# Postpartum Depression Screening in the Pediatric Emergency Department

*Beth L. Emerson, MD,\* Ellen R. Bradley, MD,† Antonio Riera, MD,\* Linda Mayes, MD,‡ and Kirsten Bechtel, MD\**

**Purpose:** This study aimed to determine the prevalence of and risk factors for postpartum depression (PPD) in mothers of young infants presenting to the pediatric emergency department (PED).

**Methods:** This was a prospective, observational study to evaluate the prevalence of PPD in a sample of mothers of young infants presenting to the PED of an urban, tertiary care children's hospital. A convenience sample of mothers with infants younger than 4 months who presented to our urban, tertiary care PED was surveyed in English or Spanish using the Edinburgh Postpartum Depression Scale (EPDS). Demographic information was collected. Members of the study team evaluated and counseled those mothers who screened positive on the EPDS (score ≥ 10). During the PED visit, social work consultation and mental health resources were also offered. Resource use and additional mental health needs were assessed, with a follow-up telephone call 4 weeks after the initial ED presentation. Performance characteristics of a brief, 3-question anxiety subset were compared using a positive EPDS as the reference standard. All study participants were given information about community resources for new mothers. Data were analyzed using $t$ test or $\chi^2$ (with Yates correction as necessary).

**Results:** A convenience sample of 200 mothers was enrolled; 31 (16%) of these mothers had an EPDS score of 10 or greater. Mothers had a mean age of 27 years (range, 15–41); 45% were first-time mothers; 40% got pediatric care in a state-funded clinic; and 10% were Spanish speaking. There were no statistically significant differences in baseline demographic characteristics of mothers with and without PPD. Mothers who were depressed were more likely to report that they either strongly agreed or agreed with the statement "I feel that my child is always fussy" ($P = 0.004$). The anxiety subscale produced a sensitivity of 0.87 (95% confidence interval [CI], 0.69–0.96), a specificity of 0.70 (95% CI, 0.63–0.77), and a negative predictive value of 0.97 (95% CI, 0.91–0.99). The majority of participants (92%) reached at follow-up reported improvement in their mood. Fifty percent reported discussing their mood with someone else, although only 33% of these women did so with a medical provider.

**Conclusions:** Postpartum depression affects a significant number of mothers of young infants who present to the PED for medical care. There are no clear demographic identifiers of these at-risk mothers, making universal screening an advisable approach. Capture of at-risk mothers during PED visits may accelerate connection with mental health resources. Anxiety seems to be a significant contributor. Mothers with PPD often characterize their infants to have a "fussy" temperament. The most appropriate referral for these women in this setting merits further investigation.

**Key Words:** postpartum depression, mental health screening, infant temperament

Postpartum depression (PPD) has been identified as an essential topic in female reproductive health by the Centers for Disease Control.[1] In addition, screening of mothers for PPD has been recommended of all pediatricians by the American Academy of Pediatrics.[2,3] It is estimated that many mothers with PPD are undiagnosed by clinicians. One series reported that 53% of mothers screened in an emergency setting had not been previously screened by their providers.[4] In addition, providers are often unable to predict which mother is likely to have depression without the use of a formal screen.[5]

Postpartum depression is a common health issue among women, affecting 5% to 15% of new mothers in different populations.[6–8] The typical onset for this disorder is within 4 weeks of delivery and may include manifestations such as anxiety, depression, sleep disturbance, and psychosis.[9] Treatment is often comprehensive and may include psychotherapy, pharmacologic management, and psychosocial/task-oriented supports.[9]

Risks to affected mothers, infants, and their families are well described. Mothers experiencing PPD are at risk for insecure attachment patterns with their newborns, ongoing mental health issues, substance abuse (particularly in adolescent mothers), risk-taking behaviors, and use of corporal punishment.[10–13] Mothers who are depressed are less likely to report interactions with their children in ways that promote development, such as reading books, playing, and talking to the infant.[14] In addition, a variety of stressors including maternal depression are found as predictors in families being evaluated for child abuse.[15]

Various demographic indicators have been predictive of a diagnosis of PPDs, such as young maternal age, low maternal educational attainment, Medicaid status, infant temperament, poor self-esteem, marital status, and socioeconomic status among others.[12,16] Previous studies in the pediatric emergency department (PED) setting have found predictors of PPD to include a history of depression, single parent status, "crying" as a chief complaint, and food/housing concerns.[4,5] However, no clear strategy has been able to be used to better target screening of mothers in this setting.

