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Selected Aspects of Medical Equipment and Instruments Industries in the Philippines

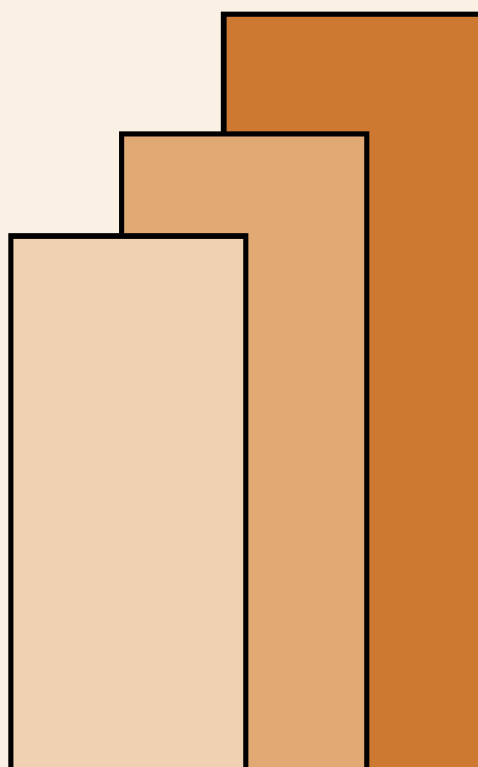
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Aspects of Medical Instruments,
Equipment and Technology
in the Philippines¹

Final Report

Oscar F. Picazo
Principal Investigator

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The author acknowledges the research assistance provided by Jose Luis Alvin Catalan and the administrative support of Cynthia J. Lopez but assumes sole responsibility for the contents of the study.

This is a draft report. It is not for quotation and is for discussion purposes only. Comments are welcome.

INTRODUCTION AND OVERVIEW

A. Objectives of the Study

This study responds to the scope of work issued by the Philippine Institute for Development Studies (PIDS) on behalf of the "Baseline Studies on Health Care Financing Reforms Project" with the Department of Health (DOH).

The objectives of the study are to construct a profile of the medical instruments and equipment sector and to identify policy issues related to the acquisition, diffusion and use of medical instruments and equipment in the Philippines. The scope of work excludes pharmaceuticals and nonmedical supplies.

B. Significance of the Study

As the Philippines prepares to launch a national health insurance program, it can be noted that much discussion has been made on the range of health financing and delivery options such program can take. In these deliberation however, too remarkable omissions have been made: one on medical inputs, and the other on medical technology.

Previous analytical work on the "Baseline Studies" series have dwelt on the market for health care in the Philippines, both its delivery and financing aspects. This study focuses on the important but often neglected inputs market. The study is motivated by the need to understand this market; identify its participants, their motivations, and relationships; cull their strengths and weaknesses; and propose reform measures. As a preliminary effort, the study constructed trade and industry profile of medical equipment and instruments and generated baseline information on two medical imaging devices.

The economic dimensions of medical technology in the Philippines have never been subjected to study. Technology is important but it is probably the single least understood aspect of health care. To a non-medical specialist, the casual dismissal of technology is understandable. Technology is amorphous, hidden. It is embodied in equipment and professional training. There is also a forbidding lack of data on use and the current stock of equipment and technologies.

This study seeks to elicit the non-medical aspects of medical technology; to identify policy issues related to the acquisition, diffusion and use of medical equipment; and to present options for policy recommendation. The discussions are generic rather than specific; they are targetted at the macro/policy rather than micro/operational aspects. By its nature, this study is oriented at synthesis of overall policy questions rather than analysis and testing of particular hypothesis. Some of the discussions are speculative. Our purpose is to challenge and provoke

discussions on them; to assist in framing the debate; and to encourage further data gathering, research, and societal evaluation of choices.

C. Organization_of_the_Report

This report consists of eight chapters and organized as follows: Chapter I provides a market profile of medical equipment, instruments and supplies in the Philippines and Chapter II focuses on two medical diagnostic imaging technologies in use in the Philippines, CT and MRI scanners.

The next chapters deal on specific issues on medical equipment and technology. Chapter III provides a bird's eye view of the issues. Chapter IV explores the possibility of developing and strengthening local capacity for medical technology assessment. Chapter V reviews the impact of provider payment systems on technology diffusion. Chapter VI deals on the issues of investment promotion and regulation. Chapter VII focuses on conflict of interest in medicine. The concluding Chapter VIII provides a synthesis of the policy aspects, issues and options in the area of medical equipment and technology.

CHAPTER I:² A MARKET PROFILE OF MEDICAL EQUIPMENT, INSTRUMENTS AND SUPPLIES IN THE PHILIPPINES

The national health insurance program envisioned for the Philippines is expected to affect not only the financing and delivery of health care but also - and less obviously - the production and distribution of inputs used by health care providers. This latter point is not much appreciated in discussions about health care financing reforms in the Philippines. This study is a modest attempt to provide data and observations on this frequently ignored aspect of health care. Information on medical equipment, instruments and supplies (henceforth, MEIS) in the Philippines is scanty and unorganized; this is a first effort to establish data series on MEIS and construct an industry profile.

The study is oriented at establishing baseline data and simple construction of indicators. Section I of this chapter describes Philippine trade patterns in MEIS. Section II analyzes the structure of the industry. Section III identifies end-users and provides indication of the size of the MEIS market. Section IV summarizes the chapter and identifies possible initiatives.

I. TRADE PATTERNS

A. Size and Composition of Imports

Health care is probably one of the most import-intensive services in the Philippines. Over the past 12 years since 1980, "medical imports" - consisting of imports of pharmaceuticals and MEIS - have totalled US\$ 3.8 billion, or an annual average of US\$ 295.4 million (Table 1). Of the yearly import expenditures, pharmaceuticals³ account for 93.5%, dwarfing MEIS's import share of 6.5%. While this may look minor in terms of proportion, imports of MEIS were US\$ 17.7 million in 1992.

²The author acknowledges the research assistance provided by Alvin Catalan and the administrative support of Cynthia Lopez in the completion of this chapter, but the author is wholly responsible for the chapter's contents.

³Pharmaceuticals are outside the scope of this study; we present import and other data here only to complete the picture or as basis for comparison with MEIS.

Table 1: Imports of Pharmaceuticals, Medical Equipment, Instruments and Supplies: 1980-1992
(US\$1,000 c.i.f.)

Year	Pharmaceuticals	Med. eqpt., instruments & supplies	Total
1980	98,045.0	16,821.0	114,866.0
1981	102,194.6	24,933.7	127,128.3
1982	298,502.6	21,026.5	319,529.1
1983	206,751.7	23,433.8	230,185.5
1984	271,700.5	11,794.4	283,494.9
1985	160,071.0	8,749.0	168,820.0
1986	217,118.3	9,711.2	226,829.5
1987	250,116.8	17,565.1	267,681.9
1988	439,183.2	21,674.7	460,857.9
1989	339,509.1	32,140.2	371,649.3
1990	344,646.0	29,892.3	374,538.3
1991	288,435.9	15,304.1	303,740.0
1992	573,249.2	17,672.5	590,921.7
Total	3,589,523.9	250,718.5	3,840,242.4
Ann. Ave.	276,117.2	19,286.0	295,403.3

Source: Foreign Trade Statistics, various years.

