Vol. 4 No. 1
January/February 1991

neonatal INTENSIVE CARE

Articles

Departments

neonatal Intensive Care is published bimonthly by Goldstein and Associates Publishing, Inc, Corp. Office, suite 198, 3540 W Sahara Rd, Las Vegas, NV, 89102 • Editorial and circulation office: 1150 Yale Street #12, Santa Monica, CA 90403. POSTMASTER: Please send form 3579 to neonatal Intensive Care, 1150 Yale Street, suite 12, Santa Monica, CA 90403.

The Effect of Event Recording Home Infant Apnea/Heart Rate Monitoring in the Greater Los Angeles Area

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ABSTRACT This study presents the findings of 54 infants sent home on event recording apnea/heart rate monitors over a seven month period. The average gestational age was 35 weeks. The number of referring facilities was 13 hospitals and the number of referring physicians was 41.

We separated the admitting diagnostic groups into the following categories: Apnea of prematurity, apnea of infancy, apparent life threatening event, subsequent SIDS sibling, gastroesophogeal reflux, maternal substance abuse, seizure disorders, respiratory distress syndrome, bradycardia of unknown origin, bronchopulmonary dysplasia, and Pierre Robin syndrome.

From March 1990 to October 1990, a period of seven months, these children were placed in our services on event recording home apnea/heart rate monitors. The average time on service for these patients was 2.90 months, ($p < .07$). This data indicates that event recording home apnea/ heart rate monitoring greatly decreases the length of home monitoring.

METHODS

The effectiveness of home apnea monitoring has been greatly discussed and questioned[1] over the last number of years along with the impact on the caregivers of the monitored child.[2,3,4,5,6,7,8,9]

Over the last seven months all patient referrals to our service have been placed on event recording home infant apnea/ heart rate monitors manufactured by Aequitron Medical Inc., Model 9500/ 9550. The caregivers were trained on the application of the monitor and appropriate CPR prior to the discharge of the infant. After a period of 7 to 10 days the patient's clinician arranged a home visit to assess the patient and caregivers' status.

At this time, an interfacing of a notebook computer, Compaq LTE/20, with the event recorder via an interface cable allows the clinician to collect the data from the event recording monitor. The computer analyzes the data and presents the findings in the following formats: monitor compliance, displayed events log, displayed events, summary report, histograms, events log. This processed data is stored on 3.5 inch floppy disks, printed out on a Hewlett-Packard Laserjet Writer, hand scored, sent to both the referring physician, or apnea monitoring program, and to the attending pediatrician.

The disk is then logged and archived. The printed report is sent along with our "physician's guide" allowing the pediatrician the ability to understand the report.

The patient and caregivers are then visited at home at least once a month thereafter, with the reports sent out as described above.

Table 1. Background of the Study Sample

ADMITTING DIAGNOSIS	NUMBER OF PATIENTS
Apparent Life Threatening Event	16
Apnea of Prematurity	25
Apnea of Infancy	6
Maternal Substance Abuse	2
Gastroesophageal Reflux	13
Respiratory Distress Syndrome	4
Seizures	2
Subsequent S. I.D.S. Siblings	3
Bronchopulmonary Dysplasia	3
Pierre Robin Syndrome	2
Other	8

Of this group there were 9 patients with multiple diagnosis

The criteria utilized for discontinuing the event recording apnea/ heart rate monitor, in general, is that the child have no apnea events > 15 seconds or pulse decelerations > 5-10 seconds for 2 consecutive months and is off all other therapy.[10] The admitting diagnoses are shown in Table 1.

RESULTS

Because of the ability to differentiate the "true" events from the "false" events, usually caused by cardiogenics or from low respiratory impedance signal, the average length of stay on service has been greatly reduced.[11,12] With this knowledge the pediatrician has in essence, the ability to manage their patient's length of stay on the monitor.

The length of stay on the monitor has dropped from 6.88 months[13] to 2.90 months in Southern California, including Los Angeles, San Bernardino, Orange, and Riverside counties.

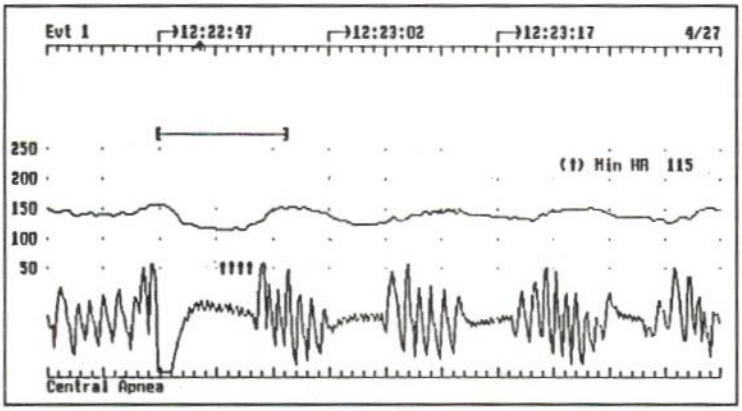
The number of patients that were on service greater than 3 months equaled 25. The average length was 4.19 months ($p < 0.08$). The number of patients that were on service less than 3 months were 28. The average length of stay was 1.74 months ($p < 0.06$). There was one patient that was on service for 3 months.

