Dr. Morse spoke of the value of getting a record from the mother of the exact dietary of the child. I never treat a child without doing this, and I think it is exceedingly important. I secure not only a list of the various foods administered, but also a statement of the amounts of each food.

The examination of the stools, as has been suggested by Dr. Talbot, is not a difficult procedure, and one can gather much valuable information from the macroscopic study alone. The microscopic examination is important, but not so much so as the macroscopic. The sooner we realize that the examination of the stools is an easy procedure, the sooner we shall employ it as a routine measure.

NITROUS OXID AND OXYGEN ANESTHESIA *

WILLIAM D. HAGGARD, M.D.
NASHVILLE, TENN.

The advances in the use and perfection of nitrous oxid anesthesia since the report of the Anesthesia Commission on this subject, at the meeting of 1908, seem to consist of the following:

1. The employment of this agent, with modifications, as the routine anesthetic in several of the large clinics of this country.

2. The demonstration clinically and experimentally of the advantages of nitrogen oxid and oxygen over ether, in the prevention of shock, the conservation of immunity and its value in the case of the handicapped patient (Crile).

3. The establishment of rebreathing of nitrous oxid and oxygen for two or three minute periods, as harmless and beneficial, with the great reduction in cost of this anesthetic (Gatch).

It has already been shown that nitrous oxid is the safest of all anesthetics and the most pleasant to take; that it requires the shortest time for induction; that there is almost immediate recovery after its discontinuance, and that it has no bad after-effects. There is no stage of excitement, and excitement is absent when the patient returns to consciousness. Dentists, who have used it in short administrations for many years, state that literally millions of administrations have yielded an infinitesimal number of deaths.

It is not absolutely free from danger, however. Death can occur from its continuous administration, without admission of air or oxygen in from two to four minutes. In overdosage, death is caused by asphyxiation and cardiac inhibition. In the fatal animal experiments, sudden arrest of the heart in overdilatation was observed. The danger-signals with this anesthetic are:

1. Deep and persistent cyanosis.
2. Depression and slowing of the pulse.
3. Vomiting.

Cyanosis is the first indication of trouble, and gives startling warning of impending danger. Discontinuance of gas and giving of oxygen, which should be always at hand, uniformly and promptly dissipate all danger.

Crile has shown in the physiologic laboratory that animals under nitrous oxid withstand shock-producing trauma much better than under ether. The resistance of animals rendered pathologic from infections, hemorrhage, and hyperthyroidism, likewise, was strikingly better under nitrous oxid than under ether. These laboratory observations were corroborated by the histologic examination of the primitive ganglion cells of the central nervous system.

Crile's recent investigations in cytology show that there is decidedly more destruction of chromatin after ether than after nitrous oxid. Again, there is no lowering of the phagocytic power after nitrous oxid, as after ether. Nitrous oxid does not reduce hemoglobin or cause any permanent blood change. There is no acetone or indicanuria as a result. Postanesthetic complications are absent.

Although oxygen was used by Andrews with nitrous oxid as early as 1868, some of the later apparatus provided for the admixture of air. Bevan employs this gas and air mixture with success, and I have used it in a series of over 100 cases. This mixture, however, does not provide such smooth anesthesia as does the mixture with oxygen. On account of the large atmospheric content of nitrogen, if enough air is used to do away with cyanosis entirely, it so dilutes the mixture that complete anesthesia is interfered with. While cyanosis is not desirable and can be prevented by the addition of oxygen, yet it should be understood that the cyanosis is not nearly so dangerous as that cyanosis produced by ether or chloroform—a cyanosis due to cardiac and respiratory depression.

It seems to have been established by Gatch that rebreathing nitrous oxid and oxygen in periods of two minutes is not only perfectly safe, but helpful to respiration, circulation and blood-pressure. Moreover, rebreathing reduces the expense greatly, which was partly responsible for the somewhat restricted use of this agent. Rebreathing seems to be more satisfactory than the continuous administration of the gas. The respirations are deeper and fuller, and the pulse is slowed by the therapeutic excess of carbon dioxid stimulating the center of cardio-inhibition. The temperature is slightly raised. The argument for rebreathing is that carbon dioxid under 4 per cent. concentration is non-toxic; that in normal and somewhat increased amounts in the blood it is the normal stimulus to the venous wall; that the abolition of venous tonus and not arterial is the primary cause of failure of circulation in shock. Carbon dioxid stimulates the cardio-inhibitory, vasomotor and respiratory centers, and an increase such as is afforded by rebreathing during gas and oxygen raises the blood-pressure and is thus an easily available preventive of shock. The loss of body heat by expired air is conserved by rebreathing and artificial warming of the gases is rendered unnecessary.

The apparatus of Gatch providing for rebreathing is extremely simple, portable and inexpensive. It has a rubber sleeve that fits snugly and conveniently over the face-piece, preventing leakage of gases and the ingress of air which checks the anesthesia. The patient can be given air or gas, with or without oxygen, and made to breathe the mixed gases to and from the bag. Even a little air allowed to mix the gases spoils the anesthesia. The apparatus has an attachment permitting ether to be added when needed for short periods, all without removal of the mask, until the anesthesia is to be permanently withdrawn. It is a very powerful etherizing device when needed.

It is not necessary to attempt to give any arbitrary percentage of oxygen. Just enough to dispel the cyanosis is the aim and, roughly speaking, a puff of oxygen in each bag of nitrous oxid that is to be rebreathed is sufficient. Keep the patient pink, is the rule. If the color cannot be kept good, it is better to give ether by the open method.

* Approved by the Committee on Anesthesia of the American Medical Association.

