# Appendix II

## Asphyxia Neonatorum*

As a result of the request and two follow-up letters addressed to fifty and twenty-nine universities respectively, sixty-eight replies were received. Five of these sixty-eight universities offered only a two-year theoretical course, reducing the total available response to the obstetrical services of sixty-three medical schools.

Since the outline submitted offers a common ground for discussion, it will be of interest to break this down as follows:

General approval and disapproval by states.

Reaction to specific details by states including matter suggested by correspondence not included in the outline and deserving of emphasis. (Key number noted below refers to particular state.)

The following special references are noted and quoted references follow:

Use of Carbon Dioxide.
Use of Aspiration.
Use of Heat.
Use of Intravenous Alpha Lobelin.
Lumbar Puncture and the Use of Whole Blood Injection.
Mouth to Mouth Insufflation.
Drugs for Respiratory Stimulation.
The Position of the Baby After Delivery.
The Use of Intracardiac Injections.
The Use of Indirect Intubation and Suction.
Prochownick's Method of Artificial Respiration.
The Use of Direct Intubation and Insufflation.
The Relation of Intracranial Pressure to Asphyxia.
The Post-Operative Observation of the Baby.
The Causes of Atelectasis.
The Circulation of Information to the General Profession.
Obstruction by Pressure on the Baby's Face.
The Use of Mechanical Devices—E & J, Flagg, Kreiselman.
Research Now Under Way.
Reference to Euthenasia.
The Use of Sedatives in Obstetrics.

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*States and Key Numbers*

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Colorado, 7
Connecticut, 8
Washington, D. C., 9, 10
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Illinois, 15, 18
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**General Approval and Disapproval of Outline**

Eight universities objected to the outline proposed for the following reasons:

Considered incomplete.

Raised the question whether first and second stages were asphyxia.

Maintained that cerebral hemorrhage occurred before asphyxia.

Attention should be directed to prevention rather than treatment.

Attention should be directed to causes, sedation and anesthesia.

Suggests that the outline be limited to two stages.

No practical advantage.

Seven universities made no comment.

Forty-eight universities specifically approved the outline as submitted:

"Thoroughly in accord with your classification and treatment. I follow the same treatment in teaching." 62, Penn.

"A good summary." 50, N. Carolina.

"I am in complete accord with treatment as outlined." 48

"Simple, sane, conservative." 12, Georgia.

"Concur in idea presented. Seems extremely sound. Would like reprint." 13, Georgia.

"Data as outlined meets in every detail with observation and treatment carried out in our institution." 23, Louisiana.

"Have gone over whole outline with members of my staff and we feel that it is entirely correct. I am taking the liberty of retaining a copy for the information of our various residents and internes." 24, Louisiana.

Certainly the Importance of Establishing Generally Accepted Principles Covering the Routine Treatment of Asphyxia Neonatorum is Urgently Necessary.

"I thought so highly of your outline for the rational treatment of Asphyxia Neonatorum that I am keeping it in my files on this subject." 38, Nebraska.

"We feel that the brief outline suggested as a fundamental approach to the treatment of Asphyxia Neonatorum is a good one, especially because of its simplified classification." 43, N. Y.

"I agree with your questionnaire as a whole. I think the dissemination of such information in uniformity of treatment will be of great benefit in combating fetal mortality." 51, N. Carolina.

"A very good statement of present day knowledge referable to asphyxia of the newborn." 79, Canada.

"I would personally compliment you on this simple and very rational classification and method of treatment which you have outlined for the asphyxia of the newborn. I like your classification so well that I think I will adopt it. The form of treatment outlined is very similar to what we have been using for the past few years and have been highly delighted with the results. Again let me congratulate you on this splendid contribution on such an important subject." 82, Canada.

**Reaction to Specific Details—**
**The Use of Carbon Dioxide in Resuscitation.**

A difference of opinion exists regarding the benefit to be derived from the use of carbon dioxide as a respiratory stimulant.

Since objection to the use of this gas is voiced by a relatively small but important minority, these opinions are quoted.

