a high degree of accuracy can be obtained. Instantaneous and continuous determinations can be made from physiological fluids, and undesirable physiologic responses can theoretically be minimized, thus making long-term clinical monitoring a possibility. Enzyme electrodes may also have a useful lifetime and meet other practical requirements.

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Blood Services: Prices and Public Policy

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The blood service complex of the United States has recently come under intense public scrutiny (*1*). This scrutiny has focused upon the issue of safe blood, reflecting mounting public concern about the alarmingly high risk of posttransfusion hepatitis (*2*). This risk is associated with the practice of collecting considerable amounts of blood from paid donors. Indeed, the public suspects that dollars are polluting its blood supply (*3*).

While attention seems now to be directed primarily toward the hepatitis problem, other issues relating to blood may soon surface unless they are dealt with by those individuals responsible for providing blood services. These other issues include the custody and conservation of the national blood resource; the provision of adequate blood services to all, regardless of where, when, amount needed, and ability to pay; and the procurement of sufficient human plasma to meet projected demands for albumin and other plasma products.

All of these issues have economic implications, but the one of most immediate importance to the patient who has received blood is the price of blood services. In this article, we describe the present structure of blood service prices, relate it to cost, and examine the principal public policy issues related to the price of blood services. Because of marked differences in organizational objectives between profit and nonprofit blood centers, and the predominance of the nonprofit center in the United States, we focus on the nonprofit center.

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Definitions

Before entering on our discussion, we wish to define the following terms.

Blood center. We use this term to include any enterprise responsible for the procurement, processing, and distribution of blood and blood components and for rendering all related professional services. Other terms for such entities include "blood bank," "community blood bank," "community blood center," and "regional blood center."

Blood service. Blood is a human tissue that should be considered a community resource over which the blood center is custodian. The output of the blood center is a set of professional, educational, and scientific services performed on, or in connection with, the

blood resource on behalf of patients for whom physicians have prescribed therapy. Quite frequently, other, more limited terms such as "products," "components," or "units" are used to designate certain outputs; but what is important is the set of services, informational as well as physical, provided the patient by the center.

Cost. Cost is the sum of dollar payments, or their equivalent, made by the blood center in order to secure the various services, such as labor, materials, equipment, and utilities, that are essential to the production and distribution of the blood service.

Price. As commonly used, price is the monetary charge made by the blood center for the blood service rendered. The terms "fee" and "charge" are synonymous with price.

The Structure of Blood Service Prices

The patient who receives a transfusion will ordinarily have to pay a number of fees for blood services, if not for the transfused material itself. Some fees, such as those for crossmatching and for the transfusion procedure, are levied by the hospital. Other fees or prices originate in the blood center, ostensibly to cover all or part of the costs of recruiting, collecting, processing, and distributing blood. These fees are almost always added to the patient's bill by the hospital; only in a few places are patients billed directly by blood centers.

The price of blood services rendered by Red Cross blood centers is charged to hospitals as the hospital participation fee. As a result, the patient, in turn, is charged for Red Cross blood services by the hospital.

Since Red Cross blood centers rely heavily on voluntary resources from their communities, the hospital participation fees they charge will usually be lower than corresponding prices set by non–Red Cross centers. In addition to a processing fee (representing the cost of collecting, processing, and distributing blood), non–Red Cross centers frequently charge a replacement fee (sometimes called a penalty fee, donor fee, or even nonreplacement fee) which the patient must pay unless he was eligible for free blood under one of the many different blood assurance programs. Under such plans, the unassured recipient is not denied the blood he needs, but he is charged for its replacement. The replacement fee can be reduced or even eliminated if the recipient provides donors to replace the blood used.

Table 1. Pricing patterns and pricing levels in two Red Cross centers (A represents the highest cost, D represents the lowest) (*5*, p. 12).