Not only do we believe that event recording allows documentation of "true" events, but also the compliance of the monitor on the child.

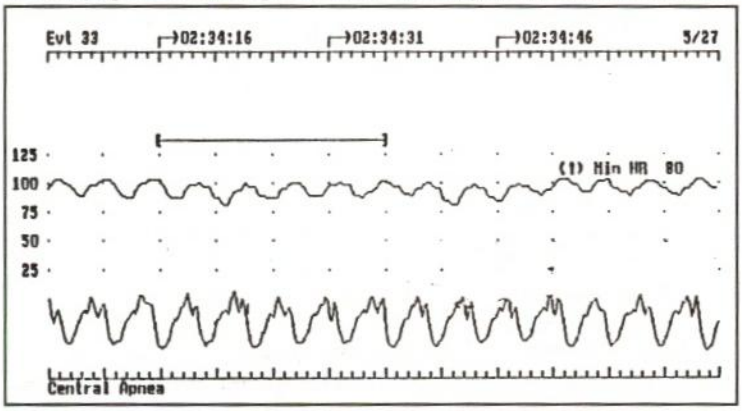
The standard month was 30.66 days based on the study period of 276 days. The total days of all children on service was 4812 days.

We have also found that this system is labor intensive. The normal patient load per clinician per month can not exceed 35-40 patients. This allows the clinician the ability to handle all the assorted paper work that is generated on each patient. We have found that the patient is seen in the home 6.3 times on average in this 2. 90 month period.

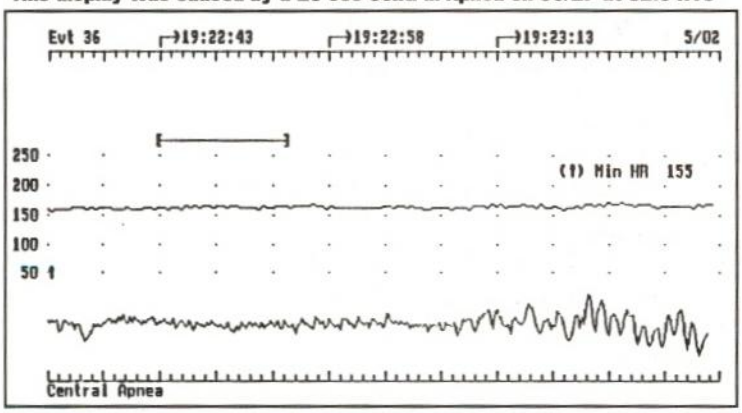
Table 2. Displayed events printout from Aequitron 9500 event recording home apnea/heart rate monitor



This display was caused by an 11 sec Central Apnea on 04/27 at 12:22:47



This display was caused by a 20 sec Central Apnea on 05/27 at 02:34:16



This display was caused by an 11 sec Central Apnea on 05/02 at 19:22:43

DISCUSSION

Not only did our initial study show that the period of stay on the apnea monitor had been reduced with the respect of the safety of the child, we also feel that we have reduced the psychological impact on the caregivers[14]–through both reduction of time on the monitor, and by allowing them to know what are "false" events compared to "real" events, Table 2.

We will not attempt to speculate at this time the number of "false" events reported as an "alarm" to a pediatrician which caused the clinical choice to continue monitoring longer than necessary, nor how many times a caregiver discontinued monitoring against medical advice because there had been no "alarms" when in actuality there had been "true" events between the parameters of >15 seconds and <20 seconds all due to using a non-event recording apnea/heart rate monitor.

Since this study we have had two cardiac arrests. One child recovered and, unfortunately, the other did not. There is complete documentation that the caregivers were in compliance and acted appropriately. We will present these cases in the future.

Lastly, the reduction in the cost to both the caregivers and also third party payors has to be noted. This we find is quite interesting when every other health care cost continues to increase.

The initial cost and continued patient care is indeed much more than the traditional home apnea/heart rate monitoring programs feel necessary, with the combination of the cost of the event recording home apnea/heart rate monitors, the portable computers and printers, and the cost of inservicing the clinicians in each of their uses. We have also found that our mail and other related costs have increased greatly, along with the cost and maintenance of the laser writers, the diskettes, paper for printing and other related expenditures. We have noted numerous third party payors requesting compliance and summary sheets to accompany the invoices on their patient.

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