Among medical equipment and instruments (Table 2), the major imports are electromedical apparatus (US\$ 2.6 million in 1992), x-ray apparatus (US\$ 2.2 million), and other surgical, medical and veterinary instruments (US\$ 7.1 million). For medical supplies, the major imports are medicated and unmedicated gauze, bandages and wadding (US\$ 1.3

million in 1992), sterile surgical catgut (US\$ 1.7 million), and hygienic glassware (US\$ 1.7 million).

Table 2: Composition of Imports of Medical Equipment, Instruments and Supplies: 1980, 1985 and 1992
(US\$ 1,000 c.i.f.)

Products	1980	1985	1992
Gauze & bandages, unmedicated	856.0	574.3	1,133.5
Wadding, gauze, bandages, medicated	449.0	515.0	136.6
Sterile surgical catgut	719.0	464.7	1,682.1
Bottle nipples of unhardened rubber	23.6	67.3	377.1
Other hygienic medical & surgical articles	881.4	253.7	0.0
Ampoules	0.0	122.8	246.1
Lab, medical, surgical, dental hygienic glassware	1,790.0	533.7	1,662.3
Electromedical apparatus	595.8	225.8	2,579.4
X-ray apparatus	2,309.0	1,225.9	2,194.8
Medical, dental, surgical & vet. furniture	283.8	67.6	225.9
Optical examination & diagnostic equipment	553.0	12.6	0.0
Parts of surg., med. & vet. inst. & appliances, not electric	180.0	41.9	0.0
Other surg., med. & vet. instruments	7,279.5	4,167.6	7,111.4
Breathing appliances	635.4	270.8	128.4
Clinical thermometers	265.5	205.3	194.9
Total supplies	4,719.0	2,531.5	5,237.7
Total eqpt. & instruments	12,102.0	6,217.5	12,434.8
Grand total	16,821.0	8,749.0	17,672.5

Source: Foreign Trade Statistics, various years.

The composition of MEIS imports has not changed much since 1980. Medical supplies still account for about 30% and medical equipment/instruments about 70% of total MEIS imports. The share of commodity medical imports to total imports rose from 1.5% in 1980 to a high of 5.6% in 1988 to 2.5% in 1991.

On per capita terms, over the 12-year period, pharmaceutical import expenditures averaged \$4.80 a year per Filipino, compared to \$0.34 for MEIS. Since 1988/89, MEIS imports per person have been declining while pharmaceutical imports per person declined somewhat since 1988 - perhaps due to the heat generated by the "generics fever" of that period - but it rose again in 1992 (Table 3).

Table 3: Current and Real Per Capita Imports of Pharmaceuticals and Medical Equipment, Instruments and Supplies: 1980-92 (US\$)

Year	Per Capita Imports (Current Prices)		Per Capita Imports (Real Prices) 1980=100	
	Pharma.	MEIS	Pharma.	MEIS
1980	2.04	0.35	2.04	0.35
1981	2.06	0.50	1.85	0.45
1982	5.82	0.41	4.96	0.35
1983	3.97	0.45	2.65	0.30
1984	5.09	0.22	2.20	0.09
1985	2.93	0.16	1.15	0.06
1986	3.88	0.17	1.65	0.07
1987	4.36	0.31	1.82	0.13
1988	7.48	0.37	3.12	0.15
1989	5.65	0.53	2.03	0.19
1990	5.61	0.49	1.74	0.15
1991	4.59	0.24	1.25	0.07
1992	8.92	0.28	2.51	0.08

Source of basic data: Foreign Trade Statistics for import data; Philippine Statistical Yearbook for population and price index data.

B. Size and Composition of Exports

Commodity "medical exports" - consisting of pharmaceuticals and MEIS -, are still modest but growing; they reached US\$ 13.0 million in 1992, more than double the 1985 figure (Table 4). MEIS only accounts for 10% of the yearly exports; 90% are pharmaceuticals.

Curiously, the most important commodity exports are artificial teeth, dentures and bridges; together these brought in US\$ 2.3 million export revenues in 1992 (Table 5). Other exports are gauze and bandages, bottle nipples, and applicators and tongue depressors. The share of commodity medical exports has remained a minuscule 0.1% since 1980.

Table 4: Exports of Pharmaceuticals and Medical Equipment, Instruments and Supplies: 1980-92 (US\$ 1,000 f.o.b.)

Year	Pharmaceuticals	Med. eqpt., instruments & supplies	Total
1980	6,121.7	1,284.1	7,405.8
1981	6,475.4	49.1	6,524.5
1982	7,006.2	129.5	7,135.7
1983	6,845.3	118.2	6,963.5
1984	5,853.4	212.5	6,065.9
1985	5,716.0	430.9	6,146.9
1986	4,910.2	515.0	5,425.2
1987	4,453.7	336.9	4,790.6
1988	4,713.7	409.1	5,122.8
1989	5,593.1	552.7	6,145.8
1990	7,176.7	962.6	8,139.3
1991	7,876.7	1,588.7	9,465.4
1992	10,500.0	2,496.6	12,996.6
Total	83,242.1	9,085.9	92,328.0
Ann. Ave.	6,403.2	698.9	7,102.2

Source: Foreign Trade Statistics, various years.

Table 5: Composition of Exports of Medical Equipment, Instruments and Supplies: 1980, 1985 and 1992
(US\$ 1,000 f.o.b.)

Products	1980	1985	1992
Wadding, gauze, bandages, unmedicated	423.0	1.7	26.9
Gauze & bandages, unmedicated	820.7	0.0	109.6
Bottle nipples	37.8	127.1	35.9
Hygienic articles of unhardened rubber(*)	0.0	0.0	0.0
Dentist's & similar chairs(**)	0.0	0.0	0.0
Applicators & tongue depressors	0.0	22.9	45.4
Massage apparatus(***)	0.0	0.0	0.0
Artificial teeth of all materials	2.6	168.8	770.8
Artificial dentures & bridges	0.0	110.4	1,508.0
Total	1,284.1	430.9	2,496.6

Source: Foreign Trade Statistics, various years.

Notes: * - Exports in 1982 were US\$ 7,000; in 1987, US\$ 1,000.
 ** - Exports in 1987 were US\$ 900.
 *** - Exports in 1987 were US\$ 6,900; in 1989, US\$ 3,700.

II. INDUSTRY STRUCTURE

The market for medical equipment, instruments and supplies consists of (a) domestic manufacturers; (b) importers, wholesalers, distributors and dealers; (c) retailers; and (d) institutional and individual end-users. In this section, we describe the first three "components" of the market; in the next we deal with end-users.

A. Domestic Manufacturers

The domestic MEIS industry consists of 17 manufacturers⁴ with a combined annual output of P256 million. They employ 1,160 persons; their fixed assets had a book value of 64.2 million in 1988 (Table 6).

By most indicators, the domestic MEIS industry is small. On average, each MEIS establishment has 68 employees - smaller than a typical manufacturing establishment and much smaller than a typical pharmaceutical firm. The industry's output and fixed assets per establishment are also far less than their pharmaceutical and other manufacturing counterparts.

