

MAIN RESEARCH ARTICLE

## Successful implementation of evidence-based routines in Ukrainian maternities

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### Abstract

**Objective.** To describe the process of change and assess compliance and effect on maternal and infant outcome when the WHO package Effective Perinatal Care (EPC) was implemented at maternities in Ukraine. **Design.** Intervention study comparing outcomes before and during 2.5 years after training. **Setting.** Three maternities in Donetsk, Lutsk and Lviv 2003–2006. **Population.** Baseline data were collected for 652, 742 and 302 deliveries and 420, 381 and 135 infants, respectively, in Donetsk, Lutsk and Lviv. Follow-up data included 4,561, 9,865 and 7,227 deliveries and 3,829, 8,658 and 6,401 infants. **Methods.** Staff training on evidence-based guideline. **Main outcome measures.** Interventions during labor, maternal outcomes and hypothermia in the infants. **Results:** EPC procedures were successfully implemented and adherence to the protocols was excellent. For most variables, the change occurred during the first three months but was well sustained. The use of partogram increased fourfold in Donetsk and from 0% to 60% in Lviv. Induction and augmentation of labor decreased to less than 1% and less than 5%, respectively. Cesarean section rate dropped significantly in two of the maternities. The proportion of hypothermic infants decreased from 60% (Donetsk), 85% (Lutsk) and 77% (Lviv) to 1% in all three maternities during the first three months and was stable throughout the study period. Admission to Neonatal Intensive Care Unit decreased significantly in two of the maternities and there was no effect on early neonatal mortality. **Conclusions:** The process of education and change was well anchored in the organization, and implementation of new procedures was quick and successful.

**Key words:** Evidence-based perinatal care, labor and delivery, hypothermia in newborn infants, Eastern Europe

### Introduction

Quality of care is increasingly recognized as the most important factor for improving maternal and perinatal health once general access to basic care is ensured (1,2). Improvement of health outcomes does not primarily require expensive technology. Rather, staff must be trained and motivated to adhere to evidence-based routines to prevent unnecessary complications and treat the unavoidable ones.

In the last decade, extensive work has been done to structure the necessary elements of good maternal and perinatal care. In 2001, the WHO launched the Making Pregnancy Safer program, and encouraged

national programs for safe pregnancies and healthy babies (3). Still, there are globally a great number of settings where inadequate, outdated and sometimes dangerous practices continue due to tradition and lack of upgrading of knowledge, skills and practice among doctors and midwives, as well as lack of a supportive environment (including laws and regulations).

Eastern European countries generally have health outcomes for mother and infant that are far less favorable than those reported from Western Europe. One reason seems to be delays in updating guidelines for care. Perinatal audits indicate that the increased risk of intrapartum fetal death can be attributed to

inadequate routines for monitoring and interventions during labor (4).

In Ukraine, a nation-wide project, the Mother and Infant Health Project (MIHP), for improving practice in maternity hospitals was implemented by the John Snow, Inc. (see [www.jsi.com/JSIInternet/](http://www.jsi.com/JSIInternet/)) in nine provinces (oblasts) from October 2002 to September 2006 (5). The project contents are based on the WHO Making Pregnancy Safer tools and framework, which has a comprehensive approach to include all stakeholders and is designed to introduce evidence-based routines in standard care. The aim of this paper is to report the effect of the project intervention on selected maternal and infant outcomes and compliance to recommended routines.

### Material and methods

Three of the 20 maternities participating in MIHP were chosen as pilot sites for evaluation of the project, i.e. Donetsk Maternity No 3, Lutsk City Maternity and Lviv Oblast Maternity. The Lutsk maternity is the only one for a population of 220,000. Lviv Oblast Maternity is one out of five in the city of Lviv. Donetsk Maternity No 3 is one of eight in the capital of the Donbass region and specializes in preterm deliveries, which account for 15% of the deliveries. The number of staff was 108, 171 and 90, respectively, when the project started.

Data about all deliveries were collected continuously before, during and after the training intervention. Baseline data before training were collected during four months in Donetsk and Lutsk and two months in Lviv. Follow-up data were collected during 36 months in Donetsk and Lutsk and 34.5 months in Lviv.

