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- Allocate clinical resources to screening, diagnosis, and treatment of perinatal depression

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The Perinatal Depression Treatment Cascade: Baby Steps Toward Improving Outcomes

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ABSTRACT

Objective: Perinatal depression is a common and costly health concern with serious implications for the mother and child. We sought to quantify the “Perinatal Depression Treatment Cascade”—the cumulative shortfalls in clinical recognition, initiation of treatment, adequacy of treatment, and treatment response for women with antenatal (AND) and postpartum depression (PPD).

Data Sources: A systematic search was conducted to identify articles about diagnostic rates, treatment rates, adequate treatment rates, and remission rates for AND and PPD. We searched PubMed and EMBASE through March 2015.

Study Selection: Articles were included if they were in English and examined rates of detection, treatment, adequate treatment, or remission for AND or PPD.

Data Extraction and Analysis: Mean rates of diagnosis, treatment, adequate treatment, and remission were calculated and weighted based on the number of subjects in each study. Search results were dually reviewed for confirmation of study eligibility and data abstraction.

Results: Decrements occur at each branch of the cascade. Data suggest that 49.9% of women with AND and 30.8% of women with PPD are identified in clinical settings; 13.6% of women with AND and 15.8% of women with PPD receive treatment; 8.6% of women with AND and 6.3% of women with PPD receive adequate treatment; and 4.8% of women with AND and 3.2% of women with PPD achieve remission.

Conclusions: Application of the treatment cascade model suggests multiple opportunities for improving perinatal depression management, informing optimal allocation of resources, and providing adequate treatment to this underrecognized and undertreated population.

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Perinatal depression, defined as depressive symptoms occurring either during pregnancy (antenatal depression [AND]) or 4–6 weeks after pregnancy (postpartum depression [PPD]),^{1,2} is a common and costly health concern with serious implications. Estimates of the prevalence of perinatal depression vary depending on the population examined and the time frame and measure used. Between 14% and 23% of women will experience AND.³ An estimated 11% of women will develop PPD within 72 hours of delivery and 16.7% within 3 months postpartum; 21.9% of women will experience a depressive disorder within the first 12 months after pregnancy.⁴

Both AND and PPD have been associated with significant adverse outcomes for the mother and infant. AND places the mother at risk

- Perinatal depression is common and costly. The Perinatal Depression Treatment Cascade was examined to formally define and evaluate treatment needs.
- 95% to 97% of women with perinatal depression are not successfully treated.
- Given the gaps that exist in this cascade, including low rates of diagnoses, treatment, adequate treatment, and symptom remission, more thoughtful allocation of resources needs to be considered at each interval.

for numerous long-term health complications, including hypertension and diabetes,⁵ and has been linked to maternal gestational weight retention, preeclampsia, and preterm birth, all of which increase the risk of cardiovascular disease and cause morbidity and mortality.⁶⁻⁸ Untreated AND has repeatedly been shown to be one of the greatest risk factors for development of PPD,^{3,9,10} and PPD has been deemed the greatest risk factor for maternal suicide and infanticide.¹¹

PPD is associated with maternal difficulties in bonding with and nurturing the newborn, which affect brain development.¹² PPD has also been associated with low birth weight as well as toxic stress, a dangerous form of stress response in the newborn that leads to persistently elevated cortisol levels that disrupt developing brain architecture and other organ systems, resulting in anatomic changes or physiologic dysregulations that may later impair learning and cause behavior difficulties in the child.^{7,13-17} For example, in children with histories of toxic stress, cortisol levels remained persistently elevated at preschool age.¹⁸

Furthermore, PPD has been associated with lactation failure, or unplanned weaning.¹⁹ The literature also demonstrates that there is an increased risk for long-term mental health problems in children of women with PPD, which is an additional encumbrance on both society and the health care system at large.^{12,20,21} Indeed, the 2-generational annual economic cost in the United States of not treating 1 mother with peripartum depression is \$22,647.²² Data from the United States in 2008 involving an estimated 657,800 pregnancies in women with AND suggest that this cost could reach approximately 15 billion health care dollars each year.

Importantly, perinatal depression is often a trigger for onset of chronic major depressive disorder, as almost 1 in 3 women still report depressive symptoms at least 4 years after childbirth.²³ As with other illnesses, including major depressive disorder, a successful clinical response to perinatal depression requires a sequence of steps: the affected individual must enter the health care system, be recognized clinically, initiate treatment, receive an adequate trial of treatment, and experience remission of symptoms.²⁴

Prior work has created a useful framework for how to consider the treatment of perinatal depression.²⁴ We examined the “Perinatal Depression Treatment Cascade”—the cumulative shortfalls in clinical recognition, initiation of treatment, adequacy of treatment, and treatment response for women with AND and PPD in the health care system. Consideration of gaps along this continuum can help

identify ways to effectively improve the identification and management of perinatal depression.

THE PERINATAL DEPRESSION TREATMENT CASCADE

The steps required for successful treatment of perinatal depression can be understood to lie along a continuum of treatment (Figure 1).²⁴ The timing of onset of perinatal depression is an area of controversy in the field. Recently, the *DSM-5* expanded the definition of perinatal depression to include onset during pregnancy (peripartum onset), in addition to within the first 4 weeks postpartum, while the *ICD-10* includes up to 6 weeks postpartum (PPD).^{1,2} However, grouping antenatal and postpartum episodes, and not differentiating between the two, may be problematic. The means of identifying, managing, and monitoring these women over time very likely differs depending on timing of symptom onset.²⁵

Accordingly, we reviewed the literature regarding the proportion of perinatal depression cases that are recognized clinically, the proportion of recognized cases that are then treated, the proportion of treated cases that receive an adequate trial of treatment, and the proportion of adequately treated cases that achieve full remission of symptoms. We separated AND and PPD to examine gaps that exist in the treatment cascade and determine where resources ought to be allocated so these patients may be optimally treated.

