

Ideas at Work

Program Evaluation of Hospital-Based Antenatal Home Care for High-Risk Women

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In light of the emphasis on increased efficiency in the delivery of hospital-based healthcare services in Canada, healthcare administrators need to advocate for greater care in the community (Helewa et al. 2000). The implementation of an antenatal home-care program for women with high-risk pregnancies at the Ottawa Hospital presented the opportunity to develop a comprehensive framework to evaluate the value and outcomes of the new community-based program.

Few hospital-based program evaluations and cost analyses have been published. To allocate funds responsibly, further research and evaluations of acute home care are required. Nevertheless, the limited research available indicates that antenatal home care is cost-efficient and patient outcomes are similar or better when compared to hospitalization. Findings reveal that women treated at home experience a longer latency period from presentation to delivery, deliver at a later gestational age and consequently have better outcomes (Helewa et al. 2000). Helewa et al. further report that the evidence suggests that patients who receive home care for pregnancy complications, such as SROM (spontaneous rupture of membranes) and hypertension, are less stressed than patients who are treated in the hospital, which may decrease their risk of preterm delivery.

These findings were also reported in a randomized study conducted by Dawson et al. (1989), in Wales. When examining home care versus hospital care, they report a reduction in the number of days of admission to hospital in addition to a decreased level of maternal stress.

The Antepartum Home-Care Program Evaluation (1997) in British Columbia also compared women with high-risk pregnancies enrolled in the home-care program ($n = 130$) to women who received hospital care ($n = 139$). The comparison group was selected during the year prior to the implementation of their program. The study revealed lower rates of chorioamnionitis for women cared for in the home (4.2% versus 11.09%, $p = 0.06$). Further, home-care costs were reported as 60 to 70 % less than hospital care.

A study conducted by Harrison et al. (2001) evaluating women with preterm labour (PTL) who received home care ($n = 228$), compared to women who received inpatient care ($n = 209$), revealed this: infants of women cared for at home had significantly shorter lengths of stay in the neonatal intensive care unit ($p = 0.001$) than infants cared for in hospital. Women cared for at home also presented with greater gestational age, 36.1 versus 34 weeks ($p = 0.001$), and greater birth weights, 2,732 versus 2,330 grams. Costs for women with PTL who

received home care were lower than for those who received hospital care (\$16,556 versus \$22,891), but the difference was not statistically significant.

In summary, there are a few reported studies evaluating antenatal home care of high-risk women. The results to date are promising. However, the number of women included is small with few control groups, and there is little published data about costs.

THE OTTAWA HOSPITAL ANTENATAL HOME-CARE PROGRAM

The Ottawa Hospital Antenatal Home-Care Program was implemented in July 1999, and is ongoing. The Antenatal Home-Care Program (AHCP) allows women with selected pregnancy complications to remain at home and receive maternal and fetal assessment by expert hospital-based obstetrical nurses. The eligible target population consists of women with threatened preterm labour, silent cervical dilatation, placenta previa, pregnancy-induced or chronic hypertension, premature rupture of membranes and patients with multiple pregnancies (with co-morbid conditions).

The main goals of the program are: (1) to offer a safe alternative to antenatal hospitalization through a family-centred and evidence-based approach to the care of women experiencing selected pregnancy complications; (2) to provide comprehensive care in the home, including, assessment, education, support, care evaluation and coordination of professional services; (3) to encourage and empower at-risk pregnant women to participate in their own healthcare; (4) to increase patient/family satisfaction thereby minimizing disruption to the family unit; (5) to determine cost-effectiveness through a cost-utility analysis.

Prior to program admission, patients must meet the established criteria. Admission criteria were also established for each specific diagnosis and were determined by maternal and fetal assessment. The criteria also described specific discharge criteria from home care to hospital and from the program to the community.

The evaluation compared the outcomes of women who were in the program during the first year of operation (from August 1, 1999 to August 31, 2000), to those of selected high-risk pregnant women who were eligible for admission to the (AHCP), but were admitted to hospital either because the program was full or because their physicians did not refer them to the program. The cost analysis provides data as to the cost effectiveness of the program. After participation in the program, patient and provider satisfaction was analyzed and recommendations made.

