Appendix D

A BASIC ECONOMIC MODEL OF HOME DRUG INFUSION PROVIDER BEHAVIOR[1]

Basic economic models of health provider behavior have been applied to hospitals, physicians, nursing homes, and home health agencies. The models are of two types: 1) those that assume that providers are profit maximizing, and 2) models of behavior of not-for profit organizations.

The first type of model has been applied to both for-profit and not-for-profit organizations, where it is assumed that not-for-profit providers face essentially the same financial incentives as for-profit providers operating in the same markets. Models of the second type (see, e.g., references 89,175,244,258) incorporate some specific factors thought to affect behavior of not-for-profit organizations. These include the possible desire of managers to maximize size or prestige of their organization or to satisfy the desires of special interest groups. These objectives, in turn, may imply that not-for-profit organizations pay more attention to volume of services, quality, or their reputation for community service than for-profit organizations.

The critical issue here, however, is whether there are differences in the way for-profit and not-for-profit organizations respond to incentives created by alternative payment methods. This appendix will later discuss some possible differences, but it assumes thereto be substantial similarities in the responses of for-profit and not-for-profit organizations; similar interests in the financial viability of the organization transcend differences in form of control. For both types of organizations the principal determinants of the quantity, cost, and quality of services include:

- the cost of inputs,
- the technology of production,
- the demand for services by patients, and
- the level and form of public and private payment for services.

Assumptions

A model must be based on some assumptions about provider behavior and the cost structure. This model begins with an assumption that providers are profit maximizers, or behave much like profit maximizers subject to some constraints to be specified. It later notes differences where they may be important.

The model presumes that providers incur some fixed costs (e.g. administrative overhead) and have a constant or near-constant marginal cost for services (for equipment, supplies, and labor). These assumptions are reasonable for home drug infusion therapy providers since most such providers can hire staff locally without significantly driving up the market price. Most such providers probably employ a small share of the suitable employees locally and represent a small share of the national market for supplies. Limited short-run supply of staff in small market areas may, nonetheless, lead to an upward-sloping marginal cost curve for some providers.

The model presumes that providers serve both Medicare and nonMedicare patients. It also presumes that, except in cases of patient cost sharing (deductibles and copayments), the demand of Medicare patients is independent of prices charged, but that at least some other patients (self payers or those with insurance involving cost sharing) are sensitive to prices. So the demand of Medicare patients is perfectly price inelastic and providers face a downward sloping demand curve for services provided to other patients.

Provider Behavior Under Different Forms of Reimbursement

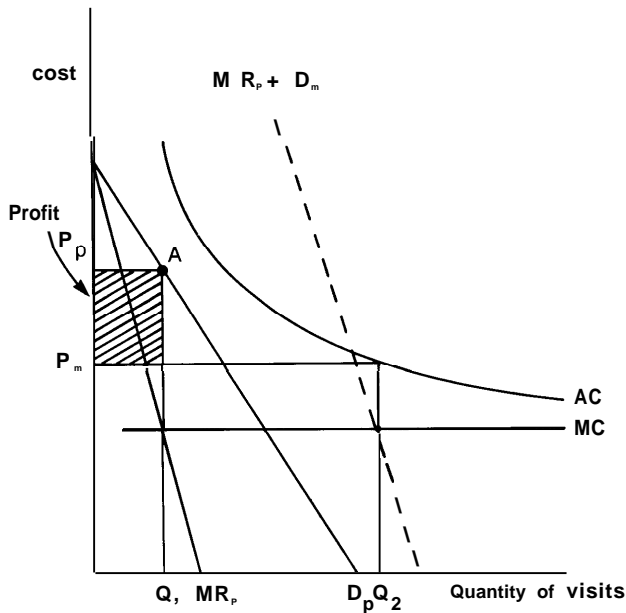Figure D-1 illustrates profit maximization under cost reimbursement. The demand of private-pay patients is Dp and the associated marginal revenue curve is MRp. The provider's average cost curve is AC. This cost curve should be viewed as endogenous-costs could be higher or lower, depending on visit quality and provider efficiency. Pp and Pm represent payment levels from private patients and Medicare, respectively.