METHODS

Search Strategy

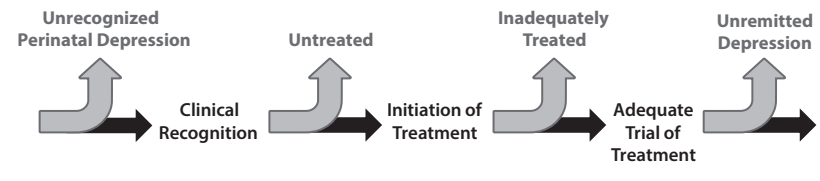
A systematic search was conducted to identify articles pertaining to the diagnostic rates, treatment rates, adequate treatment rates, and remission rates for AND and PPD. The computerized databases of PubMed and EMBASE were searched through March 2015. Broad search terms were used to ensure as many articles as possible would be identified. The search strategy used was (*perinatal* OR *postpartum* OR *pregnant* OR *antenatal*) AND *depression* AND (*screen* OR *detection* OR (*adequate* AND *treatment*) OR *remission* OR *psychotherapy*). Additional studies were identified through careful inspection of reference sections of the relevant articles from the initial search.

Study Eligibility

Studies were included if they were in English and examined detection rates, treatment rates, adequate treatment rates, or remission rates for AND or PPD. In an effort to best capture a complete picture of the existing literature, all types of studies were initially evaluated, including letters to the editor, pilot studies, and open-label studies. Outcomes were operationalized as different steps along the treatment cascade. Interventions were categorized as treatment with either pharmacologic agents or psychotherapy. An adequate trial of treatment was defined as receiving at least 6 weeks of daily use of antidepressants at the recommended starting dose or more or receiving an established and accepted method of

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Figure 1. The Perinatal Depression Treatment Cascade



psychotherapy that lasted for at least 6 weeks. Any studies not meeting our inclusion criteria were excluded. In addition, studies that used informal means of treatment (ie, support groups) and studies that presented response to treatment but did not include calculated remission rates were excluded.

Review Process, Data Extraction, and Analysis

The literature search, study review, and data extraction were initially conducted by one individual (N.A.S.); at each step, the findings were confirmed by a second reviewer (E.Q.C., B.N.G., or S.E.M.-B.) before proceeding to the next step. Any questions that arose were resolved by discussion among all reviewers. The titles of all studies identified as a result of our search strategy were examined, and studies that clearly did not pertain to our topic of interest were eliminated. Studies clearly not meeting our inclusion criteria, based on their abstracts, were eliminated from further review. The full-text articles of the remaining studies were examined for inclusion, and data extraction was conducted if deemed appropriate. From the included studies, the full text of each article was reviewed and specific information was extracted, including study location, number of participants, time frame of the study, means of diagnosing depression, definition of remission from depression, rates of diagnosis, rates of treatment, rates of adequate treatment, rates of remission from depression, and type of treatment used.

Mean rates of diagnosis, treatment, adequate treatment, and remission were weighted based on the number of subjects in each study, and 95% confidence intervals were calculated.²⁶ For studies that used more than one measurement tool to determine remission, the tool that gave the lower value of remission was used, as this very likely represented more stringent criteria to determine patient treatment responses. Individual remission rates were calculated for studies that used psychotherapy treatment only versus pharmacologic treatment only, as well as an overall remission rate. Given the small number of studies, we combined the results from studies using different types of psychotherapy (eg, cognitive-behavioral therapy [CBT], interpersonal therapy), although we realize that different therapeutic techniques may have different efficacies. To determine absolute numbers of individuals affected at each step of the treatment cascade, data were extracted from the National Vitals Statistic Report from 1990 to 2008.²⁷ Values for the actual prevalence of AND and PPD were calculated based on accepted prevalence rates of 10% and 13%, respectively, of women in the United States using these data. Values for each step of the treatment cascade were then calculated using the mean rates determined above.

RESULTS

Our approach identified 1,215 articles for consideration. Four additional articles were identified from reviewing the reference sections of included articles. On the basis of our a priori inclusion criteria, we eliminated 1,121 records at the abstract level (including 501 duplicates) and identified 98 records that were examined more closely for eligibility. Of the 98 records initially included, 66 were eliminated from further evaluation because they did not give actual remission rates for AND or PPD, resulting in 32 records that were included in the analyses. From these 32 records, we extracted specific data, including the percentage of women with AND or PPD who were diagnosed with the disorder, initially treated for the disorder, and adequately treated for the disorder and who went into remission with treatment. An adequate trial of treatment was defined as at least 6 weeks of daily use of antidepressants at the recommended starting dose or greater, or an established and accepted method of psychotherapy that lasted for at least 6 weeks. All studies providing the above results were included, regardless of the quality of the study. Our approach is highlighted in PRISMA flowchart (Figure 2); included studies are highlighted in Table 1.²⁸⁻⁵⁹