Ten of the sixty-three universities responding definitely object to the use of carbon dioxide. The following statements are on file as opposed to the use of $CO_2$:

"We do not believe in the use of $CO_2$ mixtures in the resuscitation of newborn infants, since the asphyxiated infant is more than saturated with $CO_2$ and is suffering from oxygen lack." 1

"I am dubious as to the wisdom of using $CO_2$." 9

"I agree heartily with the above (outline) except for the use of $CO_2$. We feel that pure oxygen is preferable when artificial respiration is necessary. There is much experimental evidence to support this condition." 10

"We do not believe in the use of $CO_2$." 18

"If the infant is apneic, it is felt that $CO_2$ is contraindicated, regardless of whether the depression of the respiratory center may be due to drugs, anoxia or to excess $CO_2$ alone or together." 13

"In hearty accord with your efforts if we except the $CO_2$ question." 25

"I note that you include in your recommendations the employment of carbon dioxide and oxygen; and to the use of the former gas, as you know, I cannot agree." 25

"I still feel there is some question whether oxygen alone is not better than oxygen $CO_2$." 42

"Only comment we had to offer was whether $CO_2$ should be administered with oxygen in the state of flaccidity." 43

"We do not make use of the combination of oxygen and $CO_2$." 76

On the other hand, fifty-three universities or eighty-four per cent specifically approve or voice no objection to the outline approving the use of carbon dioxide.

**The Use of Aspiration or Suction**

If there is one point in the treatment of Asphyxia Neonatorum in which there is almost universal agreement (one exception reported) this is the removal of fluid or other foreign matter from the airway of the newborn infant.

Not only is there unanimity of opinion relative to the value of suction, eighteen universities having called attention to this, but a variety of methods are employed to accomplish this purpose. A widely used method of removing fluid from the trachea and pharynx is the so-called Stripping technic in which the baby is suspended by the feet and the trachea is massaged towards the mouth. Suction applied by the surgeon's mouth through a catheter fitted with a glass receptacle is common practice.

"We make sure that the air passages are cleared before any attempt is made at artificial respirations. As soon as the baby is born the escape of mucus and liquor amnii is encouraged by suspending the baby by its legs. At the same time the pharynx is cleared by suction, using a rubber ear syringe which is sterilized and included in the delivery kit." 1.

"We use gentle cleansing of the mouth and posterior pharynx by oral suction with a soft rubber tube." 13.

"Our management of asphyxia neonatorum includes immediate emptying of pharynx of mucus and fluid by tracheal catheter." 18.

"We use a built-in suction apparatus attached to the bassinet which can be adjusted for weak suction making possible thorough aspiration of mucus without danger of damaging the delicate epithelium of the posterior pharynx and larynx." 25.

"We aspirate mucus from the nose and mouth with ear bulb syringe as soon as head is visible, milk down the trachea as soon as the head is born. If necessary, introduce tracheal catheter and aspirate mucus from trachea placing child on table with head held over edge. We feel that plugging with secretion of the bronchial tree and aspirated mucus is one of the commonest causes of respiratory difficulties, and we use every effort to relieve this condition." 38.

"We consider among the procedures of greatest value in the therapy of asphyxia neonatorum clearing the mouth and throat of mucus." 67.

"The general emphasis on suction and tracheal catheters bothers me. All of these methods, including the use of carbon dioxide and oxygen, doubtless have a very valuable place, but I foresee new difficulties on the basis of their promiscuous use." 30.

"As the clinical procedure for resuscitation I stress the freeing of the air passages of all mucus and secretions. I use a blowing technic that I have perfected through many years rather than the aspiration catheter, though some of my students prefer the latter." 55.

**Use of Heat**

Obstetrical clinics over the country are becoming thoroughly heat conscious and employ this in the treatment of asphyxia neonatorum. Twenty-two universities consider the application of heat to the child's body of sufficient importance to stress this point in their replies. Among these comments we quote the following:

"We have a very high premature death rate here. We cut it last year over the year before from sixty-three to fifty-two per cent, mainly I think by maintaining the body heat from time of birth to that of arrival at the hands of the pediatricians." 13.

"It would seem advisable to stress more thoroughly the need for maintaining body heat. . . . In severe cases we rely largely on preserving body heat through the use of hot tubs." 20.

"Of the two single procedures which we feel are of greatest value in the therapy of asphyxia neonatorum we would select aspiration of mucus and the application of heat." 67.

"The maintenance of body heat cannot be overemphasized." 5.

