COVER SHEET

Webster, Joan and Hall, Laurie and Somville, Thierry and Schneider, Patricia and Turnbull, Robin and Smith, Patricia (2005) Prospective testing of the Brisbane Postnatal Depression Index. *Birth* in press.

Title: Prospective testing of the Brisbane Postnatal Depression Index

Investigators: Joan Webster, RN, RM, BA.
Laurie Hall, RN, MA.
Thierry Somville, MD, PhD
Patricia Schneider, RN, RM, B Ed, M Ed.
Robin Turnbull, RN, RM, M Nurs Sci.
Patricia Smith, RN, RM, B Nurs Sci.

Joan Webster and Laurie Hall are at the Centre for Clinical Nursing, Royal Brisbane and Women's Hospital. Joan Webster is also at the Queensland University of Technology and at Griffith University. Thierry Somville, Patricia Schneider, Robin Turnbull and Patricia Smith are in Women's and Newborn Services at the Royal Brisbane and Women's Hospital.

The study was funded through grants from the Perpetual Philanthropic Foundation and the Royal Brisbane and Women's Hospital Foundation.

ABSTRACT

Background: Over 50 percent of women have one or more risk factors for postnatal depression during pregnancy or in the perinatal period but only 10 to 15 percent become clinically depressed. Identifying the women with risks, who will also develop depression remains elusive and has been the focus of considerable research. The objective of this study was to prospectively test the Brisbane Postnatal Depression Index, to validate a theoretical index which was developed in an earlier study, and to establish whether the Index could be introduced as an administratively simple and clinically useful method for the detection of women who may be at risk for developing postnatal depression.

Methods: Antenatally, women were asked about social support and about personal and family history of mental illness, including postnatal depression. Responses were scored according to pre-defined ratings on the Brisbane Postnatal Depression Index. In the postnatal wards, 353 women were recruited and their scores for 'blues', social support, feelings about the baby, and satisfaction with the birth process were added. Sixteen weeks after hospital discharge, women were asked to complete the Edinburgh Postnatal Depression Scale. The Brisbane Postnatal Depression Index was validated by the number of women scoring >12 on the Edinburgh Postnatal Depression Scale at 16 weeks postpartum who were correctly predicted by a score of > 6 on the Brisbane Postnatal Depression Index.

Sensitivity, specificity, positive predictive value and negative predictive value for the Brisbane Postnatal Depression Index using > 6 as a cut off point were calculated. 'Ease of use' was assessed informally through discussions with women who completed the questionnaire and with staff responsible for administration and scoring the instrument.

Results: Compared with results from the derivation study, prospective testing of the index showed an improvement in sensitivity from 36.3 to 47.5 percent and a small decrease in specificity but there was no improvement on the positive predictive value 39.8 to 39.6 percent.

Conclusion: The Brisbane Postnatal Depression Index has been validated in a prospective sample but the sensitivity and specificity of the instrument requires improvement before introduction as a measure of prediction.

BACKGROUND

Postnatal depression is a well-recognised and serious complication of pregnancy with 14.5 percent reporting a new episode during the first 3 months postpartum (1). Symptoms of postnatal depression typically appear well after the woman has been discharged from hospital (2) and although most postnatal depressed women will visit a medical practitioner in the early postnatal months (3); their condition is unlikely to be diagnosed (4). An opportunity exists to improve case finding by identifying vulnerable women before they leave hospital, to provide information and instigate supportive treatment or referral. To be acceptable to clinicians, any method used for screening must be simple, sustainable and have a reasonable positive predictive value.