Steps Along the Perinatal Depression Treatment Cascade

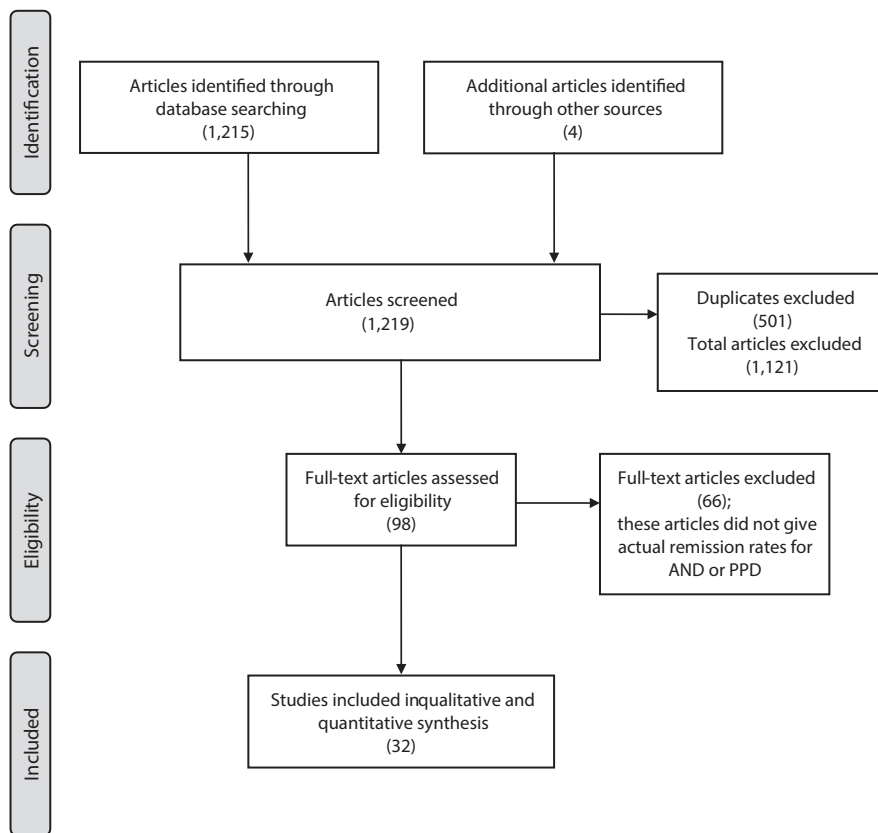
As shown in Figure 1, the Perinatal Depression Treatment Cascade consists of prevalent cases of perinatal depression (AND and PPD), which is clinically recognized and diagnosed, and followed by treatment initiation, identification of an adequate trial of treatment, and, finally, remission of symptoms. Figure 3 highlights the percentage of women in each of these categories as well as the percentage receiving an adequate trial of treatment and demonstrating remission of symptoms.

Clinical Recognition: Rate of Diagnosis

Diagnosis of AND. Three studies²⁸⁻³⁰ examined the rate of diagnosis of women with AND in the general population. One of the studies²⁸ involved 3 women, while the other 2 studies^{29,30} had over 100 participants each (109 and 134, respectively). All 3 studies were longitudinal in design. Two of the studies used a screening tool (the Edinburgh Postnatal Depression Scale [EPDS])⁶⁰ to identify women with AND and then used chart review to identify which of those women were given a diagnosis of depression by their clinicians. The remaining study used a structured diagnostic interview (the Structured Clinical Interview for DSM-IV-TR⁶¹) to identify

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Figure 2. PRISMA Flowchart



Abbreviations: AND=antenatal depression, PPD=postpartum depression.

women with AND and then used chart review to determine which of those women were given a diagnosis of depression by their clinicians.³⁰ This study had the highest rate of diagnosis by clinicians. The weighted mean rate of diagnosis of AND in these studies was 49.9% (95% CI, 48.4%–51.4%) with a range of 41%–100% (Figure 3).

Diagnosis of PPD. Five studies^{28,29,39–41} examined the rate of diagnosis of women with PPD in the general population. The weighted mean diagnosis rate from these studies was 30.8% (95% CI, 30.2%–31.4%) with a range of 15%–49%. One of the studies was much larger in number than the others,³⁹ which may have had a greater effect on the weighted mean. This study was also the only one that used chart review to first identify women with PPD, while the others used the EPDS. This study was also the only one to follow up as far out as 5–9 months after birthgiving, while all other studies looked at women 3–6 weeks after birth. Despite all these differences, the diagnosis rate in this study (30%) was near the simple mean diagnosis rate of 33%; the larger study had minimal effect on the overall weighted mean (Figure 3).

Treatment Initiation

Treatment of AND. Six studies^{28,29,31–34} examined the rate of treatment of women who had been diagnosed with AND. There was a wide range in the size of these studies, with total number of subjects ranging from 3 to 689. One of the

medium-sized studies³⁴ had a 0% treatment rate. Four of the studies used the EPDS to identify women with AND, while 2 used the Center for Epidemiologic Studies-Depression Scale.⁶⁴ Half of the studies were longitudinal in design, while the other half were cross-sectional. None of these variables appeared to affect the treatment rates. The weighted mean rate of treatment of women with AND was 13.6% (95% CI, 11.3%–15.8%), with a range of 0%–100% (Figure 3).

Treatment of PPD. Four studies^{28,29,34,42} examined the rate of treatment for women with PPD. All 4 studies were longitudinal in design and all used the EPDS to identify women with PPD. Two of the studies used telephone interviews to determine how many women with PPD were treated,^{34,42} while 2 studies^{28,29} used chart review. The weighted mean rate of treatment from these studies was 15.8% (95% CI, 14.8%–16.9%), with a range of 10%–27% (Figure 3).