During the evaluation period, 112 referrals were received and 80 women were admitted to the program. The program includes service at two campuses of the Ottawa Hospital.

However, the evaluation was based on patients cared for at only one campus (General), because the case costing system was only available at that campus. In total, there were 80 patient admissions to the Ottawa Hospital AHCP with 48 patients referred from the General Campus. Since each patient may have more than one admission to the AHCP, there were a total of 64 antenatal home-care program admissions at the General Campus.

EVALUATION METHODOLOGY

The aim of the program evaluation was to answer this research question: Is the Ottawa Hospital Antenatal Home-Care Program a safe and cost-effective alternative to hospitalization? The evaluation compared two models of care delivery: domiciliary versus hospitalization.

Objectives

Since the AHCP is an alternative to hospitalization, the two main reasons for the program evaluation were: (1) to determine if costs will be contained by reducing the average length of hospital stay; (2) to determine whether antenatal home care is a safe and feasible alternative to hospitalization.

Although we recognize that a randomized control trial is a preferable research design, the number of patients admitted to this program since its implementation in July 1999 did not provide a sufficient sample size. Hence, the research design chosen for the AHCP was a case-comparison study. Based on the antenatal program's objectives, the case-comparison study examined and compared 23 selected antenatal patients admitted to hospital with 48 patients admitted to the AHCP. The same criteria were used for both groups.

A retrospective chart review was conducted to establish the comparison group. Based on 50 patient charts, 27 patients were eliminated from the comparison group because: (1) they were admitted to hospital during a weekend when the program was closed ($n = 7$); (2) they had one- and two-day lengths of stay for assessment ($n = 16$); (3) they did not meet the criteria for admission to the program due to a language barrier ($n = 1$); (4) the patient and/or her partner refused to participate in the pilot program ($n = 3$).

Information was also downloaded from the Ottawa Hospital, General Campus Med 20/20 Health Records database. A subsequent chart review was necessary to complete the retrieval of data required to analyze the maternal and newborn outcomes for both the home-care program group and comparison group. The review consisted of the data collection and analysis of 152 inpatient charts, which included: 23 mothers admitted to hospital (comparison group), and their newborns ($n = 28$) and 48 mothers admitted to the program, and their newborns ($n = 53$).

Both qualitative and quantitative data were analyzed to provide a comprehensive evaluation of the outcomes for the

AHCP. A cost analysis was conducted. The costing elements included costs to hospital compared with the costs for AHCP admission. The following costing elements were determined:

1. Total variable direct and indirect cost for triage and/or L&D. Cost of admission to triage or L&D for any patient having conditions/complications requiring assessment.
2. Variable direct cost for stabilization. Cost for any AHCP patient who, after assessment, required admission to hospital for stabilization, or any patient not yet on the AHCP who came to hospital for assessment and required stabilization before entering the AHCP.
3. Variable indirect cost. This includes cost of supplies, travel and office space.
4. Salaries and benefits. Cost of salaries and benefits for the duration of the evaluation.

The first author conducted qualitative interviews with the two expert obstetrical nurses who provided home care to women during the study. Interviews were tape-recorded and transcribed. The purpose of these interviews was to determine the views of the Antenatal Home Care nurses regarding the current status of the program and future planning. The questions were open-ended, and based on program safety and potential areas for improvement. The questions were adapted from the program evaluation of the Community-Based Care for Women with High-Risk Pregnancies Program (1999) in Edmonton, Alberta.

Structured surveys were conducted to elicit patient and provider satisfaction after participation in the AHCP.

RESULTS

Cost Analysis

The cost analysis revealed that the total average variable direct and indirect cost for admission to the AHCP was \$108,725 or \$2,265 per case versus \$72,459 or \$3,150 per case for inpatient care. This figure excludes the stabilization cost for patients who required preadmission to hospital prior to being transferred to the AHCP, and patients who were transferred from the AHCP to the hospital because of a change in their acuity level.

