practice (14 providers); Massachusetts, USA	n=50 preg and pp; no comparison group	PRISM program leverages OB providers and staff to detect, assess, refer, and treat; program components: 1) trainings and toolkits, 2) systematic screening, and 3) perinatal psychiatric consultation via phone for providers	40% (2/5)
Byatt et al., 2017	Pilot cluster RCT (practice-level randomization); 4 OB practices (32 providers, 39 staff); Massachusetts, USA	n=30 preg and pp; n=9 MCPAP for Moms alone; n=21 PRISM	Active comparison group: MCPAP for Moms (Byatt et al. 2016); Intervention group: PRISM (MCPAP for Moms plus practice level implementation with additional training, toolkits, technical assistance, and change management)	63% (17/27)
Connelly et al., 2010	Feasibility study; 2 OB practices; California, USA	n=50 preg and pp; no comparison group	PMH and the 4As; screening in clinical setting; practice referral of positive screen to bilingual, bicultural MHA; MHA telephonically assesses and provides direct support, psychoeducation, and referral to existing treatment resources	100% (5/5)
Flynn et al., 2006	Prospective Cohort; 1 OB practice (4 OB/GYNs, 2 NPs); Michigan, USA	n=1,298 preg; no comparison group	Treating physician notified, nurse-delivered depression feedback, education and referral information (based on patient preference, insurance status, geography); primary referral to on-site MH SW for psychotherapy vs. psychiatry referral	89% (17/19)
Grote et al., 2015	Multisite RCT (patient-level blinding and randomization); 10 public health centers; Oregon, USA	n=168 preg women randomized (83 MOMCare, 85 MSS-Plus/Usual care control)	Usual care control: MSS-Plus (multidisciplinary team including SW, nurses, and nutritionists); Intervention: MSS-Plus and MOMCare collaborative care, evidence-based depression care, systematic outreach, measurement, and stepped care with access to IPT and pharmacotherapy; delivered by depression care specialist, psychiatrist, and psychologist	52% (14/27)
Harvey et al., 2012	Quality improvement; general practitioners, tertiary hospital-based	n=783 preg-2 yrs pp (n=455 preg, n=328 pp); comparison group = pre-intervention	Nurse-led consultation liaison model supporting general primary providers; initial call and 1-3 face-to-face	100% (5/5)

Author, Year	Study Type, Provider Setting, and Geography	Sample Size, Comparison Groups	Intervention	Quality Score*
	outpatient clinics; Queensland, Australia		appointments including assessment, brief intervention, community link, and referral strategies; healthcare provider training, case management, on-site assessment, resources, referral, follow-up	
Joseph et al., 2009	RCT (patient-level randomization); 6 OB practices; Washington, District of Columbia, USA	n=1,044 (Intervention n=521; Usual care n=523)	Clinic-based integrated intervention delivered during 8 routine prenatal care sessions (4 'adequate'); adapted group CBT for depression; pregnancy advisors work with participants to develop intersession homework	48% (13/27)
Katon et al., 2015	RCT (patient-level randomization); 2 OB practices; Washington, USA	n=205 preg and pp; Intervention vs. Usual care	Intervention: Collaborative care program, care manager engagement session, psychotherapy vs. med treatment choice (charity med programs), proactive outreach, in-person vs. phone visits, education, and SW; regular contact over 12 mos; tracked and reviewed with care manager, psych, and OB/GYN; Usual Care: education pamphlet and opportunity for referral to social work or psych consult	41% (11/27)
Katon et al., 2017	Quality improvement; 1 VA Medical Center and 10 Community Clinics; Western Region, USA	n=199 preg or <8 wks pp; no comparison group	Systematic screen 3 times in perinatal period; dedicated maternity care coordinator, on-site LCSW and OB/GYN	100 (5/5)
Katz et al., 2008	RCT (patient-level randomization); 6 OB practices; Washington, District of Columbia, USA	n=1,044 (Intervention n=521; Usual care n=523); <28 wks preg	Clinic-based integrated intervention delivered during 8 routine prenatal care sessions (4 'adequate'); adapted group CBT for depression; pregnancy advisors work with participants to develop intersession homework	33% (9/27)
Miller et al., 2009	Pilot study; 1 urban family health center (4 family physicians, 4 MWs, 2 OB/GYNs, 2 pediatricians, 1 internist, 1 NP, and 1 SW); Illinois, USA	n=7,630 preg and pp; intervention group: n=2,191; pre-intervention group: n=5,439	PDMP: Screening, provider assessment, algorithm to guide decisions, evidence-based pharmacotherapy guidelines, phone support, web-based consultation, feedback loop	78% (7/9)
Miller et al., 2012	Prospective Cohort; 1 federally qualified health center (family physicians and MW); Illinois, USA	n=541 preg and pp; intervention group: n=400; historical control comparison: n=141	PDMP; Intervention group: referral, healthcare provider training, case management, on-site assessment, resources, telephonic MH consultation, feedback loop, engagement strategies; pre-intervention group: on-site assessment	74% (14/19)
Rowan et al., 2012	Feasibility study; 1 large multi-specialty medical organization, 19 participating OB clinics (29 OB/GYNs); Texas, USA	n=2,199 preg and pp; n=569 with data at 6 wks pp; no comparison group	Screening in clinical setting; engagement strategies (EPDS 9); resources, referral, and systematic follow-up (EPDS 14)	100% (5/5)
Scholle et al., 2003	Feasibility study; 3 OB practices (11 OB/GYNs, 1 NP, multiple OB residents); Pennsylvania, USA	n=891 preg & pp (different clinic settings); compared to unexposed clinics	Screening in clinical setting, on-site assessment (most by phone), referral evaluation; case management; engagement strategies	100% (5/5)
Truitt et al., 2013	Retrospective Cohort; 5 primary care facilities; Minnesota, USA	n=78 pp (within 1 yr); n=15 Collaborative care; n=63 Usual care	Screening in clinical setting, referral for MH evaluation and treatment as either part of collaborative care management program or routine PPD care, treatment follow-up and remission	88% (15/17)
Venkatesh et al., 2016	Prospective Cohort; 3 OB practices; Massachusetts, USA	n=576 preg and pp (n=396 preg, n=180 pp); no comparison group	Screening in clinical setting, referral by on-site LCSW for MH evaluation, treatment initiation	63% (12/19)