The PED may be a useful clinical venue to evaluate for PPD mothers who bring their infants for emergency care. Children of depressed mothers more often miss well-child visits and vaccinations, presenting more often for acute, unscheduled health care visits.[17–19] These visits may occur with the pediatrician but often also occur in the ED setting.[17–20] The PED is often a setting with available resources including social work and other mental health providers. Screening in this setting would follow recommendations where access to treatments can make use of integrative and collaborative resources.[2]

This study aimed to assess the feasibility of PPD depression screening in an ED setting. We further sought to describe whether there were maternal factors related to the visit that could be used to identify at-risk mothers and to investigate patterns of resource use

by these mothers. Finally, we assessed the utility of full and abbreviated versions of a validated screening tool for PPD in the PED setting.

## METHODS

A convenience sample of mothers of infants younger than 4 months were prospectively enrolled in an urban, tertiary care PED. Our PED has an annual census of approximately 34,000 visits. After informed written consent was obtained, mothers were enrolled during the day and night when a member of the study team was available. Subjects were enrolled between December 2011 and November 2012. Families were excluded from the enrollment if the child's biological mother was not present, if the mother was unable to complete the form in written English or Spanish, or if they declined enrollment.

The survey tool was a written, self-administered questionnaire available in English or Spanish. A bilingual member of the research team helped translate demographic intake questions. Mothers were surveyed using the Edinburgh Postpartum Depression Scale (EPDS).[21] Additional socioeconomic, demographic, and child temperament information were collected. All participants who were approached for enrollment were provided printed information about community resources for new mothers and mothers with depression. The member of the study team who enrolled the participant scored the questionnaires. Those participants screening positive on the EPDS (score ≥ 10) were evaluated for severity of depression and counseled by members of the study team; social work consultation and mental health resources were offered to these participants. One month later, mothers screening positive on the EPDS were contacted by telephone by a member of the study team. A semistructured interview protocol was used to assess their current mood, use of resources, and need for further support.
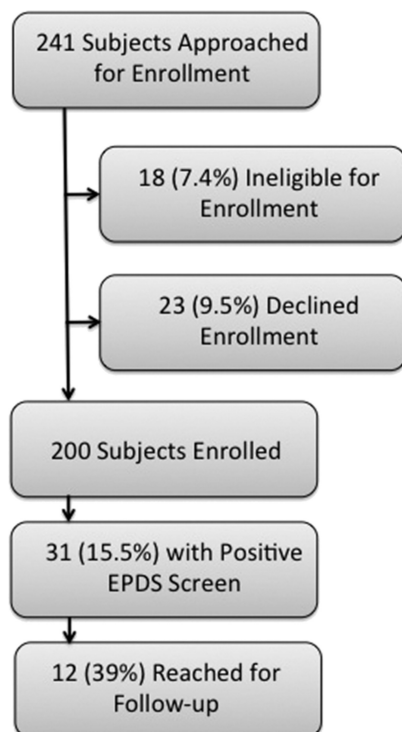


**FIGURE 1.** Subject enrollment.

The main outcome of interest was the score on the full-length EPDS (Fig. 1). The tool asks women to choose the response to a statement that most accurately describes how they have felt in the past week. It is scored on a Likert scale, with each item having 4 options ranked 0 to 3, depending on frequency and severity of symptoms. Of the 10 items on the scale, 7 are reverse scored. The total possible score is 30. A cutoff score of 10 was selected as the cutoff for a positive screen result. Validation studies by Cox et al[21] as well as several subsequent analyses have cited the threshold of 10 as appropriate for use.