Product	Rate ($) per unit	
	Cleveland	San Jose
Whole blood	7.50	20.00
Red blood cells	7.50	18.00
Fresh frozen plasma	7.50	16.00
Platelets	7.50	16.00
Factor VIII	7.50	7.50
Pricing patterns	AAAAA	ABCCD

This complex fee structure is confusing to the patient, who may, like many others, think that "blood is free." Instead, he finds that the best he can hope for is to avoid the replacement fee by reason of eligibility for blood coverage or by providing donors. A further problem, and one that heightens the visibility of charges for blood, is the fact that health insurance often does not cover the costs of blood and blood services. High-user groups are particularly sensitive to the prices charged by blood centers for the various services they provide. This group includes patients with hemophilia, leukemia, chronic anemias, and other diseases, who become highly dependent on blood components. They continually press for special economic concessions because of their unusual needs. In addition, these patients are confused by the differences in prices for blood and components that exist in blood centers across the country, and they may even relocate to be near blood centers where their needs can be met. This confusion is illustrated by the data in Table 1, which compares the price schedules of the Red Cross blood centers in Cleveland and in San Jose, California. Both price levels and pricing patterns are different. The Cleveland center charges the same price for every transfusable unit, while in San Jose there are four different prices.

Recent public discussion about blood has brought the complex and varied assortment of blood service prices throughout the United States to the attention of the public at large, as well as to the attention of those responsible for the financing and provision of health care. In a survey of all blood centers that are members of the American Association of Blood Banks (AABB), it was recently reported that processing fees for a single unit of blood ranged from $2.50 to $35. Similarly, the range in combined processing and replacement fees was from $3.25 to $100 (*4*). Since there is no reason to suppose that the range and variation of costs of operations among AABB blood centers even remotely approaches the range and variation of reported fees, it is obvious that the pricing of blood services in the various centers is based on different, and possibly quite arbitrary, methods.

The present confusion in prices can also be seen in the blood center operations report of the American National Red Cross for the year ending 30 June 1971 (*5*). During this period, hospital participation fees ranged from a low of $7.50 per unit in Cleveland to $20 in San Jose for whole blood. Red blood cells separated from whole blood by centrifugation in the blood center were $6 per unit in Washington, D.C., and $18.50 in Wichita Falls, Texas. Similarly, the range in price for cryoprecipitated Factor VIII (antihemophilic factor) prepared by the blood center was from $6 per unit in Hartford, Connecticut, to $18.50 in Wichita Falls.

It should be pointed out that profit was apparently not a motive in price-setting in the above situations. Both the AABB and the Red Cross reports are concerned with institutions that are either nonprofit or part of parent institutions (such as hospitals) that are nonprofit. What, then, are the reasons for this wide variation in prices of blood services among blood centers in the United States? Do some centers discriminate in their pricing of blood services to favor one set of blood recipients over another? Why is it that the handling of human blood, which should be characterized by altruism and public confidence, appears instead to be characterized by economic motivations and decisions more typical of an oriental bazaar?

The variation in prices can be attributed to two sets of circumstances. The first of these is a variation in the net revenues that must be generated by the services. This net revenue is measured by the difference between gross operating costs, on the one hand, and the total of all subsidies, contributions, and other sources of income that blood centers may receive, on the other. Both of these factors may, of course, vary considerably from center to center, depending on such things as costs of doing

Table 2. Whole blood and packed red cells: pricing patterns and blood utilization.

Price of red cells relative to whole blood	Centers (No.)	Revenue-producing units		Ratio of red cells to whole blood
		Whole blood (No.)	Red cells (No.)	
Higher	2	30,809	1,778	0.058
Same	63	2,171,127	342,227	.158
Lower	15	604,520	121,225	.201
Total (average)	80*	2,806,456	465,230	(.166)

* Data on the quantities of revenue-producing red cells were not available for 2 of the 82 blood centers included in our study.

business; the range, number, and quality of services offered; the amount of capital available; and special expenses. Subsidies include such things as annual grants from local community funds, gifts of money and of services, and even the revenue from the replacement fee, which acts as a subsidy in that it reduces the amount of revenue that must be generated by patient charges. (The effect of competition, which is an important factor in price-setting in the commercial sector, is difficult to assess in this situation.)

The second set of circumstances contributing to variations in pricing stems from what may be termed pricing policy decisions. This is illustrated in Table 1, where it should be obvious that the basis of setting prices in San Jose is different from that in Cleveland—that is, Cleveland decided to set the same price for each product it provided, while San Jose chose to set multiple prices. These different decisions partially explain the differences in prices between the two centers, for even if factors of size, efficiency, and local economic conditions were equalized, a different decision by each center would produce different sets of prices. We feel that the second factor in variations of prices, the decision on pricing policy, is the more important of the two insofar as nationally important principles are concerned. We therefore concentrate on this matter here.

