between 20 per cent and 40 per cent, was not invariably accompanied by hypotension. Hemoconcentration played no role in the pathogenesis of shock, as observed in this series of patients; on the contrary, spontaneous hemodilution of some degree was an almost invariable accompaniment of the condition. The coincidence of anemia and hypotension in these casualties proved to be a reliable index of marked oligemia, adequate treatment of which involved the transfusion of at least 2,000 cc. of whole blood. The pulse rate was found to be useless as an index of the degree of oligemia. Rapid blood transfusion in the treatment of oligemic shock did not appear to precipitate, or materially to enhance, the rate of bleeding in cases with chest or abdominal wounds. The rapid infusion of large volumes of crystalloid solutions—e.g., Alsever's solution employed as the blood diluent—produced but a small and transient increase in the blood volume. True irreversible shock was observed in but two instances; in each of these the total red cell volume on admission was less than 600 cc. Blood volume measurements were made pre- and postoperatively in a number of cases; the blood loss incident to various surgical procedures ranged from 500 cc. to over 3,000 cc.

"As observed by these investigators, complete restoration of the formed elements of the blood to normal levels in all casualties presenting anemia associated with hypotension requires large transfusions of at least 2,000 cc. of whole blood. However, attention should be directed to the fact that a return to 70 or 80 per cent of normal is sufficient to render the casualty safe for initial surgery and evacuation. In view of this fact and since cross-matching is necessary after every 1,000 cc. transfusion of whole blood, it would seem most practical and safe for forward installations such as field and evacuation hospitals to administer only enough whole blood to satisfy the immediate clinical demands. General hospitals of the base section, on the other hand, have blood available in greater quantity and should assume responsibility for effecting a complete return to normal of hematocrit and hemoglobin values."

A. W. F.

PHEMISTER, D. B., AND LAESTAR, C. H.: *Local Fluid Loss, Nerve Stimuli and Toxins in the Causation of Shock.* Ann. Surg. 121: 803–820 (June) 1945.

"Experiments were conducted on dogs in an endeavor to determine the relative roles of nerve impulses and local fluid loss in the production of shock due to limb trauma. . . . No evidence was obtained from these limb trauma experiments that either a flow of nociceptive stimuli from the injured field or toxin formation is an important contributing factor in the initiation of any circulatory impairment or shock which followed. . . . The animals in which the trauma was applied soon after the administration of a spinal anesthetic were protected from shock principally by the blockage of the vasomotor and (less importantly) motor nerves, which greatly lowered the blood pressure and limited the hemorrhage to an amount that was too small to produce shock, instead of by the blockage of afferent impulses. The maintenance of such a low blood pressure by spinal anesthesia for the prevention of shock during an operation on man is contraindicated as the amount of anesthetic required would be too toxic. . . . In all of the experiments where shock developed the local blood loss was large and constituted the outstanding causative factor. . . . There appears to be no indication for the renewal of efforts to prevent shock by the blockage of afferent nerve impulses through the use of local or spinal anesthesia. Indications for the use of local or spinal anesthesia in shock are based on other grounds." 10 references.

J. C. M. C.

FLINK, EDWARD B.: *The Distinction of Hemolytic and Nonhemolytic Transfusion Reactions.* J. Lab. & Clin. Med. 30: 371–373 (April) 1945.

"The importance of immediate determination of the presence or absence of abnormal amounts of hemoglobin in the plasma following febrile transfusion reactions is stressed. Unless hemoglobinemia and hemoglobinuria are looked for, it is impossible to distinguish hemolytic from simple febrile reactions on clinical grounds alone."

A. W. F.

STRUMIA, M. M.; CHORNOCK, F. W.; BLAKE, A. D., AND KARR, W. G.: *The Use of a "Modified Globin" from Human Erythrocytes as a Plasma Substitute.* Am. J. M. Sc. 209: 436–442 (April) 1945.

"Outline of Composition of Hemoglobin. The hemoglobin content of normal human blood varies, but it is usually 14 to 16 gm. per 100 cc. Hemoglobin is very soluble in water, and consists of 3 components: iron, porphyrin and a protein, globin. Globin constitutes about 96% of the total hemoglobin. . . .

"When hemoglobin is broken down in the body, the 3 components are apparently split from each other. The iron is retained by the body for the formation of new hemoglobin. Some or all of the porphyrin, which has been identified as protoporphyrin, is converted to bilirubin. It may be assumed that the fate of the globin is similar to that of any other native tissue protein. The 3 components of hemoglobin can be separated chemically with relative ease. Mild treatment of oxyhemoglobin with acid readily cleaves the globin from the iron-porphyrin combination. Treating oxidized heme with a weak acid will give iron plus protoporphyrin. . . .

"Comments. The expression 'plasma substitute' used in this paper is not to be construed as meaning that globin solutions can replace plasma in all instances. At best, 'modified globin' solutions can be expected to replace plasma insofar as colloidal osmotic properties are concerned.

"It is estimated that every year nearly 1½ billion cc. of packed red cells may be made available from the preparation of plasma for the Armed Forces and for the civilian population. By a relatively simple process, this hemoglobin can be transformed into a 'modified globin' at a fraction of the cost of plasma production.

"From the amount of red cells mentioned above 375,000 kg. of globin can be prepared, with an osmotic power about twice as great as an equivalent amount of plasma proteins, that is, an osmotic equivalent of about 12½ million liters of citrated plasma. In other words, from a blood donation it is possible to obtain about 250 cc. of plasma (about 17 gm. of plasma proteins) and about 24 gm. of globin. This globin is equivalent in osmotic power to about 600 cc. of plasma. Thus from a single 500 cc. donation of blood it is possible to obtain the osmotic equivalent of about 4 donations.

"As yet, the properties of this modified globin have not been fully investigated. It has been ascertained that this material is: (1) safe; (2) capable of replacing lost blood volume in cases of severe secondary shock."

A. W. F.

BOYNTON, M. H., AND TAYLOR, E. S.: *Complications Arising in Donors in a Mass Blood Procurement Project.* Am. J. M. Sc. 209: 421–436 (April) 1945.