
4. Market Structure and Competition

Market Structure and Competition

A market consists of a group of buyers and sellers coming together to exchange a product or service. That interaction helps determine the product's prices, quantities, and quality. To understand how these items are determined, and to evaluate the economic performance of the hemodialysis equipment and disposable industry, it is

important to understand how buyers and sellers are organized and how they compete. This section addresses the question of market structure both from the seller's side and the buyer's side; and since the U.S. market is not independent of foreign markets, the international features of the market are also examined.

THE SELLERS

Market Concentration

A key feature of any market is its degree of competitiveness. One factor that characterizes competitiveness is market concentration, the degree to which overall market activity is distributed among (or concentrated with in) the firms in the market. Economic theory suggests that the degree of competition is related to market concentration and, in particular, that competition may be stifled when a small number of firms controls a large share of the market activity.

Evidence on market concentration in the industry is presented in tables 8 through 11.¹ Tables 8 and 9 offer data on firms' shares of sales of dialysis equipment and disposables. Table 8 focuses on sales to hospitals only, whereas table 9 presents estimates for the market overall. Sim-

¹Data on hospital purchases come from an ongoing survey conducted by IMS America. Data on the market overall are derived from published estimates by professional market analysts. Although such estimates are generally respected, the sources and methods by which they are generated are proprietary and cannot be subjected to an objective evaluation of reliability.

Table 8.— Estimated Shares of U.S. Hospital Market for Dialysis Equipment and Disposable by Year (percent)

	1977 ^a	1978	1979	1980	1981	1982	1983 ^b
Baxter Travenol	32.7 0/0	23.4 0/0	29.4 0/0	28.4 0/0	26.6%	30.0 00	29.4%
CD Medical Inc. (Cordis Dow)	19.2	19.0	20.1	15.5	22.5	27.1	22.4
Extracorporeal ^c (Johnson & Johnson)	165	20.0	14.4	22.8	18.6	10.4	10.8
Gambro AB	15.1	12.7	9.4	10.4	11.1	139	13.3
Cobe Labs	5.0	12.1	13.3	10.0	7.6	72	72
Organon-Teknika	1.7	1.8	1.9	2.6	2.0	1.5	(d)
Warner Lambert	1.7	1.7	(d)	(d)	(d)	(d)	(d)
Bentley (American Hospital Supply)	1.5	(d)	(d)	(d)	(d)	(d)	(d)
Becton Dickinson	(d)	4.6	3.2	(d)	(d)	(d)	3.9
Erika	(d)	(d)	2.4	2.0	4.7	1.7	2.7
Vernitron Corp.	(d)	(d)	(d)	2.0	2.0	(d)	(d)
Terumo-America, Inc.	(d)	(d)	(d)	(d)	(d)	17	3.1

^aBased on last 6 months of 1977

^bBased on first 5 months of 1983

^cIncludes very small portion of sales attributable to Critikon Division of company dNt among leading eight corporations in this year Figures not available separately

SOURCE Compiled from survey by IMS America, Ltd. Hospital Supply Survey, contract report prepared for the Office of Technology Assessment U.S. Congress Washington, DC 1983

Table 9.—Estimated Shares of Total U.S. Market for Dialysis Equipment and Disposables by Year (percent)

	1975	1976	1977	1978	1979	1980	1983 ^a
Baxter Travenol	32.70/o	22.70/o	22.10/o	21.90/o	24.00/o	26.30/o	34.90/o
CD Medical Inc.	11.0	12.4	14.1	14.9	15.5	13.6	9.1
Cobe Labs	8.4	7.8	8.9	10.7	11.8	12.3	10.8
Extracorporeal	9.8	9.7	9.1	7.9	9.2	10.0	8.9
Erika	2.6	4.0	5.4	6.1	6.4	7.9	13.1
Gambro AB	6.5	6.5	6.3	6.5	6.9	2.3	5.7
Becton Dickinson	2.6	2.5	2.5	2.9	2.8	3.0	3.0
Renal Systems	0.6	1.0	1.5	2.0	2.2	2.3	2.7
Terumo-America, Inc.	—	0.7	1.2	1.7	2.1	1.7	1.3
Bentley	1.0	1.5	1.9	1.4	1.0	0.8	—
McGaw	1.9	2.0	1.8	1.7	1.5	1.1	1.6
Abbott	—	—	—	—	—	—	2.4
All others	22.9	29.3	25.1	22.5	16.6	13.7	6.5