All patients require a maternal and fetal assessment in the Triage Unit or Labour and Delivery Unit prior to admission to the AHCP or hospital. Consequently, the average total variable direct and indirect cost for assessment in the Triage Unit and

Figure 1: Average Variable Direct and Indirect Cost Analysis

	AHCP n = 48	Inpatient n = 23
Variable Direct and Indirect Cost for Triage and L&D		
Total	\$3,859	\$22,791
Total visits	19	20
Average cost per visit	\$203	\$1,140
Variable Direct Cost for Stabilization		
Cost of stabilization prior to admission to AHCP for 9 patients	\$15,901	N/A
Cost of stabilization when admitted to hospital from AHCP for 7 patients	14,053	
Total stabilization cost — direct cost	<u>\$29,954</u>	
Average cost per stabilization	\$1,872	
Variable Indirect Cost		
Supplies	\$2,903	
Travel expenditures	3,840	
Office	1,581	
	<u>\$8,324</u>	\$23,195
Average cost per patient	\$173	\$1,008
Total Direct and Indirect Cost (includes all costs above except the stabilization cost plus costs of salaries and benefits)	\$108,725	\$72,459
Average cost per patient	\$2,265	\$3,150
Total Direct and Indirect Cost (includes all costs above plus costs of salaries and benefits)	\$138,679	N/A
Average cost per patient	\$2,889	

the Labour and Delivery Unit is included to the total cost.

Since stabilization costs were not available for women cared for in hospital, the correct cost comparison is for costs excluding that of stabilization. Clearly, the cost of care for antenatal home-care patients with selected pregnancy complications is substantially less than the cost of care for similar women in hospital. Caring for selected high-risk pregnant women in the home as an alternative to hospitalization reduced the operational costs by \$885 per case. In order to transfer funds from the hospital to the AHCP under special funding, closure of inpatient beds is necessary (or not opened in the case of increasing demand).

Maternal and Newborn Health Outcomes

The evaluation analyzed the health outcomes for both the mothers and their newborns admitted to the AHCP (study group) compared to those admitted to hospital (comparison group). The overall outcomes reveal no significant differences in outcomes between the study group and the comparison group. Differences between the two groups were analyzed using chi-square statistics or Fisher's exact test for categorical variables and t-tests for continuous variables.

The significance level was set at 0.05. Five maternal diagnoses were examined and compared between the study and comparison group. These were the following high-risk

Figure 2: Comparison of Maternal Characteristics

Characteristics	Home n = 48	Hospital n = 23	P
Maternal Diagnosis			
• Preterm labour (PTL):	27 (57.45%)	16 (69.57%)	.4350
• Premature rupture of membranes (PROM)	11 (23.40%)	3 (13.04%)	.3612
• Pregnancy-induced hypertension (PIH) (increased B/P)	20 (41.67%)	1 (4.35%)	.0009
• Placenta previa (APH) (low-lying placenta) (bleeding) (abruption)	6 (12.77%)	4 (17.39%)	.7192
• Multiples (twins/triplets)	4 (8.33%)	5 (21.74%)	.1379
Maternal Characteristics			
Maternal age at delivery	28.44 yrs	27.74 yrs	.5767
Parity: (0)	25 (52.87%)	14 (60.87%)	.9051
(1)	18 (37.50%)	7 (30.43%)	
(2)	4 (8.33%)	2 (8.70%)	
(3)	1 (2.08%)	0%	

pregnancy complications: preterm labour, premature rupture of membranes, pregnancy-induced hypertension, placenta previa and multiple births with one of the previous complications.

Maternal age at delivery and parity were similar for these two groups. There was one statistically significant difference: more AHCP women had PIH compared to hospitalized women (42% versus 1%). This may suggest that the obstetrical care providers were comfortable admitting patients with PIH into the AHCP given that most antenatal home-care programs are designed to care for women with PIH. A larger sample may have revealed more statistically significant differences between the two groups.

Maternal Health Outcomes

Women cared for in the AHCP had health outcomes similar to the women in the comparison group (see Figure 3). No statistically significant differences were found between the women in the comparison group and study group for induction rates, mode of delivery and maternal readmission.