The Edinburgh Postnatal Depression Scale (EPDS) has been used antenatally in some settings for this purpose (5) but there are limitations with its use. For example, the items are derived from other depression indexes - so are 'diagnostic' of depression rather than predictive. Similarly, despite a reasonable correlation between a woman's EPDS score in pregnancy and her postnatal EPDS, the positive predictive value of the scale, when used prenatally is limited with reports ranging between 0.17 and 0.56 (6). Simply asking women if they feel depressed in pregnancy is more highly correlated with postnatal depression than is the EPDS (7). In addition the EPDS only taps into the psychological correlates of postnatal depression, it does not take account of the social factors, for example family support and partner conflict, which have been strongly associated with the condition

Research to develop a predictive index for postnatal depression has varied considerably in terms of sample size, items included in the tools and the use of standardised outcome measures. Finding statistical correlations between prenatal and intrapartum risk factors (such as social support, past history of mood disorder and stressful life events) and the subsequent development of depression are not hard. The difficulty remains in translation these risks into an index that has reasonable predictive validity. Research in this area, although generally disappointing, is still evolving. For example, in a study conducted by Braverman and Roux (1978) six items from a nineteen item questionnaire were statistically associated with those developing postnatal depression. A hypothetical predictive index based on these 6 items was proposed but not prospectively tested by the investigators (8). This was attempted subsequently by Stamp et al (1996) using a modified antenatal screen but it still performed poorly with a positive predictive value of only 17% for major depression (9). In a large study, Cooper et al (1996) showed that their 17-item questionnaire could improve this rate but at the expense of sensitivity. In other words, the instrument classified too many women as being at risk (10). In a later attempt, Posner et al (1997) administered a 61-item questionnaire to a sample of 125 women (11). The most predictive items were used to construct a 24-item questionnaire, which was then retrospectively tested on the same sample and prospectively tested on 99 women. Using a cut off point of 46 they achieved a sensitivity of 80% and a specificity of 82%. The positive predictive value in the study was 44% but the sample size quite small and administering and scoring their questionnaire would be difficult in a busy prenatal setting. Beck (1998) has proposed a predictive index for postnatal depression based on a meta-analysis of four instruments designed to detect women at risk for postnatal depression. The index includes postnatal as well as antenatal factors but the theoretical instrument has not been tested (12). Finally, a group in the Netherlands developed a predictive index based on items most associated with postnatal depression from an earlier prospective study but, again, the instrument has not been prospectively validated (13).

Our own work in the area has focused on the development of a *sustainable* model of identification and management of women at risk for postnatal depression. In 1996 we began asking women specific questions about their social support and about their own and their family's psychiatric history as part of their routine booking interview. Women reporting any risk factors (low support, partner conflict/control, personal or family psychiatric history) were offered a kit of educational material and the woman's case notes were referred to a multi-disciplinary team to facilitate planning for her hospital-based care. Thus, identification and

management became part of routine care with referral and support offered to those screening positive. An evaluation of the process indicated acceptance by staff and by the women who were screened (14). Having established a workable strategy, we evaluated the intervention using a randomised controlled trial, using the Edinburgh Postnatal Depression Scale, to identify those with high levels of depressive symptoms, as the primary outcome (15). Although results did not reach statistical significance ($p = 0.206$) there were less women with depressive symptoms in the intervention group (24.0%) compared with the control group (28.2%). A group of women with no risk factors for postnatal depression were also followed up in the postnatal period. When compared to those with no disclosed risks, women with antenatal risk factors were more likely to develop symptoms of postnatal depression (10.9% of the no-risk group; 25.9% of the risk group scored >12 on the Edinburgh Postnatal Depression Scale) validating the usefulness of the screen in identifying a 'risk group' (7).

Based on the results of the randomised-controlled trial, a Postnatal Depression Risk Index was developed by weighting antenatal risk factors according to the strength of the association of each risk with the postnatal Edinburgh Postnatal Depression Scale score administered 16-weeks after the birth (7). Using the index retrospectively on the women enrolled in the randomised controlled trial, 40 percent of women who scored above 3 antenatally went on to develop major depression. Even though these results compared favourably with other work, we hypothesized that adding early *postnatal* risk factors (postnatal blues, postnatal social support, satisfaction with delivery a short scale measuring mother/infant interaction) to the antenatal risk index the predictive value of the Index would be improved. This was tested in a further study (the derivation study) where the mean scores for postnatal risks were calculated and weighted in the same way as the antenatal factors. All of the weighted risks were then combined to create the Brisbane Postnatal Depression Index which was retrospectively applied to 723 patients (16). Although the combined prenatal and postnatal index improved validity, the scale has not been tested prospectively. Prospective testing was needed to validate the original findings and to test whether or not our 'theoretical' instrument would be useful and practical in a 'real world' environment.

