Outcomes for women admitted to a mother and baby unit: a systematic review

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Abstract: Mother and baby units (MBUs) provide inpatient psychiatric care for mothers and their infants up to a year after childbirth. They are commissioned to support the mother–infant relationship as well as stabilize maternal mental health. As their efficacy at meeting these aims had not previously been systematically assessed, this paper reviewed the international literature relating to psychological outcomes following MBU admission. A systematic search of five databases identified 23 papers eligible for inclusion, reporting on a range of outcomes indicating positive effects on maternal mental health and the mother–infant relationship and an absence of adverse effects on child development. The review also highlighted specific groups responding less favorably to MBU admission, eg, mothers with a diagnosis of schizophrenia. Although the included studies were of variable methodological quality, the research findings consistently indicated positive effects. Implications for research and clinical practice are outlined in the discussion.

Keywords: mother and baby unit, systematic review, psychological outcomes, postnatal mental health, quality assessment, mothers

Introduction

Recent figures indicate approximately 20% of women experience postpartum mental health difficulties,[1] and four in every 1,000 women require inpatient admission postnatally.[2] Specialist mother and baby units (MBUs) provide joint admissions of mothers and babies for inpatient treatment and monitoring of the mother–infant relationship. MBU provision varies internationally. Currently, there are MBUs in the UK (n=17), France, Belgium, Germany, and Australia.[1] The US and India have MBUs, but they are fewer in number.[3] Some units are mother–baby facilities (MBFs), which are general psychiatric units with capacity for joint admissions, not dedicated MBUs. "MBU" is used to refer to both MBUs and MBFs throughout this review.

Main[4] observed that separating the mother and infant during the 1st year could impact negatively on the developing attachment relationship. Joint admission, hypothesized to be beneficial for both parties, allows for the observation of the mother caring for her infant and for a thorough risk assessment. Consequently, MBUs have been recommended in clinical guidelines internationally. The National Institute for Health and Care Excellence[5] outlined the role of MBUs in managing mental health problems during pregnancy, assessing mental illness, risks, and parenting skills, and providing expert care for the mother and infant. Similarly, the Scottish Intercollegiate Guidelines Network[6] recommended mothers have the option of joint MBU admission. However, over the 50 years since Main's[4] initial observations, little has been published regarding the effect of MBU treatment. To date, no reviews have evaluated its psychological outcomes, despite the important clinical treatment these units provide for mothers in crisis.

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Aims

The aim of this systematic review was to evaluate the psychological outcomes of MBU admission: 1) by addressing how admission impacted on maternal mental health, mother–infant relationships, and child health and development, and 2) by evaluating the methodological robustness of the research. Further aims included identifying the commonly used outcome measures and exploring the efficacy of particular MBU treatments.

Literature search
Strategy and findings

A systematic search used Ovid to review five databases from inception to January 2, 2015: PsycInfo, Medline, Embase, Health Management Information Consortium, and Maternity and Infant Care. Furthermore, reference lists of included papers were hand-searched for relevant articles, and citation searches were completed on included papers.

Search terms included "mother and baby unit$" OR "mother-baby unit$" OR "postnatal mental health$" OR "mother-baby psychiat$" OR "mother-infant unit$" OR "postpartum depressi$" OR "postpartum psychos$" OR "perinatal psychia$" OR "postnatal psychia$" OR "postpartum psychia$" AND "outcome$" OR "maternal clinical outcome$" OR "parenting outcome$" OR "attachment$" OR "bond$" OR "mother-infant interaction$". Figure 1, based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses[7] guidelines, outlines the search process.

The Quality Assessment Tool for Studies with Diverse Designs (QATSDD) was chosen because the methodologies used in these studies were expected to be diverse.[8] Each of the 14 QATSDD items related to quantitative studies was rated on a 4-point scale from "not at all" (0) to "complete" (3). Consistent with other uses of this measure, percentage scores were reported, calculated using the actual score and the maximum total score of 42. Papers scoring over 75% were considered "high" quality, those between 50% and 75% "good", 25%–50% "moderate", and below 25% "poor". The first author and a peer, independent to the study team, independently rated all papers and resolved any discrepancies through discussion. Interrater reliability was very good (κ=0.91). The relevant information is summarized in Tables 1 and 2.
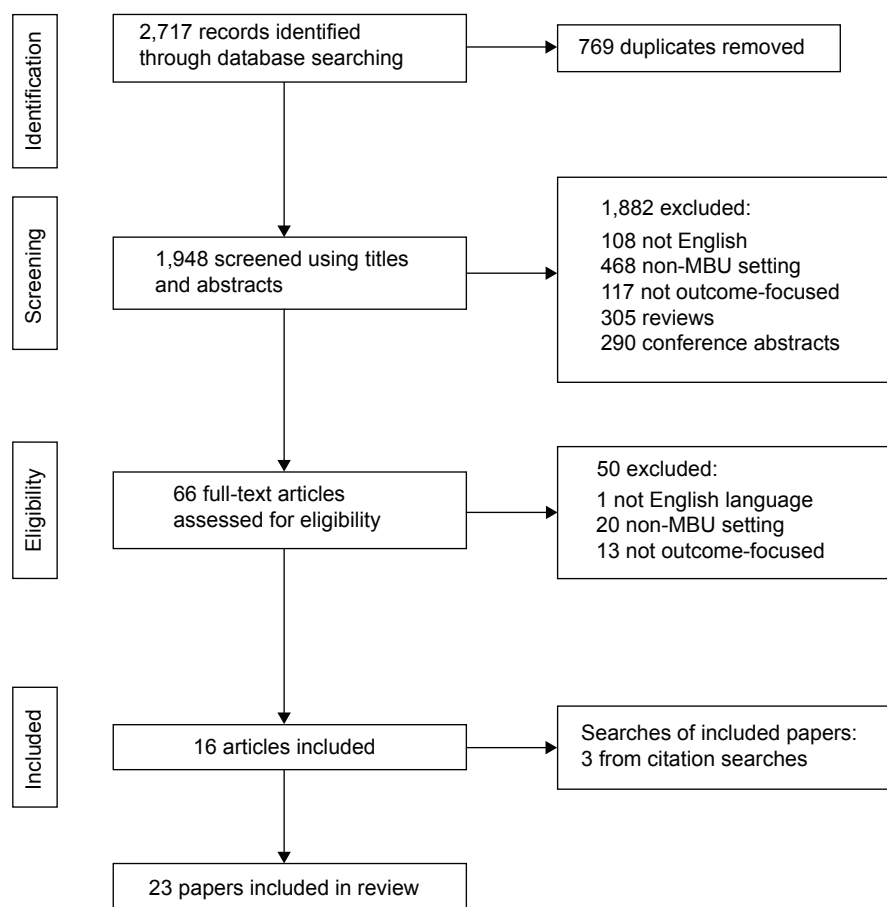