Pricing Patterns and Pricing Levels

Only limited data on blood banking in the United States are available, and good price data are even more difficult to obtain. We were fortunate to be able to find two sets of price data that we could use in studying pricing patterns in individual blood centers. The first of these is the detailed report of the American National Red Cross for the year ending 30 June 1971 (*5*). Although this is the seventh annual report of its kind, it appears to be the first in which unit rates (prices) are given. The report covers 59 blood centers, which together collected 3,405,192 units of blood. Some of the data that will appear in the 1972–1973 operations report were also made available to us by the Red Cross (*6*). A second set of data relates to some 50 nonprofit, federally licensed blood centers, which collectively drew over 1,200,000 units of blood during the same period (*7*).

We studied the prices of whole blood and four common components made available by blood centers: red blood cells, fresh frozen plasma, platelets, and cryoprecipitated Factor VIII. Some centers, both local and within the Red Cross system, either did not report a price for all five products or indicated that fewer than five products were made. We chose to eliminate these "incomplete" centers from our study in order to obtain a set of blood centers whose pricing data could be compared. The effect was to reduce the data base for this part of the study from 108 blood centers, which collected 4,397,320 units of blood, to 82 centers (52 Red Cross, 29 community, and one combined Red Cross–community blood center), which together collected 4,149,507 units of blood, or approximately 50 percent of the national blood supply.

We classified the pricing patterns of these 82 centers according to a simple scheme. Each center was assigned five letters on the basis of a simple set of rules. For the five prices at each center, the highest was assigned the letter A, the next highest the letter B, and so on. If the same price was used for two or more products, the appropriate letter was repeated. The designation was made in a standard order: whole blood, red cells, fresh frozen plasma, platelets, and Factor VIII. Thus, as shown in Table 1, the pricing pattern at Cleveland is classified as AAAAA and that at San Jose as ABCCD. The results of this classification for the 82 centers are shown in Fig. 1. They are striking in that they reveal no fewer than 30 pricing patterns in use at the 82 centers. The results also show that 30 of the centers were using a single pattern, AAAAA, in which all of the blood units distributed were priced the same. Other than the single-price pattern, only four patterns were encountered in more than two centers. These were AAAAB, AAABC, AABBB, and ABAAA. It is also clear from Fig. 1 that, while the AAAAA pattern is heavily favored by Red Cross centers, it is by no means the only pattern in the Red Cross system. Furthermore, other patterns are used by Red Cross and community blood centers for no apparent reason.

One interesting finding emerged from an examination of the relations between the prices for whole blood and red cells in 95 centers for which we had data. Fifteen charged a lower price for red cells; of these, ten were Red Cross centers and five were community centers. Five centers, one of which was a Red Cross center, charged a higher fee for red cells than for whole blood. In Table 2, the output of these 20 centers—15 plus 5—is compared with the output of 75 centers that set the same price for red cells and whole blood.

The data in Table 2 reveal that the 15 centers which charged a lower price for red cells than for whole blood distributed relatively more red cells than whole blood. The 10 Red Cross centers among these 15 distributed 24.4 percent of all Red Cross whole blood and 28.4 percent of all Red Cross red blood cells. These findings suggest, but do not prove, that prices are a factor in the choice between red cells and whole blood. Prices may act only to reinforce other circumstances favoring red cells, but it is satisfying that, in this sector of the Red Cross system, prices work in the right direction. In those ten centers, red cells were priced, on the average, $3.20 lower than whole blood.

Similarly, the findings in Table 2 suggest some association between the lower price of red cells in relation to whole blood, on the one hand, and the use of components, on the other. Whether this represents a simple association or causation, the lower price of red blood cells appears to reinforce medical indications for the use of components. There seems to be no relationship between the wide-ranging prices of platelets and Factor VIII and the price of whole blood.