^aProjected by Bernstein in 1981SOURCE Sanford C. Bernstein & Co., Inc., *The Kidney Dialysis Industry* (New York: February 1981)

ilarly, tables 10 and 11 present data on relative shares for dialyzers alone, considering again, respectively, hospitals and the market overall.

The evidence in the tables presents a consistent picture, with Baxter Travenol emerging as the U.S. leader. CD Medical, Inc., Gambro AB, and Extracorporeal are also key firms. (For brief descriptions of the major firms in the industry see app. A.) In order to assess the competitive implications of this pattern, analysts often use a single “summary” measure that can be used for comparative purposes. Two of the most commonly used measures of market concentration are considered here: the four-firm concentration ratio and the Herfindahl index.

The four-firm concentration ratio measures the total market share of the largest four firms in the industry. Where this ratio is high, competition is likely to be less intense, since the largest firms may have a greater opportunity to exercise market power (80). In the hospital market for equipment and disposable (table 8), the concentration ratio was **76** in 1983. The ratio is slightly lower, **68**, in the market overall (table 9). In the hospital market for dialyzers (table 10), the ratio was over **90** in 1983. For dialyzers overall, the ratio was 79. Although the concentration ratio is an imperfect measure of competition, the figures for the industry put it at or in excess of the 60 to 70 percent figure often viewed as the threshold for possibly serious competitive problems (80). Furthermore, this situation appears to have persisted over the past several years.

An alternative measure of market concentration is the Herfindahl index. It is generally regarded as superior to the concentration ratio (80), but it is less widely used because the data for its calculations are often not available. It is calculated by summing the squared values of the market shares of the firms in the industry. Calculating shares in fractional or decimal terms, the index can range in value from near zero, for an industry composed of many small firms, to one, for a monopoly. Again, economic analysis indicates that where this value is higher, the scope for anticompetitive behavior increases.

From the data in tables 8 through 11, Herfindahl indices can be calculated. In 1983, they ranged from about **0.16 to 0.17** for all dialysis equipment and supplies and from 0.17 to 0.28 for the dialyzer market. Since data limitations have restricted use of this index in economic studies, there is little basis for comparison among industries. However, recently published guidelines from the Department of Justice use the index in explaining their attitudes toward proposed mergers. Markets with index values in the range observed for the dialyzer market (greater than 0.18) are characterized as “highly concentrated.” In such markets, mergers that increased concentration to such levels would be a “a matter of significant competitive concern” (104).

Entry

Another important characteristic of an industry's structure, and its competitiveness, is the condition of entry. Is entry into the industry fairly

Table 4—Estimated Shares of U.S. Hospital Market for Dialyzers by Year (percent)