The aims of the MIHP project were to increase the potential to provide comprehensive perinatal care by creating a continuous monitoring and evaluation system for feedback to the staff, improving medical services and counseling with special attention to resuscitation, breast feeding and prevention of infections and to strengthen continuity of care. A close collaboration with Ministry of Health and other policy makers was established. In 2003, the MIHP maternities were assessed and some of the key problems identified were lack of evidence-based protocols for perinatal care and infection control, overuse of medical interventions, inadequate routines for avoiding hypothermia in newborn infants, poor equipment for resuscitation and rigid routines for care during delivery. National, evidence-based obstetrical and neonatal protocols in accordance with recommendations from WHO were developed and disseminated. The project also supported the revision of university curricula to include evidence-based perinatal care.

The main intervention was the provision of training for staff in the maternities. The Russian version of the training material 'Effective Perinatal Care', (EPC) developed by WHO Regional Office for Europe (6) was used. The material is a comprehensive, didactic, interactive two-week training package including clinical activities and a team approach to maternity care. Obstetricians, neonatologists, midwives, pediatric nurses, pediatricians and anesthesiologists were trained at the study sites. In addition, specialists in infectious diseases and representatives of local medical authorities were invited. All training was in Russian.

Two basic courses were provided: EPC initial training (two weeks) and follow-up EPC (three days). After evaluation of the progress in the maternities by trainers from MIHP, additional practical training was provided: reinforcement training in neonatal care (nine days), reinforcement in modern perinatal technology (nine days) and care in second stage in preterm delivery (one day).

Basic training was provided during 2003 and 2004 with EPC as the first course. The participating maternities were provided with basic equipment for resuscitation and neonatal care and tools for the delivery room to encourage change of position during labor and more family-oriented care. Site visits were conducted by an expert team from MIHP (midwife, obstetrics and gynecology specialist and neonatologist) throughout the follow-up period. All three maternities had a follow-up visit by MIHP staff in May 2004. Data collection was by then well established and thus data registered from 1 May 2004 up to 31 December 2006 in Donetsk and Lutsk (32 months) and from 1 May 2004 up to 20 November 2006 in Lviv (30.5 months) have been used to assess the effects of the intervention. The maternities in Donetsk and Lviv were closed down for cleaning for shorter periods, and thus the number of deliveries per month varied.

To assess the impact of the intervention, the following maternal outcomes were selected to reflect the procedures recommended by WHO EPC package: use of partogram, induction of labor, artificial rupture of membranes, augmentation of labor (no baseline data available), operative delivery, episiotomy, anesthesia post partum, use of pain medication during labor, and presence of a companion during labor. Of the infant outcomes, the following were assessed: early neonatal mortality, temperature in delivery room and infant temperature assessed 30 minutes after birth, resuscitation and admission to Neonatal Intensive Care Unit (NICU).

The variables were recorded into study protocols daily at the participating maternities by local staff, mostly midwives working in the delivery ward, according to written definitions for each variable.

A monitoring coordinator appointed by the project checked and completed all protocols at each facility. The MIHP-team checked the reliability at site visits. Data were computerized by MIHP staff at the head office in Kiev.

Data were analyzed in three-month periods during the follow-up period and compared with baseline.

Statistical analyses were performed by Fisher's exact test comparing baseline with the last three-month period during the project. Temperature recordings in the delivery room and infant temperature 30 minutes after birth were compared for means with 95% confidence intervals.

This project was a quality improvement of care approved by relevant authorities. Data used for this paper were collected to monitor the project and cannot be linked to any individual patients.

## Results

In Donetsk 100%, in Lutsk 36% and in Lviv 49% of the staff were trained directly by MIHP personnel. Characteristics of the participating maternities during the project period are presented in Table 1. Donetsk specializes in preterm deliveries and consequently had more infants with low birthweight, higher admittance to NICU and a higher early neonatal mortality.

The selected outcomes are listed in Table 2. Results from the first, last and middle three-month periods during follow-up are presented.