The Relationship between Costs and the Price Structure

The above findings demonstrate the wide variability of pricing patterns for blood services among the 82 blood centers in this study. In addition, there appears to be great independence among these centers with respect to pricing practices. While local factors might tend to increase the similarity between the commercial and the nonprofit sectors, blood centers, even those within the Red Cross, seem to exercise virtual autonomy in setting prices for their services. How can these differences among the 82 centers, all of which are nonprofit institutions, be explained?

The primary financial objective of a nonprofit blood center is to generate sufficient revenue to avoid a deficit. This is usually accomplished by pricing blood services in such a way that the sum of revenues received from services rendered is equal to the sum of all costs to the center, less subsidies. But the paradox of blood service pricing is that, while total revenue must equal total cost, the price of each unique service cannot be exactly matched to the cost of producing it. Blood center managers who have tried to set the prices of Factor VIII, platelet concentrates, red cells, and other blood services on the basis of the cost of producing them have undertaken an impossible task, for there is no way to measure the precise cost of providing each of these services.

The reason for this is simple. The production of blood components from whole blood is an example of a classic textbook problem in cost accounting known as "common costs of joint products" (*8*). Briefly, the provision of any and all blood services by a blood center is based on a single starting material, whole blood, from which all (or no) by-products, or components, may be derived. So, while all blood centers must begin with whole blood, how and in what proportions they choose to process and distribute it (that is, as whole blood, red cells, Factor VIII, and so on) varies from blood center to blood center, as well as within a single blood center over a period of time.

Another dimension of the problem of common costs of joint products is that the cost of providing any particular service cannot be directly and completely allocated to the service itself. How much of the cost of recruiting donors, for example, or of the medical director's salary actually belongs to each component? And how can the cost of producing any one component be determined when the production of one yields others as by-products? The concomitant yield of several products from a single starting material makes separation of the costs of producing each product impossible. Thus, "Where different products are necessarily produced in combination, they are *joint products* with *joint costs*. To the extent that costs are joint, individual products in a combination have no objectively determinable separate costs" (*9*).

Here, then, is a partial explanation for the variation in prices for blood services. Whenever the attempt is made to establish the price of any blood service on the basis of the cost of producing it, there are bound to be variations because there are several acceptable, albeit imprecise, methods of measuring its cost.

Unfortunately, many blood center managers consider as ideal the situation in which the price of a blood service equals its cost. But only where blood service is limited to whole blood can price be made equal to cost. While some commercial blood centers provide only whole blood, most nonprofit blood centers now offer a comprehensive range of blood services. Failure to do so would be anachronistic in most parts of the United States today.

Besides having idealized the fair price as one based on cost, many blood center administrators believe that the more "accurate" the method of pricing blood services, the fairer the price; furthermore, they often see any deviation of price from its apparent cost as unfair discrimination in favor of one group of blood recipients at the expense of another.

Blood center administrators have therefore tended to evaluate the discharging of their responsibilities to the public in terms of a notion of fairness that, from an accounting point of view, has no firm basis. Since there can be no precise measurement of cost, there can be no sure correspondence between cost and price. Therefore, administrative decisions about prices must be made on the basis of criteria other than cost.

Costs, Prices, and the Public Good

The institutions that are responsible for supplying the blood needs of the American people, whether they be blood systems or centers, have a unique franchise from the public. As private, nonprofit enterprises, they are expected to be vigorous, resourceful, and autonomous in fiscal matters, generating revenue from operations and obtaining in-