"In your outline no statement is made as to how heat is to be applied to the body or what the degree of temperature should be." 1.

"Promptly after delivery the baby is wrapped in a sterile, dry warm blanket." 69.

"Every endeavor is made to keep the child as warm as possible. We do not use the hot and cold bath but sometimes the baby is put in a warm bath, leaving only the face exposed while $CO_2$ and oxygen or occasionally mouth to mouth insufflation is tried." 79.

"We should handle a baby with extreme gentleness and maintain the baby in a warm temperature." 76.

"The maintenance of body heat is often forgotten until too late." 40.

"Wherever I have any foreknowledge of possible asphyxia I have a warm bath ready so that the baby can be put in it the moment it is born. This means in effect that whenever I put on forceps—no matter how low—wherever I have a breech, or any other abnormal presentation —whenever the labor has been protracted in a tight-fitting pelvis—wherever there are signs of a failing fetal heart, the bath is ready and

waiting to receive the baby. I feel very strongly that this is the most vital part of my treatment.

"I do not see the sense in resuscitating a baby that is going to die a few hours or a few days later because its body heat has been allowed to fall too far in the first half hour after birth, and I therefore feel that my main criticism of the scheme you lay down is the neglect to stress this most important point. I would not only put it before all your other steps, but I would put it in the largest capitals you have. And what is more, I would like to stress the point that the bath should be ready and waiting when the baby is born." 80.

### Intravenous Medication

Reference is made by fourteen correspondents to experience in the use of intravenous medication with special reference to alpha lobelin.

"Am persuaded that alpha lobelin into the umbilical vein is of a valuable help. There seems to be some difference re use but I am convinced that after ten years' use of it that it does the trick in a certain percentage of cases." 80.

"We resort to the administration of oxygen $CO_2$ under controlled pressure for a measured period. The percentage of $CO_2$ being five per cent. Should this method fail to resuscitate the infant, alpha lobelin is then administered, one twentieth grain injected into the umbilical vein as prescribed by Dr. Robert A. Wilson of New York City." 23.

"We are under the impression that alpha lobelin is of value in the second and third stage." 6.

"If the baby is doing badly, 1 cc. of alpha lobelin is injected into the cord vein before the baby is cut off." 74.

"In those cases in which there is respiratory failure we use alpha lobelin." 15.

"In cases of delayed respiration we inject alpha lobelin or coramine directly into the vein of the umbilical cord and milk it towards the baby's abdomen. We are not sure that these drugs are of any value but we are of the opinion that they do help in initiating respiration." 24.

"I believe that there may be some value in the addition of alpha lobelin or metrazol in certain cases." 31.

"We give alpha lobelin in the hope of stimulating respiration." 38.

"Occasionally alpha lobelin is injected into the umbilical cord and then gradually milked into the circulation as needed." 1.

"Would urge caution in the use of hypodermic or intravenous respiratory stimulants unless cardiac stimulants are also available. This applies particularly to alpha lobelin." 52.

"Most, if not all, drugs used to stimulate respiration are valueless. Certainly we have found this true of alpha lobelin." 40.

"I have yet to see a single baby benefited by the intramuscular or intravenous injection of drugs." 21.

"I do not believe that intravenous medication is practical except through intra cardiac injection or into longitudinal sinus." 18.

"Between the years 1925 and 1927 I used alpha lobelin routinely in the treatment of asphyxia neonatorum but stopped after having lost two infants from convulsions and I have reason to believe that they were the result of alpha lobelin. Autopsies showed no organic causes for these convulsions. You will note that even enthusiastic authors admit that alpha lobelin produces opisthotonus." 25.

"I am not convinced that some of the respiratory stimulants, such as alpha lobelin, are valuable." 18.

**Use of Lumbar Puncture; Injection of Whole Blood to Reduce Cerebral Hemorrhage**

"If we suspect intracranial hemorrhage we usually employ lumbar puncture with the administration of whole blood into the buttocks of the baby." 76.

"The clotting time on the baby is taken and if over five minutes by our method the baby is given an injection of 10 cc. of blood to try to control cerebral hemorrhage because that, we believe, is a very common cause of asphyxia." 74.

"At times we practice a spinal or cistern puncture hoping by that to relieve pressure on the vital centers. There is some difference of opinion particularly on the part of the pediatrician as to the advisability of this procedure but I personally feel that at times a baby has been saved by spinal or cistern tapping at this time." 24.