Figure 1 Flowchart demonstrating literature-review procedure.
Abbreviation: MBU, mother and baby unit.

Inclusion and exclusion criteria

Inclusion criteria were: 1) English language, 2) published in a peer-reviewed journal, 3) reporting outcomes relating to women admitted to a psychiatric MBU, 4) assessing maternal well-being, the mother–infant relationship, child development, or another psychological outcome, and 5) including assessment of change over time or functioning at discharge. Reviews were excluded. Studies on child-care arrangements[9] and relapse rates[10] were also excluded, as were studies in "mothercraft" units.[11]

Search results

Selection of studies

A total of 23 papers were identified for inclusion in this review.

MBU/MBF characteristics

The units ranged from four to 13 beds, and had multidisciplinary staff teams (Table 1). As information about treatments offered was sparse, collating comparable findings was difficult. Only eight papers described psychological treatments that focused on the mother or the mother–infant relationship.

Characteristics of participants

This review is based on 5,023 participants, including 215 control participants (4.3%). Primary diagnoses included depressive disorders (50% of the sample), schizophrenia (25%), and bipolar disorder (10%). The remaining 15% had diagnoses of anxiety disorders, personality disorders, and intellectual disabilities. The studies varied in their participant descriptions; most included maternal and child age and marital status; few provided further details (Table 1).

Characteristics of studies

Of the 23 papers, nine assessed mother–infant and maternal clinical outcomes, eight mother–infant outcomes, and six maternal clinical outcomes (Table 2). Five included a follow-up period, ranging from 1 to 6 years. Most used cohort designs, without control or comparison groups, although one presented a case series of two mothers.[12] Five studies used a controlled design; four compared mothers admitted to an MBU with various groups, including healthy and depressed mothers in the community. One study compared different treatment programs.[13]

Quality ratings

QATSDD scores ranged from 29% to 83%, with a mean of 62% (Table 2). Baker et al[14] obtained the lowest rating,

due to a lack of clarity of aims, justification of methodology, and description of procedure. In total, five papers scored as moderate quality, 12 as good, and six as high (Table 2). No relationship was observed between quality and design or year of publication. As this is the first review of MBU-related psychological outcomes, all studies were retained to present a comprehensive picture of the available research.

Study findings

Findings were grouped by outcome and methodology (see Table 2 for a summary).

Maternal mental health outcomes

Fifteen studies assessed maternal outcomes. Four used the Marcé checklist, an international scale using categories of "symptom-free", "considerably improved", "slightly improved", and "no change or decline". Ten used standardized tools, such as the Beck Depression Inventory (BDI)-II,[15] but one[16] was unclear about the method, appearing to use clinical judgment.

The Marcé checklist

The Marcé checklist is an international checklist to be completed with all joint admissions, with 53 items regarding diagnosis, the presence or absence of specific symptoms, treatment and outcome, and information on obstetric history and ethnicity. Two papers[17,18] detailed Marcé audits in the UK, covering 1996–2002 and 1994–2000, respectively. A further two reported audits of French MBUs over 2001–2007[19] and 1999–2000.[20] To compare data categories, "symptom-free" and "considerably improved" were combined, as were the "no change" and "worse" categories. The results were comparable across audits, with around 70% "symptom-free or considerably improved". Similar research assessed women admitted from 1959 to 1965; 44.6% were symptom-free at discharge, although 14.8% had poor adjustment at follow-up.[16] Unfortunately, a mixture of methods were used to assess follow-up outcomes, making assessments imprecise, with small samples prohibiting valid conclusions.[16] Furthermore, given the timeframe of this study, it is questionable how comparable these figures are to more recent research.

Maternal education, occupation, employment status, relationship status, and substance use during pregnancy were identified as predicting being "symptom-free or considerably improved".[19] Women with personality disorders or nonaffective psychotic disorders improved less than women with mood or acute transient psychotic disorders.[18,20]

Table 1 Settings of studies included in review and reported demographic characteristics (in chronological order)