In summary, existing research has not been prospective and has not resulted in an administratively simple index. Such an index would provide guidance for those caring for women in the postnatal period and provide more objective criteria on which to base referrals. The purpose of the present study was to prospectively test the efficacy of the Brisbane Postnatal Depression Index at meeting these needs.

METHODS

Participants and setting

All women, irrespective of age, who birthed at the Royal Brisbane and Women's Hospital between March 2004 and August 2004, were eligible for inclusion in the study. The hospital is a large, tertiary institution where approximately 4,000 infants are born each year. Potentially eligible women were excluded if they were unable to complete the study documentation unaided or if their baby was in the intensive or special care nurseries. These women were excluded because they were unable to answer questions about the baby's usual behaviour, a requirement of the study. The study was approved by the Hospital's Human Research Institutional Ethics Committee.

Instruments

Brisbane Postnatal Depression Index (16)**.** The index is based on the strength of associations between risk factors for postnatal depression and scores on the Edinburgh Postnatal Depression Scale derived from our earlier studies. Items on the Index are shown in Figure 1 and are a combination of direct questions and responses to other self-report scales. The questions and validity details of the scales used to make up the Brisbane Postnatal Depression Index have been

published elsewhere but, briefly, the Maternity Social Support Scale contains 6 Likert style questions related to satisfaction with support from family, friends and partner and the extent to which the woman feels conflict with, controlled by and loved by her partner. Satisfaction with delivery is measured on a 5-point Likert scale (17), the Blues score is derived from administering an adapted form of the Kennerley Blues Scale (18) and the Brisbane Mother Baby Scale is a 15 item Likert scale with seven questions beginning with 'Compared to most babies, I feel that my baby is ……(eg healthy)' and seven questions leading with 'compared to most mothers I feel that I……(eg am attached to my baby)'. Higher scores indicated higher risk (16). Scores on the Brisbane Postnatal Depression Index range from zero to 21. A score of six or above on the Index is considered positive, meaning that the woman is at risk for developing postnatal depression.

Edinburgh Postnatal Depression Scale

The Edinburgh Postnatal Depression Scale is a simple; self-report questionnaire with 10 items scored between 0 and 3 (range of possible scores between 0 and 30). It was designed to identify symptoms of depression; it is not a diagnostic tool (5). The scale is widely used and a recent review of validation studies has confirmed its high sensitivity when compared with the DSM-lll-R and DSM-4 criteria for major depression, SADS criteria for minor, intermittent and major depression and ICD-10 criteria for light, moderate and heavy depression (19). It has been validated for use in Australia as a screen for postnatal depression with a sensitivity of 100 percent and specificity of 95.7 percent, when 12.5 is used as the cut-off value (20). However, as a score of 12.5 is not possible, a score of > 12 is generally used in research and practice to identify women with symptoms of postnatal depression.

Procedure

Antenatal

A copy of the Brisbane Postnatal Depression Index was incorporated into the maternity medical record. The antenatal component of the Index was scored by the midwife who conducted the 'booking in' interview at the woman's first hospital visit. All data collected for the antenatal component of the study is part of the normal booking process so consent was not requested for study participation at this time. Usual care was provided, including referral to the obstetric psychiatric clinic if indicated, however we did not collect information about such referrals.