**Mouth-to-Mouth Insufflation Is Well Established and Generally Recognized**

This is especially useful where mechanical methods have not been adopted or are not available.

One of our correspondents refers to this technic in no uncertain terms.

"Mouth to mouth insufflation properly used is much more valuable than any machine yet devised." 40.

"If simple apparatus is not available we employ mouth to mouth insufflation covering the baby's mouth with gauze, holding the nose to prevent reflux and extending the head in order to establish a free airway." 24.

"We are still employing mouth to mouth insufflation. I am acquainted with several drawbacks of this method but it possesses a great advantage of requiring no apparatus and being available on a moment's notice. Our staff are given instructions in regard to the force of breath equivalent to 14 cm of water and are urged never to exceed it." 25.

"I lay more stress than you apparently do to mouth to mouth breathing and to artificial respiration by compressing and relaxing the thorax with the babe held in the inverted position, the head resting on the table to prevent extension." 55.

"It might be noted that when pure $CO_2$ is not available mouth to mouth respiration is a substitute of some value if properly done." 83.

**A Number of Institutions Employ Drugs for Respiratory Stimulation**

"Metrazol may help. We are proceeding slowly with our experiments with this drug." 40.

"Coramine and caffeine are occasionally used." 8.

"I have not seen any wonderful results by hypodermic injections." 27.

"Our experience with drug medication has not been very good and consequently we use it rarely.

"Adrenalin, alpha lobelin and coramine are rarely employed except in very severe asphyxia where the results of our administration are not particularly good." 20.

"We employ alpha lobelin and adrenalin injected directly into the musculature of the heart as a measure of last resort." 67.

"We rarely use hypodermics as respiratory stimulants." 69.

**The Position in Which the Newborn Baby Is Placed after Delivery Is Considered of Importance by a Number of Our Correspondents**

"It would seem advisable to define correct posture." 20.

"I would state definitely what you believe to be the correct posture in which these infants should be placed." 46.

"I feel that the correct posture should be explained for those unfamiliar with it." 51.

"The child is kept on its right side immediately after suction." 59.

"Immediately after delivery the infant is maintained in a posture with the head slightly below the level of the body." 61.

**Intracardiac Injection for Resuscitation Is Recommended as a Last Procedure**

"Adrenalin is injected into the right auricle if cardiac arrest is present." 13.

"Intracardiac administration of adrenalin is reserved for desperate cases." 18.

**Spanking, Tubbing in Hot and Cold Water and Holding by the Feet**

"We still conform to some of the older methods, thumping of the soles of the feet gently and a mild or brisk rubbing of the back of the child while in the vertical position." 23.

"Avoid suspension by the feet if cerebral hemorrhage is suspected." 38.

**Indirect Intubation**

Indirect intubation by manual palpation accompanied by suction according to the method of de Lee is widely practiced as may be noted from the

fact that it is referred to by seventeen universities. We quote a number of these comments:

"If cardiac action does not improve, tracheal catheter is introduced and suction made, removing all fluid from the upper respiratory tract." 18.

"We also aspirate mucus from the pharynx but rarely resort to tracheal catheterization." 20.

"If respiratory efforts are made and it is apparent that air is not entering the lungs, the trachea is cleared with an intratracheal catheter according to the de Lee method." 24.

"We do not have any instruments except the tracheal catheter for clearing the passages." 27.

"The creation of a clear air passage, if possible, is absolutely necessary and can be accomplished in the great majority of cases without the use of a tracheal tube. The use of the latter by other than the most experienced is dangerous. Rarely do we find it necessary." 40.

"We recommend blind passage of intratracheal catheter with an index finger. Laryngoscope never found necessary." 67.

"We use a catheter attached to a glass mucus trap for sucking the mucus out of the air passages." 69.

"We have a tracheal catheter if ordinary suction does not seem sufficient." 79.

"I have found that my house staff can be easily taught to introduce a soft rubber catheter into the trachea under the sense of touch." 1.

"The general emphasis on the tracheal suction and catheters bothers me. I am inclined to believe that inexperienced and unqualified individuals will in time do considerable harm if they become enthusiastic about such procedures." 30.

