tive history of syphilis should make one hesitant to employ spinal. . . . Carcinoma of the prostate with its possible rapid metastasis following operation may produce a paralysis that will be attributed to the lumbar puncture. Pernicious anaemia with its concomitant neurological changes presents a similar problem. A preanaesthetic explanation to the relative of the possible sequelae in these cases is advisable. Septicaemia is a deterring factor to the use of spinal anaesthesia. . . . Likewise, lumbar puncture should not be attempted in the presence of superficial or deep seated infection at or near the site of injection. In patients with respiratory complications, subarachnoid block is especially indicated. . . . Theoretically, spinal anaesthesia is the anaesthetic of choice for diabetic patients but the frequent coincidence of cardio-vascular degeneration with this disease necessitates consideration of the additional risk. Organic changes in renal function are little affected by spinal anaesthesia. Hence it is the anaesthetic par excellence in kidney diseases. The advantages of spinal anaesthesia to the new-born, in Caesarean section, have been set forth by Heard. . . . We personally prefer cyclopropane for this operation. . . .

"In conclusion I would like to emphasize the necessity first, that spinal anaesthesia be entrusted only to those who through training and practical experience have made themselves proficient in its use, and second, that careful and constant observation of the anaesthetized patient be kept throughout the entire operation. Upon careful consideration of the effects of spinal anaesthesia on the disease present, together with the urgency of relaxation to facilitate surgical manipulation, and upon the judgment and ability of the anaesthetist, must rest the decision whether spinal anaesthesia is or is not indicated." 8 references.

J. C. M. C.

ARNOTT, G. M., AND YOUNG, W. F.: *Postoperative Administration of Fluids to Children.* Lancet 1: 523–526 (May 2) 1942.

"Children who are suffering from acute abdominal diseases often become dehydrated. They take less by mouth, they lose more by the skin and lungs, vomiting may add to their distress and persistent vomiting may lead to a serious loss of salt as well as of water. The commonest causes of vomiting of this type in children are hypertrophic pyloric stenosis, paralytic ileus and intussusception. In the last two, large volumes of the gastro-intestinal juices may accumulate in the distended coils of bowel and so increase the degree of dehydration. Treatment may also increase dehydration if the stomach is often washed out, or if suction drainage is instituted or an enterostomy performed. Haemorrhage into the bowel in intussusception may contribute to the dehydration, but it requires treatment by blood-transfusion if the loss of blood has been severe. . . . It was found that, in children, degrees of dehydration ranging from mild to moderate and severe were relieved by volumes of fluid representing 3–6% of their body-weight. As the tissues absorbed the fluid the patients assumed a more normal appearance, the sunken features filled out, the skin regained its elasticity, the mucous membranes became moist, and larger volumes of less concentrated urine were passed. Lashmet and Newburgh (1932) have shown that the normal kidney can concentrate urine to a specific gravity of 1032, and that even with this concentration an adult must secrete 500 c. cm. each day to eliminate the waste products of the body. Accordingly, the restoration of normal volumes, coupled with a fall in the specific gravity of the urine, were accepted by us as proof that adequate amounts of fluid were being given. Confirmation was obtained by observing the relief of haemoconcentration and the fall in blood-ureas. . . .

"At the beginning of treatment it is necessary not only to relieve the dehydration but also to give the patient sufficient fluid to cover his normal losses. Because the basal metabolic rate (BMR), the blood-volume and the kidney function are related to the surface area rather than to the body-weight, the following formula was used to estimate the normal daily fluid requirement of children. Child's requirement = Adult's requirement ÷ Surface area of adult/Surface area of child. The adult's requirement was taken to be 3000 c. cm. . . . The assessments are only approximate but with these volumes the kidneys can be relied on to make the necessary adjustments. . . . The required intakes are easily remembered as follows:

| | | |
|---|---|---|
| 750 c. cm. | at | 1 year |
| 1000 c. cm. | at | 3 years |
| 1500 c. cm. | at | 8 years |
| 2000 c. cm. | at | 12 years |