Paper number	Author	Country	Unit size	Setting	Staff	Intervention
1[#]	Meltzer-Brody et al[30]	USA	5 beds No overnight facility for children	MBU	Nurses, lactation consultants, chaplain, recreational and occupational therapists, psychologists, psychiatrists, social worker, yoga instructor	Group and individual therapies: art, relaxation, behavioral, and mindfulness-based cognitive therapy, M-wave biofeedback therapy, mother–infant attachment therapy, family and partner-assisted interpersonal psychotherapy, therapeutic yoga, spiritual support
2	Reddy et al[12]	India	*	MBU	*	*
3	Vliegen et al[21]	Belgium	8 beds 4 beds	2 MBUs	Psychiatrist, a child, and an adult psychologist–psychotherapist, psychomotor and creative therapist, social worker, nurses, child-care worker	Systemic, psychodynamic, and cognitive approaches to treat mother and mother–infant relationship
4[#]	Kenny et al[50]	UK	13 beds	MBU	Psychiatrist, psychologist, nurses, OTs, social workers, nursery nurses	Medication, psychological therapies, video interaction work
5	Bilszta et al[13]	Australia	*	2 MBUs	Psychiatrist, nurses	Practical baby-care sessions, group discussions, CBT, music therapy, art therapy, medication
6[#]	Glangeaud-Freudenthal et al[19]	France	*	13 MBUs	*	*
7[#]	Bergink et al[37]	Netherlands	5 beds	MBU	*	Medication
8[#]	Pawlby et al[53]	UK	12 beds	MBU	*	Video interaction feedback
9	Vliegen et al[25]	Belgium	*	2 MBUs	*	*
10	Noorlander et al[40]	Netherlands	*	MBU	*	Medication, video intervention, feedback from nursing staff, therapy group

Maternal (M) and infant (I) age (years and weeks/ months, respectively)	Education/occupation	Marital status	Primiparous	Ethnicity
M: 28.8 years I: 16 weeks	*	49% married 12% cohabiting 23% single 6% divorced/separated 1% widowed	19%	50% White 29% African-American 12% Hispanic 1% Asian American 10% other
M: * I: 6 months, 1 year	*	*	*	*
M: 29.39 years I: 4.17 months	13.68 years of education	*	*	*
M: 31.4 years MBU 30.6 years community ill 28.8 years healthy I: 20.6 weeks MBU 8.9 weeks community ill 22.3 weeks healthy	*	Single: 20.4% MBU 20.9% community ill 19.0% healthy	42.9% MBU 35.8% community ill 68.2% healthy	White: 58.2% MBU 43.3% community ill 54.5% healthy
M: * I: 5.8 weeks	*	92% married or cohabiting	*	99% English language, 85% born in Australia
M: 31 years I: 9.6 weeks	29.5% training 11.7% unemployed 13.1% disability 17.2% sick leave 13.6% not in labor force 15% other 35.1% high school and over 46.5% secondary 17.8% primary or unknown	65.5% cohabiting	62.1%	Country of birth: 83.6% France 16.4% other
M: 31.9 years I: *	52.9% postsecondary education	96.1% married	78.4%	88.2% dutch ethnicity
M: 34.6 years schizophrenia 32.2 years depression 29.0 years mania 30.5 years controls I: 11.0 weeks schizophrenia 12.2 weeks depression 7.0 weeks mania 12.0 weeks controls	Professional/managerial: 25% schizophrenia 40% depression 40% mania 31.7% control	Single: 53.3% schizophrenia 4.3% depression 41.7% mania 0 controls	33.3% schizophrenia 43.5% depression 50% mania 56% controls	White: 20% schizophrenia 69.6% depression 50% mania 100% controls
M: 29.39 years I: 4.17 weeks	*	*	*	*
M: 32.16 years postpartum depression 31.73 years postpartum psychosis I: 2.29 months postpartum depression 0.99 months postpartum psychosis	Postpartum depression 23.1% primary 53.9% secondary 23.1% higher Postpartum psychosis 0% primary 58.3% secondary 41.7% higher	Married/cohabiting: 84.6% postpartum depression 100% postpartum psychosis	53.8% postpartum depression 91.7% postpartum psychosis	*

(*Continued*)

Table 1 (*Continued*)

Paper number	Author	Country	Unit size	Setting	Staff	Intervention
11	Wan et al[27]	UK	*	MBU	*	*
12	Wan et al[59]	UK	*	MBU	*	*
13[#]	Abel et al[56]	UK	*	8 MBUs, 3 MBFs	*	*
14[#]	Glangeaud-Freudenthal[20]	France and Belgium	*	11 MBUs	*	*
15	Salmon et al[17]	UK	*	8 MBUs 3 MBFs	*	*
16[#]	Salmon et al[18]	UK	*	8 MBUs 3 MBFs	*	*
17[#]	Hipwell et al[29]	UK	*	MBU	MDT	*
18	Riordan et al[51]	UK	*	MBU	*	*
19	Snellen et al[35]	UK	*	MBU	*	*