Secondary measures were scores on the EPDS subscales, the anxiety subscale (EPDS-3), depression subscale (EPDS-7), and mini screen (EPDS-2) (Table 1). Scores of 3 or higher, 7 or higher, and 2 or higher were used as cutoffs for EPDS-3, EPDS-7, and EPDS-2, respectively. For each subscale, sensitivity, specificity, and predictive values were calculated using the full EPDS as the reference standard.

An a priori sample size was determined to be 200 based on an estimated 15% prevalence of PPD in similar populations providing a 95% confidence interval between 10% and 20%.[4–8] Basic frequencies were used to describe the study population. For categorical data, the $\chi^2$ test was used to compare characteristics of the positive and negative screen groups. For continuous data, the Student *t* test was used for group comparison. To examine the association between a positive screen and demographic and presenting characteristics, Pearson $\chi^2$ (with Yates correction as necessary) with 95% confidence intervals was used.

The Human Research Protection Program of Yale University School of Medicine approved this study.

## RESULTS

During the 11-month study period, a convenience sample of 241 mothers of infants younger than 4 month was approached for enrollment. Twenty-three (9.5%) declined enrollment after further explanation of the study. Eighteen (7.4%) were ineligible for participation because of absence of the mother in the ED, lack of fluency in English or Spanish, or previous study enrollment during a previous ED visit (Fig. 1).

Two hundred mothers were enrolled in the study. Mean (SD) maternal age was 26.8 (5.65) years (range, 15–41 years). Ninety (45%) were first-time mothers. Twenty-two (11%) were primarily Spanish speaking. The majority of participants (89%) had a high school diploma or higher education.

Reasons for presenting to the ED were varied, with the largest proportion (37%) falling into the category of respiratory complaints. Crying and irritability represented a minority of presentations (4%). Complaint categories are shown in Figure 2.

Of the respondents, 175 (88%) reported having help with child care from another adult, either within or outside the home. Eighty of subjects' infants (40%) were receiving pediatric care at a state-funded clinic. Additional maternal characteristics are shown in Table 1.

Edinburgh Postpartum Depression Scale scores ranged from 0 to 25, with a mean (SD) score of 5.24 (4.71). The distribution of EPDS scores is show in Figure 3. Thirty-one mothers screened positive, giving a prevalence of 15.5%. Within the positive screen group, mean (SD) EPDS score was 13.6 (3.69). For mothers scoring less than 10 on the EPDS, mean (SD) score was 3.7 (2.92). Analysis of the EPDS subscales showed the EPDS-3 as the most sensitive tool (87%), relative to the full version. Specificity and positive predictive value, however, were lowest at 70% and 35%, respectively. Operating characteristics of the EPDS subscales are shown in Table 2.

**TABLE 1.** Maternal Characteristics (N = 200)

| Characteristic | EPDS Positive (31) | EPDS Negative(169) | *P* |
|---|---|---|---|
| EPDS, mean (range) | 13.6 (10–25) | 3.7 (0–9) | <0.001 |
| Mean age | 26.6 | 26.9 | 0.83 |
| Spanish speaking | 3 (9.7%) | 19 (11.2%) | 0.96 |
| Child seen in Medicaid (n = 197) | 13 (41.9%) | 67 (40.3%) | 0.87 |
| First-time mother | 17 (54.8%) | 72 (42.6%) | 0.21 |
| "I feel my child is always fussy" (n = 199) | | | |
| Strongly agree | 2 (6.4%) | 5 (3%) | <0.001 |
| Agree | 6 (19.3%) | 17 (10%) | |
| Neutral | 14 (45.2%) | 24 (14.3%) | |
| Disagree | 3 (9.7%) | 67 (39.9%) | |
| Strongly disagree | 6 (19.3%) | 55 (32.7%) | |
| Respiratory complaint (n = 199) | 11 (35%) | 63 (37.5%) | 0.83 |
| Referral source | | | |
| PMD | 16 (51.6%) | 96 (56.8%) | 0.59 |
| Family/friend | 4 (12.9%) | 16 (9.5%) | 0.79 |
| Self | 18 (58%) | 77 (45.6%) | 0.2 |
| Child care support | | | |
| In home | 26 (84%) | 137 (81%) | 0.71 |
| Out of home | 5 (16%) | 55 (32.5%) | 0.067 |
| No help | 7 (22.5%) | 18 (10.7%) | 0.12 |
| Education | | | |
| Lower than high school | 1 (3%) | 21/168 (13%) | 0.23 |
| High school | 11 (35%) | 48/168 (30%) | 0.43 |
| Some college or associate's degree | 11 (35%) | 61/168 (36%) | 0.93 |
| Bachelor's degree | 8 (26%) | 38/168 (21%) | 0.70 |

PMD indicates primary care provider.