Not all patients, notably not the very robust and alcoholics, can be sufficiently relaxed without disagreeable cyanosis. In these, ether given for three or four minutes in the mask or by the open method, will usually accomplish relaxation and oblivion. The quantity of ether is negligible. When rigidity is overcome the gas may be resumed. A little ether, so small in quantity that the patient is never aware of it, is given in about three-fourths of the abdominal cases at Johns Hopkins Hospital (Gatch). The post-operative discomfort is less with a little ether and no cyanosis than with no ether and prolonged cyanosis. Pronounced cyanosis is apt to be followed by headache.

Teter estimates that a small quantity of ether given in this way will be necessary in about 10 per cent. of the cases. In laparotomies three, five or seven minutes of ether will be required in about 40 per cent. of cases.

Gas and oxygen can be used with impunity where ether is contraindicated, i. e., in kidney disease. Nitrous oxid has also been employed in advanced pulmonary lesions and seems to have caused no mortality. It is particularly helpful in those desperate cases from any cause that urgently demand operation and yet are so risky that the surgeon realizes that ether or chloroform is the added weight which depresses the beam.

The borderline cases in which the operator seriously questions the wisdom of trying to do anything, may have surgical aid extended safely, so far as the anesthetic is concerned, by nitrous oxid and oxygen, but only at the greatest hazard with ether or chloroform. Moreover, the inevitable, though small, anesthetic mortality from pneumonia, anuria, fatty degeneration of the liver, etc., can be prevented.

The chief class of cases rendering nitrous oxid unsafe is that of heart lesions, whether myocardial or valvular.

Anesthetization with nitrous oxid is incontestably more difficult than ether. It requires special training and expertness to acquire the technic. Crile has had it administered practically as his routine anesthetic in over 1,000 cases. There has been one death six hours afterward which he charges to the anesthetic. With the increased experience acquired by his special anesthetist he feels that this fatality could now be averted.

The danger, therefore, is not so much in the agent as in the administrator, but this is equally true of the other anesthetics. The simple cases should be chosen first.

It is therefore not adaptable for the all-round use of the general practitioner, but will grow greatly in popularity in the highly perfected clinics, in hospitals with expert permanent anesthetists, and with those who specialize in anesthetics. Fortunately most of the major surgery and graver traumas are cared for under these conditions, and thus the desperate-chance patient may have this added safeguard and adjuvant to life-saving.

Gas and oxygen are not only indicated where the risk is great, but routinely they are a special boon to patients who have been operated on before and who have a more or less justifiable and vigorously expressed dread of the primary "smothering" effects of ether, and the secondary feeling of *mal de mer*.

Nitrous oxid can be safely administered for two or three hours, and at Johns Hopkins Hospital where it has been used routinely on the surgical side in over 1,000 cases, Gatch kept one patient under its influence for five hours without ill effects. It can be given longer with safety than any other anesthetic.

A preliminary dose of morphin gr. $\frac{1}{4}$ and atropin gr. $\frac{1}{150}$ or half that amount is useful in the majority of

cases to assuage the fear of the anesthetic and of the operative ordeal. Anesthesia is induced more easily and proceeds more tranquilly; a smaller quantity is required and the after pain is annulled. No food or drink should be given for at least four hours prior to operation. Do not begin the operation too soon.

Crile gives $\frac{1}{150}$ gr. scopolamin or less two hours before operation. It induces the "twilight slumber" and obliterates any fright or even anxiety about the operation. The effect, and with the preliminary dose of morphin followed by the anesthetic lulls the patient into a drowsy somnolence which deprives the entire day of painful recollection.

Nitrous oxid and oxygen anesthesia with the apparatus not permitting rebreathing, costs about \$5.00 an hour. With the apparatus of Gatch, obtaining the other benefits of rebreathing, the cost is reduced to \$1.00 or \$1.50 an hour. This cost may be further greatly reduced by installing, for a few hundred dollars, a permanent plant in the basement of the hospital, for the manufacture of nitrous oxid. It can be piped to the operating-room, thus doing away with the noise made by the escape of the gas under pressure in the cylinders.

Continuous auscultation of the heart by a phonendoscope, as practiced by Cushing and advised by Teter, gives accurate information, and allows both hands of the anesthetist to be employed with the patient and the apparatus.

ANESTHESIA IN TRAUMATIC SURGERY*

GASTON TORRANCE, M.D.
BIRMINGHAM, ALA.

On being asked by the committee to report on anesthesia in traumatic surgery from the Birmingham district, I sent a circular letter to a number of surgeons in this country and abroad, asking them to give their experience and observations in regard to this subject; and below will be found a condensed form of the reports submitted by them.

Professor Eiselsberg writes that in the Vienna clinic they have a special station devoted to traumatic surgical cases. He advises that as small an amount of the anesthetic be used as possible. No morphin or scopolamin should be used in fractures of the skull as there is danger of sudden collapse. Morphin should precede the anesthetic in fractured ribs, thereby avoiding dyspnea. He prefers using Billroth's mixture (chloroform, ether and alcohol) followed by ether where a general anesthetic is to be used. Spinal anesthesia is to be used only where others are contra-indicated. He has never observed a death from the anesthetic. The greatest precautions are to be taken where a general anesthetic is used as traumatized patients are much more sensitive to the effects of anesthetics than other. Where possible the operation should be postponed until the first period of shock has been passed.

Dr. Charles H. Mayo says that he and his colleagues have practically no traumatic cases in their surgery and that they have had very little opportunity to observe the effects of anesthesia in this class of work.

Dr. George W. Crile writes as follows:

Wherever possible, nitrous oxid oxygen anesthesia is used. I base my preference on the observation that under nitrous oxid anesthesia there is less shock than under ether. That is,

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