The industry consists of three segments (Table 7):

- * The "medical equipment" segment (Code 38516) is the least developed. It consists of three establishments with a combined output of only P2.0 million. Firms are typically small, with 15 employees per establishment. They are also severely undercapitalized; the fixed assets of an average firm is no more than P125,000.
- * The "medical supplies" segment (PSIC Code 3904) covers the manufacture of surgical, medical, dental and orthopedic supplies. It consists of eight firms with a total annual output of P111.0 million. On average, each firm employs 70 persons.
- * The "ophthalmic goods" segment (PSIC Code 3905) manufactures optical products. It consists of six firms with an aggregate output of P142.9 million a year. This segment is the biggest and probably the most developed. A typical ophthalmic-goods manufacturer employs 92 persons and has fixed assets of P6.1 million.

⁴This only covers establishments with employees of 10 or more, based on the 1988 NSO Census of Establishments.

Table 6: Selected Data on the Manufacturers of Medical Equipment, Instruments and Supplies Compared to Pharmaceutical Manufacturers and All Manufacturing Industries: 1988

Items	All manufacturing industries	Pharmaceutical industry	Medical, eqpt., instruments & supplies industry
No. of establishments	11,488	98	17
Value of output (P1,000)	P385,010,014	P13,184,610	P255,924
Cost of materials (P1,000)	P251,186,329	P7,035,966	P130,046
Employment	856,951	14,026	1,160
Total compensation (P1,000)	P31,810,602	P1,441,394	P41,798
Book value of fixed assets (P1,000)	P98,740,873	P1,264,180	P64,164
Output per establishment (P1,000)	P33,514	P134,537	P15,054
Employment per establishment	75	143	68
Fixed assets per establishment (P1,000)	P8,595	P12,900	P3,774

Source: 1988 NSO Census of Establishments.

Note: The above data only cover establishments with 10 or more employees.

Table 7: Selected Data on the Segments of the Medical Equipment, Instruments and Supplies Manufacturing Industry: 1988

Items	PSIC 38516	PSIC 3904	PSIC 3905
	Medical Equipment	Medical Supplies	Ophthalmic Goods
No. of establishments	3	8	6
Value of output (P1,000)	P2,042	P110,953	P142,929
Cost of materials (P1,000)	P1,363	P59,133	P69,550
Employment	44	563	553
Total compensation (P1,000)	P521	P20,174	P21,103
Book value of fixed assets (1,000)	P376	P27,840	P36,324
Output per establishment (P1,000)	P681	P13,869	P23,822
Employment per establishment	15	70	92
Fixed assets per establishment (P1,000)	P125	P3,480	P6,054

Source: 1988 NSO Census of Establishments.

B. Domestic Products

The principal products locally manufactured are: incubators and suction pumps; hospital furniture such as operating tables, beds and cabinets, autoclaves, wheelchairs, surgical gloves; and rehabilitation/orthopedic appliances such as tilt tables, whirlpool baths, exercise chairs, parallel bars, and alpine lamps.

Local manufacturers are still largely dependent on imported components such as heating elements, motors and thermostats. The local industry is not expected to produce any special or advanced medical equipment within the next few years because of technological limitations (Marmont: n.d.).

Due to the large foreign exchange requirements of medical imports, there is a growing sentiment in government and the private sector to locally produce medical supplies and, possibly equipment. In August 1989, a Health Product Development Group (HPDG) was organized with strong support from DOH to review consumption of medical products and look into the possibility of local commercial production. The HPDG sought to obtain information on the feasibility and cost-effectiveness of the local manufacture of specific health products and to stimulate the scientific and business communities develop plans for their manufacture. The HPDG effort was initially directed at "small-ticket" items. Among the health products targetted for local R & D and eventual commercialization were (HPDG: 1989):

- * Diagnostic kits and components - DNA and RNA genetic probes; polyclonal and monoclonal antibodies; immunoassay kits (ELISA, RIA, IFA, etc.); microbiologicals (differential media, etc.); and assay components (reagents, enzymes).
- * Therapeutics - antibiotics (antibacterial, antiviral, antifungal, antiprotozoan); immunotherapeutics (antitoxin, hyperimmune serum, immunosuppressants); analgesics (including opiates), antipyretics and anesthetics; vaccines; intravenous fluids and supplements/additives; nutritional supplements (vitamins, amino acids, minerals).
- * Medical, dental and laboratory supplies - glasswares (capillets, collection tubes, pipettes, thermometers, etc); metal instruments (surgical blades, needles, scissors, forceps, etc.); rubberwares (surgical gloves, catheters, condoms, etc.); plasticwares (colostomy bags, wee bags, urobags, venosets, butterflies, syringes, feeding tubes, etc.)
- * Medical, dental and laboratory equipment - clinical laboratory equipment (centrifuge, microscopes, spectrophotometers, electrophoretic apparatus, etc); tissue culture and biotechnology equipment (CO₂ incubators, laminar flow hoods, DNA synthesizer and sequencer, peptide sequencer, etc.); medical equipment (stethoscopes, ophthalmoscope, sphygmomanometer, fiber optics, laser technology, etc.).

The Department of Science and Technology, through the Philippine Council for Health Research and Development, is spearheading research efforts for the possible commercialization of selected biotechnology products. Among the research activities being undertaken are the assembly of a portable laser blood flow meter; the development of serum/plasma standard using indigenous materials; the development of a pregnancy kit using locally produced reagents and assembly/packaging of kits; and the pilot manufacture of immunodiagnostic reagents for the detection of hepatitis B virus (PCHRD: 1991).

Even for "big-ticket" medical equipment - such as ESWL - there have been incipient

efforts to study the feasibility of local production. Albano, et al (1990), in 1990 pioneered a local ESWL prototype machine using locally available and inexpensive materials. They hope that their project will spur the local medical community to rethink its strategy concerning biotechnology.

C. Importers and Distributors

There are three types of importers/distributors (Galt: 1987):

- * "Supermarket-style" distributors - these are large, diversified dealers usually with showrooms that sell to most or all sections of a hospital. They are strong retailers which sell an array of product lines and are reputed to be capable of changing buying habits and establishing trends.
- * "Pharmaceutical-style" distributors - these are smaller than "supermarket-style" distributors but handle a comparable array of products, mostly drugs. They engage mostly in pure distribution⁵; the burden of promotion and sales is assumed by their suppliers and they do not provide engineering support. Most of them started as drug distributors which diversified into medical instruments and supplies. They are good at high-volume, low-margin consumable product lines.
- * "Boutiques" - these are small, entrepreneurial operations that sell a limited range of products. They have limited capital and usually use personalized service to compete with the bigger importers.

To these must be added the large multinational firms (General Electric Medical Systems; Siemens of Germany) which provide upper-end, high-tech medical equipment such as CT, MRI, nuclear medicine technologies, and x-ray systems.

Tables 8 and 9 show indicative sales magnitude and staffing patterns of a sample of MEIS distributors (Galt: n.d.). Their annual sales turnover ranges from US\$ 0.75 million for "boutique-style" distributors to US\$ 10 million for medical "supermarkets"; average sales per firm based on this very small sample is probably US\$ 2-3 million per firm.