There were no statistically significant differences between mothers with positive and negative screen results for PPD in terms of age, primary language (English vs Spanish), education level, state-funded clinic versus private well-child care, first-time mothers, presenting complaint (respiratory vs all other), referral source, or child care support. The only association with a positive screen result was perceived fussiness. Mothers who were depressed were more likely to report that they strongly agreed or agreed with the statement, "I feel that my child is always fussy" (*P* = 0.004) (Fig. 4).

Of the mothers who screened positive, 3 of the 31 opted for social work and/or psychiatric evaluation at the time of screening. Those who did not opt for social work or psychiatric assessment were assessed for suicidality and personal safety by the research team.
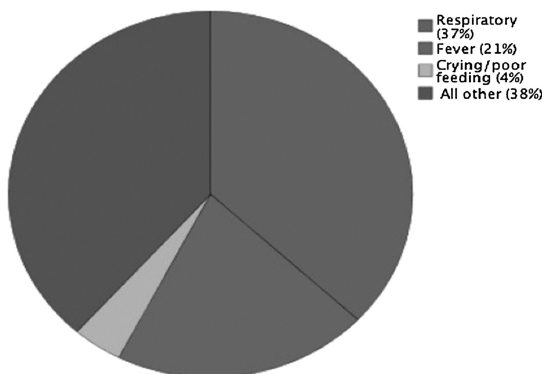
Of the mothers with a positive screen, 12 (39%) of the 31 were reached by telephone for follow-up approximately 4 weeks after the initial ED visit. Ninety-two percent of those interviewed noted improvement in mood symptoms since the PED encounter. Half reported having discussed their mood symptoms with someone else, although only a third of these women did so with a health care provider. None of the mothers interviewed reported using the resource sheet provided in the PED.

## DISCUSSION

We have demonstrated a prevalence of PPD of 16% in a population of mothers who present their young infants for ED care. This rate is consistent with the existing literature.[5,6,14,21–25]
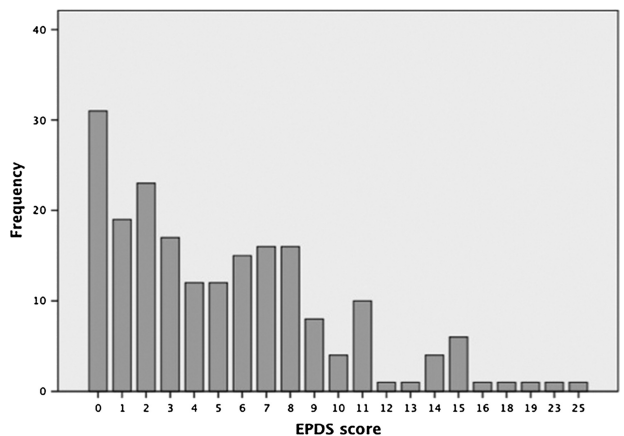


**FIGURE 2.** Presenting complaints.



**FIGURE 3.** Range of EPDS scores.

**TABLE 2.** Test Characteristics of EPDS Subscales

| Measure | EPDS-3, % (95% CI) | EPDS-7, % (95% CI) | EPDS-2, % (95% CI) |
|---|---|---|---|
| Sensitivity | 87 (0.69–0.96) | 71 (0.52–0.85) | 83 (0.66–0.94) |
| Negative predictive value | 97 (0.91–0.99) | 95 (0.90–0.97) | 97 (0.93–0.99) |
| Specificity | 70 (0.63–0.77) | 98 (0.94–1.0) | 92 (0.87–0.96) |
| Positive predictive value | 35 (0.25–0.47) | 88 (0.68–0.97) | 67 (0.50–0.80) |

Reference standard is a score of 10 or greater on the full EPDS.