Figure 3: Comparison of Maternal Health Outcomes

Maternal Outcomes	Home n = 46*	Hospital n = 20	P
Pregnancy Outcomes			
Inductions	19 (40.43%)	5 (25%)	0.2752
Mode of delivery:			
• Vaginal	37 (80.43%)	13 (65%)	0.2175
• Cesarean section	9 (19.57%)	7 (35%)	
• Previous C/S	1 (11.11%)	3 (42.86%)	
Postpartum maternal readmission (one month post discharge)			
	0	0	

* Two women in the home and three in the hospital group did not deliver during the evaluation period.

If complications arose, the mothers were advised to visit promptly the labour and delivery room closest to their home. Patients were also instructed to bring their daily diaries along with a copy of their chart to ensure accurate maternal and fetal assessments. Of the 48 patients in the AHCP, seven were admitted to the antenatal obstetrical unit for clinical reasons.

Newborn Health Outcomes

The health outcomes for newborns were also similar for both the study and comparison group (see Figure 4) regarding gestational age at delivery, birth weights, Apgar scores, requirements for mechanical ventilation and admission rates to the NICU. One infant of a mother in the AHCP group was admitted to the Children’s Hospital of Eastern Ontario for surgery due to congenital anomalies.

Figure 4: Comparison of Newborn Characteristics and Outcomes

Characteristics and Outcomes	Home n = 53	Hospital n = 28	P
Gestational age at delivery	36.4 wks.	35.4 wks.	.3291
Infant Outcomes			
• Birth weight (grams)	2647.4 g	2507.5 g	.5112
• Apgar at 1 minute	6.86	7.67	.1015
• Apgar at 5 minutes	8.08	8.38	.3960
• Mechanical ventilation	6 (11.32%)	4 (14.29%)	.7312
• Admission to regular nursery	29 (56.86%)	15 (68.18%)	.8056
• Admission to NICU	20 (39.22%)	7 (31.82%)	
• Admission to CHEO	1 (1.96%)	0	

There appeared to be no impact on the mother or infant health outcomes as a result of this home-care program. A randomized clinical trial with a larger sample size is needed to more rigorously examine the potential differences in health outcomes.

QUALITATIVE ANALYSIS

Interviews of Home Care Nurses

Figure 5 shows the interview questions asked of the two AHCP nurses.

The nurses perceived the program to be “very successful.” They stated that “the program meets the client’s needs because the family unit is maintained.” The nurses further stated that the husbands “experience less stress, because they are not struggling to do everything at once, such as housework, looking after children, pets and household duties while their spouse is hospitalized.” Other reasons identified for this success were that the program provided great “flexibility,” including: (1) “partner participation,” (2) “easy access to nurses” and (3) “individualized programs to meet educational needs.” A better “understanding of the patient’s condition and continuity of care were definite assets to the women and their partners.”

Figure 5: Questions Based upon Areas of Improvement and Safety*

1. Do you think this program is successful?
2. What are the advantages for women being cared for on the program?
3. What are the health risks related to the mother and the baby?
4. What do you think is the most serious health risk associated with the program?
5. What do you find satisfying about the work? What are the greatest challenges?
6. What do you think are the weaknesses related to the program?
7. What is your level of satisfaction with working on the program on a scale of one to ten. (Ten being the highest level of satisfaction).
8. Based on your experience, what do you think are the essential characteristics for an antenatal home care nurse?

* From Community-Based Care for Women with High-Risk Pregnancies Program (1999) in Alberta.

The nurses believed that these were the main advantages of the program: (1) “remaining part of the family unit, and continuing to keep a finger on the pulse of the family,” (2) “cultural sensitivity and ethnicity is respected and encouraged. Customs, rituals, are more easily practised and cultural foods more easily accessed at home” and (3) “The moms who have premature rupture of membranes are definitely safer by being cared for at home due to the decreased risk of iatrogenic infection.”

One risk the nurses reported was the “distance from the hospital in an emergency situation is a recognized concern.” Concerning the most serious health risk, both nurses expressed “feeling somewhat insecure about caring for moms with placenta previa or concealed abruptions at home due to the 30 minute distance from hospital and the potential for sudden hemorrhaging.” The nurses did feel somewhat more comfortable in caring for patients with “undiagnosed bleeding,” providing that the placenta previa and significant abruption were ruled out.