**Prochownick's Method of Artificial Respiration** (referred to by two universities although the method is undoubtedly practiced by many schools).

"I would suggest the inclusion of Prochownick's method of resuscitation in the first and second stages." 48.

"In most cases we find that cleansing the throat of mucus and applying gentle rhythmic pressure over the chest with the newborn held by its feet and the head extended (Prochownick's method) will resuscitate most of the asphyxia cases in the stages of depression and spasticity." 67.

### Direct Intubation

Direct exposure of the larynx by laryngoscope according to the Chevalier Jackson method of intubation and suction and insufflation as recommended by Flagg are both condemned and approved.

"I believe that examination of the pharynx and glottis which requires the use of a suitable piece of apparatus is beyond the ability of the

average physician, largely because he does not possess such a piece of equipment." 1.

"I fail to see when an inspection of the glottis has anything to do with the treatment of these cases. While we do not have one, there is a bronchoscope in use for premature infants that is inserted by sight due to the fact that the premature baby's throat is so small that it is almost impossible without doing a great amount of harm to insert the tracheal catheter in the usual manner. After insertion of this bronchoscope the catheter is passed through it into either bronchii. This is exceptionally useful in the treatment of premature infants. It requires no great amount of training for its use." 15.

"I do not believe inspection of the larynx and the vocal cord are practical in the average delivery room during delivery by an interne, general practitioner or obstetrician." 18.

"We tried the bronchoscope but on the recommendation of the pediatric section we have discontinued anything which would cause an inflammatory action." 27.

"Close at hand in each delivery room are the E & J respirator and the Flagg respirator. The Flagg apparatus is used routinely when spastic obstruction is present and the E & J respirator and Flagg apparatus are applied when necessary and air-way is often used with the E & J." 59.

"All treatment is stopped when the reflexes return and when respiration is established and in those which falter, constant observation and administration of $CO_2$ and oxygen are given at measured intervals. In addition, I am giving our figures compiled by the Chief of the Pediatric Staff over a period of seven years. These were 15,488 deliveries and 944 baby deaths, a fetal mortality of 2.6%: there were 4.062 private cases and 98 baby deaths or 2.4% with corrected fetal mortality of .98%." 59.

"I personally am convinced that it is seldom necessary or advisable to invade the trachea with a metal tube and apply strong mechanical suction." 63.

"We use the Flagg apparatus and like it." 7.

**Asphyxia and Cerebral Hemorrhage**

There is much difference of opinion concerning the sequence in which asphyxia and cerebral hemorrhage take place. The opinion is repeatedly expressed that intracranial hemorrhage occurs independently of, or is the cause of, asphyxiation.

"One of the most important factors to determine in this whole subject is the relative importance of the asphyxia as the cause of death or some other condition, such as cerebral hemorrhage, which produces the asphyxia. The present statistics on asphyxial death in the newborn

are absolutely worthless. We are showing that twenty-five per cent of the neonatal deaths, if carefully autopsied, are due to cerebral hemorrhage. It is probable that no amount of management of the asphyxia will greatly influence the outcome in these cases." 18.

"Any discussion of asphyxia in my opinion should not fail to take into account the fact that many babies delivered instrumentally are really suffering from intracranial hemorrhage which may be the main factor in the case. This is particularly true, of course, as regards difficult forceps delivery or breech extraction. Of course premature babies are particularly liable to intracranial hemorrhage. We have even noticed this complication in some babies delivered by caesarian section. Some of these can be explained by the fact that the mother had been in labor for a considerable time before the section was performed, with pressure of the fetal head above the pelvic brim. For others, no other explanation seems to be forthcoming." 24.

"I might say that I have become intensely interested in the late effects of asphyxia resulting in cerebral anoxemia. Our interest has been particularly aroused by work of Schriber, Journal, Michigan State Medical Society, Feb., 1938, as to the possible late end results in infant suffering from this condition." 31.

"The pallid, flaccid type of asphyxia will rarely respond to treatment even if it does, the eventual outcome is doubtful since most of these babies have suffered intracranial hemorrhage." 40.

"The most difficult problem is to determine whether one is dealing with asphyxia alone or intracranial hemorrhage." 42.

"I am convinced that the picture described under stage three is in the vast majority of instances associated with an underlying intracranial hemorrhage." 46.