Mothers who screened positive for PPD presented with infants with a wide variety of complaints (respiratory difficulties, fever, crying, poor feeding, injuries). This provides further evidence for the idea that mothers with depressive symptoms may present to the PED for many reasons.[4,5] As others have pointed out, limiting screening to mothers of infants with certain types of complaints may be a misguided strategy that could cause providers to miss women with PPD.[4]

This study examined several factors hypothesized to be associated with PPD. As discussed previously, young maternal age, first-time mother status, lack of child care support, immigrant status (perhaps represented by non-English primary language), low education level, and low socioeconomic status (receipt of infant care in a state-funded clinic serves as a proxy) have been described as risk factors for PPD.[8,12,26] In this study, the only maternal characteristic correlating with a positive screen was the mother's perceived temperament of the infant.

This finding is consistent with previous reports of the association between depressive symptoms and mothers' perceptions of infant heath and behavior. Wake et al[27] found, in a 2-year follow-up study, that persistent cry-fuss problems were strongly associated with maternal depression. Orhon et al[28] followed up mothers for 1 year, finding that those with depressive symptoms perceived their infants as more frequently crying and difficult to care for throughout the follow-up period. Whether perceived temperament is a cause or effect of PPD (or both) is unclear and cannot be determined based on our results. Furthermore, we did not obtain objective indicators of infant behavior and temperament in this study. This correlation may warrant further evaluation, particularly as it pertains to infants presenting with a chief complaint of fussiness or crying.

That maternal demographic characteristics were not associated with a positive EPDS screen result suggests that evaluation of risk factors for PPD warrants further study. Alternatively, risk factors for PPD among our population may have a different profile. Although a history of depression has been shown to be a



**FIGURE 4.** Maternal response to "I feel that my child is always fussy."

strong predictor of postpartum depressive symptoms,[25,29] reports of the effect sizes of several other risk factors have varied.[8,12,26,30,31] We did not assess subjects' history of depressive symptoms or family history of depression—these risk factors may have demonstrated stronger predictive value for PPD in our population.

The rate of consent to screening in this study was 90%. Of those who screened positive, 10% were amenable to the social work consult. The high rate of acceptability of screening lends support to the idea that the PED may be an appropriate setting for screening. This finding is consistent with previous studies of screening in similar settings.[4,5] That only 10% of those with positive screen results consented to see social work, however, is important to consider. It may be explained by the nature of a hectic ED encounter—mothers may be overwhelmed at that specific time and unlikely to welcome yet another provider. Alternatively, it may represent a barrier to the screening process if women are hesitant (due to stigma or lack of education about PPD) to seek help once identified. The most acceptable treatment and/or referral plan for women with PPD identified in this setting may warrant further investigation.

Performance of the EPDS subscales is consistent with previous studies, with the anxiety subscale (EPDS-3) showing high sensitivity compared with the full version.[5,7] This also supports the idea that perinatal depression is characterized by a more prominent anxiety component.[21,23,32] The EPDS-3, however, sacrificed specificity significantly. This is an important consideration in the design of a screening protocol because a high proportion of false positives may tax available resources. Although others have suggested that the use of an ultrabrief tool is beneficial in the primary care environment,[5,7] the actual savings in time and resources when a subscale is used instead of the full EPDS have not been evaluated. In addition, the EPDS-2 specifically has not performed well for women with a history of depression.[7] That cost-savings must be weighed against the cost of evaluating a higher number of false positives after initial screen.

Follow-up data for this study are limited, as only 39% of women who screened positive were reached by telephone. The vast majority of those reached reported significant improvement of symptoms and had used family/partner resources for support rather than health care providers. The generalization of these findings, however, is difficult given the limited number of subjects available in follow-up. Further study of the course of PPD and help-seeking behaviors is critical to design effective screening programs.

