the lost fluid in shock due to hemorrhage. In other forms of shock with hemoconcentration, the cellular elements of blood are so plentiful that plasma or serum replaces the fluid elements adequately. . . . Massive or adequate transfusions are advocated by the Mayo Clinic. . . . Infusion of adequate amounts of plasma is extremely important in relieving shock. Failure of a severely wounded and shocked patient to recover after receiving 2 to 3 pints of blood or plasma probably means that further quantities must be administered. In some severely burned patients, as much as 8 to 11 quarts were used in individual cases. . . . The importance of oxygen in the treatment of shock is stressed to relieve anoxia. . . . The use of adrenal cortical extract in therapy of delayed shock is still in the experimental stage. It seems to offer great promise. . . . Adequate proteins in the diet are building stones for plasma proteins but if additional large quantities of plasma protein are given by vein, there may be an intoxication. Administration of abundant carbohydrates and fat is necessary to prevent this intoxication. The National Research Council recommends the following vitamin requirements for general nutrition and wound healing: Vitamin A, 5,000 U; thiamin, 2 mg.; ascorbic acid, 75 mg.; riboflavin, 3 mg.; nicotinic acid amide, 20 mg.; and vitamin D, 400 U. . . . Plasma is the keystone of therapy—whether liquid or dried, natural or concentrated makes little difference as long as the quantity is sufficient—the prevention of shock is the most important part of therapy. Prevention includes the replacement of fluids before shock is fully developed. Once the vicious circle is started, it rapidly becomes irreversible." 42 references.

J. C. M. C.

GOVIER, W. M.: *Studies on Shock Induced by Hemorrhage. III. The Correlation of Plasma Thiamin Content with Resistance to Shock in Dogs.* J. Pharmacol. & Exper. Therap. **77**: 40–49 (Jan.) 1943.

"It has been shown in previous communications that the administration of thiamin to dogs in which shock has been induced by hemorrhage results, in many instances, in a prolongation of survival time and in a return to normal of the elevated keto acid, blood sugar, and blood lactic acid levels which occur in shock. Since dogs show marked variability in resistance to shock and response to treatment with thiamin, studies were made to determine whether or not any relationship exists between the amount of plasma thiamin and resistance to shock. . . . Thirty-seven dogs were used. . . . Resistance to shock induced by hemorrhage in dogs anesthetized with pentobarbital-sodium is significantly greater in those animals having high plasma thiamin levels than in those showing low plasma thiamin values. Dogs having high plasma thiamin values withstand more bleeding before developing severe hypotension than do animals having low plasma thiamin levels. Dogs fortified with thiamin before bleeding show a constant tendency for their blood pressures to return to normal after hemorrhage, whereas low thiamin animals develop persistent hypotension early, after small amounts of hemorrhage. The incidence of intestinal hemorrhage after bleeding is much greater in dogs low in thiamin than in animals having high plasma thiamin levels." 14 references.

J. C. M. C.

BARNARD, M. A.: *Shock.* New York State J. Med. **43**: 228–230 (Feb.) 1943.

"Shock, always of interest to the surgeon, obstetrician, and physician, now becomes of interest to the first-aider and the public. A committee from Rochester (N. Y.) hospitals, Dr. Don Hutchens, Chairman, reports:

"In the event of possible bombing of cities, experience of the English medical personnel suggests the value of the practical rather than the theoretical import. Recognition of shock and its treatment at the site of the disaster are stressed. It demands quick decision and decisive, direct action. Careful handling is necessary, and sometimes plasma infusion at the site before transfer, may be indicated.

"Dr. Philip D. Wilson said: 'While heat, fluids, and sedatives are important in the treatment of shock, the really life-saving measure, when required, is transfusion of plasma or whole blood. The crush syndrome is caused by the pinning of an extremity under debris from which it cannot be extricated for several hours. The individual seems in good condition until after release, when shock develops.'

"Treatment of Patient in Shock from Severe Trauma without Hemorrhage or with Minimal Hemorrhage: 1. Make patient comfortable by first aid treatment. 2. Shock position. 3. Record blood pressure as indicated. 4. Maintain body temperature; do not overheat. 5. Sedation: Morphine to control pain. Do not prescribe larger doses than necessary. 6. Administer oxygen in high concentrations. 7. Fluid therapy: Take blood for hemoglobin determination and blood grouping. Cannulate accessible vein. 8. Fluids: First choice—half strength plasma; second choice—matched whole blood if available, or compatible universal donor; third choice—6 per cent acacia in normal saline; fourth choice —5 per cent glucose in normal saline or Ringer's solution. . . .

