In-home nursing care for women with high-risk pregnancies: outcomes and cost


Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The Healthy Beginnings Antenatal Program was examined for two groups of pregnant women. One group was women whose pregnancies were threatened by preterm delivery, including preterm labour, preterm premature rupture of membranes (PROM), or multiple gestations. The second group was women who had preeclampsia or essential hypertension. The programme, which aimed to guide hospital referrals, offered in-home care by experienced antenatal nurses and homemaker services by family aides, and received referrals 7 days a week. The programme included nursing and support services.

Type of intervention
Patient care management.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised women with high-risk pregnancies. There were several eligibility criteria.

The eligibility criteria for women with preterm labour were uterine contractions less than 10 minutes apart or progressive cervical dilatation or effacement, gestation of 20 to 37 completed weeks, and cervical dilatation no more than 3 cm.

Women with PROM were eligible if they had confirmed rupture of membranes and gestation greater than 24 weeks.

Women with multiple gestations were eligible if gestation was 20 to 34 weeks and there was no evidence of PROM.

The eligibility criteria for women with preeclampsia or essential hypertension were gestation of 26 to 40 weeks, a blood pressure (BP) of 140/90 to 150/100 (sitting), protein no more than 1+, and no signs of central nervous system irritation.

Pregnant women with diabetes, foetal growth restriction, oligohydramnios, vaginal bleeding, or chorioamnionitis were excluded.

Setting
The setting was the community. The economic study was carried out in the state of Alberta, Canada.

Dates to which data relate
The effectiveness and resource use data were gathered between May 1996 and November 1997 in the intervention group, and between September 1992 and April 1995 in the control group. No price year was reported.

Source of effectiveness data
NHS Economic Evaluation Database (NHS EED)
Produced by the Centre for Reviews and Dissemination
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The effectiveness evidence came from a single study.

**Link between effectiveness and cost data**
The costing was performed retrospectively on the same sample of patients as that used in the effectiveness study.

**Study sample**
Preliminary power calculations were not conducted. However, the authors pointed out that, due to the small detected difference in the main outcome measure, a sample of 3,000 women in each group would have been required in order to achieve 80% power. All women who received the study intervention and the comparator over the reported time frames were enrolled in the study. Among women with risk of preterm labour, there were 228 women in the intervention group and 209 in the control group. The mean maternal age was 28.1 (+/- 5.7) years in the intervention group and 27.9 (+/- 5.7) years in the control group, and the proportions of nulliparous were 32% (intervention) and 36% (control), respectively. Among those with hypertension, there were 155 women in the intervention group and 153 in the control group. The mean maternal age was 29.3 (+/- 5.7) years in the intervention group and 28.7 (+/- 5.7) years in the control group, and the proportions of nulliparous were 66% (intervention) and 45% (control), respectively. It was not reported whether any patients were excluded for any reason from the initial study sample.

**Study design**
The effectiveness study used a retrospective cohort design with a historical control group. The study was carried out in the community of Edmonton (AB), Canada. Among multiple pregnancies that resulted in twins, one infant was randomly selected and included in the analysis. The patients were followed up until 14 days after discharge. No loss to follow-up was reported. The outcome data were obtained from the Canadian Institute for Health Information Discharge Abstracts, a patient-specific database that contained selected clinical, demographic and administrative data on patient discharge from hospital.

**Analysis of effectiveness**
All patients included in the study were accounted for in the clinical analysis. The primary health measure was the proportion of infants being admitted to the neonatal intensive care unit (NICU) for longer than 48 hours. Such a measure was intended to detect immediate and long-term infant morbidity in a conservative manner. The secondary health outcomes included pregnancy complication factors that could be affected by the methods of antenatal care. For example, gestational age, birth weight, Apgar score at 5 minutes, foetal growth restriction, use of mechanical ventilation, intraventricular haemorrhage, perinatal death (both foetal and neonatal deaths), infant readmission within 14 days after discharge, clinical chorioamnionitis, eclampsia, Caesarean, maternal readmission and maternal death.

The study groups were generally comparable at baseline in terms of the demographics and pregnancy characteristics. However, among women at risk of preterm labour, family income was significantly higher in the intervention group. Among those with hypertension, the proportion of nulliparous and the family income were significantly higher in the intervention group. To take into account possible confounding factors, a logistic regression analysis was undertaken in which maternal age, parity and family income were considered as explicatory factors. A sub-group analysis, which excluded women in both cohorts who had antenatal lengths of stay of less than 24 hours, was conducted to exclude women presenting with imminent preterm deliveries.

**Effectiveness results**
When women at risk of preterm delivery were considered, the infants of those in the intervention group were half as likely to be in the NICU longer than 48 hours as infants in the control group (odds ratio 0.53; 95% confidence interval, CI: 0.36 - 0.78);

the gestational age was 36.1 (+/- 3.1) weeks (intervention) and 34 (+/- 4) weeks (control), respectively, (p<0.001);

the birth weight was 2,732 (+/- 716) g (intervention) and 2,330 (+/- 749) g (control), (p<0.001); and
Clinical chorioamnionitis occurred in 7.5% (intervention) and 14.8% (control) of the patients, (p=0.014).