Postnatal

Between March 2004 and August 2004 women in postnatal wards on Monday through Wednesday of each week were provided with information about the study and invited to participate. Consenting women were asked to complete a short postnatal questionnaire which included birth details (including satisfaction with the birthing experience on a 5 point Likert scale), a blues questionnaire (18) a social support scale (17) and a mother baby scale (16). Responses to the postnatal section were scored and the antenatal and postnatal components summed to ascertain the Brisbane Postnatal Depression Scale score. To assist with follow-up, we sought an alternative address, a mobile phone number and enquired about whether the woman intended to move residence within the next 16 weeks.

Follow-up

A follow-up questionnaire was mailed 16 weeks after the birth. In the questionnaire, we repeated the social support scale and the mother baby scale. We also asked the woman to complete the Edinburgh Postnatal Depression Scale (this was not administered in the prenatal period or during postnatal hospitalization). If the initial 16 week questionnaire was not returned within 2 weeks, another questionnaire and letter was sent. When there was still no response, we attempted phone contact and arranged to either send another questionnaire, or to complete details by phone. This arrangement worked best when the woman was able to read the form and tell us the answers.

Primary outcome:

The usefulness of the Postnatal Depression Predictive Index was assessed by the number of women scoring >12 on the Edinburgh Postnatal Depression Scale at 16 weeks postpartum who were correctly predicted by a score of > 6 on the Brisbane Postnatal Depression Index.

Secondary outcome

'Ease of use' was assessed informally through discussions with women who completed the questionnaire and with staff who would be responsible for administration and scoring the instrument. The number of minutes taken to complete the postnatal component of the questionnaire was also timed.

ANALYSIS

Statistical analysis was performed with SPSS for Windows® release 12.0.1 (SPSS Inc) (21). For analysis of qualitative characteristics, we used Pearson's Chi-Square or Fisher's exact test, when appropriate. To evaluate the effect of continuous variables we used the Student's *t* test. The Brisbane Postnatal Depression Index was validated through comparison of the Index results with those obtained using the Edinburgh Postnatal Depression Scale. Sensitivity, specificity, positive predictive value and negative predictive value for the Brisbane Postnatal Depression Index using > 6 as a cut off point were calculated. The area under the receiver operating characteristic curve was also calculated.

RESULTS

Of the 707 potentially eligible women during the study period, 303 (42.9%) were not available for recruitment when the research assistant was in the ward (sleeping, visitors, feeding, not in bed etc). Forty one (10.2%) of the 404 remaining women were ineligible; no antenatal details for 27 (6.7%) women and the infants of a further 14 (3.5%) women were admitted to the special or intensive care nurseries. Ten (2.8%) of the remaining 363 women did not consent, leaving 353 women who were recruited into the study in the early postnatal period. Of these, 59 (16.7%) women were lost to follow-up, leaving a sample of 294 women, a retention rate of 83 percent. There were no differences between those who returned the 16 week questionnaire and those who did not with respect to the Brisbane Postnatal Depression Index score; number of children; antenatal and early postnatal maternity social support scale scores; personal or family history of psychiatric illness; satisfaction with the birth; blues scores; or mother-baby scale scores. However, women were more likely to return their questionnaire if they had higher levels of education ($p = 0.002$) or if they owned or were buying their own home ($p = 0.000$).

Notable differences were observed in the risk characteristics of the derivation and validation studies and this may have affected the proportion of women who scored > 6 on the postnatal depression index (Table 1). However, in the validation set the receiver operating characteristic curve area of the Index was 0.71 (95% confidence interval [CI]: 0.62 to 0.80). This was within the 95 percent CI of the receiver operating characteristic curve area found in the derivation study (0.77; 95% CI: 0.70 to 0.82). Of the validation sample of 294 women, 40 scored 13 or more on the Edinburgh Postnatal Depression Scale, an overall prevalence 13.6% for this sample. This compares with a prevalence of 12.7 percent in the derivation set. Applying the Index score threshold of > 6, postnatal depression was correctly predicted in 19 of the 40 women who tested positive on the Edinburgh Postnatal Depression Scale. Comparisons with results from the derivation study are shown in Table 2.