The object of these investigations was: (1) to determine whether the methods employed for assessing the fluid requirements formed a safe basis for treatment; and (2) to find which observations were most helpful for controlling the treatment. The fluid intake and when possible the urinary output were measured for several 24-hour periods after operation. . . . Children who were not acutely ill were sometimes able to take the whole of the fluid required by mouth; 4–6 hours after the operation, sips of water (up to ½ oz.) were offered at half-hourly intervals; the amount was then increased gradually, longer intervals were allowed, and fruit drinks were added. It was difficult to give enough sugar to prevent ketosis, but a 10 per cent solution of "Dextri-Maltose" flavoured with fruit juice and containing about 60 g. of carbohydrate per pint proved a palatable drink. It was much more effective than "hospital" lemonade, and barley sugar and boiled sweets were useful supplements. . . .

"It was usually impossible to give an ill child the whole of the required volume by mouth for the first few days after operation; in these circumstances the balance of fluid was given, preferably by rectum. A continuous rectal drip of tap water, or ⅕ normal saline was well retained by children over the age of 3 years, but sugar solutions given by rectum were not. Since prolonged sugar starvation is badly tolerated by children, rectal fluids were only used to supplement oral feeding. . . . When feeding by mouth is contraindicated—as it is in general peritonitis, paralytic ileus and after operations on the gut—fluid has to be given intravenously, and the correct type of solution and its rate of administration are very important. The infusion of large volumes of 5 per cent glucose in normal saline has had unwarranted popularity, and we were able to observe the ill effects of such treatment in a child who had been kept on it for several days. . . . The effects of administering massive doses of sodium chloride are often seen in hospital practice, and the dangers of such therapy have been stressed by Coller, Dick and Maddock . . . and other workers. . . . We have used 4.1 per cent glucose in ⅕ normal saline solution to cover the normal daily requirement and any fluid shortage due to starvation. Normal saline was reserved for the relief of dehydration caused by vomiting and to replace, in approximately equal volume, any postoperative loss of intestinal juices by emesis or drainage. At the beginning of treatment the volume for the relief of dehydration was added to the estimated normal requirement for 24 hours. The hourly rate of flow was then calculated and the fluid given by continuous intravenous drip. After the dehydration was relieved the rate of flow was readjusted, and, as the oral intake was gradually increased, the infusion was proportionately withdrawn. . . .

"Postoperative treatment of patients suffering repeated loses of gastro-intestinal juices is a complicated procedure, but with careful therapy it is possible to maintain their fluid balance over a long period. The loss by vomiting, duodenal drainage or enterostomy is replaced by an approximately equal volume of normal saline. It is clear that more hydrochloric acid than sodium chloride is lost in duodenal drainage, for the plasma chloride is often low while the sodium is normal. . . . If the plasma chloride alone had been taken as an indication for giving more normal saline, an overdose of sodium with consequent water retention would have been risked. . . .

"It is necessary to control the rate of administration carefully when using the intravenous route. No ill effects have been observed from giving the volumes recommended here, although these are considerably larger than those used in the past at this hospital. The faster rate of flow required during the relief of dehydration was well tolerated, but convention suggests that too much fluid should not be given to a sick patient; we do not now give intravenously, in the first 24 hours, a volume representing more than 4 per cent of the body-weight plus the estimated normal daily requirement. If necessary the balance is made up on the following day, the deficiency being reflected only in a slower return to the normal urinary output. If the specific gravity of the urine falls well below 1030 it can be assumed that sufficient fluid is being given. No fixed rule can be made for assessing the salt requirement. Each case must be judged on its own merits but, if the amount to be given is regulated by the methods we have described, any gross error will be avoided. . . . The patient's progress is always the best indication of the effects of treatment, and since giving these volumes and solutions no child has become dehydrated during the postoperative period. Accurate observations on the urine output in the younger patients are often impossible, nor are they necessary. A record of the number of times the bed is wet and a daily specimen for examination usually provide sufficient information. The interpretation of the blood chemistry needs great care, particularly that of single samples. We have found that some sick children have comparatively low haemoglobin levels and that the concentration of protein in the plasma may also be low even when they are dehydrated. Neither can, therefore, be used as a guide to the amount of fluid required to relieve dehydration. During the postoperative period haemolysis may cause a sudden drop in the percentage of haemoglobin, and the plasma proteins tend to fall as a result of infection and starvation. When fluids are given intravenously the rate of infusion may affect the findings, and the blood should not be taken for analysis if the drip has been running quickly during the preceding hour. If these complicating factors have been excluded, however, serial estimations may be very useful as an indication of haemo-dilution, for it has been shown that water retention follows the administration of excess of salt. A fall in the plasma proteins below the oedema level (5 g. per 100 c. cm.) must be taken as a warning to avoid further dosage while maintaining a sufficient water intake for an adequate urinary output. If the urine remains scanty a 20 per cent glucose solution is a valuable diuretic. It has already been pointed out that low plasma chlorides are to be expected when there have been persistent losses of hydrochloric acid from the stomach, and that they alone should not be used as a guide to the amount of saline required. Further work is needed before assessing the value of plasma transfusions for maintaining the level of the proteins in the plasma of children who are ill for a long time, but our findings suggest that they might be useful. It must be remembered that the salt content of plasma is approximately equivalent to that of normal saline." 10 references.