In 2003 during the baseline period, the cesarean section (C/S) rate was 30% in Donetsk, 33% in Lutsk and 22% in Lviv indicating a variation in practice. After implementation of the new routines, the C/S rate decreased significantly in Donetsk and Lutsk whereas the change in Lviv, although substantial, did not reach statistical significance.

Compliance to the new routines was excellent in all three maternities. For some variables, the change had taken place already by the first follow-up period; for instance, use of partogram, avoiding induction of labor and use of analgesics for labor pain. Before the change, approximately 80% in Donetsk, 50% in Lutsk and 90% in Lviv had general anesthesia for suturing and examinations post partum. This was reduced to less than 10% in all three maternities by the end of follow-up (data not shown). For other variables, such as presence of a companion in the delivery room, the change was gradual. Adherence to the new routines increased during the follow-up period and for all indicators the results for the last three-month period was the best. The final level was very similar for all three maternities irrespective of the initial situation.

Use of partogram, augmentation of labor, artificial rupture of membranes, instrumental delivery and C/S were plotted for baseline and each three-month period during follow-up after intervention (Figure 1). The graphs illustrate the quick change for partogram use and artificial rupture of membranes in the three maternities. Augmentation of labor was uncommon in all three maternities and decreased further over time in Lutsk and Lviv. Instrumental vaginal delivery, also seldom performed, decreased in Donetsk and Lutsk.

According to the EPC training package normal temperature of the baby 30 minutes after birth should be at least 36.5°C and the temperature in the delivery room 25°C. Mean infant temperature increased significantly in all three sites: from 36.4° to 36.9°C in Donetsk, from 36.3°C to 37°C in Lutsk and from 36.3°C to 36.7°C in Lviv (data not shown). Table 3 illustrates that the proportion of babies with hypothermia decreased substantially in a short time. The proportion of infants needing resuscitation also decreased significantly. The room temperature was quickly adjusted to the recommendations. Mean temperature in the delivery room after intervention was in Donetsk 26.7°C, in Lutsk 26°C and in Lviv 25.8°C, which means an increase by at least 2°C compared to baseline (data not shown). These changes remained stable over time.

## Discussion

The most striking finding was the high compliance reported from the pilot hospitals. The MIHP could successfully change clinical management so that some unnecessary interventions such as general anesthesia post partum, which was used very frequently, decreased to less than 10% and the reverse trend was seen for presence of a companion during delivery. The change in routines was well sustained over the follow-up period of 2.5 years.

Hypothermia in the baby is a well-documented risk that can be eliminated with a change of routines without costly technical equipment. This part of the project also was the most successful and is clearly documented by a corresponding shift in the temperature in the delivery room and normalization of the temperature of the infants. In two of the maternities the proportion of infants admitted to NICU decreased significantly, and in all three fewer infants needed resuscitation.

Partogram use was only noted as yes or no, but the quality was not assessed. Experience shows that it is difficult to achieve correct use of the partogram, including appropriate and timely interventions

Table 1. Characteristics of the study populations in the three maternities during the MIHP.

Characteristics	Donetsk		Lutsk		Lviv	
	Baseline	Follow-up	Baseline	Follow-up	Baseline	Follow-up
No. of deliveries	652	4,561	742	9,865	302	7,227
2004		1,021		2,283		1,756
2005		1,720		3,578		2,881
2006		1,820		4,004		2,590
<i>Maternal outcomes</i>						
Maternal age						
Median	24	25	25	25	23	22
Range	16–42	15–45	14–44	15–48	16–40	14–46
Gestational age						
Median	37	39	39	40	38	39
Range	26–42	25–43	30–43	25–44	28–42	25–41
Primiparae (%)	52	65	47.4	51.8	49.7	58.6
Cesarean section (%)	30	17	33	12.3	22	19.6
<i>Neonatal outcomes</i>						
BW < 2,500 g (%)	15	14.1	2	4.3	10.6	5
BW < 1,500 g (%)	1.1	1.3	0.3	0.1	0	0.7
Admission to NICU (%)	11.2	10.7	7.3	4.3	6.4	3.3
Early neonatal death (%)	13.6	10.9	4.6	2.4	6.4	1

Note: BW, birthweight; MIHP, Maternal and Infant Health Project; NICU, Neonatal Intensive Care Unit.