Maternal (M) and infant (I) age (years and weeks/ months, respectively)	Education/occupation	Marital status	Primiparous	Ethnicity
M: 28.93 years I: 8.27 weeks	6 professional/managerial 4 skilled/manual 2 semiskilled/unskilled 3 unemployed 1 not classified	87% married	*	*
M: 30.54 years schizophrenia 27.43 years bipolar disorder 27.45 years depression I: *	Professional to skilled manual: 23% schizophrenia 57% bipolar disorder 27% depressive illness Educational qualification: 54% schizophrenia 29% bipolar disorder 55% depressive illness	Married/cohabiting: 39% schizophrenia 71% bipolar disorder 64% depressive illness	69% schizophrenia 57% bipolar disorder 54% depressive illness	White: 62% schizophrenia 93% bipolar disorder 100% depressive illness
M: schizophrenia 20% <20 years, 29% 25–29 years, 30% 30–34 years, 22% 35+ years Affective disorder 20% <20 years, 29% 25–29 years, 29% 30–34 years, 23% 35+ years I: 41% <3 weeks schizophrenia 22% <3 weeks affective disorder	Schizophrenia: 28% professional/managerial 54% semiskilled/unskilled 18% never employed Affective disorder: 51% professional/managerial 40% semiskilled/unskilled 9% never employed	Married/cohabiting: 53% schizophrenia 76% affective disorder	57% schizophrenia 56% affective disorder	Schizophrenia: 56% White 27% Black African or Caribbean 11% South Asian 6% other Affective disorder: 78% White 9% Black African or Caribbean 7% South Asian 6% other
M: 30 years I: 10.6 weeks	29% professional 24% unemployed 22% student 14% disability 11% other	76% living with partner	*	*
M: 26% 16–25 years 73% 26–50 years I: *	23% professional/managerial 18% skilled manual 42% semiskilled/unskilled 4% unclassified 7% unemployed	68% married/cohabiting 5% separated/divorced 24% single 0.2% widowed 1% other	*	11% Black African 6% Black Caribbean 8% Indian/Pakistani/ Bangladeshi 1% Chinese 66% White 7% other
M: 26% 16–25 years 73% 26–50 years I: *	23% professional/ managerial 18% skilled manual 42% semiskilled/unskilled 4% unclassified 7% unemployed	68% married/cohabiting 5% separated/divorced 24% single 0.2% widowed 1% other	*	11% Black African 6% Black Caribbean 8% Indian/Pakistani/ Bangladeshi 1% Chinese 66% White 7% other
M: 29.5 years MBU 28.9 years control I: 4.1 weeks MBU 1.7 weeks control	Nonmanual: 60% MBU 63% control	Married/cohabiting: 80% MBU 88% control	MBU 64% Control 56%	*
M: 31.5 years schizophrenia 25.7 years affective disorder I: *	*	*	*	*
M: 28.6 years I: 16.9 weeks	*	53% single 27% married 20% de facto	*	*

(*Continued*)

Table I (*Continued*)

Paper number	Author	Country	Unit size	Setting	Staff	Intervention
20	Milgrom et al[57]	Australia	6 beds, focus on mothers with psychosis	MBU	Consultant psychiatrist, psychiatric nurses, pediatrician, psychologist, maternal and child health nurse, social worker, occupational therapist, psychiatry registrar	Medication, nursing, mothering skills, baby play group, CBT, family/couples work, social skills training, relaxation, daily living skills
21[#]	Hipwell and Kumar[44]	UK	*	MBU	MDT	*
22	Bardon et al[16]	UK	10 beds	MBU	Nurses	Medication, weekly group therapy, staff discussion, individual psychotherapy, OT
23[#]	Baker et al[14]	UK	8 beds, focus on mothers with psychosis	MBU	"Mentally trained nurses", nursery nurses, psychiatrist, psychologist, social worker	ECT, chlorpromazine, atmosphere of emotional warmth and support

Notes: *Information not provided; #external funding sources.
Abbreviations: MBU, mother and baby unit; OT, occupational therapist; CBT, cognitive behavioral therapy; MBF, mother and baby facility; MDT, multidisciplinary team; ECT, electroconvulsive therapy.

Standardized psychometrics

Several studies used psychometric self-report tools to measure change during follow-up periods. One[21] showed significant decreases in depression (BDI-II),[15] state and trait anxiety (State Trait Anxiety Inventory)[22] and state anger (State Trait Anger Expression Inventory).[23] Furthermore, participants reported less negative and more positive affect (Leuven Emotions Scale).[24] Therefore, the majority had good mental health at follow-up, although 39% were clinically depressed. Further analysis[25] noted participants remained depressed if they were more severely depressed and more self-critical (Depressive Experiences Questionnaire)[26] at admission. Another study[27] assessed depression (BDI)[28] over a 4- to 6-year-follow-up period, with comparable findings: 21% of participants were clinically depressed at follow-up, and 60% reported current mental health needs.

In research reporting slightly better outcomes,[29] 16% of MBU participants reported some depressive symptoms at 12 months postpartum, although none met diagnostic criteria (BDI).[28] In contrast, 44% of a community ill group reported symptoms and 19% met diagnostic criteria. This may indicate the superiority of inpatient treatment or reflect intergroup differences. The community ill group had diagnoses of depression, whereas the MBU group had other diagnoses, including schizophrenia. Therefore, outcome differences could be due to variations in the chronicity or treatability

of each disorder. Additionally, follow-up was conducted at 12 months postpartum rather than a specified time since MBU discharge. Therefore, it is questionable whether this could be viewed as MBU outcome data.

These results are consistent with research using psychometric tools to assess change over admission. One study[30] found depression and anxiety significantly reduced (Edinburgh Postnatal Depression Scale [EPDS], Patient Health Questionnaire 9, Generalized Anxiety Disorder scale 7),[31–33] and participants reported an increase in overall functioning (Work and Social Adjustment Scale).[34] Similar research[35] with participants with schizophrenia recorded significant improvements in psychotic symptoms (Positive and Negative Syndrome Scale, PANSS).[36] Focusing on postpartum psychosis, a further study[37] showed 92.2% of participants were symptom-free at discharge (EPDS, Clinical Global Impression scale [CGI], Young Mania Rating Scale),[31,38,39] although those with depressive features had a longer recovery period than those with manic features.

One study[13] used the EPDS[31] to assess video-feedback interventions during admission, comparing this to verbal feedback and standard care. EPDS scores significantly improved across groups, and no intervention was significantly superior to any other.