Informal interviews with staff and patients suggested that while completing the postnatal component of the Index took only about 3 minutes, scoring the scales was time consuming for staff. To test if this process could be simplified without a loss of validity, we conducted a series of sub-analyses in which prenatal risk factors were combined with individual postnatal risk factors. Table 3 shows that this approach was not effective.

DISCUSSION

The purpose of this study was to prospectively validate the Brisbane Postnatal Depression Index. Previous theoretical testing of the Index on a retrospective sample found the Index to have a sensitivity of 36.3 percent and specificity of 92 percent. Prospective testing of the Index in this

study resulted in an improvement in sensitivity and a small decrease in specificity but the positive and negative predictive values remained practically unchanged. Although prospectively testing the Brisbane Postnatal Depression Index only marginally improved its predictive properties, findings from the original study have now been validated in a different cohort.

These findings appear to be quite robust given the obvious differences in the two cohorts. Overall, the prevalence of postnatal depression was comparable in both groups and a similar proportion of women scored over 6 on the Index (11.2% in the validation set and 10.8% in the derivation set). Some demographic differences between the derivation and validation sets were evident; women in the validation set were older and had higher levels of education. These factors were not statistically related to postnatal depression in either cohort, so are unlikely to have changed the outcome. However, there were differences in the prevalence of risks that are consistently associated with postnatal depression. For example, more women in the validation set reported past personal and family psychiatric history. This may be a real difference or reflect an improvement in the way these questions are now asked by midwives at the first prenatal visit, a response to ongoing research in this area in our hospital. Women in the validation set were also more dissatisfied with their delivery when compared with the derivation cohort. Data for the derivation study was collected in 1999 and since that time there has been increasing emphasis on budgetary efficiencies and we have experienced staff shortages, placing additional burdens on existing staff. Whether this has translated into lower patient satisfaction is unclear but other studies have shown a relationship between staff and patient dissatisfaction (22). Women in the derivation cohort had less social support after delivery and higher 3-day 'blues' scores. The difference in the 'blues' score is probably explained by a variation in the way the scale was scored between the two studies. In the derivation set, answers to the question were structured "No different from usual", "A little more different that usual" or "A lot more different than usual". When we realised that answers should have been in two categories ("Yes, more that usual" or "No different than usual") we combined the two positive responses. In the validation set, only two options were offered. Despite differences in risks between the two studies, there was no effect on the receiver operating characteristic curve area and the predictive accuracy remained similar.

However, the acceptability of the 64.0 percent (60.2% in the derivation study) of cases of depression that were not correctly predicted must be considered in any instrument to be used as a screening tool. In addition, the time involved in collecting and interpreting the data is also an issue for busy clinicians. The antenatal components of the Brisbane Postnatal Depression Index are simple to collect and have become an established part of the prenatal care at our hospital so are not at issue (7). However, the postnatal component is more difficult. There are 3 instruments to complete, the 'Blues' questionnaire, the 'Mother – Baby Scale' and the 'Maternity Social Support Scale'; in all 40 questions. Items from the instruments are then scored and summed to determine the 'Brisbane Postnatal Depression Index' score. This does not pose a problem for new mothers; the time taken to complete the scales is approximately three minutes. However, it is difficult for staff to score the scales in a timely fashion.

We started the journey of trying to identify women who may develop postnatal depression before they leave hospital in response to a request from a Queensland Postnatal Depression Group. In conversations with women from this group it was clear that they believed that signs and symptoms of impending postnatal depression were present during their pregnancy and the early postnatal period. This may be so, there are statistical associations between all of the risks we screen for and an Edinburgh Postnatal Depression Scale score of > 12 in the months after childbirth but the issues associated with false positive results (women who score positive to screening but who do not develop depression) needs further discussion. The question is, whether it is better to draw attention to the woman about her *potential* for developing depression or not. At least one study has shown that women find the Edinburgh Postnatal Depression Scale an unacceptable instrument for screening (23) however; our approach is quite different in that we identify risks and offer support. Other interesting work is being undertaken in this area (24) but, until we have more information we need to decide on the best approach. Is it better to advise