As for sales personnel, the number varies from 2 to 45. Apparently, the medical "supermarkets," because of their size and visibility, simply attract buyers or have established relationships with them over the years such that they do not see any need for a large sales force. On the other hand, the "boutiques" may be more aggressive, with one of them having a sales force of as much as 60% of its total employees. Almost all importers/distributors

⁵Stocking, invoicing, credit and delivery.

maintain a service force; their size varies from 3-5 to 15 or more.

Importers/distributors, on the other hand, have banded together into a trade association: the Hospital Medical Laboratory Equipment and supply Importers Association of the Philippines (HOMELESIAP)⁶.

Table 8: Indicative Sales Magnitude of Sample Distributors of Medical Equipment, Instruments and Supplies, by Type of Distributor

Distributor Type	Company	Sales	
		Surgical market	Total market
"Supermarket style" distributor	Company #1	\$2-3 M	> \$10 M
	Company #2	\$1-1.5 M	\$3-4 M
"Pharmaceutical style" distributor	Company #3	\$0.75-1 M	\$0.75-1 M
"Boutique style" distributor	Company #4	\$1-1.5 M	\$2-3 M
	Company #5	\$0.25-0.5 M	\$1.5-2 M
	Company #6	\$0.5-0.75 M	\$1.5-2 M
	Company #7	\$0.75-\$1 M	\$0.75-1 M
	Company #8	\$0.25-0.5 M	\$0.75-1 M
	Company #9	\$0.25-0.5 M	\$0.75-1 M

Source: Unpublished consultant's report.

D. Dealers of Professional and Scientific Equipment

⁶c/o Medical Center Trading Corp., Pioneer St. cor. Shaw Blvd., Metro Manila. Phone 673-1575; 77-28-62.

No statistical data exist on the size and activities of MEIS importers and distributors as a specific group. Existing NSO establishment census and surveys lump them with other related wholesalers under PSIC 61604 - "dealers of professional and scientific measuring and controlling equipment." Although this is too broad for the purposes of this study, we present them here (in Table 10) for additional information.

There are 64 dealers of professional and scientific measuring and controlling equipment, with total employment of 1,236 and yearly sales of P422.9 million. It is not known how many of these dealers devote their business to medical equipment and instruments. From all indicators, these dealers fare less than overall wholesale trade. They are typically smaller (19 employees per establishment); have less sales turnover; generate less value added; have smaller gross margins; and offer lower compensation per employee than wholesale trade in general.

These indicators are counter-intuitive; it is popularly believed that the more "sophisticated" the product, the higher must be the margin and employee compensation. It is possible that the aggregation of all dealers of professional and scientific equipment diluted that indicators for MEIS dealers.

Table 9: Indicative Staffing Patterns of Distributors of Medical Equipment, Instruments and Supplies, by Type of Distributor: 1987

Distributor Type	Company	Staff			
		Mgt. & adm.	Sales	Service	Total
Supermarket style distributor	Company #1	12	2	3	17 (47)
	Company #2	39	32	15	86 (86)
Pharmacy style distributor	Company #3	13	12	2	27 (40)
Boutique style distributor	Company #4	30	45	0	75 (75)
	Company #5	17	15	3	43 (350)
	Company #6	13	8	5	21 (33)
	Company #7	26	15	19	60 (60)
	Company #8	15	6	18	39 (39)
	Company #9	10	2	14	26 (26)

Source: Unpublished consultant's report.

Note: Figures in parentheses in the last column represent total staff in the Philippines.

D. Retailers

There are 27 retailers of medical, surgical and dental equipment and supplies and 11 retailers of optical goods and supplies (Tables 11A, 11B, and 12); these data cover only those establishments with 10 or more workers. There is a plethora of smaller-scale MEIS retailers but their number and magnitude is unknown.

MEIS retailers (PSIC 62702) generate more value added than drugstores and recover higher gross margins per establishment and per employee.

E. Sales Commissions and Taxation Issues in MEIS Trade

In reviewing the local trade in medical equipment, instruments and supplies, two observations stand out: the unusually large proportion of commissions/fees to sales revenues and the equally large proportion of indirect taxes to costs among MEIS retailers (Table 13)

Wholesalers and retailers as a whole derive less than 1% of their sales revenues from commissions and fees but medical, surgical and dental equipment suppliers generate as much as 5.4% of their revenues from fees. Given the earlier finding that employees from this trading segment do not receive unusually large compensation, such fees and commissions must accrue to firms themselves.

Corollary to this observation, medical equipment suppliers are subject to the highest indirect taxes compared to the trading sector as a whole. On average, indirect taxes account for less than 1% of the cost of wholesale and retail firms; in contrast, such taxes account for 3.9% of the cost of medical equipment suppliers.

These issues need looking into as they have been identified as sources of higher prices by MEIS end-users.

Table 10: Selected Data on Dealers of Professional and Scientific Measuring and Controlling Equipment: 1988

Items	PSIC 61	PSIC 61604
	Wholesale trade	Dealers of professional & scientific measuring & controlling eqpt.
No. of establishments	3,328	64
Employment	90,347	1,236
Compensation (P1,000)	P4,472,569	P57,435
Revenues or sales (P1,000)	P112,363,509	P422,766
Costs (P1,000)	P103,555,233	P355,724
Gross margin (P1,000)	P20,011,412	P160,320
Value added (P1,000)	P14,372,630	P99,885
Employees per estab.	27	19
Compensation per employee (P1,000)	P49.50	P46.47
Value added per establishment (P1,000)	P4,427	P1,561
Value added per employee	P163.07	P80.81
Sales per establishment (P1,000)	P33,763	P6,606
Sales per employee (P1,000)	P1,243.69	P342.04
Gross margin per establishment (P1,000)	P6,013	P2,505
Gross margin per employee (P1,000)	P221.50	P129.71

Source: 1988 NSO Census of Establishments, Vol. VIII-Wholesale and Retail Trade.

Note: The above data cover only establishments with 10 or more employees.

Table 11A: Selected Data on Retailers of Pharmaceuticals and Medical Equipment, Instruments and Supplies: 1988

Industry Data	PSIC 627	PSIC 62701	PSIC 62702	PSIC 62703
	Total	Drug-stores	Medical, surg'l & dental equipm't supplies	Optical goods supplies
No. of establishments	480	442	27	11
Employment	7,908	7,255	496	157
Compensation (P1,000)	P321,766	P301,075	P17,054	P3,637
Revenues or sales (P1,000)	P5,551,522	P5,378,870	P150,302	P22,350
Costs (P1,000)	P5,155,991	P4,993,628	P142,951	P19,412
Gross margin (P1,000)	P664,321	P608,790	P47,389	P8,142
Value added (P1,000)	P515,061	P478,491	P30,553	P6,017

Source: 1988 NSO Census of Establishments, Vol. VIII - Wholesale and Retail Trade.

Note: The above data cover only establishments with 10 or more employees.