Weaknesses identified by the home-care program nurses were “the lack of childcare and homemaking available to the patients when they are admitted to the program.” “However, there may be greater demands placed on the high-risk pregnant patients when admitted to hospital since there are even fewer supports available in the home while the mother is hospitalized.” Weekend coverage is required through, (1) nurses being on pagers, (2) phone calls to all patients in the program and (3) possible home visits for new or more critical patients. This could alleviate patient anxiety and enable the physicians and nurses in the labour and delivery room to contact the AHCP nurses during weekends with questions regarding their patients. “Weekend coverage would also allow for new admissions over the weekend thereby decreasing unnecessary hospitalization.”

The nurses found that “there is definitely a high degree of work satisfaction in being able to apply assessment skills and nursing diagnosis ability while being able to follow the patient through the course of their high-risk pregnancy.” Strong physician collaboration and respect for nursing skills and abilities was also reported.

Essential characteristics of an AHCP nurse were identified as: (1) high-risk antepartum, postpartum and labour and delivery experience; (2) teaching experience; (3) ability to problem solve instantly without much backup.

Physician Satisfaction Survey Findings

A physician satisfaction survey was developed using a five-point Likert response scale. The tool was adapted from the Antepartum Home-Care Program Evaluation (B.C. Women’s 1997) and Heaman et al. (1994). Based upon a 67% response rate, 100% agreed that the program was a safe and economical alternative to hospitalization (see Figure 6). The majority of the remaining responses were in the “Agree” or “Strongly Agree” categories.

Several comments were written in the spaces available on the questionnaires:

Figure 6: Physician Satisfaction Survey Responses (%) n=16

	1= Strongly Disagree	2= Disagree	3= Uncertain	4= Agree	5= Strongly Agree
AHCP safe & economical alternative to hospital care (n = 16)	0.0	0.0	0.0	12.5	87.5
Acceptable enrollment criteria (n = 15)	0.0	0.0	6.7	47.6	46.7
Easy to refer to AHCP (n = 15)	0.0	6.7	6.7	26.7	60.0
AHCP nurses provide support & teaching (n = 15)	0.0	0.0	0.0	6.7	93.3
AHCP nurses inform me about patients’ condition (n = 14)	0.0	0.0	7.1	21.4	71.4
AHCP enrolled patients rarely present to office or hospital for unscheduled visits (n = 15)	0.0	0.0	6.7	33.3	60.0
Patients referred are satisfied with AHCP (n = 14)	0.0	0.0	7.1	14.3	78.6
Overall I am satisfied with AHCP (n = 15)	0.0	0.0	0.0	13.3	86.7

1. Four physicians suggested that weekend coverage was needed.
2. Several physicians felt that the program criteria should be expanded:
 - Two physicians thought that there should be room for relaxing the criteria for specific individuals, depending on such patient characteristics as compliance and responsibility.
 - Two physicians thought that patients with IUGR should be included.
 - One physician thought that patients should be allowed in prior to 24 weeks gestation.
3. One physician believed that the program’s capacity should be increased so that it is available to more women.

Patient Satisfaction Survey Results

A five-point Likert Scale was also used to measure the patients’ level of satisfaction. The tool was adapted from the Antepartum

Home-Care Program Evaluation (B.C. Women’s 1997) and Heaman et al. (1994). Based upon a 75% patient response rate, 94.1% reported being glad of their home care. Eighty percent of the patients reported that clear instructions were given on when to call the physician or go to the hospital (see Figure 7). The most frequent responses to the survey were “Agree” and “Strongly Agree,” the combined response rate ranging from 80 to 100% except for one question. Over one-third of the women did not find the AHCP team helpful.