"In the few cases in which asphyxia does occur we believe that the first efforts should be made to determine whether there is intracranial damage or not. If we suspect the former we usually employ lumbar puncture and the administration of whole blood into the buttocks of the baby." 76.

"It is my opinion that some cases of still birth following the flaccid type and not coming to autopsy are really due to intracranial injury." 83.

"Experience in numerous autopsies have demonstrated that the cause of asphyxia is a large or a small cerebral hemorrhage." 85.

### Post-Operative Observation

An important factor in the treatment of neonatal asphyxia is continuous post-operative observation of the baby. This point is referred as follows:

"Would suggest specific instructions for observation for some hours after birth." 50.

"Constant observation is recommended."

### Atelectasis

A reference dealing with atelectasis, an extremely interesting and important problem in connection with asphyxia is noted.

"One group of cases of asphyxial deaths which particularly concerns me are those babies born spontaneously or by caesarian section which appear normal at birth, cry lustily, are a good color when sent to the nursery, who within a few hours develop a cyanosis and respiratory difficulty and who die apparently from this cause. Post-mortem in these cases shows marked atelectasis. This degree of atelectasis probably did not exist shortly after birth. Why it developed I have not determined. I am sending a group of newborns to the X-Ray Department for lung pictures in order to throw some light on the expansion of the air sacks in the first few hours of life." 18.

### General Information to Be Disseminated

A number of our correspondents feel that it is desirable that certain general information should be widely circulated. Specific recommendations are noted as follows:

"To spread broadcast the technic of some relatively simple program such as you recommend is most commendable; and efforts along this line should be pushed, it seems to me, as much as possible." 25.

"Would like to see you eliminate:

1. Ancient resuscitation methods from modern textbooks.
2. Those awful resuscitation basins from delivery rooms.
3. Haphazard hypodermic cardiac stimulation.
4. Intracardiac injection.
5. Routine holding up of babies by feet.
6. Alpha lobelin." 41.

"Suggestions:

1. I feel that the correct posture should be explained for those unfamiliar with it.
2. Call attention to certain don'ts; such as, Do not manipulate or strike the baby too vigorously in attempting stimulant or respiration.
3. Use tracheal tubes with caution." 51.

"The reader is specifically referred to the results of a questionnaire suggested by the Chicago Board of Health." 67.

"Frankly it seems to me that in such a report the emphasis should be placed on prevention rather than cure. I am convinced that if proper obstetric diagnosis and care employed together with good judgment in the use of analgesic and anesthetic agents there would be very little need for the active treatment of asphyxia neonatorum. Furthermore, auscultation of the fetal heart in the second stage of labor with judicious control of the oxygen and carbon dioxide content of the mother will

render the number of asphyxiated babies so small that there will be little opportunity to put into practice means of treating asphyxia. . . . I am firmly of the opinion that this is where the emphasis should be placed and it seems to me one of the most neglected phases of modern obstetrics." 76.

**Pressure on Lower Jaw**

The importance of obstructing the baby's airway by making pressure upon the lower jaw with a mask is noted.

"We emphasize as you do that artificial respiratory obstruction may be easily induced by the slightest pressure on the baby's face which tends to depress the lower jaw." 5.

"Keep the baby's lower jaw well foward." 15.

"If the note under Indications for Relief of 2nd Stage implies that artificial respiratory obstruction is frequently induced by the slightest pressure on the baby's face which tends to press the lower jaw, I must disagree, since in my experience the overwhelming majority of these cases respond to the passage of a tracheal catheter in the usual manner which necessitates inserting the finger in the mouth and pressing the lower jaw. I feel that the danger in attempting not to clear the upper pharynx is greater than the danger of producing artificial respiratory obstruction in these cases." 18.

**Specific Apparatus**

Since specific references to apparatus known by name are made in a number of cases we note these references:

"We had one of the first Drinker respirators that was made but have disposed of it, since we did not find it of any benefit. The difficulty seems to be that the machine operating at a regular rate of speed could not be adjusted to the respirations of an infant which, as you know, are extremely irregular at birth." 1.

"The use of the small Drinker respirator has been helpful in the relief of the third stage of asphyxia." 6.

"The using of various mechanical respirators, such as the Drinker apparatus and others may prove of value when available." 18.