women that they have risk factors for postnatal depression, offer referral and possibly raise their concern about something that may never occur, or just take a general approach of providing information about postnatal depression to all women? At present, we do both. If a woman reports a history of postnatal depression or any kind of psychiatric illness during a visit in antenatal clinic, midwives refer the woman to the clinical nurse consultant for the Mental Health Consultation Liaison Service within the hospital and those with low social support are offered referral to a social worker. In the postnatal wards we provide women with a booklet about postnatal depression but we do not routinely attempt to identify women with postnatal risks. However, several studies have shown that providing education alone does not improve postnatal outcomes (25, 26).

We know that women at our hospital do not mind being asked about their prenatal risk factors for postnatal depression (14) and, although we do not have clear evidence that the referral systems that we have in place in the antenatal clinic affect postnatal depression rates, we are addressing the women's immediate psychosocial needs. In other words, we operate in this area under a preventative rather than a treatment model. Whether it is appropriate to extend this model to routinely assessing a woman's postnatal risks is debatable. Screening for postnatal risks is much more complicated than for prenatal risks and, while this is acceptable for research, it may not sustainable in a busy postnatal ward. As table 3 shows, attempts to try to simplify the postnatal component led to a reduction in validity; high positive predictive values tended to be associated with low sensitivity and vice versa. Further testing and modification of the Index will be the focus of further research.

LIMITATIONS

We used a score of > 12 on the Edinburgh Postnatal Depression Scale to identify women with symptoms of postnatal depression rather than using a diagnostic interview; this may have either over or under-estimated the number of women experiencing depressive symptoms. In addition, the Edinburgh Postnatal Depression Scale asks women about how they have felt in the past seven days. The Scale was administered 16 weeks after the birth, so women who experienced depressive symptoms prior to 15 weeks following the birth could have been missed; this may have impacted on usefulness of the Brisbane Postnatal Depression Index in identifying women with symptoms of depression.

CONCLUSION

The Brisbane Postnatal Depression Index has been validated in a prospective sample and it may be useful for research purposes and for identifying women's immediate psychosocial needs. The limited sensitivity and positive predictive value of the instrument make it unsuitable for use as a predictive instrument.

REFERENCES

1. Gaynes BN, Gavin N, Meltzer-Brody S, Lohr KN, Swinson T, Gartlehner G, et al. Perinatal depression: prevalence, screening accuracy, and screening outcomes. *Evid Rep Technol Assess* (Summ) 2005; 119:1-8.

2. Nott PN. Extent, timing and persistence of emotional disorders following childbirth. *Br J Psychiatry* 1987;151:523-7.

3. Mandl KD, Tronick EZ, Brennan TA, Alpert HR, Homer CJ. Infant health care use and maternal depression. *Arch Pediatr Adolesc Med* 1999;153:808-13.

4. Hearn G, Iliff A, Jones I, Kirby A, Ormiston P, Parr P, et al. Postnatal depression in the community. *Br J Gen Pract* 1998;48:1064-6.

5. Murray D, Cox JL. Screening for depression during pregnancy with the Edinburgh Depression Scale (EPDS). *J Reprod Inf Psychol* 1990;8:99-107.

6. Austin M-P, Lumley J, Antenatal screening for postnatal depression: a systematic review. *Acta Psychiatr Scand* 2003;107:10-17.

7. Webster J, Linnane JW, Dibley LM, Pritchard M. Improving antenatal recognition of women at risk for postnatal depression. *Aust N Z J Obstet Gynaecol* 2000;40:409-12.

8. Braverman J, Roux JF. Screening for the patient at risk for postnatal depression. *Obstetr Gynecol* 1978;52:731-6.

9. Stamp GE, Sved Williams A, Crowther CA. Predicting postnatal depression among pregnant women. *Birth* 1996;23:219-23.

10. Cooper PJ, Murray L, Hooper R, West A. The development and validation of a predictive index for postpartum depression. *Psycholog Med* 1996;26:627-34.