Table 11B: Selected Data on Retailers of Pharmaceuticals and Medical Equipment, Instruments and Supplies: 1988

Items	PSIC 627	PSIC 62701	PSIC 62702	PSIC 62703
	Overall	Drug-stores	Medical, surg'l & dental supplies	Optical goods supplies
Employee per estab.	16	16	18	14
Compensation per employee (P1,000)	P40.69	P41.50	P34.38	P23.17
Value added per estab. (P1,000)	P1,073	P1,083	P1,132	P547
Value added per employee (P1,000)	P65.13	P65.95	P61.60	P38.32
Sales per estab. (P1,000)	P11,566	P12,169	P5,567	P2,032
Sales per employee (P1,000)	P702.01	P741.40	P303.03	P142.36
Gross margin per estab. (P1,000)	P1,384	P1,377	P1,755	P740
Gross margin per employee (P1,000)	P84.01	P83.91	P95.54	P51.86

Source: 1988 NSO Census of Establishments.

Note: The above data only cover establishments with 10 or more employees.

Table 12: Comparison Between All Traders and Retailers of Medical Equipment, Instruments and Supplies: 1985, 1987, 1989

Indicators	Sector	1985	1987	1989
Employees per establishment	All traders	31	33	30
	MEIS retailers	21	20	20
Value added per establishment (P1,000)	All traders	P2,299	P2,958	P4,343
	MEIS retailers	P1,176	P1,250	1,903
Sales per establishment (P1,000)	All traders	P20,002	P24,158	P31,411
	MEIS retailers	P12,734	P16,843	P18,931
Compensation per employee (P1,000)	All traders	P27	P32	P46
	MEIS retailers	P29	P40	P47
Value added per employee (P1,000)	All traders	P75	P89	P144
	MEIS retailers	P57	P63	P97
Sales per employee (P1,000)	All traders	P650	P731	P1,039
	MEIS retailers	P619	P846	P966

Source: NSO Annual Survey of Establishments, various years.

Table 13: Proportion of Commissions and Fees to Sales Revenues and of Indirect Taxes to Cost Among Dealers and Retailers of Medical Equipment, Instruments and Supplies: 1988

Trading Sector	Commissions & fees (P1,000)	% of commissions & fees to sales	Indirect taxes (P1,000)	% of indirect taxes to cost
All trade	1,260,362	0.7 %	1,011,357	0.6 %
All wholesale trade	1,205,149	1.1 %	717,706	0.7 %
Prof'l & scientific equipment dealers	1,848	0.4 %	2,642	0.7 %
All retail trade	55,213	0.1 %	293,651	0.5 %
Drugstores	266	negl.	19,056	0.3 %
Medical, surgical & dental equipment suppliers	8,127	5.4 %	13,244	3.9 %
Optical goods suppliers	-		274	1.4 %

Source: 1988 NSO Census of Establishments.

III. END-USERS

A. Institutional End-Users

The major end-users of medical equipment, instruments and supplies are surgery

departments and operating rooms, radiology departments, and laboratories of hospitals. In the Philippines, institutional end-users may be typified according to their purchasing patterns as follows:

- * Government-owned general medical centers (with at least 300 beds), government-owned specialist hospitals (heart, kidney, lung, children's, orthopedic), and one university hospital (Philippine General Hospital) - these contain the government's most technically sophisticated and well-funded surgery departments. Most of the country's opinion-leading surgeons and research activities are in these institutions.
- * Government regional hospitals, at least one in each region. These have between 200-300 beds and offer general surgery, orthopedics, pediatrics, and Ob-Gyne.
- * "Devolved" government hospitals - 600 or so provincial, district and municipal hospitals under the supervision of local government units.
- * Manila- and Cebu-based "corporate" hospitals with the largest surgery departments (Makati Medical Center, St. Luke's, Medical Center Manila, etc.) and private university hospitals (UST, UERM, FEU). These are well-budgetted and technically sophisticated.
- * Tertiary, secondary, and primary private hospitals - technical competence varies greatly; most "primaries" are poorly equipped, mostly entrepreneurial operations.
- * Free-standing diagnostic centers and ambulatory clinics/physician office. apparently increasing in number, but there are no data on their number and level of sophistication.

B. Decisions to Acquire

Private hospitals have informal decision-making processes to assess and acquire medical equipment. They send physicians and specialists to local and foreign seminars to update their knowledge of medical equipment who in turn give suggestions and recommendations to hospital administration on what equipment the hospital needs. Vendors and suppliers also actively provide information on the latest technology available. There may or may not be a formal planning process in technology acquisition. In some instances, hospital administrators conduct financial and market feasibility assessments of the equipment. All final decisions for major purchases are made by the board of trustees.

Public hospitals have much less flexibility in their decisions to acquire equipment. All major purchases have to go through the usual government budget process. Public hospital

decisions may also be colored by donors, who usually prevail upon the government to receive donations which may or may not be useful⁷. The impact of these donated equipment on the already-limited recurrent costs of public hospitals remains to be studied.

Nonprofit hospitals also acquire a number of their machines through donations. It is not clear whether hospitals actively seek the kind of equipment they want or need, or whether they are just passive recipients.

C. Factors in the Choice of Distributor/Supplier

End-users consider quality as a major factor in purchasing any medical equipment. Big hospitals and specialized institutions cannot accept low-priced but poor-quality instruments. Their reputation as medical institutions depends greatly on the capabilities of their staff and the efficiency/reliability of supplies. Price becomes a major deciding factor only during economic slowdowns or financial limitations of hospitals. End-users also give weight to after-sales service, free training of clients' technicians, and availability of spare parts and consumables in the choice of equipment supplier.

For "big-ticket" items, delivery lead time has an important bearing on the choice of supplier, particularly in instances when an equipment breaks down and an immediate replacement is needed. Due to their proximity to the Philippines, Japanese suppliers have an edge over their American and German competitors in this area. South Korea and India are also becoming important suppliers.

D. Replacement Rates

In almost all types of hospital equipment, private hospitals replace faster than public hospitals (Table 14). For some items, the public sector lags in replacement relative to the private sector by as much as two years. The effect of slower public-hospital replacement of equipment on quality of care is unknown.

⁷A typical news account of these usually undocumented cases is that of a P160 million Toshiba linear accelerator donated by the Japanese Government to a public hospital in Manila in the mid-1980s which has become junk. See Philippine Daily Inquirer, May 20, 1994, p. 12, "Japanese anti-cancer machines rot in RP hospital

Table 14: Replacement Rate of Major Hospital Equipment in Sample Public and Private Hospitals, in Years

Equipment	Private	Public	All
Operating tables	10.0	10.6	10.3
Theater lights	9.8	10.6	10.2
Defibrillators	7.7	9.4	8.5
Surgical microscopes	8.2	9.4	8.8
Ventilators	9.0	9.0	9.0
Heart-lung machines	7.7	9.0	8.2
Portable x-ray eqpt.	8.0	10.6	9.3
Patient monitoring/ anesthesia eqpt.	7.7	9.8	8.8
Gurneys	10.2	11.1	10.7
Suction eqpt.	9.8	9.8	9.8

Note: Private hospitals, n=5; public hospitals, n=5.

E. Some End-User Financial Indicators on MEIS

End-user financial indicators related to MEIS acquisition (capital and operating costs)

and utilization (revenues, rate of use) are very poorly developed. Available data are shown in the next two tables. Table 15 shows the value of hospital assets and inventories of MEIS while Table 16 shows revenues from radiology and laboratory departments of hospitals. Except for primary and secondary private hospitals, the figures confirm the increasing capital and resource intensity of higher-levels of care. Except for primary and secondary public facilities, the figures also confirm the expected increasing revenues from x-ray and lab departments of higher levels of care. The counter-intuitive results for teaching vs. non-teaching hospitals in both the public and private sectors may be due to sampling errors.