(7,8). Therefore, it is of interest to compare the high level of use of partogram to the decreased or absent use of active interventions such as augmentation of labor or assisted vaginal delivery of which some might be justified for safe outcomes. This indicates that the quick change of routines in some cases may not have been due to a better understanding of the principles of evidence-based obstetric care and active management of labor. However, the goal of avoiding frequently used unnecessary interventions by introducing the partogram was achieved.

This project in three maternity hospitals in Ukraine illustrates a full-scale intervention to change existing routines in a large number of public hospitals through a training program to upgrade knowledge in all staff taking care of the mother at delivery and her newborn infant. The new guidelines were developed within the existing organization and structure of health care in the country involving the health care authorities as well as the academics. This is a prerequisite for ownership, for the necessary adaptation to local circumstances and for continuation and dissemination after the end of the pilot project (9).

The intervention combined an extensive and structured training of staff with hands-on training in real situations. This approach is generally well accepted by health care professionals who often have few

opportunities for specialized training after graduation. Since most doctors and nurses are convinced that their traditional way of working is effective and good for their patients, it is important to provide not only new guidelines but also in-depth understanding of the rationale for a change. A recent project in Sri Lanka demonstrated that significant and sustained change could occur with a very limited input of training, if the staff are motivated. After half-a-day of retraining including role play, the midwives increased their correct use of partogram from 32 to 77% when assessed three months later. Improvement of communication and empathic care of the mother were also observed and the positive change was sustained also six months after training (10).

Change of clinical practice that involves several categories of staff is a complicated process (11–13) and a strong and clear leadership is important both for acceptance and monitoring of new routines. A systematic review of strategies for change of practice in obstetrics concluded that education and training generally were less effective for doctors than for other staff (14). Audit and feedback and strategies for reminding staff about the guidelines were generally effective for all professionals. The MIHP had a follow-up component but did not include audit of poor outcomes or feedback.

Table 2. Interventions during labor and delivery and infant outcomes during baseline and first, middle and last three-month period after implementation of training in the MIHP.

Maternal and infant outcomes	Baseline	First period	Middle period	Last period	p-Value <sup>a</sup>
No. of deliveries					
Donetsk	652	394	440	425	
Lutsk	742	920	905	998	
Lviv	302	899	713	1,016	
Induction of labor (%)					
Donetsk	39.6	2.3	0.9	0.9	<0.0001
Lutsk	6.9	0.2	1.6	0.4	<0.0001
Lviv	15.6	3.5	0.3	0.2	<0.0001
Use of partogram (%)					
Donetsk	19.5	86.6	84.1	85.4	<0.0001
Lutsk	71.3	88.4	90.7	89.9	<0.0001
Lviv	0	59.5	74.9	80.5	<0.0001
Artificial rupture of membranes (%)					
Donetsk	29.8	1.8	0.2	0.2	<0.0001
Lutsk	40.2	5.3	4	4.2	<0.0001
Lviv	11.6	4.6	0	0.3	<0.0001
Augmentation of labor (%)					
Donetsk	Missing	1.3	1.6	5	–
Lutsk	Missing	8.2	5.4	2	–
Lviv	Missing	4.7	3.1	0.7	–
Episiotomy (%)					
Donetsk	36.8	5.8	2	4	<0.0001
Lutsk	19.4	5.4	2.8	5.7	<0.0001
Lviv	22.2	19.3	9.5	7	<0.0001
Instrumental vaginal delivery (%)					
Donetsk	3.7	0.3	0.2	0	<0.0001
Lutsk	2	2.8	1.1	2	0.8634
Lviv	0	0	0	0	–
Cesarean section (%)					
Donetsk	30	16.3	13.6	18.4	<0.0001
Lutsk	33	12.8	10.6	12.7	<0.0001
Lviv	22	18.3	18.2	16.9	0.0606
Companion present (%)					
Donetsk	0.5	68.5	83.2	91.5	<0.0001
Lutsk	2.2	60.1	81.4	79.1	<0.0001
Lviv	0.3	2	56.8	76.5	<0.0001
No pain medication during labor (%)					
Donetsk	40.6	95.7	99.5	97.9	<0.0001
Lutsk	28.8	99.4	99.2	99.8	<0.0001
Lviv	25.8	79.2	100	99.9	<0.0001
Infant admitted to NICU (%)					
Donetsk	11.2	16.5	9.1	9.4	0.4153
Lutsk	7.3	5	3.3	4.4	0.0115
Lviv	6.4	7.5	3.7	2.4	0.0015