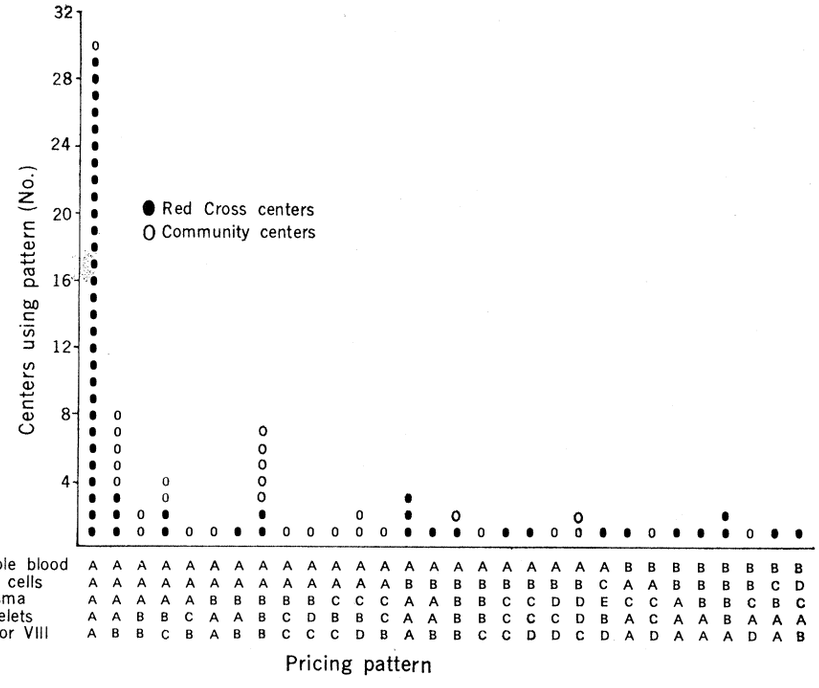

Fig. 1. Pricing patterns for whole blood, red blood cells, fresh plasma, platelets, and cryoprecipitated Factor VIII in 82 U.S. blood centers between 1971 and 1972 (A represents the highest price, D represents the lowest).

come from other sources as they are able. As public service institutions, they are expected to act as custodians of the community blood resource. This latter role carries with it the obligation to be responsive to the public interest. From this, it follows that pricing policies of blood centers should reflect, above all, considerations of the public good. Unfortunately, however, the historical evidence suggests that blood center administrators have been preoccupied with cost-based pricing; and the process of setting prices has all too frequently been reduced to a choice among accounting methods. Considerations of the public good have been secondary, if indeed they were taken into account at all.

The public good may be expressed as a set of expectations which include an adequate supply of safe blood and conservation of the blood resource. This implies the maximum use of components in order to extend supplies that will always, by their nature, be limited. Further, the American public seeks to achieve the provision of blood services to every individual who needs them, regardless of amount of blood, location, or ability to pay. In addition, the public is becoming increasingly concerned about the sources of supply of plasma, from which normal serum albumin, immune globulins, and related products are obtained. And the public requires accountability, with full disclosure of information about the stewardship of the blood center—that is, about its handling of the community blood resource and its related financial resources. What these public expectations suggest, in turn, are certain policy objectives that should be adopted by the centers, including maximum production of components and fair access to all blood services without special burdens being placed on high users.

The real importance of these expectations lies, however, in the extent to which they affect day-to-day operating practices of the blood center. In this regard, we urge that price schedules be established to reinforce these public policy objectives for conserving and maximizing efficient utilization of the blood resource and for alleviating the economic burden now imposed on certain groups of users. Specifically, the price of whole blood should be set well above the prices of components—red cells, plasma, platelets, and Factor VIII. The data in Table 2 suggest that even a small price differential can increase the utilization of red cells instead of whole blood. The single-price pattern now so commonly used fails to provide incentives for using components instead of whole blood. The sole advantage of the single-price procedure would appear to be its simplicity of administration, and it seems likely that this great simplicity is what made it so popular. While we do not mean to suggest that economic factors should outweigh medical indications for transfusion, differential pricing of whole blood and components can reinforce sound medical indications for prescribing components and thereby help increase the availability of plasma, platelets, and Factor VIII.

We have estimated that the national need for Factor VIII to support a program of home therapy for all hemophiliacs corresponds to at least half—perhaps more—of the national blood resource (*10*). If this estimate is correct, it implies that the "blood economy" should be shifted by whatever means are available, including economic, to a basis in which half the whole blood is used clinically as red cells and other components.

In the same way, achievement of the second public policy objective—fair access to blood services without severe economic burden on high users—must be promoted through pricing practices. A variety of possible mechanisms exists, including special pricing for certain components, substantial discounts for use above a certain base level, or even a single charge covering all blood services that are needed in a given period of time.

In view of the importance of price as an instrument of public policy, the total lack of national leadership and direction on pricing is remarkable. Within the American National Red Cross, the pertinent policy is that "Regional blood programs are authorized . . . to enter into hospital participation agreements calling for the reimbursement of amounts up to the total operating cost . . . less the contribution of the national organization and less the combined expenditure of participating chapters . . ." (*6*). Thus, under this policy, the method of determining prices has been left up to the individual centers.