In this mode1[2] the provider maximizes profits by setting marginal revenue equal to marginal cost, where the marginal revenue curve is detemined by the (horizontal) sum of the private patient marginal revenue curve and the demand of Medicare beneficiaries (MRp + Din). At point A in figure D-1 the provider supplies Q_1 **units** of service **to private-pa**$_y$**patients and** Q_2**-Q**$_1$ **units to Medicare**
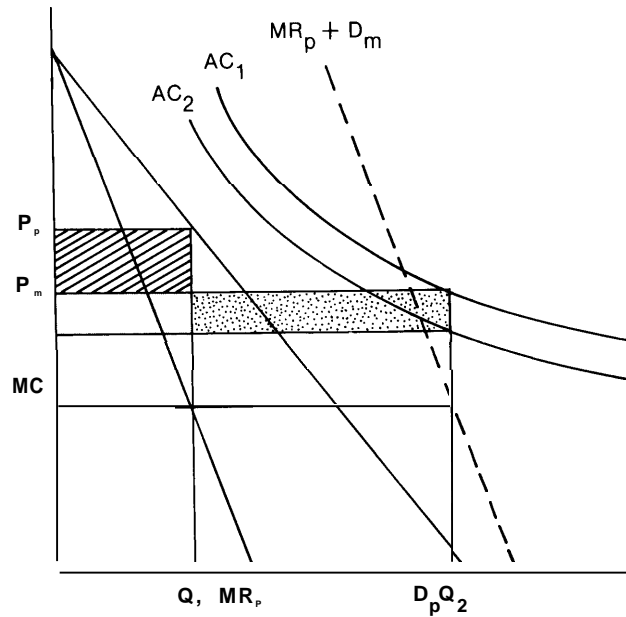
Figure D-l—Home Drug Infusion Therapy Provider Behavior: Profit Maximization Under Cost Reimbursement

NOTE: See text for explanation.
SOURCE: T. Grannemann, "Incentives and Behavioral Responses to Alternative Payment Methods for Home Intravenous and Immunosuppressive Drug Therapies Under the Medicare Program," paper prepared under contract to the Office of Technology Assessment, Washington, DC, February 1990.

Figure D-2—Home Drug Infusion Therapy Provider Behavior: Profit Maximization Under Prospective Payment

NOTE: See text for explanation.
SOURCE: T. Grannemann, "Incentives and Behavioral Responses to Alternative Payment Methods for Home Intravenous and Immunosuppressive Drug Therapies Under the Medicare Program," paper prepared under contract to the Office of Technology Assessment, Washington, DC, February 1990.

patients. The profit (or surplus for not-for-profit providers) is shown in the shaded area.

Prospective payment, that is, where providers receive a predetermined, fixed rate of payment, provides strong incentives to control costs. In figure D-2, under cost reimbursement the only gain to the provider from reducing average cost from AC_1 to AC_2 is the dark area. But under prospective payment, the provider could keep the dotted area as profits as well, thus providing extra incentive to reduce costs. A shift from cost reimbursement to prospective payment in such circumstances could give providers a short-run windfall gain in profit or surplus and could provide Medicare with an opportunity to lower per unit payments below the initial level of Pm. Profit-seeking providers might be the most responsive to such incentives, while not-for-profit organizations may be less interested in additional surplus than in maintaining high quality at the higher cost. The choices for not-for-profit organizations nonetheless are expanded by prospective payment, as they are given an opportunity to use any savings derived from reduced costs for other purposes, such as covering care for the poor or providing other services needed in the community.

Impacts on Quality of Care

Like quantity, the level of quality a provider chooses to produce can be viewed as a product of supply and demand. Fully insured patients who have no cost-sharing requirements can be expected to demand the highest level of quality, to the point where extra quality provides no additional benefit (after accounting for any cost in terms of patient inconvenience). Cost-reimbursed providers have every reason to be accommodating to these patient desires. Providers may, however, provide a uniform standard of care to all their patients. So a provider's quality standards may reflect the best possible accommodation to all patients, insured and uninsured.

The provider's choice of quantity and quality of visits is illustrated in figure D-3. This figure shows possible combinations of quality and quantity. The iso-cost (IC) curves represent combinations of quality and quantity that can be attained at a given cost. The Engle curve (E) represents the patient's preferred combinations of quality and quantity, given the relative costs of producing each. This curve is determined by the point of tangency of indifference curves with iso-cost curves.