Author, Year	Study Type, Provider Setting, and Geography	Sample Size, Comparison Groups	Intervention	Quality Score*
Wood et al., 2010	Retrospective Cohort; 7 public health centers and 1 community MH clinic; Alberta, Canada	n=100 pp; no comparison group	Screening in clinical setting, referral to PPD consultation service, treatment initiation and follow-up	71% (12/17)

4 As, Assess, Advise, Assist, Arrange; CBT, cognitive behavioral therapy; EPDS, Edinburgh Postnatal Depression Scale; IPT, interpersonal psychotherapy; LCSW, licensed clinical social worker; LIP, licensed independent practitioner; MCPAP, Massachusetts Child Psychiatry Access Program; MH, mental health; MHA, mental health advisor; mo, month; MSS-Plus, Maternity Support Services; MW, midwife; NP, nurse practitioner; OB, obstetric; OB/GYN, obstetrician-gynecologist; PDMP, Perinatal Depression Management Program; pedi, pediatric; PMH, Perinatal Mental Health model; pp, postpartum; PPD, postpartum depression; preg, pregnant; PRISM, PRogram In Support of Moms; psych, psychiatry/psychology; PWH, Partnership for Women's Health model; RCT, randomized controlled trial; SW, social worker; USA, United States; VA, Veterans Affairs; wk, week; yr, year

* Quality scale rating based on modified Downs and Black criteria. Percentage quality score is total score divided by maximum score possible. Maximum score varies based on the eligible number of items on the rating scale according to study type.

Table 3

Interventions and Outcomes of the 21 Studies Included in the Systematic Review of Integrating Depression Care for Pregnant and Postpartum Adult Women in Obstetric Settings

Author, Year	Integrated Care Intervention Components											Outcomes			
	Patient-centered team care*	Measurement-based treatment to target*	Evidence-based care*	Accountable care*	Co-located behavioral health	On-site face-to-face assessment	Access to mental health consult with Psychiatrist	Systematic Provision of Resources to patients	Population-based care*	Healthcare provider feedback loop	Psychoeducation or treatment engagement strategies	Feasibility	Acceptability	Effectiveness	Sustainability
Baker-Ericzen et al., 2008	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	
Baker-Ericzen et al., 2012	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	
Baron et al., 2015	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Byatt et al., 2016						✓	✓	✓				✓			✓
Byatt et al., 2016						✓	✓	✓				✓			
Byatt et al., 2017						✓	✓	✓	✓	✓	✓	✓	✓	✓	
Comelly et al., 2010	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Flynn et al., 2006		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Groje et al., 2015	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hanvey et al., 2012			✓			✓								✓	✓
Joseph et al., 2009			✓		✓									✓	
Katon et al., 2015	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Katon et al., 2017	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Katz et al., 2008			✓		✓									✓	
Miller et al., 2009	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Miller et al., 2012	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Rowan et al., 2012			✓			✓								✓	
Scholte et al., 2003			✓			✓	✓	✓						✓	✓

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Author, Year	Integrated Care Intervention Components										Outcomes				
	Patient-centered team care *	Measurement-based treatment to target *	Evidence-based care *	Accountable care *	Co-located behavioral health	On-site face-to-face assessment	Access to mental health consult with Psychiatrist	Systematic Provision of Resources to patients	Population-based care *	Healthcare provider feedback loop	Psychoeducation or treatment engagement strategies	Feasibility	Acceptability	Effectiveness	Sustainability
Touir et al., 2013	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		✓	
Veekatesh et al., 2016	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓		✓	
Wood et al., 2010		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

* The 5 components of collaborative care