In confirmation of this laissez-faire policy, we found that 29 out of 52 Red Cross centers studied had changed their decisions about pricing patterns between 1971 and the present. About half of the centers that had been using the single-price pattern abandoned it; but, in the same period, five centers decided to adopt the single-price pattern (*6*). Heterogeneity of pricing in the 52 Red Cross centers increased during the 2-year period—the number of pricing patterns in use went from 17 to 21.

The AABB, whose stated objectives include the provision of administrative services to its member institutions, has not, apparently, addressed the problem of cost and price, notwithstanding its preoccupation with a detailed study of replacement fees (*4*). The Council of Community Blood Centers, a newly formed organization, has begun to address this problem; the data it collects were of special use to us in the present study.

Prices, Use, and Choice of Products

Except in the case of Factor VIII, there is little evidence of a direct relation between price and the use of whole blood or components. Use, or demand, appears to be affected primarily by medical need but is severely damped by the risk of posttransfusion hepatitis. That demand is determined more by medical indications than by price is illustrated by the current demand for red cells that have been frozen, thawed, and washed. Despite a premium price that may be several times the price of ordinary red blood cells, there is considerable use of these frozen, thawed, and washed cells in certain parts of the country, both because of a reduced risk of hepatitis transmission (*11*) and because of their relative freedom from histocompatibility antigens. These antigens are found on leukocytes and platelets and must be matched between donor and recipient in organ transplantation in order to minimize the likelihood of rejection of the transplanted organ. If a candidate for organ transplantation requires a transfusion, it is desirable to use the frozen, thawed, and washed red cells in order to avoid unnecessary sensitization by additional histocompatibility antigens arising from the blood donor. The clinical demand for normal human albumin and albumin-containing products obtained from the fractionation of human plasma is interesting in this connection. Because there is no risk of hepatitis transmission, demand remains high, and approximately 1.7 million liters of human plasma flow into this industry each year (*12*).

The economics of Factor VIII is an exception. There is good evidence that price affects demand and that more Factor VIII would be used if prices were lower. When the costs of components for therapy are covered by insurance, more components are used. Similarly, the wider adoption of newer therapeutic regimes, such as home care, in which patient need is, in effect, allowed to dominate the clinical decision, is slowed by their economic impact upon the patient, despite important medical advantages to the patients and overall benefits to society.

The relationship between price and the choice of product, where a choice exists, has been referred to already in relation to the choice between whole blood and red cells. Here we believe there is a relationship, but we prefer to stay with the minimum statement suggested by the data: a lower price for red cells is associated with an increased clinical utilization of red cells. We suspect that, in this case, the attitudes and behavior of others in the hospital beside physicians, perhaps the director or the technologist in the blood bank or even the administrator of the hospital, may have contributed to the outcome we have observed. The effect of price upon choice is more pronounced in the case of the hemophiliac. There are numerous examples of cases in which the demand for cryoprecipitated Factor VIII available from the blood bank has fallen off sharply when, for one reason or another, the price of a dried commercial preparation available from a pharmaceutical house became competitive. Episodes of this kind have been observed recently in Massachusetts, Connecticut, and New York City. It seems that hemophiliacs and their physicians are continually sensitive to the prices being charged for preparations of Factor VIII and that they respond strongly to price.

In the case of hemophiliacs, the patient benefits when there is a competitive interaction between the blood service complex and the pharmaceutical industry. But there may be an attendant social cost that must be recognized. It takes up to three times as much plasma to meet the therapeutic needs of hemophiliacs with dried concentrates as it does with the cryoprecipitate. While the effect of this choice may be slight locally, it can be very large indeed on a national scale. In one estimate, based upon extending home care to all hemophiliacs in the United States, it represents a choice between 3 million units of whole blood for the cryoprecipitated Factor VIII and the plasma equivalent of 8.6 million units of whole blood for dried Factor VIII concentrates. In the interests of conserving the national blood resource, as well as easing the financial plight of the hemophiliac patient, we urge that blood centers respond not by cutting down on their production of the cryoprecipitate, as many have done, but by lowering their prices. (Obviously, a sudden decrease in demand for one component will result in a sudden loss of revenue; if allowed to continue, this will necessitate an increase in prices of other products if a deficit is to be avoided.) It seems likely that attempts to remain competitive by lowering prices, as we have suggested, will result in less turbulence in the fiscal affairs of blood centers than would cessation of production.