Table 2 (Continued)

Maternal and infant outcomes	Baseline	First period	Middle period	Last period	p-Value <sup>a</sup>
Early neonatal death (%)					
Donetsk	13.6	7.7	13.7	9.5	0.5812
Lutsk	4.6	2.2	3.4	3	0.4113
Lviv	6.4	5.6	0	0	0.0524

<sup>a</sup>p-Value calculated for the difference between baseline and the last three-month period.  
Note: MIHP, Maternal and Infant Health Project; NICU, Neonatal Intensive Care Unit.

Table 3. Temperature in the delivery room, infant temperature and need for resuscitation in the three maternities: baseline, first, middle and last three-month period of the MIHP.

	Baseline	First period	Middle period	Last period	p-Value <sup>a</sup>
No. of deliveries					
Donetsk	420	393	380	341	
Lutsk	381	706	787	884	
Lviv	135	1,356	590	881	
Temperature in delivery room <25°C (%)					
Donetsk	49.5	0	0	0	<0.0001
Lutsk	74	5.2	0	0.6	<0.0001
Lviv	98.5	7.8	1.9	0	<0.0001
Infant temperature <36.5°C (%)					
Donetsk	59.5	1	0.3	0.6	<0.0001
Lutsk	85.8	1	0.3	0.3	<0.0001
Lviv	77	1.1	0.5	0.7	<0.0001
Resuscitation (%)					
Donetsk	13.1	12.7	4.2	7.4	0.0025
Lutsk	2.4	1.7	1.5	0.9	<0.0001
Lviv	4.5	3.2	2.7	1.1	0.0003

<sup>a</sup>p-Value calculated for the difference between baseline and the last three-month period.  
Note: MIHP, Maternal and Infant Health Project.

In an authoritarian tradition such as in the former Soviet republics, it is more likely that staff are used to work according to a recommended standard (15). Another factor of significance is that private consultants, who expect to take individual decisions about the principles of care for their patients, do not staff these hospitals. In an intervention in Latin American hospitals to decrease C/S through new guidelines, the effect was small in spite of training and information to all doctors (16).

Data collection was designed for quality assessment and feedback to local staff and not for scientific purposes. Registration of data was done locally by staff working in the ward. However, it was checked by a local coordinator and regularly assessed for reliability by MIHP personnel from Kiev. The sustainability of

the results during the long follow-up period also makes it unlikely that data have been changed systematically to make the results more favorable.

Unfortunately, the condition of the newborn was not documented with Apgar scores, but in fact admission to NICU decreased during the project in two of the maternities. Neither was there information about length of labor or the experience of pain in the mothers when no alternative to anesthetic drugs was offered. Even with a companion during labor, many mothers will need pain relief.

This project to introduce evidence-based routines for perinatal care in a setting with a different tradition is of great interest for the whole region. The changes were generally not increasing costs or need for more staff; on the contrary, there was a decrease in costs for