Two studies reported changes in illness severity over admission, although neither statistically assessed these for

Maternal (M) and infant (I) age (years and weeks/ months, respectively)	Education/occupation	Marital status	Primiparous	Ethnicity
M: 28.8 years I: 3.8 months	14% employed 25% home duties 61% unemployed and receiving benefits	39% single 44% married 14% de facto 3% separated	58%	*
M: 29.7 years unipolar depression 28.2 years bipolar depression 26.8 years schizophrenia I: 6.9 weeks unipolar depression 4.3 weeks bipolar depression 5.1 weeks schizophrenia	Nonmanual: 68% unipolar depression 54% bipolar depression 27% schizophrenia	Married/cohabiting: 82% unipolar depression 77% bipolar depression 40% schizophrenia	54% unipolar depression 69% bipolar depression 53% schizophrenia	*
M: 28.3 years I: 13 weeks	*	*	53%	*
M: 26.6 years MBU 27.4 years control I: *	*	*	60% MBU 65% control	*

significance. Firstly, a decrease in CGI[38] scores was noted for those with both postpartum depression and postpartum psychosis.[40] Secondly, lower Wittenborn Psychiatric Rating Scale[41] scores were found for participants admitted with their child than those without.[14] Without statistical assessment, it is hard to draw conclusions from these differences.

Therefore various psychometric tools have demonstrated improvements in maternal mental health symptoms over admission and into follow-up periods, with slower recovery for those with depressive features[37] and self-criticism.[25] While some superiority has been demonstrated to community-based treatment, the research also shows symptoms persisting at follow-up.

Summary of maternal mental health outcomes
Numerous data-collection methods, follow-up periods, and inclusion criteria were used, yet the results indicate improvement in maternal mental state from admission to discharge or to follow-up. These findings are promising, as are the results of the studies using control groups. However, the methodological concerns, including design issues, such as small sample sizes and diagnostic group differences, limit the implications of these results. Diagnostically, it appears that psychotic disorders, personality disorders, and high levels of self-criticism are related to poorer outcomes, but there is not enough research to draw firm conclusions.

Mother–infant outcomes
Seventeen papers assessed child or mother–infant outcomes (Table 2), using the Marcé checklist (n=4) or other standardized tools (n=13).

Rating scales of the mother–infant relationship
Several studies used scales to assess the mother–infant relationship, including either self-report or staff-rated scales. The Emotional Availability – Self-Report scale identified significant increases in the child's capacity to involve their parent and the affect quality of the interaction over a 3.5-year follow-up period.[21] Participants who were depressed at follow-up had significantly lower levels of mutual attunement than nondepressed participants.

Similar progress was recorded over admission with both a staff-completed scale (Bethlem Mother–Infant Interaction Scale [BMIS])[42] and self-report scale (Postpartum Bonding Questionnaire).[40,43] At admission, participants with postpartum depression rated their bonding as more problematic than participants with postpartum psychosis. In contrast, staff ratings recorded more difficulties for participants with postpartum psychosis. At discharge, all self-report scores were below clinical thresholds and staff ratings were reduced. A further study also showed BMIS scores improved significantly over MBU admission, and differed by diagnosis; scores at discharge were better for

Table 2 Designs and outcomes of included studies

Studies assessing maternal mental health and child outcomes (in chronological order)

Paper number	Sample size	Diagnosis	Design	Measures	Outcomes	Quality rating
1[21]	41	Postpartum depression	Cohort	Maternal health: BDI, STAI, STAXI, LES Mother–infant relationship: EA-SR	Depression, anxiety, and state anger decreased, positive affect increased, and negative affect decreased 39% depressed at follow-up Child's capacity to involve the parent and affect quality of the interaction improved	Good 67%
2[13]	74	100% major depressive disorder 4% comorbid borderline personality disorder 1% comorbid panic disorder	Control	Maternal health: EPDS Mother–infant relationship: PSCS, NPI	Improvement in maternal health in all three groups Improvement in parenting sense of competence in verbal and standard-care group but no improvement in maternal perceptions of infant behavior	Good 62%
3[40]	25	Postpartum depression (n=13) Postpartum psychosis (n=12)	Cohort	Maternal health: CGI Mother–infant relationship: PBQ, BMIS	Maternal mental health improved Improvement in bonding	Good 64%
4[27]	15	53% depression 33% bipolar 7% schizophrenia 7% OCD	Cohort	Maternal health: BDI Mother–infant relationship and child development: MSCA, MCAST, ABQ, SDQ, theory-of-mind tasks	60% self-report current mental health needs and 21% current depression No evidence of poorer child outcomes	Good 55%
5[17]	1,217	43% depressive illness 21% schizophrenia 14% bipolar affective disorders 3% anxiety disorder 1% OCD 3% PD 15% other/unknown	Cohort	Maternal health: Marcé checklist Mother–infant relationship: Marcé checklist	43% symptom-free 35% considerably improved 9% slightly improved 4% no change or worse **Schizophrenia** 36% significant problems caring for infant **Affective** 12% significant problems caring for infant	Good 67%
6[20]	176	25% schizophrenia 11% acute transitory delusional episode 11% bipolar affective disorder 22% depressive illness 22% PD/intellectual disability 9% other	Cohort	Maternal health: Marcé checklist Mother–infant relationship: Marcé checklist	65% symptom-free or considerably improved 20% slightly improved 14% no improvement or deterioration **Child health** 76% good 9% emotional problems 11% psychomotor problems 5% somatic/nutritional problems **Maternal skills** 18% significant practical problems 41% significant problems of emotional response	Moderate 45%

	Sample	Diagnoses	Design	Measures	Outcomes	Quality
7[18]	1,081	38% depressive illness 21% schizophrenia 14% bipolar affective disorders 3% anxiety disorder 1% OCD 3% PD 20% other	Cohort	Maternal health: Marcé checklist Mother–infant relationship: Marcé checklist	43% symptom-free 35% considerably improved 9% slightly improved 4% no change or worse 17% significant practical problems in baby care 20% significant problems of emotional response	Good 62%
8[29]	25 MBU 16 community group	**MBU group** 28% nonpsychotic depression 20% psychotic depression 32% manic disorder 20% bipolar disorder **Community group** 50% major depressive disorder 50% minor depressive disorder	Control	Maternal health: BDI Mother–infant relationship: POSER	**MBU group** 16% reported some depressive symptoms 0 clinically depressed **Community group** 44% reported some depressive symptoms 19% clinically depressed MBU and community less sensitive than controls, attachments no different from controls **MBU** 58% secure **Community** 38% secure	Good 71%
9[35]	15	27% first-episode psychosis 53% chronic schizophrenia 20% postpartum relapse of schizophrenia	Cohort	Maternal health: PANSS Mother–infant relationship: BMIS, ICBS	Significant improvement for positive and general psychopathology-syndrome scores, least significant change for negative syndrome scores Significant improvement in mother–infant interaction apart from baby-care variables Significant improvement in some infant interaction and mutual attention variables. Improvement related to maternal improvement	High 76%