Table 15: Assets and Inventories of Medical Equipment, Medical Supplies, and Other Supplies of Sample Hospitals: 1991

Sector	Level	Medical Eqpt.	Medical Supplies	Other Supplies
Public	P	128,851	2,557	86,660
	S	501,178	75,390	196,190
	T-T	4,436,910	1,386,679	794,013
	T-NT	19,544,323	956,561	135,557
Private	P	389,655	36,712	22,825
	S	87,116	35,056	27,778
	T-T	1,547,153	533,435	204,497
	T-NT	4,036,655	1,253,548	414,679

Note: P-primary; S-secondary; T-T-tertiary teaching; T-NT-tertiary nonteaching.

Source: 1991 PIDS Baseline Survey.

Table 16: Percent Contribution of Radiology and Laboratory Departments to Hospital Revenues of Sample Hospitals: 1991

Sector	Level	Radiology	Laboratory	Radiology + Laboratory
Public	P	1.3	19.5	20.8
	S	3.6	9.0	12.6
	T-T	7.8	18.8	26.6
	T-NT	7.8	6.8	14.6
Private	P	2.1	3.3	5.4
	S	2.8	3.6	6.4
	T-T	2.9	6.0	8.9
	T-NT	5.1	11.1	16.2

Note: See Table 15.

Source: 1991 PIDS Baseline Survey

IV. CONCLUSIONS

The domestic MEIS industry is very weak; end-users have to rely mostly on imports. The National Health Insurance Program is likely to expand medical imports unless support is given for local MEIS producers. A program for health product development conceptualized in the late 1980s but which never got off the ground needs to be re-ignited. Fortunately, real per capita imports for MEIS products remains low. Real per capita pharmaceutical imports also declined since 1988, possibly on account of the Generics Law, but it inched up in 1992.

The large proportion of commissions to sales revenues among retailers of medical equipment, instruments and supplies is disturbing. The large proportion of indirect taxes borne by retailers of medical equipment, instruments and supplies - and the still-undocumented proportion of such taxes that are passed on to end-users - is also disturbing. There does not seem to be any economic efficiency rationale for such high taxes, except for revenue generation. The high cost of medical equipment, instruments and supplies reported by end-users can probably be traced to large commissions and high indirect taxes.

End-user indicators on MEIS acquisition and utilization, including financial data, are very poorly developed. Trade and industry organizations should develop more resources to set these up.

CHAPTER II:⁸ MEDICAL DIAGNOSTIC IMAGING TECHNOLOGY: CT AND MRI IN THE PHILIPPINES

This chapter looks into the diffusion of two state-of-the-art medical diagnostic imaging technologies in the country: computed tomography (CT) and magnetic resonance imaging (MRI). These expensive technologies are rapidly being acquired by Philippine hospitals. This inquiry is a modest attempt to explore, understand and ventilate the economic issues related to their diffusion.

Section I provides a background on medical diagnostic imaging. Section II presents data on the diffusion of CTs and MRIs in the Philippines, discusses the economic aspects of CT and MRI investments, and analyzes utilization rates and fee structures. Section III identifies policy issues related to CT and MRI diffusion.

I. MEDICAL DIAGNOSTIC IMAGING: CT VS. MRI

Medical diagnosis deals with determining the nature of a patient's disease. There are seven broad categories of diagnostic procedures but our interest in this study is limited to two: radiology and magnetic resonance imaging, a form of nuclear imaging⁹ (Atkinson: 1992).

Radiology deals with x-rays, radioactive substances, and ionizing radiations for diagnosis and treatment. Examples of the radiological procedures are conventional x-ray applications (chest, mammography), fluoroscopy and more recently, computerized axial tomography (CT or CAT). Nuclear imaging involves the use of radio-frequency energy for identifying abnormalities in anatomic structures, e.g. magnetic resonance imaging (MRI).

CT uses an x-ray beam in conjunction with a computer. The x-ray beam moves back

⁸The author acknowledges the research assistance provided by Alvin Catalan and the administrative support of Cynthia Lopez in the completion of this chapter. The author is wholly responsible for the chapter's contents.

⁹The five other modalities are: (a) pathology which deals with the nature of disease through the study of its causes, processes and effects, e.g., biopsy; (b) ultrasonography which uses sound energy for studying pulse-echo alterations of anatomic structure, i.e., use of "ultrasound"; (c) endoscopy which deals with the visual examination of the interior of a body cavity or viscus, e.g. bronchoscopy; (d) plethysmography which involves the measurement of changes in volume of an extremity or organ caused by blood flow, e.g., oculoplethysmography; and (e) sensory evoked potentials which deals with the measurement of somatosensory, visual and/or auditory nerve pathways, e.g., auditory brainstem evoked potential (Atkinson: 1992).

and forth across the body to project cross-sectional images; thus the technique is referred to as computerized tomography or computerized axial tomography. The technique produces a highly contrasted, detailed study of bodily structure and is largely noninvasive.

Unlike conventional x-ray technology, CT provides three-dimensional information on the internal structure of the body through a series of slices. It is very sensitive and can show differences in soft tissues clearly, which conventional x-ray technology cannot do. It permits accurate measurement of x-ray absorption of various tissues, enabling one to study the nature of these tissues. The amount of x-rays given to CT patient is much less than that emitted by conventional x-ray technique, thus CT is safer (Bronzino: 1991).

Unlike CT, MRI does not use radiation; the patient lies flat inside a large electromagnet. In this static magnetic field, s/he is exposed to bursts of alternating radio-frequency waves (Atkinson: 1992). While the CT technique looks at the body's structure in detail, in addition MRI looks at its function (See Table 17). MRI produces clear, striking images of soft brain/other neurological tissues missed by CT scan; it shows damage more clearly than CT; it is noninvasive.

II. ECONOMIC ASPECTS OF CT AND MRI TECHNOLOGY IN THE PHILIPPINES

A. Domestic Diffusion of CT and MRI

As of mid-1994, there are 20 CT scanners in the Philippines (Table 18); 16 in Metro Manila and its environs, one in Lipa City (Region IV), two in Cebu City (Region VII), and one in Davao City (Region XI). By 1986, local hospitals had acquired six CTs but it was in the late 1980s and early 1990s that many of the CTs were installed. The number of local CTs still pale in comparison with the more affluent Asian countries such as South Korea (Table 19), but the rate of recent local acquisition is worrisome and their geographic distribution leaves much to be desired.

Table 17: Comparison of CT and MRI

Aspect	CT	MRI
Dev't	Introduced in England in 1972	First used to create <i>in vivo</i> images in 1973; First installed in England in 1975; U.S. production prototypes in 1980.
U.S. diffusion	Around 1973	1981; by 1983, at least 173 MRI units had been installed worldwide.
Phil. diffusion	Introduced in 1978; 20 at present ¹⁰	Introduced in 1989 ¹¹ ; Makati Med. - 1990; 5 at present
Energy source	Uses radiation; advanced form of x-ray machine with a computer attached	Does not use radiation; uses radio-frequency energy
Capabi-lity	Bodily structure	Bodily structure and function - metabolism and biochemical reactions
Cost	US\$0.5 - 0.6 M (c. P16 M)	US\$2.0 - 3.0 M (c. P40 M)
Marginal benefit over previous technology	CT incremental advance over conventional x-ray is large.	MRI incremental advance over CT is smaller.