Conclusion

It is becoming increasingly difficult to accept the picture of thousands of blood service units, each with a similar set of professional functions (such as collecting blood from donors, distributing blood to hospitals, and processing blood in accordance with uniform professional standards and procedures), acting in nearly total independence in areas such as pricing policies, donor recruitment, and blood coverage policies. We do not advocate conformity to a single set of policies; but we do conclude that the donor, the recipient, the blood service complex, and the public at large may all benefit from the simplification and coordination of pricing practices. The recipient of blood in this country is fortunate to have access to such high quality professional service. But he finds it costly, confusing, and complicated. While the person who receives blood in his own community need not worry particularly about prices and promises in other regions, there is a group of recipients who must. These are the patients who receive medical care, and thus require blood, in a community other than their own. Now the differences in prices, assurances, and coverage between a patient's home blood center and the one that actually serves him can be of considerable consequence to him. The donor of blood confronts a different set of problems. He is more likely to give under circumstances in which he hears a simple, clear statement of need and of assurance as to the availability of blood to him and his family should they ever require it. On the contrary, he is less likely to donate blood under a cloud of confusion, competition, and narrow territoriality. At the same time, the blood service complex stands to gain by simplifying and coordinating pricing practices, primarily because its public image is so tarnished by the scramble of credits, debits, and exchanges among blood centers.

And the public—the vast body of donor-recipients bound by mutual need—can only benefit from the rational and just custodianship of its blood resource.

References and Notes

1. Within the last year, many newspaper articles on the problems associated with blood services have appeared. For example: A. Gribbin, *National Observer* (29 January 1972), sect. 2, p. 1; a series in the Chicago *Tribune* (12–15 September 1972); and an editorial in the *New York Times* (6 March 1972), p. 32. See also R. M. Titmuss, *The Gift Relationship: From Human Blood to Social Policy* (Pantheon, New York, 1971). Among the approximately 20 bills introduced in the 92nd Congress were the "National Blood Bank Act of 1972" (H.R. 12155, 1st sess., 1971) and the "National Heart, Blood Vessel, Lung, and Blood Act of 1972" (H.R. 13715 and S. 3323, 2nd sess. 1972). Bills were also introduced in many state legislatures. Typical of them was the "Blood Labelling Act" (State of Illinois House Bill 4445, 77th General Assembly, 1972).
2. Editorial, *Transfusion* **10**, 1 (1970).
3. C. Holden, *Science* **175**, 1344 (1972).
4. B. Hemphill, *Transfusion* **12**, 128 (1972).
5. *Blood Centers Operations for the Year Ending June 30, 1971* (American National Red Cross, Washington, D.C., 1971).
6. We are grateful to Jack Henry, administrator of the blood program, American National Red Cross, for this information.
7. These data were supplied by William Kyler, executive secretary of the Council of Community Blood Centers, Scottsdale, Ariz.
8. R. Anthony, *Management Accounting* (Irwin, Homewood, Ill., ed. 4, 1970), p. 375.
9. *Costing Joint Products* (National Association of Cost Accountants, research series No. 31, New York, 1957), p. 1.
10. D. M. Surgenor, "Hemophilia: The magnitude of the problem," paper presented at the Symposium on the Management of Hemophilia, National Hemophilia Foundation, San Francisco, 4 December 1971.
11. J. Tullis, J. Hinman, M. Sproul, R. Nickerson, *J. Amer. Med. Ass.* **214**, 719 (1970).
12. *Summary Report: N.H.L.I.'s Blood Resource Studies* (Department of Health, Education, and Welfare Publ. No. NIH-73-416, National Heart and Lung Institute, National Blood Resource Program, Bethesda, Md., 1972), p. 23.

13. This article was prepared in part on the basis of research performed pursuant to contract NIH-71-2500 with the National Institutes of Health, Department of Health, Education, and Welfare.