Studies assessing maternal mental health outcomes only (in chronological order)

	Sample	Diagnoses	Design	Measures	Outcomes	Quality
10[30]	91	69% depression disorder 12% psychotic disorder 7% bipolar disorder 8% anxiety disorder 4% other	Cohort	EPDS, PHQ-9, GAD-7, WSAS	Significant reductions in depression, anxiety, and overall functional impairment	Good 69%
11[19]	814	38% mood disorder 23% schizophrenia/delusional disorder 23% PD/behavioral disorder/learning disability	Cohort	Marcé checklist	16% symptom-free 53% considerable improvement 21% slight improvement 8% no change 2% deterioration	Good 64%
12[27]	51	100% postpartum psychosis	Cohort	EPDS, CGI, YMRS	92.2% full remission before discharge Significantly longer duration of illness for depressed/psychotic than manic/psychotic patients	Good 54%

(*Continued*)

Table 2 (*Continued*)

	Sample size	Diagnosis	Design	Measures	Outcomes	Quality rating
13[25]	55	100% major depressive disorder with postpartum onset	Cohort	BDI, DEQ	Depression decreased over the 3.5-year follow-up period, with only 39% scoring above the cutoff Mothers who remained depressed were more depressed while at the MBU and more self-critical	High 76%
14[16]	112	28% schizophrenia 10% mania 60% depression 2% neurosis	Cohort	Assessment measure unclear	**Discharge** 44.6% symptom-free 55.4% residual symptoms **Follow-up** Adjustment good (51.8%), moderate (33.3%), poor (14.8%)	Moderate 40%
15[14]	20 MBU 20 control group	Schizophrenia	Control	WPRS	**With baby** Admission 34.6 Discharge 13.6 **Without baby** Admission 29.4 Discharge 17.6	Moderate 29%

Studies assessing mother–infant or child outcomes only (in chronological order)

	Sample size	Diagnosis	Design	Measures	Outcomes	Quality rating
16[12]	2	Chronic schizophrenia, but no current symptoms	Case series	Mother–infant relationship: PIPE	Significant improvement in mothering over the admission period	Moderate 40%
17[50]	49 MBU 67 community ill group 22 healthy community group	**MBU group** 16% schizophrenia 47% depression 37% mania **Community ill group** Depression + 37% cluster A PD 40% cluster B PD 70% cluster C PD	Control	CARE-Index	The MBU group mothers became more sensitive and less unresponsive; infants were more cooperative and less passive. No difference by diagnosis. The MBU group did not differ from the healthy group at discharge, and scored significantly better than the community ill group at discharge	High 83%
18[53]	50 MBU 49 control group	30% schizophrenia 46% depression 24% mania	Control	Mind-mindedness coding scheme	**Schizophrenia** Mothers talked to their children more at discharge than admission. Behaved most similarly to healthy control group **Depression** No change in mother or infant behavior over admission. More intrusive than healthy controls at admission and discharge **Mania** Infants more likely to look at their mother at discharge than admission. More intrusive than healthy controls at admission and discharge	High 79%

	N	Diagnosis	Design	Measure	Findings	Quality
19[59]	38	34% schizophrenia 37% bipolar disorder 29% depressive illness	Cohort	Global Rating Scales of Mother–Infant Interaction	Mothers with schizophrenia scored significantly worse than the other diagnostic groups, and the infants were more avoidant, less communicative, and less engaged. Interaction was less smooth and less mutually satisfying. These results were not explained by the social and clinical differences between the groups	High 76%
20[56]	932	26% schizophrenia 19% bipolar 55% unipolar	Cohort	Marcé checklist	**Schizophrenia** Significant problems caring for the infant 36% Significant problems of emotional response 43% **Bipolar disorder** Significant problems caring for the infant 15% Significant problems of emotional response 13% **Unipolar depression** Significant problems caring for the infant 11% Significant problems of emotional response 14%	High 76%
21[51]	26	31% schizophrenia 69% affective disorder	Cohort	Global Rating Scales of Mother–Infant Interaction	Mothers with schizophrenia and their infants showed less positive styles of interaction than the mothers with affective disorder	Good 74%
22[57]	36	44% schizophrenia 8% other psychosis 8% bipolar affective 25% depression 5% intellectual disability 8% other	Cohort	Mothering Skills Rating Scale	**Admission** Incompetent (20.2%), passable (26.6%), or competent (43%) **Discharge** Incompetent (7.6%), passable (43.1%), competent (49%)	Moderate 40%
23[44]	78	36% unipolar depression 45% bipolar/manic depression 19% schizophrenia	Cohort	BMIS	Scores decreased over time and differed across diagnosis	Good 57%