Sources: Bronzino (1991); Herzlinger (1992); Hillman (1986); Med. Obs. (1993); Protacio (1993).

For MRI, five are already in place, all in Metro Manila. Local adoption of this technology started in 1990 but acquisition has been so rapid that in three years, four more have been acquired. The current number already compares with what South Korea, a much more affluent country, had in 1989 (Table 20).

¹⁰Dr. Raul Fores, quoted in "Technological sophistication - a must for quality health care", Medical Observer, August 1993, p. 20.

¹¹Protacio, A.L. (1993).

Table 18: Philippine Hospitals with CTs: mid-1994

Name of Hospital	No.	Year Acquired	Brand/Model or Description
Capitol Med. Ctr.	1	pre-92	n.a.
Cardinal Santos M.C.	1	pre-92	n.a.
Cebu Doctors Hosp.	1	pre-92	n.a.
Chinese Gen. Hosp.	1	pre-92	n.a.
Chong Hua Hospital	1	pre-92	n.a.
Davao Doctors Hosp.	1	n.a.	4th g. Picker IQ
De los Santos General Hosp.	1	n.a.	n.a.
Jose Reyes Medical Center	1	n.a.	Non-functioning since 3/94
Makati Medical Center	2	1987	single-photon emission (SPECT)
		1989	n.a.
Medical City General Hosp.	1	pre-92	n.a.
N.L. Villa Mem. Medical Center	1	1993	GE Sytec 3000i
Perpetual Help Medical Center	1	pre-92	n.a.
Phil. Children's Hosp.	1	n.a.	n.a.
Phil. Gen. Hosp.	1	pre-92	n.a.
Phil. Heart Center	1	1992	Hitachi
St. Luke's Hospital	2	n.a.	3-dimensional
		n.a.	single-photon emission (SPECT)
UERM Hospital	1	n.a.	n.a.
UST Hospital	1	n.a.	n.a.
Total	20		

Sources: Panel interviews; PIPS 1991 Baseline Survey; PMCC Accreditation Files

Table 19: Number of Installed CTs by Selected Countries: various years

Country	Year	Source	No. of CTs
Philippines	1986	JART	5
	1994	This study	20
Brunei	1986	JART	1
Malaysia	1986	JART	10
Thailand	1986	JART	25
Singapore	1986	JART	8
Taiwan	1986	JART	60
S. Korea	1981	Lee	19
	1985	Lee	94
	1986	JART	101
	1989	Lee	146
Japan	1986	JART	3,294
U.K.	1986	JART	250

Sources: JART (1986); Lee, Kyu-Sik (1990); De Geyndt (1991).

Table 20: Philippine Hospitals with MRIs: mid-1994

Hospital	No.	Year Acquired	Brand/Model or Description
Makati Medical Center	2	1990	n.a.
		1994	n.a.
St. Luke's Hospital	1	1992	Elscint Gyrex S.5000
Card. Santos Med. Ctr.	1	n.a.	Dyasonic, USA
Waterous Gen. Hosp.	1	n.a.	n.a.
Total MRIs	5		n.a.

Sources: Panel interviews; PIDS 1991 Baseline Survey.

Table 21: Number of Installed MRIs by Selected Countries: various years

Country	Year	Source	No. of MRIs	MRI Per Million Pop.
Philippines	1990	This study	1	
	1994	This study	5	
S. Korea	1986	Lee	1	
	1989	Lee	5	
	1989	De Geyndt	n.a.	0.20
Japan	1987	De Geyndt	n.a.	1.00
U.S.	1987	De Geyndt	n.a.	3.70
Canada	1989	De Geyndt	n.a.	0.46
Germany	1987	De Geyndt	n.a.	0.94

Sources: This study; Lee, Kyu-Sik (1990); De Geyndt (1991).

B. CT and MRI as Lumpy Investments

CTs and MRIs are lumpy capital investments and economic theory suggests that they may be used at a rate lower than the one at which unit costs are minimized, i.e., their operating rates may be such that scanners could have large excess capacity. This economic truism derives from the nature of any investment with large "sunk" costs.

Like any capital investment, operating a CT or MRI involves Fixed and Variable Costs. Fixed Cost represents the cost of acquisition, installation, and training. This cost is "sunk", i.e., it has been incurred. As more scans are done, Fixed Cost gets "spread out" over each scan so that Average Fixed Cost steadily declines. On the other hand, Variable Cost represents the cost of supplies, workforce, electricity, administration, etc. It varies with the number of scans. Average Variable Cost reaches a certain point - the optimum - after which it begins to rise, i.e., the equipment is being worked beyond its normal capacity as, for instance, when staff are made to work overtime at higher salaries. Beyond this optimum point, the equipment begins to experience so-called "diseconomies of scale".

The sum of Average Fixed Cost and Average Variable Cost yields the Average Total Cost, which is hypothesized to be U-shaped: The large fixed cost involved in acquiring scanners requires a sufficiently large number of scans to be performed for such equipment to break-even. The U-shaped curve implies that: (a) Low rates of utilization is associated with high unit cost. Within this range, the CT or MRI owner may be tempted to increase fee per use to recoup the investment, or induce demand for scanning among patients (perhaps even to those in which the procedure is not medically indicated) to achieve a higher rate of utilization. (b) The optimum rate of utilization is associated with the least unit cost. At this point, the CT/MRI has reached so-called "economies of scale". (c) Rates of utilization higher than the optimum rate engenders "diseconomies of scale" with concomittant increase in unit cost.

C. Utilization Rates

Ideally, CT and MRI should be analyzed as typical lumpy investments subject to economies of scale, as explained above. Absence of detailed cost data, however, precludes conduct of such an analysis at this point.

Table 22 shows available data on the annual number of three CT scan procedures - chest, abdominal, and skull/brain scan - in nine hospitals, representing about half of the stock of CTs in the Philippines. CT utilization rates are striking in their variability:

- * High utilization: about 3,900 to 4,900 scans a year, or about 8-14 scans a day. Three hospitals are in this range, two of which are university hospitals. One of the hospitals tends to have predominantly chest scans; the other, brain scans.
- * Moderate utilization: about 1,000 to 1,500 scans a year, or about 4-6 scans a day. Four hospitals are in this range: three private and one government. Three of the hospitals tend to have predominantly brain scans.
- * Low utilization: about 350 scans a year, or one scan a day. Two hospitals are in this range, both private. One tends to have predominantly chest scans and the other predominantly brain scans.

Table 22: Total Annual No. of CT Scans Performed by Type of Scan, by Hospital: 1991

Rate of Utiliz'n	Hosp. Code	Chest	Abdom- inal	Skull/ Brain	Total
High	151	1,916	1,392	1,619	4,927
	148	720	560	3,080	4,360
	159	3,294	522	127	3,943
Moderate	129	424	325	749	1,498
	34	72	108	1,230	1,410
	88	116	135	939	1,190
	32	36	58	1,043	1,137
Low	91	360	-	-	360
	128	10	13	328	351

Source: 1991 PIDS Baseline Survey.