The remaining secondary outcomes did not differ statistically between the two study groups. Similar results were obtained in the adjusted and sub-group analyses, with the exception that there was no statistically significant difference in terms of the occurrence of clinical chorioamnionitis and there was a smaller number of infants in the NICU after 48 hours (35.5% in the intervention group versus 54.5% in the control), (p=0.01).

When women with hypertension were considered, there was no statistically significant difference in the probability of having their infants in the NICU longer than 48 hours. In addition, no statistically significant differences were found in any of the secondary outcomes used in the analysis.

Adjusted and sub-group analyses produced similar results.

**Clinical conclusions**

The effectiveness analysis showed that the in-home care programme offered similar results to the in-hospital care intervention for women with hypertension and those at risk of preterm labour. In particular, among the latter group of patients (preterm labour), the in-home care programme offered a halved probability of the infants being admitted to NICU for longer than 48 hours.

**Measure of benefits used in the economic analysis**

The health outcomes were left disaggregated and no summary benefit measure was used. A cost-consequences analysis was therefore conducted.

**Direct costs**

Discounting was not relevant since the costs per patient were incurred in a short time period. Details on resource use were reported, but the unit costs were not given. The costs of health services included in the analysis were for inpatient services, physician services (consultations in and out of hospital), laboratory tests, outpatient drugs (betamethasone and dexamethasone), nursing hours (clinic, in-home, travel and telephone), taxi and home aide services. The inpatient services were antenatal, labour and delivery for mothers, and nursery and neonatal intensive care for infants.

The cost/resource boundary adopted in the study was not explicitly reported, but costs relevant to both the health system and the patient were included in the analysis. Resource use was estimated using actual data derived from the consumption of each patient. The cost data were obtained from Diagnosis Related Groups for inpatient costs, provincial billings for physician visits, financial costs at the Alexandra Hospital for laboratory tests, acquisition costs for drugs, specifically collected prices for nursing services, and average costs per trip for taxi expenses. No price year was reported.

**Statistical analysis of costs**

Due to the high variability in data, the costs were transformed using the natural logarithm. Comparisons were made through geometric means.

**Indirect Costs**

The indirect costs were not included in the economic analysis.

**Currency**

Canadian dollars (Can$).

**Sensitivity analysis**
Sensitivity analyses were not conducted.

**Estimated benefits used in the economic analysis**  
See the 'Effectiveness Results' section.

**Cost results**  
Among women at risk of preterm delivery, the total estimated costs per patient were Can$16,556 (+/- 23,616) in the intervention group and Can$22,891 (+/- 29,677) in the control group, (non significant), although there was a significant difference in the length of prenatal and postnatal hospital stay in the normal ward and NICU.

Similarly, among pregnant women with hypertension, the total estimated costs per patient were Can$7,872 (+/- 10,689) in the intervention group and Can$10,313 (+/- 23,748) in the control group, (non significant).

**Synthesis of costs and benefits**  
Not relevant as a cost-consequences analysis was conducted.

**Authors’ conclusions**  
The in-home service for high-risk pregnant women was a safe programme. In comparison with hospitalised women, women who received in-home care gave birth to infants with greater birth weights and gestational ages who required shorter stays in the neonatal intensive care unit (NICU). The costs were comparable between the home- and the hospital-based interventions.

**CRD COMMENTARY - Selection of comparators**  
The rationale for the choice of the comparator was clear. In-hospital care was selected since it represented the standard care for high-risk pregnant women before the introduction of the new programme. You should decide whether it is a valid comparator in your own setting.

**Validity of estimate of measure of effectiveness**  
The analysis of effectiveness used a retrospective cohort design with a historical control group. The authors stated that the retrospective design may have affected the comparability of the two groups. This, and the lack of randomisation in patient allocation to the study groups and the fact that the study groups were not perfectly similar at baseline, may have introduced bias and confounding. To address potential bias and confounding, the authors conducted statistically-adjusted and sub-group analyses. Power calculations were performed after the study and these revealed that the study was somewhat underpowered. The clinical outcomes post-discharge were not evaluated and remained uncertain. The study sample appears to have been representative of the study population.

**Validity of estimate of measure of benefit**  
No summary benefit measure was used in the economic analysis. The analysis was therefore categorised as a cost-consequences study.

**Validity of estimate of costs**  
The perspective adopted in the study was unclear, but the cost evaluation involved items relevant to the health service provider and the patients. The unit costs were not reported, although the quantities of resources used were given. No price year was reported, thus making reflation exercises in other settings difficult. Statistical analyses of the costs were conducted to account for the high variability in the data, but sensitivity analyses were not performed. The cost estimates were specific to the study setting. The authors stated that in-hospital costs were likely to have been underestimated due to the approach used for data collection. Further, health professionals in the intervention programme exercised
excessive caution, which could have led to an unnecessarily long antenatal length of stay, particularly for women in the preterm labour group.

Other issues
The authors did not explicitly compare their findings with those from other studies, but stated that their study supports the results of other studies evaluating antenatal in-home care. The issue of the generalisability of the study results to other settings was not addressed and no sensitivity analyses were conducted. These factors limit the external validity of the analysis (although details on resource use were clearly reported). The study enrolled high-risk pregnant women and this was reflected in the conclusions of the analysis. The authors pointed out some limitations of their study, which have been highlighted already.

Implications of the study
The main implication of the study was that the in-home programme for high-risk pregnant women was effective and safe, but did not produce significant cost-savings in comparison with the standard hospital-based programme.

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