Abbreviations: BDI, Beck Depression Inventory; STAI, State-Trait Anxiety Inventory; STAXI, State-Trait Anger Expression Inventory; LES, Life Events Scale; EA-SR, Emotional Availability – Self-Report; EPDS, Edinburgh Postpartum Depression Scale; PSCS, Parenting Sense of Competence Scale; NPI, Neonatal Perception Index; CGI, Clinical Global Index; BMIS, Bethlem Mother–Infant Interaction Scale; PBQ, Postpartum Bonding Questionnaire; OCD, obsessive-compulsive disorder; MSCA, McCarthy Scales of Children's Abilities; MCAST, Manchester Child Attachment Story Test; ABQ, Attachment Behavior Questionnaire; SDQ, Strengths and Difficulties Questionnaire; PD, personality disorder; POSER, Play Observation Scheme and Emotion Rating; ICBS, Infant/Caregiver Behavior Scale; PANSS, Positive and Negative Syndrome Scale; PHQ-9, Patient Health Questionnaire 9; GAD-7, Generalized Anxiety Disorder 7 scale; WSAS, Work and Social Adjustment Scale; DEQ, Depressive Experiences Questionnaire; WPRS, Wittenborn Psychiatric Rating Scale; PIPE, Pediatric Infant Parent Exam; YMRS, Young Mania Rating Scale; MBU, mother and baby unit.

those with unipolar depression or bipolar disorder than those with schizophrenia.[44] In a sample of mothers with schizophrenia,[35] scores increased on most BMIS subscales over admission. The Infant/Caregiver Behavior Scale recorded significant improvements on dyadic and maternal responses, but only on three of eight infant-response scales.[35] However, validity or reliability Infant/Caregiver Behavior Scale data were unavailable, so these findings must be viewed cautiously.

In a comparison of three groups of participants receiving video feedback, verbal feedback, or standard care, improved parenting confidence (Parenting Sense of Competence Scale)[45] was noted for the verbal feedback and standard-care groups, but perceptions of infant behavior remained unchanged for all three groups (Neonatal Perception Index).[13,46] Although data were not presented, the authors[13] reported no superiority of either intervention over standard care, nor any significant difference between the interventions.

In summary, rating scales indicated improvements in the mother–infant relationship through admission and into follow-up. They suggested that mothers with depression perceive more difficulties in their relationship than are recorded by nursing staff. There is some indication that participants with schizophrenia have more difficulties in the mother–infant relationship at discharge than those with other diagnoses. Improvements in the relationship were not shown to differ according to the offered intervention.

Observational measures of the mother–infant relationship

A range of observational measures was used to assess the mother–infant relationship at either discharge or follow-up. At 12 months postpartum, 58% of children of MBU-admitted participants were securely attached, as were 38% of children of community participants, neither differing significantly from their matched controls.[29] This is markedly similar to rates of secure attachment at 4–6 years after discharge from an MBU.[27] Higher rates of insecure attachments were noted for MBU participants with affective disorders compared to those with bipolar disorders,[29] consistent with the literature on the different psychopathologies.[47] The depressed MBU participants engaged in significantly less affectionate talk with their children than the depressed community group (Play Observation Scheme and Emotion Rating).[29,48]

In contrast, when compared with community-ill participants, the CARE-Index[49] showed MBU participants had significantly better mother–infant relationships.[50] However, all community ill participants had comorbid personality disorders, compared with only one MBU participant. Previous

research related personality disorders to poorer treatment outcomes,[19] suggesting improvements in the MBU participants could be due to diagnostic differences. This could also explain the contradiction with the previous research,[29] which was limited to participants with depression.[29] Furthermore, postpartum assessment times varied greatly[50] (8.9 weeks for the community ill group, 22.3 weeks for the healthy group, and 20.6 weeks for the MBU group), meaning the community-ill group had less time to adjust to motherhood.

Two studies[51,59] used the Global Rating Scales of Mother–Infant Interaction[52] to assess participants at MBU discharge. Again, results differed by diagnosis: participants with schizophrenia had the lowest interaction scores, being significantly less accepting and warm than participants with affective disorders. Ratings of video interactions of MBU participants and healthy mothers were used to focus on mind-mindedness or the caregivers' ability to understand their child's internal state.[53,54] MBU participants with schizophrenia talked to their infants significantly more, and infants of participants with mania looked at their mothers more at discharge than admission. However, the research failed to reveal the hypothesized intergroup difficulties in mind-mindedness; the authors related this finding to the assessment schedule, which was designed for healthy mothers and did not appear to capture observed instances of nonattunement.

Outcomes from video feedback were reported in a case series of two symptom-free participants with schizophrenia admitted to the same MBU in India,[12] and both showed improvements on the Pediatric Infant Parent Exam;[55] however, the sample was too small to draw meaningful conclusions.

Therefore, the observational measures recorded similar findings to the rating scales, revealing improvements in mother–infant interactions over admission and into follow-up. Regarding diagnosis, the research is mixed. More difficulties appeared to be experienced at discharge by participants with schizophrenia or personality disorders, although attachment styles at follow-up were less positive for participants with affective disorders.

Parenting skills

Three studies used the Marcé checklist to report on parenting skills.[17,20,56] The French audit[20] recorded more parenting difficulties than either UK audit.[17,56] When viewed by diagnosis, outcomes were significantly worse for those with schizophrenia; however, schizophrenia rates in the French audit[20] were nearly double those in either UK audit,[17,56] potentially explaining this discrepancy.

The Mothering Skills Rating Scale was used to assess aspects of parenting skills, including practical management,

daily routine, and interactional tasks, which were rated "incompetent", "passable" or "competent".[57] Data were missing for 14 of the 36 participants, and no analysis contrasting those with complete data and those with missing data was reported. Potentially, staff made more effort to complete ratings for specific mothers, introducing bias. A trend for improvement in parenting competence over admission was observed, as "incompetent" ratings decreased and "passable" ratings increased. Unfortunately, it is difficult to differentiate this from the natural increase in parenting skills that might be expected for all mothers.