"In some cases especially as regard premature babies we have employed the Drinker apparatus and feel that we have occasionally saved a baby's life in this way." 24.

"As to the use of methods of resuscitation, permit me to say that in addition to the usual methods of artificial respiration we also have the Drinker respirator. I am sorry to say that the mechanical respirators which we have used, and we have probably used each one of them as they have appeared and been discarded, we have not been greatly impressed by them. We have found these machines valuable only in maintaining the respiration after breathing has been established." 32.

"We have practically given up the Drinker respirator and use it only for those cases which continue to have respiratory difficulty, namely atelectasis and weak, puny infants whose respiration falters while in the nursery and in the early days of their existence." 59.

"If breathing does not begin immediately the infant is placed in a Drinker respirator and is given artificial respiration continuously until the normal rate of respiration is inaugurated or until death takes place. This is indicated by periodic examination of the heart sounds. During the treatment in the respirator a face mask covers the infant's face and it is permitted to breathe a mixture of carbon dioxide and oxygen. The treatment is the same regardless of the apparent degree of asphyxia." 61.

"We recommend the Foregger or Drinker respirator for artificial respiration in the hospital." 67.

"We have been using the E & J resuscitator for the past six years. We feel quite certain that we have saved one life and possibly two or three others during that time." 21.

"Close at hand in each delivery room are the E & J respirator and the Flagg respirator." 59.

"We use the E & J resuscitator which has given excellent satisfaction." 63.

"In extreme cases the Kreiselman machine is used." 1.

"The Kreiselman apparatus is obviously suitable only for hospital use." 25.

"We have been using the Kreiselman apparatus for the past two years in the treatment of asphyxia neonatorum. It seems to us to supply the four main desiderata, proper posture, aspiration of mucus, the delivery of oxygen under measured pressure and warmth." 25.

**Researches in Asphyxia Neonatorum Now under Way**

"Our assistant pediatrician is conducting a somewhat extensive piece of research on exchange of gases through the placenta." 1.

"Research under way: Determination and comparison of maternal oxygen tension to fetal oxygen tensions when Barbiturate and Hyoscine Amnesia employed in delivery." 13.

"Studies in intra-uterine respiration and the effect of various types of anesthesia on this phenomenon. We have been hoping to get under way a study dealing with the efficacy of various methods of insufflation in producing expansion. This would have to be carried out on stillborn infants and presents certain technical difficulties which we have thus far not been able to circumvent." 25.

"At present we are undertaking an investigation bearing directly upon the problem of asphyxiation. Earlier in the year, however, we

carried on some unpublished clinical experiments on the effect of morphine administration to the mother in labor. As a result of this work, we are more than ever persuaded that morphine rarely has any harmful effects and that it has unjustly developed a bad reputation as an agent likely to produce fatal asphyxia. It is likewise the opinion of the staff that any possible morphine effect on the baby is rarely, if ever, fatal." 20.

"Children whose mothers have had some form of analgesia during labor seem more prone to develop cerebral anoxia. We think that possibly this may be due to a lowering of the metabolic rate during labor under that which we would normally expect in a woman without analgesia, and we are attempting now to set up a normal by taking metabolic rates on patients actually in labor without analgesia." 31.

"A report on infant autopsies." 46.

**"Euthanasia" in Asphyxia Neonatorum**

"Some times I wonder how justified we are in stressing procedures for resuscitating babies. If we assume that the more severe grades of asphyxia are commonly associated with intracranial lesions there is certainly some doubt as to whether these babies should be saved. Certainly when there is definite evidence of intracranial hemorrhage it may be better for everyone concerned if they are permitted to die peacefully, rather than to make them burdens to themselves and to their community.

"No doubt you have given thought to the hard-boiled philosophy in such a suggestion." 20.

**Sedatives to Mother**

Indirect reference to sedatives given the mother have already been noted. However, the following comments stress the situation directly.

"We feel that it is important not to give morphine to the mother in the last three or four hours of labor, fearing that it will depress the baby's respiratory center. Consequently we do not employ it previous to the performance of caesarian section. We do not feel that the barbiturates which are so widely employed at the present time when properly administered give any particular difficulties in regard to the resuscitation of the baby. Ether when given to the surgical degree does appear to effect the baby to some extent but it has never done so to an alarming degree in our experience. We never employ it in an operative obstetric case except when we are unable to obtain a skilled anesthetist or when apparatus is not available, such as is the case in obstetrics performed in the home. Our preference is for ethylene oxygen as an obstetrical anesthetic." 24.