	1977 ^a		1978		1979		1980		1981		1982		1983 ^b	
	Dollars	Units	Dollars	Units	Dollars	Units	Dollars	Units	Dollars	Units	Dollars	Units	Dollars	Units
Baxter Travenol	33.0%	23.9%	24.2%	19.1%	33.7%	34.1%	32.4%	31.6%	31.3%	30.6%	37.9%	38.1%	40.1%	43.0%
CD Medical Inc.	25.5	22.0	25.1	16.7	25.6	20.8	19.5	17.7	26.2	24.3	31.1	31.2	26.0	24.2
Gambro AB	20.9	33.9	17.3	25.3	11.5	13.1	12.9	12.5	13.4	12.7	15.8	14.0	15.8	13.8
Extracorporeal	14.4	16.0	18.9	25.3	11.2	13.8	23.0	25.8	18.4	22.5	8.6	10.6	10.6	12.5
Bentley	2.2	2.6	0.6	0.8	0.2	0.3	0.2	0.3	0.1	0.1	(c)	(c)	(d)	(d)
Cobe	1.5	0.2	9.6	9.0	11.8	12.1	8.5	8.7	4.6	4.6	4.3	4.1	3.1	2.4
Becton-Dickinson	1.1	0.8	3.7	3.5	2.0	1.7	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)
Erika	1.1	0.6	0.4	0.4	2.7	3.3	2.2	2.1	5.6	5.0	1.6	1.3	1.6	1.4
Hospal	(d)	(d)	0.1	0.1	1.3	0.8	0.4	0.2	0.2	0.1	0.1	(c)	(c)	(c)
Terumo-America, Inc.	(d)	(d)	(d)	(d)	(c)	(c)	0.9	1.1	0.1	0.1	0.6	0.6	2.5	2.6
Organon-Teknika	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(c)	(c)	(d)	(d)	0.2	0.2
All others	0.3	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

^aBased on last 6 months of 1977^bBased on first 5 months of 1983^cVery small sales (less than 0.1%) indicated in survey^dNo sales indicated in survey

SOURCE: Compiled from survey by IMS America Ltd., Hospital Supply Survey, contract report prepared for the Office of Technology Assessment, U.S. Congress, Washington, DC, 1983.

Table 11 .—Estimated Shares of Total U.S. Market for Dialyzers by Year (percent)

	1975	1976	1977	1978	1979	1980	1983
Baxter Travenol	47.40/0	41.10/0	34.10/o	33.10/0	30.9%	29.30/o	260/o
CD Medical Inc.	18.7	18.6	21.3	24.5	27.9	23.5	20
Extracorporeal	18.8	16.9	14.9	11.0	10.8	12.5	NA
Gambro	11.2	11.0	10.9	10.9	10.9	12.1	24
Cob.	0.4	1.9	5.2	8.1	8.9	9.6	9
Erika	0.4	4.2	6.9	7.7	7.7	9.4	7
Bentley	1.1	3.7	4.2	3.0	1.9	1.5	NA
Hospal	—	—	01	0.2	0.2	0.9	NA
Terumo-America, Inc	—	—	—	—	—	0.7	9
Organon-Teknika	—	—	—	—	0.1	0.2	NA
Renal Systems	—	—	—	—	—	0.1	NA
Renal Devices	—	—	—	—	—	0.1	NA
All others	2.0	2.6	2.4	1.5	0.7	0.1	NA

NA Indicates data not available

SOURCE For 1975-80 data Sanford C. Bernstein & Co. Inc. *The Kidney Dialysis Industry* (New York February 1981), for 1983 data, information Resources International, Inc. *Biomedical Business International*, VI Mar 16 1983, and A. Kraus, Executive Vice President Gambro AB, personal communication September 1983

easy or are there substantial “barriers” to new firms? Insubstantial barriers do exist, established firms are insulated from an important source of competition, the new entrant.

Barriers to entry arise from the advantages established firms have over new entrants. These could include cost advantages associated with access to technology or materials, or “product differentiation” advantages associated with the strong image of established producers with customers. Certainly some of these advantages exist. Firms such as Baxter Travenol, for example, have established a strong identity with buyers. Cordis Dow for many years controlled patents in hollow fiber dialyzer technology and, although they have extensively licensed thereto other firms, this may have generated some cost advantages for the company.

An indirect test of the condition of entry can be performed by observing actual patterns of entry. If entry can be accomplished relatively easily and the market offers profit potential, then entry should occur. A review of tables 8 through 11 suggests the emergence over time (i. e., the movement from unmeasured to significantly measurable sales) of at least a few firms. Most notable are Terumo America and Abbott Labs. Each emerged from a solid base: Abbott moved into dialysis from a strong foothold in related health markets; Terumo America is part of a large Japanese firm that produces dialysis products.

