

The Economics of Centralized Automatic Fetal Monitoring

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Abstract

Aims: Economical conditions were compared between individual human fetal monitoring and computerized monitoring of intrapartum fetus.

Methods: Economical conditions were compared in personal monitoring with obstetrical staffs and the central computerized simultaneous monitoring in multiple births.

Results: Clinical results were the decrease of perinatal mortality and the zero case of cerebral palsy in the present update computer system comparing previous computer system.. Economical expense calculation showed 4292 USD lower expense in the computerized monitoring than the visual CTG watching monitoring.

Keywords: Fetus; FHR; Central computer, Automatic analysis; Rapid and direct reporting; Outcome; Improvement; Economics

Introduction

Although human observation, analysis and diagnosis of continuously recorded fetal heart rate was common fetal monitoring, which resulted the reduction of perinatal mortality, neonatal asphyxia, and even reduced cerebral palsy [1,2], continuous intrapartum fetal monitoring of cardiotocogram (CTG) of obstetrician or obstetric staff was time-consuming, troublesome and endless work in obstetrics. Therefore, various computerized automatic fetal monitorings were reported starting from the author around in 1975 using a minicomputer. The author and co-authors developed automatic program to calculate FHR score [3], to analyze further objective artificial neural network [4], analyzing frequency spectrum to diagnose pathologic sinusoidal FHR [5] and to predict the loss of FHR variability [6], and they were accumulated in an centralized automatic computer system with 100 channel time sharing to analyze multiple fetuses in pregnancy and labor with doctor-direct reporting system, which was actually tested in a hospital resulting reduction of

perinatal mortality and zero case of cerebral palsy, which was better than previous computer system [7], while the system was rather expensive than CTG watching system therefore, the author tried to compare the expenses of traditional fetal monitoring to the update computerized monitoring in this article.

Methods

Traditional fetal monitoring was the monitoring of individual birth recording personal CTG, of which record is continuously watched by trained staffs in obstetrics, detecting pathologic FHR signs to report the attendant physician. There was a simple computer system, of which model name was MT140, attached to single CTG monitor, only calculate the FHR score of single subject, composed of micro-computer, without alarming function, designed by Maeda and provided by TOITU (Tokyo) in late 1970s.

A typical automatic FHR monitoring computer system is as follows. Each FHR and contraction data are transferred from the woman in pregnancy or labor to the central computer by LAN or telemetry, where the data are received by 100 channel time sharing system, and analysed in each channel, in which FHR details are detected, FHR score is calculated, that is abnormal if it is 15 or more and the result is confirmed by the more objective neural network analysis system. Pathologic sinusoidal heart rate and decreased variability are diagnosed by frequency spectrum analysis of FHR baseline, common FHR patterns are diagnosed by an FHR analyzing computer, where pathologic results are detected to alarm attendant doctor calling registered address directly and rapidly. The physician indicates necessary treatments promptly by the alarming report of computer [7].

Results

Simultaneous multiple births were automatically diagnosed using TOITU's software (TOITU, Tokyo), where perinatal mortality decreased significantly than previous computer system, and cerebral palsy was zero in the new system of rapid and direct reporting computer [7].

Economics

The expenses paid for the machines and nurses of individual monitoring and above listed automatic monitoring system are compared in the monitoring of 20 simultaneous births, which will be 7,000 births in a year. It looks like to pay more to the computer in the first year (Table 1), however, the expense is 4292 USD less in the computer than individual monitoring with human power (Table 2).

Table 1: Expenses paid for 7,000 birth (daily 20 births) in the computer system and individual human fetal monitoring.

Centralized Computer system	Individual monitoring
The first year	
Central computer system 20000 USD	(20 fetal monitors have been set)
Patient set 100000 USD	Employ 20 Nurses: 24000 USD
Copy paper = 4 USD	Recorder paper × 20=40 USD
Central nurse × 1 = 120 USD	Record filing room 4700 USD
Total 120124 USD	Total 28740 USD

Table 2: Expenses in 5 years after introduction of computer system.

Centralized Computer system	Individual monitoring
Further 4 years	
Copy paper 4 USD	Employ 20 nurses for 4 years:
Central nurse 120 USD × 4	24000 × 4 = 96000 USD

= 480 USD	Recorder paper 40 × 4 = 160USD
Total in 5 years	
120608 USD	124900 USD

Therefore, computerized monitoring will be recommendable, because computerized monitoring has various advantages, because computer does not sleep nor tired, the results are objective and detailed.

References

1. Takeshita K, Ando Y, Ohtani K, Takashima S (1989) Cerebral palsy in Tottori, Japan. *Neuroepidemiology* 8: 184-192.
2. Tsuzaki T, Sekijima K, Morishita K, Takeuchi Y, Mizuta M, et al. (1990) The survey on the perinatal variables and the incidence of cerebral palsy for 12 years before and after the application of the fetal monitoring system. *Jpn Acta Obstet Gynecol* 42: 99-105.
3. Maeda K, Arima T, Tatsumura M, Nagasawa T (1980) Computer-aided fetal heart rate analysis and automatic fetal-distress diagnosis during labor and pregnancy utilizing external technique in fetal monitoring. *MEDINFO* 80: 1214-1219.
4. Maeda K, Utsu M, Makio A, Serizawa M, Noguchi Y, et al. (1998) Neural network computer analysis of fetal heart rate. *J Matern Fetl Invest* 8: 163-171.
5. Maeda K, Nagasawa T (2005) Automatic computerized diagnosis of fetal sinusoidal heart rate. *Fetal Diag Ther* 20: 328-333.
6. Maeda K, Nagasawa T (2010) Loss of FHR variability diagnosed by frequency analysis. *J Perinat Med* 38: 77-82.
7. Maeda K, Utsu M, Noguchi Y, Matsumoto F, Nagasawa T (2012) Central computerized automatic fetal heart rate diagnosis with a rapid and direct alarm system. *The Open Medical Devices* 4: 28-33.