"First, while asphyxia neonatorum will always be with us, I wonder

if we haven't got the cart a bit ahead of the horse in emphasizing asphyxia when perhaps we might be placing the emphasis on the factors which produce asphyxia with particular reference to over-sedation." 30.

"I am impressed by the fact that the conduct of the labor and the use of drugs for relieving the pains of labor are large factors in asphyxia. I feel that there should be a special investigation of the cases in which the various drugs have been applied in the production of so-called painless labor. I think that one of the objections to the indiscriminate use of such drugs for the relief of pain is reprehensible, and in any research on this problem this should be a prominent feature." 32.

"It is my belief that the two predominant causes of asphyxia neonatorum are: First and foremost, injudicious and unwise attempts at analgesia and anesthesia; and secondly, the inordinate amount of operative deliveries that are done in the country as a whole. The two subjects are so intimately interrelated that it is usually impossible to separate them. In other words, excessive drug therapy of various kinds is being employed which so interferes with the normal process of labor as to render operative delivery more or less the rule. For example, just recently, I heard a prominent obstetrician connected with a well-known medical society, in which he advocated large doses of nembutal. He admitted that the dosage was so great that it was necessary to complete the delivery by forceps in almost every instance. I cannot help but believe that these two factors are responsible for the large incidence of asphyxia neonatorum.

"Our practice here is to give our patients as much relief in labor as we can consistent with the normal progress of labor and this we accomplish in the first part of the first stage by the use of heroin; in the latter part of the first stage and throughout the second stage the use of intermittent nitrous oxide oxygen, maintaining the oxygen at a high level, especially for the few moments before the birth of the baby. Of course, we have to vary our technic with the individual patient, but I have outlined the management of the average case on our hands. The result is that labor is not unduly prolonged, operative incidence is not increased, and rarely is it necessary for us to use artificial means to establish normal respiration.

"I would not have you believe from the above that we are entirely satisfied with our methods of pain relief in labor. While I wish we could afford more relief to our patients than they now obtain, and I believe that the day will come when that will be possible, I am satisfied that we are not jeopardizing the baby's welfare and neither are we increasing our incidence of operative deliveries." 76.

"I am also impressed with the fact that the conduct of the labor and the use of drugs for relieving the pains should be a special investigation of the cases in which the various drugs have been applied in the production of so-called painless labor. I think that one of the objections to the

indiscriminate use of such drugs for the relief of pain is reprehensible, and in any research on this problem this should be a prominent feature." 32.

"We use no pituitary extract during labor. We use no scopolamine and no barbiturates. For twenty-five years it has been well accepted that 30% of all babies born in twilight sleep labors show some degree of asphyxia. Fritz Irving's article on the barbiturates some two years ago showed exactly the same figures (30%). Without making a careful survey of our own results, it is my opinion that we do not have more that 3%, including the complicated as well as the uncomplicated asphyxia. I think it is high time that the American Medical profession should receive a scathing denunciation of twilight sleep and all similar procedures. It seems to me that your committee is in an excellent position to render a real service of this sort. The only defense that I have ever heard a physician give for the use of such procedures is that they were "Business getters." 21.

Note: Endotracheal intubation and suction may be said to be practiced by two distinct schools. The first employs palpation and blind intubation. It corresponds to the technic popularized by Joseph O'Dwyer in his treatment of diphtheria fifty years ago. The second employs direct vision by the use of a laryngoscope and corresponds to the technic employed by Chevalier Jackson in per oral endoscopy. Endotracheal suction is indicated and should be practiced only in advanced spasticity and flaccidity. In spasticity suction may be necessary to relieve glottic obstruction from mucus or amniotic shreds. In flaccidity tracheal fluid may demand removal. It is difficult to remove shreads of mucus or pools of fluid which cannot be seen. It is an entirely non-traumatic procedure to laryngoscope and intubate a flaccid baby.

Exposure of the field and treatment under direct vision in the case of asphyxia neonatorum will very likely follow the course pursued in the case of diphtheria where blind intubation has given way to direct methods as familiarity with the structures involved and the technic employed becomes generally understood.