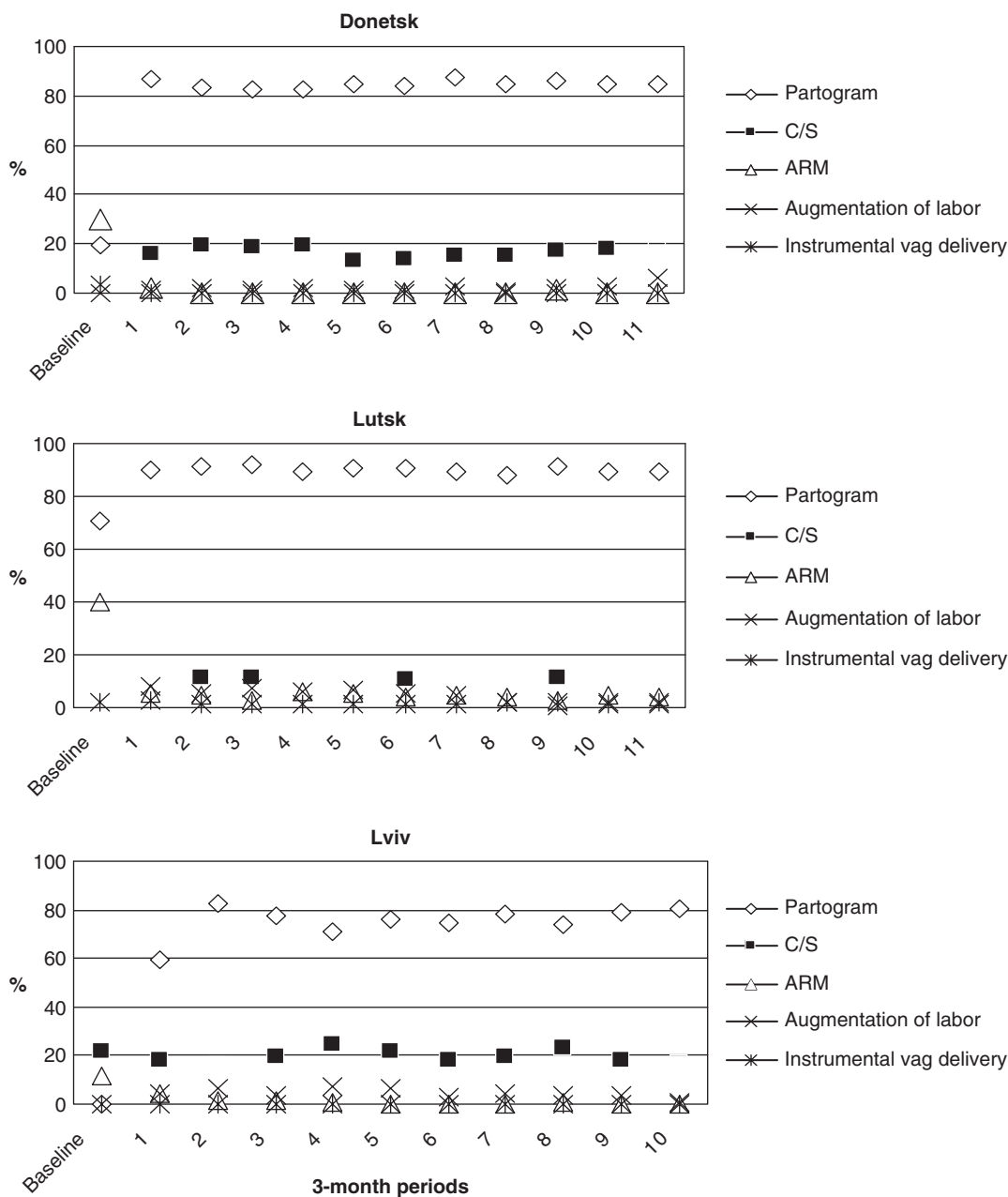


Figure 1. Interventions during delivery in the three maternities; baseline and follow-up in three-month periods during the MIHP. Note: ARM, Artificial rupture of membranes; C/S, Cesarean section; MIHP, Maternal and Infant Health Project.

drugs. The comprehensive approach with strategic involvement of decision makers and local authorities has evidently been successful, and the project can therefore serve as a model for similar settings in need of extensive quality improvement of perinatal care. Substantial change in procedures and attitudes can be achieved in an authoritarian medical setting if change is well anchored among central policy makers and sufficient time and effort are put in the education of staff and feedback.

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