This study has several limitations, although many reflect the real-life challenges of the implementation of such a screening program. We have not determined true prevalence of PPD for this population because psychiatric interview is the criterion standard required to diagnose PPD. In addition, limitations include the fact that the study represents a convenience sample due to the need for study personnel to be present for enrollment; however, enrollment occurred during all shifts of the day. Characteristics of the mothers and infants who declined to participate in the study were also not
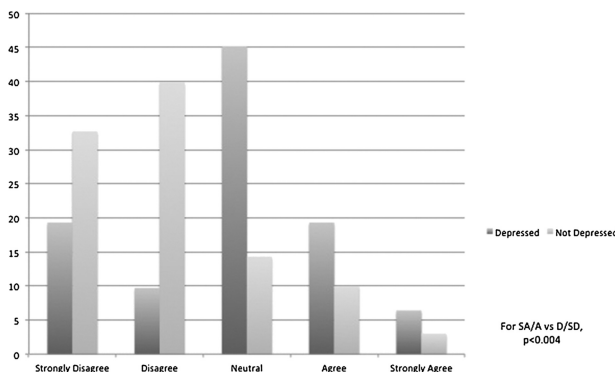
assessed; we cannot say whether there are significant differences between this population and those who enrolled. Not all mothers of infants younger than 4 months were approached because of the acuity of the infant's condition, emotional state of the mother, or time limits of ED personnel.

Because women with a history of depression were not identified, we cannot distinguish between those experiencing a postpartum depressive episode or a continuation of symptoms that began before or during pregnancy. In terms of screening with the goal of improving health outcomes, however, this distinction is less relevant. Maternal depression of any kind presents a risk to the mother and infant.

Although there are certainly inherent costs to the institution in time, manpower, and providing appropriate resources, the feasibility of early detection and treatment of PPD in this setting is promising.

## CONCLUSIONS

The prevalence of PPD approximates 16% in mothers of infants younger than 4 months evaluated in our PED. This study demonstrates effective identification of women experiencing depressive symptoms and shows that screening is feasible and has a high level of acceptability in the ED setting. Anxiety seems to be a common phenotype in the manifestation of PPD in this group, and a brief related subscale of the EPDS shows promise in screening in this setting. In addition, many mothers screening positive for PPD report their infants as "fussy." Screening in the PED may become an important strategy in identifying and treating a frequently underdiagnosed disorder that has significant impact on the physical and mental health of women and their families.

## REFERENCES

1. Centers for Disease Control and Prevention. Reproductive Health. Available at: http://www.cdc.gov/reproductivehealth. Updated October 11, 2012. Accessed July 29, 2013.

2. Earls MF. Incorporating recognition and management of perinatal and postpartum depression into pediatric practice. *Pediatrics*. 2010;126: 1032–1039.

3. Chaudron LH, Szilagyi PG, Campbell AT, et al. Legal and ethical considerations: risks and benefits of postpartum depression screening at well-child visits. *Pediatrics*. 2007;119:123–128.

4. Stock A, Chin L, Babl FE, et al. Postnatal depression in mothers bringing infants to the emergency department. *Arch Dis Child*. 2013;98:36–40.

5. Birmingham MC, Chou KJ, Crain EF. Screening for postpartum depression in a pediatric emergency department. *Pediatr Emerg Care*. 2011;27: 795–800.

6. Gavin NI, Gaynes BN, Lohr KN, et al. Perinatal depression: a systematic review of prevalence and incidence. *Obstet Gynecol*. 2005;106(5 pt 1): 1071–1083.

7. Kabir K, Sheeder J, Kelly LS. Identifying postpartum depression: are 3 questions as good as 10? *Pediatrics*. 2008;122:e696–e702.

8. O'Hara MWSA. Rates and risk of postpartum depression—a meta-analysis. *Int Rev Psychiatry*. 1996;8:37–54.

9. American Psychiatric Association, American Psychiatric Association. Task Force on DSM-IV. *Diagnostic and Statistical Manual of Mental Disorders DSM-IV-TR* [electronic book]. Washington, DC: American Psychiatric Association; 2000. Available at: http://www.psychiatryonline.com/resourceTOC.aspx?resourceID=1. Accessed July 29, 2013.

10. Beck CT. The effects of postpartum depression on maternal-infant interaction: a meta-analysis. *Nurs Res*. 1995;44:298–304.