"Treatment of Shock in Patient Suffering from Hemorrhage: 1. Place in shock position. 2. Control external hemorrhage. 3. Appraise presence of internal hemorrhage. 4. Record blood pressure as indicated. 5. Maintain body temperature. Do not overheat. 6. Sedation: Morphine to control pain. In suspected internal hemorrhage, postpone sedatives until the diagnosis of internal hemorrhage is established. Avoid larger doses than necessary. Anoxia or deprivation of oxygen is present in shock because of depleted circulation. Morphine reduces the ability of body tissues to avail themselves of oxygen. Pain only should be the signal for its use. 7. Drugs: If no response to treatment as outlined, adrenal cortex extract may be given—5 cc. intravenously or subcutaneously at the start, followed by 2 cc. at intervals of from four to six hours. 8. Administer oxygen in high concentrations. 9. Fluid therapy: Concentrated blood where victim has been sweating and deprived of water intake, may indicate need for saline rather than blood or plasma. 10. Fluids: On suspicion of shock fluids may be administered. Attempt to control hemoglobin concentration and stabilize blood pressure. First choice—whole blood; second choice—half strength plasma; third choice—6 per cent acacia in normal saline; fourth choice—5 per cent glucose in normal saline or Ringer's solution.

"Dehydration reminds us of dehydration at the time of operation. . . . A practical means of judging fluid reserve in injured or preoperative patients is the color and amount of urine. A dark urine usually indicates dehydration.

"Treatment of Shock in the Burned Patient: 1. Place patient on a sterile sheet if available. 2. Check extent and severity of burned area and make a written record. 3. Record blood pressure as indicated. 4. Maintain body temperature. Do not overheat patient. 5. Sedation: Morphine sulphate indicated by the individual case. Pain is the only indication. Danger of overdosage in old, very young, or badly shocked casualties. 6. Shock position. 7. Drugs: If adrenal cortex available, 5 cc. may be given intravenously or subcutaneously at the start, followed by 2 cc. at intervals of from four to six hours. Adrenal cortex, readily carried in the first aid kit, might often be indicated at the site of the casualty, with blood or plasma given at the hospital. 8. Administer oxygen. 9. Fluid therapy: Cannulate accessible vein. Start full-strength plasma intravenously at the rate of 200 cc. plus per hour or more rapidly if the blood pressure is falling. Continue eighteen hours if hemoglobin percentage is tending to increase. During second twenty-four hours combat hemoglobin concentration with half-strength plasma as indicated. If burn exceeds 15 per cent of the body surface, begin full-strength plasma injection, whether or not patient shows signs of shock during the early treatment. 10. Do not begin local burn treatment until blood pressure is stabilized. 11. During the second twenty-four hours maintain near normal hemoglobin or hematocrit level by: (a) fluids by mouth; (b) equal parts of plasma with normal saline intravenously as indicated."

P. M. W.

BOWMAN, R. O.: *Fluid Administration.* Rhode Island M. J. **25**: 207–217 (Oct.) 1942.

"The human body is a complex mixture of water, salts and organic substances maintained in form by rigid structural units and covered with a relatively waterproof coating. In the presence of a variable environment . . . the maintenance of fluid and electrolyte balance within the normal limits of health is a remarkable process. Fortunately the body possesses many physiological mechanisms for the maintenance of this balance and only rarely is medical aid necessary as a supplement. Like all medical treatment, replacement therapy must be on a sound physiological basis or definite harm will result. . . . Body tissues vary from 20% water in fat to 99% in spinal fluid. Blood plasma has 92% water and whole blood about 80%. . . . A rough average is that three-quarters of body weight is water. . . . This water is divided in two phases generally spoken of as intracellular water (75%) and extracellular water (25%). The latter may be again divided into intercellular water of the tissues (17%) and intravascular water of the blood (8%). Thus our average normal man will have about 35 liters of intracellular water, 10 liters of intercellular water and about 5 liters in his vascular system. . . . Normally about 2500 cc. of water are added to and the same amount lost from the body in each 24 hours. . . . During growth there is water retention in the body. . . . Water can be withdrawn from cells for vital processes, but a total loss of about ¼ of the body water is inconsistent with life. . . .

"Water acts not only as the fluid medium for transport of foods and waste products, but because of its high latent heat of vaporization, it plays an important role in heat regulation of the body. . . . With a fever of 105° F. the body may secrete 5 liters of sweat in 24 hours instead of the 1 liter of normal insensible perspiration. . . . The walls of the capillaries are permeable to salts, glucose and water but not to the larger molecules of serum proteins. The latter exert an osmotic pressure and so tend to draw water into the capillaries. Blood pressure within the capillaries tends to shove water out through the vessel wall. At the arterial end of the capillary water and salts are going out into the tissue spaces, but at the venous end where hydrostatic pressure is less than the osmotic pressure, water and salts are entering the capillary. . . . Normally