Upon entry to the U.S. market the company was accused of infringing on Cordis Dow patents. The suit was settled when Terumo agreed to royalty payments (79).

In the dialyzer market, in particular, one sees a number of new entrants. However, other than Terumo, none has managed to achieve a major market share. Another form of entry has occurred among some of the existing dialyzer producers, who are now making hollow fiber dialyzers. Extracorporeal, a producer of coil dialyzers, began to produce hollow fiber dialyzers in 1977. Similarly, Erika moved into hollow fibers in 1980, and Gambro entered in 1979 (61,79). These companies already had a part of the overall market, so such entry was easier than it would have been de novo.

Although the evidence suggests that some entry into the dialysis equipment and supplies market is possible, it is hardly wide open. Entry has mainly consisted of established firms expanding geographically (e.g., from Japan to the United States) or into related products (e.g., into production of another type of dialyzer). Another indication of the difficulty of entry is the degree of stability in the identities of the major firms. The lack of opportunity to move within the market is also a sign of some limits in competition (see, e.g., (19)). Overall, therefore, the market may best be characterized as having moderate barriers to entry.

THE BUYERS

The ultimate consumers of hemodialysis equipment and supplies are, of course, the patients on hemodialysis. However, for the most part, the buyers in this market are the various facilities, hospital-based and free-standing, offering dialysis services. Facilities purchase equipment and supplies from manufacturers; patients then pay facilities a rate per dialysis session. The exception to this occurs primarily in the case of home dialysis. A recent study by the U.S. General Accounting Office (GAO) found that about 70 percent of home patients were dealing directly with suppliers (105). For the remainder, the contact with suppliers was accomplished through the dialysis facilities. The hospitals and patients do not constitute a highly concentrated buying group. Hospital-based facilities, for the most part, seem to make purchases independently of one another. Although some facilities may be quite large, power over price will depend on the hospital's ability and willingness to bargain with suppliers.

Individual patients on home dialysis have even less power given the proportionately smaller quantities purchased. However, given the existence of coinsurance, the patient has a personal incentive to bargain. Note also that many of these patients lease rather than purchase, but GAO has suggested that a switch to purchasing may be cost effective (105).

INTERNATIONAL DIMENSIONS

The market for hemodialysis equipment and supplies is clearly international in scope. In the United States alone, foreign-owned firms have become increasingly important. The most important of such firms is probably Gambro, which is incorporated in Sweden. Gambro produces various products and overall is the world's leading manufacturer of dialysis equipment and disposables (61).

Terumo has become a significant competitor, although still a relative newcomer to the U.S. market. Its success seems to stem largely from an aggressive pricing strategy (79), even though it does not manufacture dialyzers in the United States.

The greatest market power on the buyers' side probably rests with free-standing facilities. These facilities account for a growing share of the market. As of 1981 approximately 42 percent of facilities were independent. The comparable figure was 11 percent in 1973. Such facilities are predominantly profit-making enterprises and are larger on average than hospital facilities (110). Their power and incentives are accordingly likely to be greater. The key example here is National Medical Care, Inc. (NMC). With its 161 facilities it can potentially exert a great deal of pressure on sellers. NMC does have a substantial portion of its supply needs met by its own subsidiary, Erika.

Another major purchaser is the Veterans Administration (VA), which was an early supporter of dialysis treatment for its clientele. The VA accounts for roughly 3 percent of treatment volume in the United States (79). GAO suggests that the VA has used its market power effectively to secure more favorable terms of purchase (105). Smaller units might, of course, enhance their market power if they were to form cooperative buying groups. GAO has even suggested that this might be accomplished under Federal Government auspices.

Other foreign-owned firms have also played a role in the U.S. market. As noted in tables 10 and 11, foreign-owned firms such as Hospal and Organon-Teknika participate in the dialyzer market. Still others can be expected to initiate or step up activities here. For example, Toray, a Japanese manufacturer of hollow fiber dialyzers, is reported to be planning marketing efforts in the United States (39).