11. Beck CT. The effects of postpartum depression on child development: a meta-analysis. *Arch Psychiatr Nurs*. 1998;12:12–20.

12. Beck CT. Predictors of postpartum depression: an update. *Nurs Res*. 2001; 50:275–285.

13. Chung EK, McCollum KF, Elo IT, et al. Maternal depressive symptoms and infant health practices among low-income women. *Pediatrics*. 2004; 113:e523–e529.

14. McLearn KT, Minkovitz CS, Strobino DM, et al. The timing of maternal depressive symptoms and mothers' parenting practices with young children: implications for pediatric practice. *Pediatrics*. 2006;118: e174–e182.

15. Kotch JB, Browne DC, Dufort V, et al. Predicting child maltreatment in the first 4 years of life from characteristics assessed in the neonatal period. *Child Abuse Negl*. 1999;23:305–319.

16. Centers for Disease Control and Prevention (CDC). Prevalence of self-reported postpartum depressive symptoms—17 states, 2004–2005. *MMWR Morb Mortal Wkly Rep*. 1998;57:361–366.

17. Mandl KD, Tronick EZ, Brennan TA, et al. Infant health care use and maternal depression. *Arch Pediatr Adolesc Med*. 1999;153:808–813.

18. Minkovitz CS, Strobino D, Scharfstein D, et al. Maternal depressive symptoms and children's receipt of health care in the first 3 years of life. *Pediatrics*. 2005;115:306–314.

19. Flynn HA, Davis M, Marcus SM, et al. Rates of maternal depression in pediatric emergency department and relationship to child service utilization. *Gen Hosp Psychiatry*. 2004;26:316–322.

20. Bartlett SJ, Kolodner K, Butz AM, et al. Maternal depressive symptoms and emergency department use among inner-city children with asthma. *Arch Pediatr Adolesc Med*. 2001;155:347–353.

21. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatr*. 1987;150:782–786.

22. Chaudron LH, Szilagyi PG, Kitzman HJ, et al. Detection of postpartum depressive symptoms by screening at well-child visits. *Pediatrics*. 2004; 113(3 pt 1):551–558.

23. Howell EA, Mora P, Leventhal H. Correlates of early postpartum depressive symptoms. *Matern Child Health J*. 2006;10:149–157.

24. Freeman MP, Wright R, Watchman M, et al. Postpartum depression assessments at well-baby visits: screening feasibility, prevalence, and risk factors. *J Womens Health (Larchmt)*. 2005;14:929–935.

25. Yonkers KA, Ramin SM, Rush AJ, et al. Onset and persistence of postpartum depression in an inner-city maternal health clinic system. *Am J Psychiatry*. 2001;158:1856–1863.

26. Milgrom J, Gemmill AW, Bilszta JL, et al. Antenatal risk factors for postnatal depression: a large prospective study. *J Affect Disord*. 2008;108: 147–157.

27. Wake M, Morton-Allen E, Poulakis Z, et al. Prevalence, stability, and outcomes of cry-fuss and sleep problems in the first 2 years of life: prospective community-based study. *Pediatrics*. 2006;117:836–842.

28. Orhon FS, Ulukol B, Soykan A. Postpartum mood disorders and maternal perceptions of infant patterns in well-child follow-up visits. *Acta Paediatr*. 2007;96:1777–1783.

29. Wisner KL, Parry BL, Piontek CM. Clinical practice. Postpartum depression. *N Engl J Med*. 2002;347:194–199.

30. Milgrom J, Mendelsohn J, Gemmill AW. Does postnatal depression screening work? Throwing out the bathwater, keeping the baby. *J Affect Disord*. 2011;132:301–310.

31. Bloch M, Rotenberg N, Koren D, et al. Risk factors associated with the development of postpartum mood disorders. *J Affect Disord*. 2005;88:9–18.

32. Ross LE, Gilbert Evans SE, Sellers EM, et al. Measurement issues in postpartum depression part 1: anxiety as a feature of postpartum depression. *Arch Womens Ment Health*. 2003;6:51–57.