11. Posner NA, Unterman RR, Williams KN, Williams GH. Screening for postpartum depression: an antepartum questionnaire. *J Reprod Med* 1997;42:207-15.

12. Beck CT, Gable RK. Postpartum Depression Screening Scale: development and psychometric testing. *Nurs Res* 2000;49:272-82.

13. Righetti VM, Conne PE, Bousquet A, Manzano J. Risk factors and predictive signs of postpartum depression. *J Affect Dis* 1998;49:167-80.

14. Webster J, Linnane J, Dibley L, Starrenburg S, Roberts J, Hinson J. The impact of screening for risk factors associated with postnatal depression at the first prenatal visit. *J Qual Clin Pract* 1997;17:65-71.

15. Webster J, Linnane J, Roberts J, Starrenburg S, Hinson J, Dibley L. IDentify, Educate and Alert (IDEA) trial: an intervention to reduce postnatal depression. *BJOG* 2003 Sep;110:842-6.

16. Webster J, Pritchard MA, Creedy D, East C. A simplified predictive index for the detection of women at risk for postnatal depression. *Birth* 2003;30:101-8.

17. Webster J, Linnane J, Dibley L, Hinson J, Starrenburg S, Roberts J. Measuring social support in pregnancy: can it be simple and meaningful? *Birth* 2000;27:97-101.

18. Kennerley H, Gath D. Maternity blues. I. Detection and measurement by questionnaire. *Br J Psychiatry* 1989;155:356-62.

19. Eberhard-Gran M, Eskild A, Tambs K, Opjordsmoen S, Samuelsen SO. Review of validation studies of the Edinburgh Postnatal Depression Scale. *Acta Psychiatr Scand* 2001;104:243-9.

20. Boyce PM, Stubbs JM, Todd A. The Edinburgh Postnatal Depression Scale: validation for an Australian sample. *Aust NZ J Psychiatry* 1993;27:472-476

21. SPSS Inc. SPSS version 12.0 for Windows®. MagInfo Corporation, New York, 2003

22. Lang TA, Hodge M, Olson V, Romano PS, Kravitz RL. Nurse-patient ratios: a systematic review on the effects of nurse staffing on patient, nurse employee, and hospital outcomes. *J Nurs Adm* 2004;34:326-37.

23. Shakespeare J, Blake F, Garcia J. A qualitative study of the acceptability of routine screening of postnatal women using the Edinburgh Postnatal Depression Scale. *Br J Gen Pract* 2003;53:614-9.

24. Buist AE, Barnett BE, Milgrom J, Pope S, Condon JT, Ellwood DA, et al. To screen or not to screen--that is the question in perinatal depression. *Med J Aust* 2002;177 Suppl:S101-5.

25. Stamp GE, Williams AS, Crowther CA. Evaluation of an antenatal and postnatal support to overcome postnatal depression: a randomized controlled trial. *Birth* 1995;22:138-43.

26. Hayes BA, Muller R, Bradley BS. Perinatal depression: a randomized controlled trial of an antenatal education intervention for primiparas. *Birth* 2001;28:28-35.

Brisbane Postnatal Depression Index (BPDI)	
ANTENATAL (Circle responses at 'Booking-in')	
Maternity Social Support Scale score below 25	1
Family history of psychiatric illness	1
Woman's mother had postnatal depression	2
Past history of postnatal depression	3
Past psychiatric history	3
POSTNATAL (Circle responses on day 3 or at discharge)	
Maternity Social Support Scale score below 25	2
Satisfaction with delivery 3 or less	2
Blues score > 8	3
Brisbane Mother Baby Scale score > 30	4
TOTAL	
1. *Provide all women with information about postnatal depression* 2. *Consider all women scoring above 3 to have approximately 1 in 3 chance of developing postnatal depression* 3. *Consider all women scoring above 8 to have approximately 1 in 2 chance of developing postnatal depression*	

Figure 1. Brisbane Postnatal Depression Index

Table 1. Baseline demographic data and prenatal and postnatal patient risk factors of the derivation (14) and validation sets.