Child development

Only two studies considered the development of children whose mothers were admitted to an MBU. One[20] included the Marcé checklist data of child's health at discharge: 76% of children were rated as having good health or no problems, and recorded difficulties were often transitory. A further study[27] used a range of standardized tools with children whose mothers had been discharged 4–6 years previously. No concerns with behavioral, emotional, or cognitive functioning were revealed. However, only 28% of eligible mothers participated, limiting the power of this study.

Summary of mother–infant outcomes

The quality of mother–infant interactions generally improved, regardless of assessment method. Although mothers with schizophrenia had the poorest outcomes, attachment studies suggest higher levels of insecure attachment in children of mothers with affective disorders.

Discussion

This review systematically examined 23 identified studies reporting on outcomes following MBU admission. In summary, the research indicated improvements in maternal mental health, mother–infant relationship, and child development. However, studies also indicated poorer outcomes for specific groups of mothers, particularly those with a personality or psychotic disorder, severe depression, or high self-criticism. Furthermore, outcomes were influenced by variables indicating socioeconomic status, including education and employment. However, without further research, it remains possible that the diagnostic differences were related to the higher rates of stigma attached to specific diagnoses.[58]

The second aim of this review concerned the methodologies used: given the urgent care MBUs provide, it was not surprising that no randomized control trials were identified. Although only four studies included a control group, these were not always optimal, eg, differing substantially from the MBU participants in diagnosis. Therefore, sample sizes,

outcome measures, and designs varied greatly, making it difficult to draw overarching conclusions, yet reflecting the reality of clinical services. Most studies appropriately assessed participants at admission and discharge only, but without follow-ups to assess lasting change.

With regard to the measures commonly used, there was little consistency across the studies. Maternal mental health was assessed using self-report or staff-rating scales, mostly the BDI (n=4) for symptom change and the Marcé checklist (n=4) for improvement indicators. Specific symptoms or difficulties, such as psychosis, were assessed with specific measures, such as the PANSS. The mother–infant relationship was assessed using staff rating, video-observation rating, and self-report scales. Child development was assessed using self-report, observational measures, and the Marcé checklist. Overall, no single outcome measure or methodology dominated across the 23 studies.

This review also aimed to report on the efficacy of MBU-based interventions; however, no intervention appeared to be consistently offered, nor was any superior when compared with other interventions. For example, video feedback was used, but was not found to be superior to verbal feedback or standard care.[13] An important observation was that most studies provided limited descriptions of the staffing, theoretical underpinnings, and psychosocial interventions provided in each unit. Therefore, it was not possible to explore relationships between these interventions and outcomes.

Limitations

A major limitation is the variable quality of the available studies. While randomized controlled trials were not expected, even the studies with control groups had weaknesses, limiting the strength of the conclusions that can be drawn. Furthermore, descriptions of each MBU and their participants were sparse. Although the use of the QATSDD quality measure allowed for the diverse designs used in these 23 papers to be compared, there were methodological weaknesses that it did not capture, including the suitability of control-group participants and differing assessment time points. Additionally, scores were categorized by the authors into groups to assist with interpretation, so must be viewed with some caution. However, rather than using opportunistic control groups, researchers should seek more appropriate comparators and include follow-ups, as patients may access additional services after MBU discharge.

Recommendations for future research

This review highlighted the limited quality of existing research. Future studies should at the very least include

detailed descriptions of the studied unit, including size, staffing, and intervention approaches, allowing units to be contrasted and outcomes compared. Socioeconomic details should also be reported, given their possible association with outcome. Greater use of control groups would provide a comparative base for identified outcomes; ideally, these would be matched in terms of child age and socioeconomic or educational background. However, outside the research context, the use of control groups as comparators may not be practicable, which is why greater priority should be given to the systematic reporting of routinely collected admission and discharge data. Currently, the range of measures being used makes it difficult to compare outcomes reported by MBUs. Although the Marcé checklist was used in some studies, it is not a validated assessment tool sensitive to change. The BMIS was used to assess the mother–infant relationship in three studies. However, many observational measures (including the CARE-Index) can only be used if staff are trained in their use, are reliable raters, and receive regular supervision to ensure interrater reliability remains high, which can be costly undertakings for services. Similarly, assessing maternal mental health can be complex; measures may be more or less relevant depending on the diagnostic group. At the very least, these outcomes should be assessed at admission and discharge, and where possible with an appropriate follow-up.

Recommendations for clinical practice

In clinical practice, measures need to be quick, easy, and require minimal training. For maternal mental health, staff-rated CGI[38] scales of illness severity, improvement, and intervention effect may be appropriate, and could be completed during ward round. Quality will depend on the expertise and experience of staff completing the rating; however, this very quick measure is freely available, requires no training, and is transdiagnostic. Additionally, the BMIS, developed in MBUs for nurses to rate the mother–infant relationship, is freely available and requires no training. At admission, some patients may lack the capacity to complete measures; therefore, staff-rated measures may be more appropriate. However, it could be informative to collect self-report measures when possible, given the differences revealed by research comparing these methods.[40] If similar measures are used, this would allow for comparisons with other MBUs and their clinical service contexts. Furthermore, the data relating to specific diagnostic groups and socioeconomic characteristics suggest staff may be able to identify mothers

requiring more support, allowing for the planning of longer admissions or longer outpatient follow-up.

Conclusion

Joint admissions were recommended by Main[4] in 1958, and specialist MBUs followed shortly thereafter. Despite this history, this is the first review to collate systematically all studies reporting on outcomes following MBU admission. While the evidence base is neither large nor methodologically robust, this review finds encouraging evidence that MBUs positively impact on maternal mental health, the mother–infant relationship, and possibly child development. However, due to the limitations of these studies, these conclusions are preliminary. The recommendations aim to support the growth of this emerging research literature to guide clinical practice.

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Disclosure

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