J. C. M. C.

THOMPSON, S. A., AND BIRNBAUM, C. L.: *The Phenomenon of Asphyxial Resuscitation. I. Resuscitation with Inert (Asphyxiating) Gas in Advanced Asphyxia.* Surg., Gynec. & Obst. **74**: 1078–1083 (June) 1942.

"Resuscitation in asphyxia is of considerable and mutual interest to physiology and medicine. From the practical standpoint, the problem is important in the operating room—cessation of respiration and of circulation or both—, in industrial surgery—electric shock, cave-in, gases and fumes—, in civilian life—carbon monoxide asphyxia, drowning—, and military surgery—crushing injuries, air raid casualties, war gas poisoning, thoracic trauma. Yet, much controversy still exists on methods of resuscitation. For this reason, we have carried out an experimental investigation in an attempt to clarify this important problem. During this work we observed a phenomenon, to our knowledge hitherto not described, which bears directly on the practical aspects of resuscitation. . . .

"Advanced asphyxia was produced experimentally by tracheal obstruction or inhalation of inert gases—nitrogen, helium. When in such asphyxia the respiration has ceased, it is possible to resuscitate with a suck and blow apparatus, inert gas being used. Such resuscitation is possible in a high percentage of cases and far beyond the period at which spontaneous recovery could occur by discontinuing the asphyxial procedure. With other methods of resuscitation—manual artificial respiration, rhythmic inflation, rhythmic suction—recovery of the circulation and respiration is the exception rather than the rule. In this phenomenon of asphyxial resuscitation, the heart and circulation recover first, the respiration later. Typically applied in experimental asphyxia, the positive-negative resuscitator, with inert gas, is kept in action until the blood pressure has definitely recovered and spontaneous respiration is taken, when the lungs are let in communication with the atmospheric air. In many instances recovery is also possible by discontinuing the resuscitator after the blood pressure has recovered but before spontaneous respiration has occurred." 3 references.

J. C. M. C.

ALTSCHULE, M. D.; GILLIGAN, D. R., AND ZAMCHECK, N.: *The Effects on the Cardiovascular System of Fluids Administered Intravenously in Man. IV. The Lung Volume and Pulmonary Dynamics.* J. Clin. Investigation **21**: 365–368 (May) 1942.

"Studies of the effect of the injection of fluids intravenously on the subdivisions of the lung volume and on the respiratory dynamics have been made in six normal subjects. Injection intravenously of 1800 cc. of isotonic sodium chloride solution, at rates of 39 to 185 cc. per minute, in these normal subjects caused no change in residual air, and only slight decreases in the vital capacity, its components, the reserve and complemental airs, and in the total lung volume. The respiratory minute volume showed no consistent change, although the tidal air was usually decreased. All the changes in pulmonary function found after intravenous infusions in these normal subjects were insignificant. The slight decreases in vital capacity, its components, and the total lung volume, after these massive intravenous