Adequacy of Treatment

Adequate Trial of Treatment of AND. One study³² retrospectively examined the number of “high risk” pregnant women (defined as women who were either identified through depression screening tools or clinician-identified through the use of a structured interview) who received “any treatment” for depression and those who received “adequate antidepressant treatment.” An adequate trial of treatment was defined as receiving at least 6 weeks of daily

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Table 1. Studies Included in the Analysis

Study	Population and Treatment Duration/Timing	Type of Study	N	Percentage of Interest	Means of Measurement	Treatment
ANTENATAL						
Diagnosis				% Diagnosed		
Burton et al (2011) ²⁸	Community-based medical center 36 wk	Longitudinal	3	100%	EPDS, chart review	...
Goodman and Tyler-Viola (2010) ²⁹	Urban teaching hospital Third trimester	Longitudinal	109	41%	EPDS, chart review	...
Lyell et al (2012) ³⁰	Urban teaching hospital 12–30 wk	Cohort	134	56%	SCID, chart review	...
Weighted mean				49.9%		
Treatment				% Treated		
Burton et al (2011) ²⁸	Community-based medical center 36 wk	Cross-sectional	3	100%	EPDS, chart review	Antidepressant
Carter et al (2005) ³¹	OB clinics First trimester	Longitudinal	49	12%	EPDS	CBT
Flynn et al (2006) ³²	Hospital-based OB clinics Mean = 21.6 wk pregnant	Cross-sectional	46	33%	CES-D, SCID	Any treatment
Goodman and Tyler-Viola (2010) ²⁹	Urban teaching hospital Third trimester	Longitudinal	113	15%	EPDS, chart review	Any treatment
Marcus et al (2003) ³³	10 OB clinics	Cross-sectional	689	14%	CES-D, questionnaire	Any treatment
Rowan et al (2012) ³⁴	OB clinic First trimester	Longitudinal	102	0%	EPDS, telephone follow-up	Any treatment
Weighted mean				13.6%		
Adequate Treatment				% Adequately Treated		
Flynn et al (2006) ³²	Hospital-based OB clinics	Cross-sectional	276	8.6%	CES-D, SCID	Antidepressant
Remission				% Treated Achieving Remission		
Grote et al (2009) ³⁵	Large hospital-based clinics Mean = 22.6 wk	RCT	22	95%	EPDS Remission = no longer met criteria by SCID	IPT
Spinelli (1997) ³⁶	Psychiatric clinic of teaching hospital Duration not reported	Open-trial pilot study	13	100%	DSM-III-R criteria Recovery = HDRS ≤ 6	IPT
Spinelli and Endicott (2003) ³⁷	Psychiatric clinics of teaching hospital, OB referrals Mean = 21.5 wk	Controlled clinical trial	21	19%	DSM-IV criteria Recovery = HDRS ≤ 6	IPT
Spinelli et al (2013) ³⁸	OB clinics in city hospitals Mean = 22.4 wk	RCT	43	42%	DSM-IV criteria Recovery = HDRS ≤ 6	IPT
Weighted mean				56.5%		
POSTNATAL						
Diagnosis				% Diagnosed		
Burton et al (2011) ²⁸	Community-based medical center 6 wk	Longitudinal	20	15%	EPDS, chart review	...
Coates et al (2004) ³⁹	Women in large HMO 5–9 mo	2-part (retrospective and cohort)	1,966	30%	Chart review, telephone interview	...
Goodman and Tyler-Viola (2010) ²⁹	Urban teaching hospital 6 wk	Longitudinal	51	29%	EPDS, chart review	...
Hearn et al (1998) ⁴⁰	Seven OB clinics Up to 6 wk	Cross-sectional	30	43%	EPDS, clinical interview	...
Nishizono-Maher et al (2004) ⁴¹	Community health center 3–4 wk	Cross-sectional	88	49%	EPDS, chart review	...
Weighted mean				30.8%		
Treatment				% Treated		
Burton et al (2011) ²⁸	Community-based medical center 6 wk	Longitudinal	20	10%	EPDS, chart review	Any treatment
Goodman and Tyler-Viola (2010) ²⁹	Urban teaching hospital 6 wk	Longitudinal	51	27%	EPDS, chart review	Any treatment
Horowitz and Cousins (2006) ⁴²	Community-based population 3–4 mo	Longitudinal	122	11%	EPDS, telephone interviews	Psychotherapy or medications
Rowan et al (2012) ³⁴	OB clinics 6 wk	Longitudinal	28	18%	EPDS, telephone interview	Any treatment
Weighted mean				15.8%		

(continued)