Figure D-3—Provider Tradeoffs Between Quality and Quantity of Visits Under Alternative Payment Methods
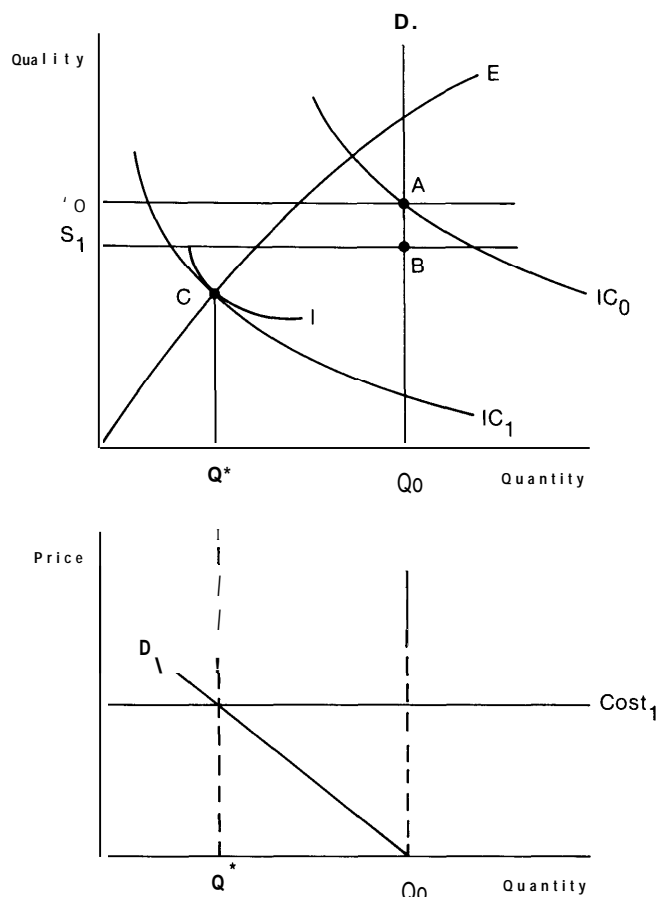
NOTE: See text for explanation.

SOURCE: T. Grannemann, "Incentives and Behavioral Responses to Alternative Payment Methods for Home Intravenous and Immunosuppressive Drug Therapies Under the Medicare Program," paper prepared under contract to the Office of Technology Assessment, Washington, DC, February 1990.

Point A represents *cost reimbursement in* which the patient demands and receives Q_0 visits-the amount demanded at zero out-of-pocket cost, shown in the lower portion of the figure. The quality of visits, determined by the provider's standard of care, S, is directly related to the cost curve discussed above. Lower costs imply lower quality, though more efficient providers may have lower costs without sacrificing quality.

Point B in figure D-3 represents the likely result of *per-visit prospective payment* that covers at least marginal cost. The provider has incentives to keep costs lower than with cost reimbursement and may provide services of somewhat lower quality. But the provider has no reason to deviate from the patient's desired quantity of care,

Q_0-since the provider continues to make a profit on each unit of service.

Point C represents the possible outcome of *per-month or per-episode prospective payment.* Providers would maximize profits by keeping costs as low as possible subject to the need to maintain patient satisfaction sufficient to maintain a suitable patient load. Professional standards, or quality assurance standards imposed by Medicare, must also be met. Profits can be expressed as:

Profit = N(quality, quantity) * payment - cost(quality, quantity)

First order conditions for profit maximization require that the marginal contribution of quality and quantity to number of patients (N) weighted by the payment rate just equals their respective marginal contribution to cost.

To maximize profits, then, providers must operate where the marginal cost due to increased quality (quantity) just equals the marginal benefit in terms of patients added due to a quality (quantity) increase. Providers thus must be responsive to patient preferences regarding quality and quantity mix. It is likely, therefore, that providers under per-month or per-episode prospective payment will operate close to the Engle curve in figure D-3 and on an iso-cost curve lower than would be the case under cost reimbursement or per-visit prospective payment. If, as shown by point C and the lower portion of figure D-3, competitive forces lead to a point on the Engle curve where the quantity equals what would be demanded by an uninsured patient, then an optimal quantity and quality would also be achieved in the sense that marginal cost equals marginal benefit to the patient. One would therefore expect per-month or per-episode prospective payment to lead to lower quality and fewer visits per week than would be found under cost reimbursement.

While incentives would lead providers in this direction, competitive forces and quality assurance regulations could counterbalance this effect. If policymakers desire higher quality and frequency of visits than competitive forces and professional standards can sustain, then regulations or other quality assurance systems must be established.

To summarize the implications of this model:

- Cost reimbursement promotes high quality care with incentives for providers to meet any patient demands for quantity (frequency) of service.
- Per-visit prospective rates promote cost control and lower quality, without any incentive to reduce quantity (frequency) of visits.
- Per-month or per-episode prospective payments encourage both cost control and reduction in quantity or frequency of visits.

. Quality assurance mechanisms or regulatory controls may be used to counter some of the adverse effects of incentives under prospective payment. Under per-visit rates, controls may be needed on quality but not frequency of visits. Under per-month or per-episode rates, controls maybe needed on both quality and frequency of visits.