	Derivation set N (%)	Validation set N (%)	P value
Mean age in years [SD]	28.1 [5.2]	30.7 [5.7]	0.000
Primipara	379 (50.4)	166 (56.1)	0.056
Education			
Some secondary	124 (17.2)	24 (8.1)	
Completed secondary	192 (26.7)	81 (27.5)	
Vocational training	174 (24.2)	89 (30.2)	

Tertiary education	230 (31.9)	101 (34.2)	0.002
Employment			
Unemployed	41 (5.7)	16 (5.4)	
Full-time at home	214 (29.7)	90 (30.5)	
Full-time study	32 (4.4)	3 (1.0)	
Part-time work	159 (22.1)	60 (20.3)	
Full-time work	275 (38.1)	126 (42.7)	0.072
Housing			
Living with family	62 (8.6)	29 (9.8)	
Renting	303 (42.0)	112 (37.8)	
Own home/apartment	353 (49.0)	1154 (52.0)	
No permanent address	3 (0.4)	0 (0.)	0.578
Antenatal social support score <25	107 (14.2)	49 (16.6)	0.195
Past psychiatric history (excluding postnatal depression)	56 (7.4)	37 (12.5)	0.008
Family psychiatric history (excluding postnatal depression)	107 (14.2)	63 (21.4)	0.004
Past postnatal depression	42 (5.6)	26 (8.8)	0.106
Woman's mother had postnatal depression	23 (3.1)	20 (6.8)	0.007
Day-3 social support score < 25	172 (23.7)	47 (15.9)	0.003
Blues score > 8	228 (30.3)	20 (6.8)	0.000
Mother baby score >30	67 (9.3)	32 (11.0)	0.238
Dissatisfaction with delivery	94 (13.4)	78 (26.7)	0.000

Table 2: Comparison between the derivation (14) and validation sets of the Brisbane Postnatal Depression Index (BPDI) in predicting postnatal depression

	Prevalence (%)	Sensitivity (%)	Specificity (%)	PPV[1] (%)	NPV[2] (%)
BPDI (derivation)	12.2	36.3	92.0	39.8	90.8
BPDI (validation)	13.6	47.5	88.5	39.6	91.4

[1] Positive predictive value; [2] Negative predictive value

Table 3: Comparison between various combinations of risk factors from the validation set of the Brisbane Postnatal Depression Index (BPDI) in predicting and Edinburgh Postnatal Depression Scale score > 12

	n (%)	Sensitivity (%)	Specificity (%)	PPV[1] (%)	NPV[2] (%)
More than 1 positive response (from either antenatal risks or 3-day MSSS[3] score < 25)	65 (22.3) identified	50.0	82.1	30.8	91.2
More than 1 positive response (from either antenatal risks or 3-day Blues score >8)	58 (19.8) identified	47.5	84.6	32.8	91.1
More than 1 positive response (from either antenatal risks or 3-day BMBS[4] >30)	58 (19.8) identified	41.0	83.3	27.6	90.1
More than 1 positive response (from either antenatal risks or Delivery score < 3	19 (6.6) identified	47.5	78.1	27.7	90.3
A positive response to any antenatal risk factor **and** an MSSS[3] score <25	38 (13.0) identified	32.5	90.1	34.2	89.8
A positive response to any antenatal risk factor **and** 3-day Blues score >8	14 (4.8) identified	15.0	96.8	42.9	87.8
A positive response to any antenatal risk factor **and** 3-day BMBS[4] >30	19 (6.3) identified	20.0	95.6	42.1	88.2

A positive response to any antenatal risk factor **and** Delivery score < 3	34 (11.8) identified	18.4	89.2	20.6	87.8

[1] Positive predictive value; [2] Negative predictive value; [3] Maternity Social Support Scale; [4]Brisbane Mother baby Scale