Table 1(continued). Studies Included in the Analysis

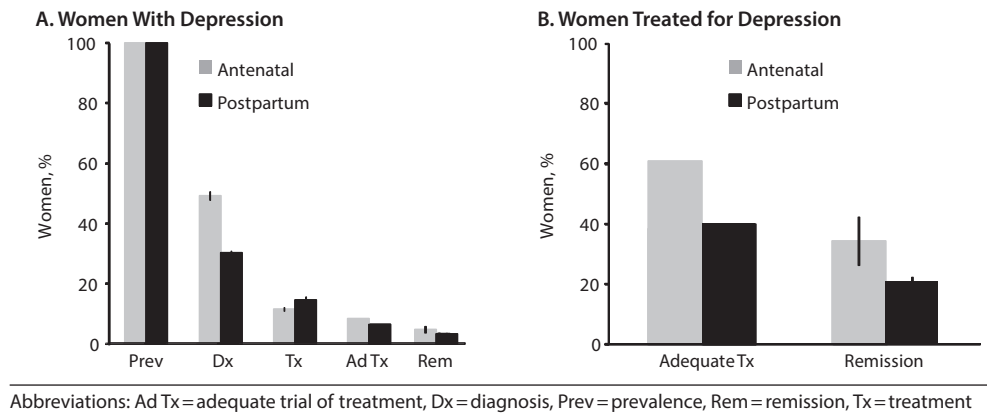
Study	Population and Treatment Duration/Timing	Type of Study	N	Percentage of Interest	Means of Measurement	Treatment
				% Treated Achieving Remission		
Psychotherapy						
Bloch et al (2012) ⁴³	Single-site medical center Mean = 14 wk	RCT	20	50%	SCID Remission = MADRS < 10 or EPDS < 7	Brief dynamic psychotherapy
Chabrol et al (2002) ⁴⁴	OB clinic 10–12 wk	Unblinded RCT	21	71%	DSM-IV Remission = HDRS < 7	Counseling (supportive, education, and CBT)
Cooper et al (2003) ⁴⁵	OB hospital records 8–18 wk	10-wk, RCT	42 to 48	CBT: 57%, psychodynamic: 71%, counseling: 54%	DSM-III Remission = DSM-III	CBT, psychodynamic, counseling
Freeman and Davis (2010) ⁴⁶	Hospital clinic Duration not reported	8-wk, open trial	59	31%	SCID Remission = HDRS < 8	Supportive psychotherapy
Klier et al (2001) ⁴⁷	University hospital clinic Mean = 19 wk	12 sessions, open trial	17	59%	EPDS, HDRS Remission = HDRS ≤ 9	Group IPT
Mulcahy et al (2010) ⁴⁸	Community recruitment Mean = 6.6 mo	8-wk, RCT	23	44%	EPDS, HDRS Remission = HDRS?	Group IPT
O'Hara et al (2000) ⁴⁹	Community screening Mean = 6.1 mo	12-wk, RCT	60	32%	DSM-IV Remission = HDRS ≤ 6	Individual IPT
Reay et al (2006) ⁵⁰	Community recruitment Mean = 6.2 mo	12 sessions, open trial	18	50.0%	DSM-IV Remission = HDRS < 8	Group IPT
Stuart and O'Hara (1995) ⁵¹	Community screening Mean = 4.1 mo	12-wk, open trial	6	100%	DSM-III-R criteria Remission = absence of MDD criteria	Individual IPT
Wickberg and Hwang (1996) ⁵²	Child health clinics 3 mo	6-wk, RCT	15	80%	DSM-III-R criteria Remission = DSM-III-R	Nondirective counseling
<i>Weighted mean</i>				51.2%		
Psychopharmacologic						
Cohen et al (2001) ⁵³	Hospital clinic 3 mo	8-wk, flexible-dose, open trial	15	80%	SCID Remission = HDRS ≤ 7 or CGI ≤ 2	Venlafaxine
Nonacs et al (2005) ⁵⁴	Community health centers/ advertisements Duration not reported	8-wk, open-label trial	8	38%	DSM-IV criteria Remission = HDRS ≤ 7	Bupropion SR
Stowe et al (1995) ⁵⁵	Teaching hospital, psychiatric clinic 6 mo	8-wk, open-label trial	21	54%	DSM-III-R criteria Remission = SIGH-D < 7, CGI = 1, GAF > 80	Sertraline
Suri et al (2001) ⁵⁶	Teaching hospital, psychiatric clinic 8 wk	8-wk, open-label trial	6	67%	HDRS, EPDS Remission = HDRS < 7	Fluvoxamine
Suri et al (2005) ⁵⁷	Teaching hospital, psych clinic 8 wk	8-wk, open-label trial	4	75%	SCID Remission = HDRS < 7	Nefazodone
Wisner et al (2006) ⁵⁸	3 Urban clinical sites 3 mo	8-wk, double-blind trial	109	47%	HDRS ≥ 18 Remission = HDRS < 7	Nortriptyline vs sertraline
Yonkers et al (2008) ⁵⁹	Multisite teaching hospitals 3 mo	8-wk, parallel, placebo-controlled trial	26	37%	DSM-IV criteria Remission = HDRS ≤ 8	Paroxetine vs placebo
<i>Weighted mean</i>				49.8%		
Psychotherapy + psychopharmacologic						
Bloch et al (2012) ⁴³	Single-site medical center Mean = 14 wk	RCT	20	65%	SCID Remission = MADRS < 10 or EPDS < 7	Brief dynamic psychotherapy + sertraline
<i>Total weighted mean</i>				51.2%		

Abbreviations: CBT = cognitive-behavioral therapy; CES-D = Center for Epidemiologic Studies-Depression scale; CGI = Clinical Global Impressions scale; DSM-III-R = *Diagnostic and Statistical Manual of Mental Disorders*, Third Edition, Revised; DSM-IV = *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition; EPDS = Edinburgh Postnatal Depression Scale; GAF = Global Assessment of Functioning; HDRS = Hamilton Depression Rating Scale; HMO = health maintenance organization; IPT = interpersonal psychotherapy; MADRS = Montgomery-Asberg Depression Rating Scale; MDD = major depressive disorder; OB = obstetrics; RCT = randomized controlled trial; SCID = Structured Clinical Interview for DSM-IV-TR Disorders; SIGH-D = Structured Interview Guide for the Hamilton Depression Rating Scale; SR = sustained release.

Symbol: ... = not applicable.

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Figure 3. Percentage of US Women at Each Step of the Perinatal Depression Treatment Cascade



use of antidepressants at the recommended starting dose or more or receiving an established and accepted method of psychotherapy that lasted for at least 6 weeks. The researchers found that approximately 20% of the women received any treatment, and, of those that received any treatment, 43% received an adequate trial of treatment. Thus, of the whole population of women with AND, only 8.6% received an adequate trial of treatment (Figure 3).