Figure 7: Patient Satisfaction Survey Responses (%) n = 36

	1= Strongly Disagree	2= Disagree	3= Uncertain	4= Agree	5= Strongly Agree
Physician explained the program prior to discharge (n = 36)	5.6	5.6	8.3	30.6	50.0
Hospital nurse gave clear instructions prior to discharge home (n = 30)	3.3	6.7	10.0	36.7	43.3
Patients reported greater satisfaction to be cared for at home (n = 34)	0.0	0.0	5.9	8.8	85.3
AHCP nurse provided useful information about rest and activity (n = 36)	0.0	0.0	0.0	5.6	94.4
Education provided by AHCP nurse thorough and clear (n = 35)	0.0	0.0	5.7	22.9	71.4
AHCP nurse encouraged participation in care (n = 34)	0.0	0.0	8.8	38.2	52.9
AHCP nurse encouraged questions (n = 36)	0.0	2.8	0.0	22.2	75.0
AHCP nurse reinforced physician information (n = 35)	0.0	2.9	2.9	34.3	60.0
AHCP considered opinions and preferences (n = 34)	5.9	2.9	0.0	26.5	64.7
AHCP was thorough in teaching about care and monitoring (n = 35)	0.0	0.0	0.0	11.4	88.6
Clear instructions given on when to call the physician or go to the hospital (n = 36)	0.0	0.0	0.0	8.3	91.7
Chart records easy to complete (n = 36)	0.0	0.0	0.0	19.4	80.6
AHCP team was helpful (n = 33)	6.1	21.2	9.1	27.3	36.4
AHCP booklets gave useful information (n = 36)	0.0	0.0	2.8	36.1	61.1
AHCP nurse made me feel secure (n = 36)	0.0	0.0	0.0	11.1	88.9
Satisfied with quality of doctor’s care (n = 34)	0.0	0.0	0.0	14.7	85.3

In Figure 8, the remaining questions were answered on a different response scale. Most patients felt that the number of visits was just right and that keeping the required records and doctor’s appointments was easy. However, over half of the patients were either undecided or found it difficult to get the required bedrest.

Figure 8:

	Too Many	Just Right	Too Few
Number of visits by AHCP nurses (n = 35)	0.0	97.1	2.9
	Easy	Undecided	Difficult
Getting enough bedrest was (n = 35)	51.4	20.0	28.6
Keeping records of bedrest, fetal movements and blood pressure was (n = 35)	91.4	8.6	0.0
Keeping doctor’s appointments was (n = 35)	80.0	20.0	0.0

The majority of the respondents answered the four open-ended questions. The first question asked what patients liked most about the program. Twenty patients responded that they liked staying home and not being in hospital. A few gave reasons such as being able to rest more easily, being less stressed, living a normal life and being with their families. Twenty-two patients noted that the nurses were supportive/friendly and provided good care. Twelve patients commented on the information provided by the nurses and that it was more comprehensive than that provided in hospital. Eleven participants found that the daily monitoring of their and their baby’s condition was reassuring, made them feel secure and relieved stress.

When asked what they liked least about being in the program, 8 patients did not respond and 15 patients said “nothing.” Two patients felt insecure without weekend coverage. Five patients found it difficult being on bedrest and doing nothing when others were working and there were children to care for. Three mentioned that hospital visits were difficult because of long waiting periods.

Another question asked for suggested changes to improve the program. Twelve respondents felt no changes were required and nine did not respond to this question. Three patients suggested a homemaker/housekeeping service. Five would have liked visits on weekends as well as weekdays. Five thought the program should be expanded. Miscellaneous suggestions included standing appointments, improved communication between the program and hospital and better equipment.


Finally, patients were asked if they would choose to receive care in the program again if it were necessary. Thirty-four responded positively or very positively and two did not answer.

Health Policy Recommendations

Based upon the findings of the program evaluation, AHCP at the General Campus of the Ottawa Hospital appears to be a safe and cost-effective alternative to hospitalization. Although there were no statistically significant differences in the maternal and newborn outcomes of care, a small sample was used. Accordingly, a large-scale multi-site randomized control trial must be considered to further evaluate the safety and outcomes of the program.

In support of this direction, hospital administrators should encourage more program evaluations. It is recommended that evaluation costs be planned for and increased in funding submissions. A policy recommendation is to allocate Ministry of Health and Long-Term Care funding towards program evaluation. Evidence-based, acute home-care programs managed by expert hospital-based nurses are required to decongest hospitals of patients who can be safely monitored at home.

Program evaluations need to focus on comprehensive models to include all three components: patient satisfaction, cost-effectiveness and patient outcomes of a successful program.

Policy recommendations specific to the Ottawa Hospital were provided to administrators for the further development of their AHCP. It has been decided to continue and expand the program with additional resources and weekend operation. 

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