This interest is not surprising. Particularly in the 1970s, the U.S. market showed dramatic growth and appeared quite attractive. The U.S. population of ESRD patients is still large and generates roughly one-third of the world market (46).

Thus, it remains an attractive market for world producers. Despite current competitive pressures in the U.S. market, foreign firms with an established market base elsewhere may be able to compete effectively here.

At the same time, U.S.-based firms have ventured into foreign markets. Many foreign countries are experiencing greater increases than the United States in the patient population, and these foreign markets are quite attractive (46,50). Table 12 illustrates the U.S. role in a number of markets for renal equipment. The variations observed seem attributable to numerous factors. Historical, geographic, political, and economic factors probably all contribute. In any case, U.S. firms clearly are playing an important role abroad. Although market shares in some countries may decline as the markets expand, the potential sales remain a strong attraction.

The U.S. firms' movements into foreign markets is consistent with a general pattern in U.S. manufacturing, particularly in so-called "high-tech" industries. Most observers have tended to view this as an attempt to take advantage of the technological superiority of the firms' products. (For example, see (32), (37), (111), and (112).) Whether this superiority existed in this market is unclear. Certainly today, leading foreign firms seem to produce products of comparable quality.

Indeed, as noted above, foreign firms have made inroads into the U.S. market.

If one judges from the dialyzer market, technological factors have been of some importance domestically and internationally. Cordis Dow's power in the dialyzer market stemmed at least in part from its control of patents related to the hollow fiber dialyzer. Erika's production of hollow fiber dialyzers in Ireland is being done through licensing technology from a foreign firm, Fresenius (39). Many dialyzer manufacturers use a membrane, Cuprophane, which is made by Erika, a West German company, although Japanese and other foreign and U.S. firms are developing membranes as well (2).

International activity may also be prompted by a production technology that may involve significant economies of scale in dialyzer production (47,79). These economies may prompt firms to broaden their market to achieve further sales and to maintain or achieve potentially lower unit costs. Economies of scale would allow Terumo, for example, operating from a high-volume base in Japan, to export to the U.S. market at a competitive price. Economies of scale may also lead firms with declining domestic sales to seek markets abroad, thereby allowing high-volume production to be maintained.

Table 12.—U.S. Involvement in the Renal Equipment Market in Various Countries

Country	Year	Total sales (\$ millions)	Imports from U.S. (\$ thousands)	U.S. market share (o/o)
Belgium	1979	\$5.3	\$583	1.1 %
	1985a	6.4	750	12
Germany	1979	12	2100	17.5
	1985a	28	3000	11
Mexico	1980a	4.3	3500	81
Philippines	1979	0.48	251	52
	1985a	0.80	443	56
Spain	1978	5.31	1850	35
	1983a	8.0	1600	20
Switzerland	1979	2.1	900	43
	1985a	2.5	1200	48
Taiwan	1978	0.15	150	100
	1983a	0.8	200	25
United Kingdom	1979	21.6	2530	12
	1985a	26.0	2500	9.6

^aEstimated

SOURCE U S Department of Commerce, International Trade Administration, Country Market Survey, *Medical Equipment, Belgium*, CMS 82-517, February 1982, *idem*, *Medical Equipment, Germany*, CMS 82-516, February 1982, *idem*, *Medical Equipment, Mexico*, CMS 79-004, February 1979, *idem*, *Medical Equipment, Philippines*, CMS MED 565/83, March 1983, *idem*, *Medical Equipment, Spain*, CMS 81-511, September 1981, *idem*, *Medical Equipment, Switzerland*, CMS 81-512, September 1981, *idem*, *Medical Equipment, Taiwan*, CMS 81-509, February 1981, *idem*, *Medical Equipment, United Kingdom*, CMS 81-515, September 1981. Renal equipment as defined appears to include at least some disposables.