Adequate Trial of Treatment of PPD. No studies were identified that examined the rate of women with PPD who received an adequate trial of treatment. Estimates from the general population suggest that approximately 40% of people with depression are adequately treated.²⁴ This value is similar to the 43% value seen in the single study on AND.³² Given that 15.8% of women with PPD receive any treatment, we estimate that approximately 6.3% of all women with PPD receive an adequate trial of treatment (Figure 3).

Treatment Response: Rate of Remission

Treatment Response of AND. Four studies^{35–38} were identified that used psychotherapy treatment and reported remission rates for AND. No studies were identified that used pharmacologic therapy and reported remission rates for AND. The 4 studies had a weighted mean remission rate of 56.5% (95% CI, 48.5%–64.4%) and had a range of 19%–100% (Figure 4, Table 1). One of the studies³⁶ was a 1-armed, pilot study with outcome assessors who were not blinded to treatment and had a 100% remission rate. It was included in our analysis despite the poor study design given the small number of overall studies identified. If this study were excluded, the mean remission rate would then be 43.3% (95% CI, 35.5%–51.1%). Given that only 8.6% of all women with AND receive adequate treatment, and using the weighted mean remission rate, an estimated 4.8% of all women with AND achieve remission (Figure 3).

Treatment Response of PPD. Seventeen studies^{43–59} examined the rate of remission of women with PPD who were adequately treated for PPD. Seven^{53–59} of the 17 studies used a pharmacologic intervention alone for treatment and had a weighted mean remission rate of 49.8% (95% CI,

49.0–50.6%) and a range of 38%–80% (Figure 4, Table 1). Ten^{43–52} of the 17 studies used a psychotherapy intervention alone for treatment and had a weighted mean remission rate of 51.2% (95% CI, 49.1%–53.3%) and a range of 31%–100% (Figure 4, Table 1). One study⁴³ examined psychotherapy in addition to pharmacotherapy and had a remission rate of 65% in the psychotherapy + pharmacotherapy group. Overall, a variety of psychotherapy techniques were used, including brief dynamic psychotherapy, CBT, supportive psychotherapy, interpersonal psychotherapy, and nondirective counseling. Most of the studies were small in size, with only 1 pharmacologic study with more than 100 participants. Remission was defined in various ways, including based on diagnostic criteria using the *DSM-IV*⁶⁶ or *DSM-III*⁶⁷ as well as cutoffs on the Hamilton Depression Rating Scale (HDRS),⁶⁸ the Structured Interview Guide for the Hamilton Depression Rating Scale (SIGH-D),⁶⁹ the Montgomery-Asberg Depression Rating Scale (MADRS),⁷⁰ and the Clinical Global Impressions scale (CGI).⁷¹ The overall weighted mean rate of remission was 51.2% of adequately treated women (95% CI, 48.6%–53.8%), with a broad range of 31%–100% (Figure 4, Table 1). Overall, given that only 6.6% of all women with PPD receive adequate treatment and using the overall weighted mean remission rate, an estimated 3.2% of all women with PPD achieve remission.

DISCUSSION: POTENTIAL AREAS TO ADDRESS THE PERINATAL DEPRESSION TREATMENT CASCADE

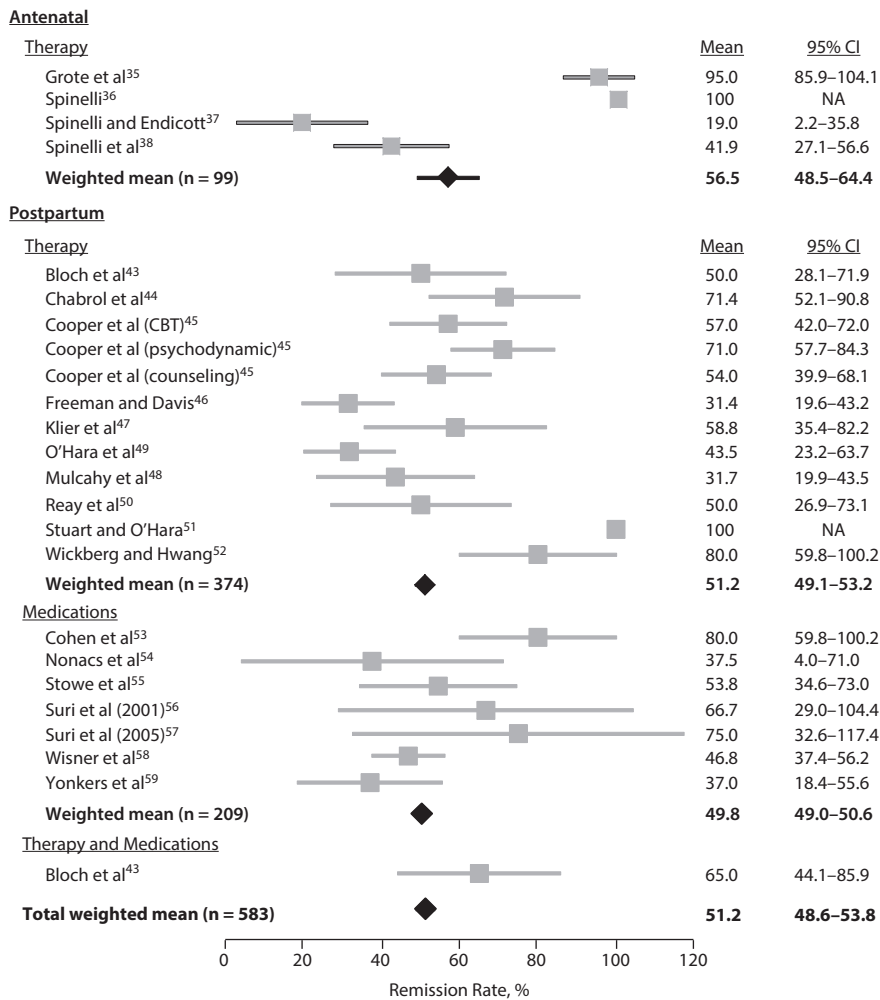
The framework provided offers a suggestion for potential intervention points to address the drop off between the subsequent steps.

Improving Detection: To Screen or Not to Screen?

Over 50% of women with AND or PPD are going unrecognized and undiagnosed (Figure 3). One strategy to improve outcomes would be to increase the number of women with AND or PPD who are successfully screened as a first step, which could ultimately improve treatment outcomes. Screening for perinatal depression has been mandated in

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Figure 4. Analysis of Studies of Perinatal Depression Remission



Abbreviations: CBT=cognitive-behavioral therapy, CI=confidence interval, NA=not applicable.

several states,⁷² and given that the *DSM-IV* had previously focused solely on PPD, most screening interventions to date have been targeted during the postpartum period.⁷³ Screening alone has been shown to have little to no impact on detection and management of PPD by clinicians,⁷⁴ and without formal diagnostic evaluations or treatment implementation, screening in and of itself may not be justifiable or cost effective.^{75–77} As with general depression screening programs, substantial staff assistance and support are required for PPD screening programs to be successful.⁷⁸ Ensuring follow-up care is paramount. During pregnancy, women have the highest contact with the health care system, making this an easier time for screening and identification; however, psychotherapy may not be available in many settings, and not everyone is comfortable treating pregnant women with psychotropic medications. Postpartum women make most contact with the health care system through their children's pediatricians, who are largely focused on treating their identified patients—the children. However, the provision of quality care to the child should include ensuring the child is in a safe environment, with a healthy mother.

Treating maternal PPD will improve child developmental outcomes and form the basis of family-centered care.

Improving Treatment Initiation

According to our estimates, approximately 85% of women with AND or PPD are not receiving treatment (Figure 3). Once these women are identified, appropriate treatments need to be available. Disease management programs, consisting of interdisciplinary care teams within health systems, have been shown to improve detection, treatment, and management of patients with MDD,^{79,80} as have systematic care management protocols utilizing a team-based approach with physicians and nonphysician case managers.^{80–82} Disease management programs have proved successful in treating depression in the non-perinatal population; therefore, these programs may prove to be equally efficacious for patients with AND and PPD.

Improving Adequacy of Treatment

Prior systematic review analyses involving depression in primary care indicate that the greatest hurdle to long-term

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relief from MDD is probably inadequate treatment, rather than insufficient identification.⁸⁰ Our results suggest that this scenario is likely also true for AND and PPD. Only 8.6% of all women with AND and 6.6% of women with PPD receive an adequate trial of treatment, leaving over 90% of women suffering from these disorders with inadequate treatment and little relief (Figure 3). AND is the biggest risk factor for PPD, and an estimated 60%–70% of women will experience relapse when terminating antidepressant use during pregnancy.⁸³

The American Psychiatric Association and American Congress of Obstetrics and Gynecology both recommend either psychotherapy or antidepressant medication as first-line treatment for mild-to-moderate depression.⁸⁴ Medication treatment and psychotherapy are each effective treatments for perinatal depression.^{85–87} It is key to ensure that women are receiving adequate trials of these available and efficacious treatments.

Improving Remission: Bringing Mental Health Care to the People

According to our data, only approximately 3%–5% of women with PPD or AND are experiencing remission of their symptoms, indicating that nearly 95%–97% of these women are not successfully treated (Figure 3). Perinatal women experience numerous barriers in receiving accessible and available health care. One model that could be modified to systematically address perinatal mental health is the “Centering Pregnancy” model of care delivery. Centering Pregnancy is a group prenatal care model that was designed to address ways to improve the quality of perinatal care.^{88–90} A curriculum is delivered in a series of 10 group sessions over a 6-month time period with goals of improving health literacy by establishing a continuum of care.⁸⁸ Areas of focus have included nutrition counseling, breastfeeding, and maternal weight gain. Mental health has not yet been addressed in this model,⁸⁹ and it is possible that by adding mental health to group perinatal care models, we could improve awareness, treatment initiation, adequacy of treatment, and, ultimately, remission of symptoms for these women.

Furthermore, a collaborative, multidisciplinary approach among psychiatry, obstetrics and gynecology (OB/GYN), and pediatrics may help address this public health care problem. In a group of depressed women in an OB/GYN setting, those who received collaborative care experienced a greater satisfaction with patient care, demonstrated an improvement in functioning, were more likely to have their depressive symptoms decreased by 50% at 12 months out from treatment, were more likely to attend at least 4 or more mental health specialty visits, and were more likely to receive an adequate dose of an antidepressant.⁹¹ Furthermore, the women within that cohort who had no insurance or public coverage benefited the most from the collaborative care model.⁹² Two studies^{94,95} have examined collaborative care in specifically treating PPD. In the stepped care intervention program, women enrolled in collaborative care had better understanding of their diagnosis of PPD, as well as actual receipt of treatment.⁹⁵ In the TRIPPD (Translating Research

Into Practice for Postpartum Depression) study,⁹⁴ 28 practices were randomized to either usual care or an intervention utilizing collaborative care with tools for PPD screening, diagnosis, initiation of treatment, and follow-up within the practice; women who were enrolled in collaborative care were more likely to receive treatment for PPD and had lower levels of depressive symptoms at 6 and 12 months postpartum. Alternative methods of reaching out to patients and bringing mental health care directly to the consumer are also promising. A manualized telephone-based peer support program reaching out to patients in their home postpartum may also prove to be efficacious.⁹⁶

While universal screening for AND or PPD could become standard of care, providers will need to know what to do with a positive result, and collaborative care models, as well as innovative programs such as telephone-based peer support programs, may provide appropriate instructions for how to access care and proceed with treatment. Limitations of such models may include political and cultural fit, cost, level of resources required, necessary expertise needed, and ease of adoption.^{89,97}

CONCLUSIONS

In our review, we found similarly low rates of diagnosis, treatment, and remission for both AND and PPD. While improvements are being made in identifying and screening women for perinatal depression, management remains grossly inadequate: nearly 50%–70% of women go undetected, approximately 85% go untreated, 91%–93% are not adequately treated, and 95%–97% continue to suffer from symptoms without remission. Our data show greater challenges for PPD, which has lower diagnostic, adequate treatment, and remission rates than AND (30.8%, 6.3%, and 3.2%, vs 49.9%, 8.6%, and 4.8%, respectively). In 2008, there were 6,578,000 pregnancies and 4,248,000 births in the United States.²⁷ Using estimates of prevalence of 10% for AND and 13% for PPD, our data suggest that 657,800 women developed AND and 552,240 women developed PPD that year. Of these women, only 31,772 women with AND and 17,893 women with PPD achieved remission, leaving 626,028 women with uncontrolled AND and 534,347 women with uncontrolled PPD.

Our study does have several limitations. We completed a strategic, systematic search; however, we did not complete a formal systematic review (and therefore had no formal means for quality assessment of included studies). It is possible that some relevant studies were missed; however, in general, the literature available in this area is minimal. Additionally, we extrapolated data for adequate trials of treatment from non-perinatal populations due to lack of available data for perinatal women. However, given the lack of data for the perinatal populations, these results may actually overestimate actual rates, making the actual proportion of patients who remit even lower than our calculated rates. As more data become available in this area, further analyses of rates will be needed.

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Results from the existing mandated screening programs for perinatal depression indicate that screening these women alone is insufficient.⁷⁶ The educational campaign and screening used were not associated with improved treatment initiation, follow-up, or continued care in the Medicaid population of New Jersey.⁹⁸ In another study reviewing 54 mandated screening programs, only 8 of these programs had clearly stated both their interventions and outcomes in their reports.⁹⁹ Given that these diseases have validated, efficacious treatments, these findings highlight the need for more thoughtful allocation of our limited resources so that patients may be optimally treated. Once a patient has a positive screen for depression, referral for a diagnostic assessment and proper treatment must be initiated.⁷⁷ Indeed, screening in combination with additional interventions has been associated with superior rates of both detection and treatment in perinatal care settings.¹⁰⁰ Further mechanisms must be put into place for such programs to succeed, such as monitoring that screening is actually occurring or providing incentives to providers to screen individuals and follow-up on patient care.

Our proposed treatment cascade identifies multiple steps along the perinatal management continuum at which increased effort could substantially improve outcomes. Consistent with the United States Preventive Services Task Force recommendation that adults should be screened for depression when staff-assisted depression care supports are in place to systematically assure accurate diagnosis, effective treatment, and follow-up,¹⁰¹ a model for the perinatal population that addresses each one of these steps by providing evidence-based support could very likely produce substantially beneficial effects. Indeed, a collaborative care model is associated with better results, as compared to non-integrative models, by adequately treating patients and improving patient satisfaction with care.⁹¹ At each branch of the treatment cascade, improvements must be considered in order to optimally allocate resources and provide sufficient treatment to patients with perinatal depression. Ultimately, a combination of system-level enhancements for the identification and treatment of perinatal depression is necessary to substantially improve depression outcomes and quality of life among pregnant and postpartum women with depression.

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Drug names: bupropion SR (Wellbutrin, Aplenzin, and others), fluvoxamine (Luvox and others), nortriptyline (Pamelor and others), paroxetine (Paxil, Peveva, and others), sertraline (Zoloft and others).

Disclosure of off-label usage: The authors have determined that, to the best of their knowledge, bupropion, fluvoxamine, nortriptyline, paroxetine, sertraline, venlafaxine, and nefazodone are not approved by the US Food and Drug Administration for the treatment of perinatal depression.

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POSTTEST

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1. What is the *approximate* estimated prevalence of perinatal depression in the general population?
 - a. 5%–10%
 - b. 10%–20%
 - c. 20%–30%
 - d. 40%–50%
2. Screening women for postpartum depression (PPD) has been shown to have great impact on detection and management of PPD by clinicians.
 - a. True
 - b. False
3. Ms A is a 32-year-old woman with no prior psychiatric history who is currently 20 weeks pregnant with her first baby. She presents for evaluation because she has excessive anxiety that her baby will have numerous birth defects. Ms A has been unable to sleep at night, has been isolating herself during the day, experiences frequent crying spells, and is unable to enjoy previously pleasurable activities. She says she feels hopeless that she will ever feel better and worries that she is unfit to be a mother. Which intervention would be *best* to help Ms A to achieve remission of her symptoms?
 - a. Start sertraline
 - b. Refer Ms A for interpersonal psychotherapy
 - c. Provide Ms A with a peer support helpline
 - d. Provide collaborative care possibly combining medication, psychotherapy, and community support resources