What accounts for such variability is not clear. Unfortunately, further analysis cannot be done due to the small sample size. From the available information, we can hazard the following:

- * Utilization does not seem to be associated with the level of fees. As will be shown in the next section, high-fee hospitals also tend to have higher rates of utilization.
- * Utilization seems to be a function of how well-established the scanner is; it takes some time before recent capital acquisitions begin to attract customers. This is clearly the reason why new capital investments are so aggressively advertised.
- * Utilization seems to be strongly correlated with wider specialties and sub-specialties in a hospital. This is especially true in the two university hospitals.

D. Fee Structures

Given a technology so outwardly similar¹², in equipment used and in diagnostic procedure, CT fees per scan are striking in their variability (Table 23).

- * For chest scan, fees vary from P1,540 to P5,680, an almost four-fold difference; for abdominal scan, fees vary from P1,540 to P7,000, a difference by a factor of 4.5; and for brain/skull scan, fees vary from P1,540 to P4,280, an almost three-fold difference.
- * Fees do not seem to be associated with the volume of scans and therefore of economies of scale. Hospitals with high utilization also tend to have higher fees per scan, especially Hospital #148 and #159. There seems to be "stickiness" in fees so that they do not decline even after CTs have reached scale economies.
- * On the other hand, the lowest-utilization hospital is obviously engaging in "predatory" pricing to attract customers¹³. This hospital also has the same "base" rate for chest, abdominal and brain/skull scans, with the rates changing only with the type of accommodation.
- * Some hospitals engage in "skim" pricing; 3 of them have fees varying with the type of accommodation. Such practice is obviously not related to the cost of scan but to revenue maximization.
- * The effect of charity care on the overall structure of fees is difficult to analyze and establish (Table 24). From the sample, two hospitals provide outright free care to charity patients; four hospitals provide large discounts; the remaining three hospitals charge charity patients no differently from pay patients.
- * Most probably, the cross subsidy being done by Hospitals 151, 148, 159, and 91 accounts for their higher fees.

¹²This statement needs to be modified. While CT/MRI may look the same, they vary by their generation. Newer generations are more powerful and do scans quicker. This may be another factor for fee variations.

¹³One is tempted to conjecture that CTs in low-utilization hospitals may have been acquired also for their visible "prestige" effect.

Table 23: Fee Per Scan for Pay Patients by Type of Scan, by Hospital: December 1991 (Pesos)

Rate of Utiliz'n	Hosp Code	Chest	Abdominal	Skull/Brain
High	151	3,520-3,833	3,520-3,833	3,080-3,339
	148	4,530-5,680	5,140-6,450	3,413-4,280
	159	3,500	7,000	2,950
Moderate	129	2,750	2,750	2,350
	34	3,082	5,459	2,112
	88	3,480	3,480	3,180
	32	4,400	4,048	3,258
Low	91	3,800	6,000	3,500
	128	1,540-3,663	1,540-3,663	1,540-3,179

Source: 1991 PIDS Baseline Survey.

III. POLICY ASPECTS AND ISSUES

A. Hospital Profits

CT scans must be one of the most profitable hospital capital investments at present. Data presented in this paper indicate that a hospital's \$600,000 investment in a CT can be recouped in just two years: seven scans a day at a fee of P3,500 yields about P17 to P18 million in two years, enough to pay for the P16.5 million investment. Given the 20-year normal life of these types of equipment, the CT can be a definite revenue center for a hospital.

The conventional economic model on lumpy investments hypothesizes that hospitals with underutilized CT/MRI tend to charge higher fees per scan to make up for the slack. But available data do not bear this out; in fact, hospitals with newly-acquired CT tend to do "predatory pricing" - deliberately keeping fees low to attract patients. On the other hand, economies of scale does not produce the hypothesized reduction in fees; hospitals with well-

established CT tend to keep their fees high even after reaching scale economies.

This finding may be startling to economists but not to marketing specialists. Price "stickiness" is rather common in medicine. "New medical technologies such as CT and MRI are usually introduced at a high level of fees per use, consistent with the scarcity of resources and expertise necessary for their operation. However, prices rarely decline as these services become more widespread or easier and less costly to perform" (Hillman: 1986).

Table 24: Fee Per Scan of Charity Patients by Type of Scan, by Hospital: December 1991 (Pesos)

Rate of Utiliz'n	Hosp. Code	Chest	Abdominal	Skull/Brain
High	151	1,870	1,870	1,870
	148	0	0	0
	159	2,100	4,200	1,900
Moderate	129	1,100	1,100	1,150
	34	3,082	5,459	2,112
	88	3,480	3,480	3,180
	32	4,400	4,048	3,258
Low	91	2,000	2,000	2,000
	128	0	0	0

Source: 1991 PIDS Baseline Survey.

B. Supplier-Induced Demand

Providers as care-managers generally decide the type and volume of services given to patients. This information asymmetry gives physicians the power to influence demand for their services, even the possibility of self-referrals in cases where they have financial stake in the setting where care is obtained. One can conjecture that hospitals with underutilized CT/MRI may be induced to do duplicative or marginal scanning, or to prescribe scanning even if it is not medically indicated. Current data do not permit analysis of this potential phenomenon, but this study suggests that at this early stage, physicians already develop common practice guidelines to govern the use of expensive scanning technology.

C. Technology-Sharing

While the number of CTs and MRIs are still low by developed-country standards, the recent spate of acquisitions is worrisome. Following the hospital-networking concept popularized by the DOH in the 1980s, one recommendation is for hospitals to co-own CT/MRI technologies. Two or more hospitals may arrange to use just one CT/MRI and share in its financial benefits and losses.

The economic issue that can arise is whether technology-sharing is collusive. If hospitals can be shown to be price takers, then no collusion exists; if they can be shown to be price setters, then collusion exists. Collusion is not easy to establish but factors such as further analysis into the competitive environment in the health care market, the availability of other medical diagnostic imaging alternatives, and cost and fee structures of CT/MRI scans can assist policy.

D. Spatial Distribution

The current distribution of CT and MRI, like any expensive medical technology in the Philippines, leaves much to be desired. Technology-sharing is one strategy with which to address the problem of economies of scale. Another related strategy is through "regionalization" of imaging technologies. The government through moral suasion or other means, or provider associations on their own, can impose a moratorium on CT/MRI installations in Metro Manila and designate public or private hospitals - one in each region - where future CT/MRI will be sited.

Proponents of the regionalization strategy abroad argue that hospitals with higher volume of procedures may be associated with lower per unit costs. Those against such strategy, however, claim that the concentration of scanning procedures to a limited number of designated hospitals may adversely affect patient choice and access.

E. Rate of Obsolescence of New Technologies

Because of the large foreign exchange involved in CT/MRI acquisition, policymakers should be concerned about their rate of obsolescence. In the U.S., "CT technology underwent four distinct generations in its first ten years. Most of the changes in the technology were not retrofitable, and hospitals were faced with the choice of keeping obsolete technology or selling it to generate revenue toward the purchase of a new device. Larger hospitals sold their older devices to smaller hospitals. There was rapid escalation of expenditures on CT scanners" (Rhea: 1991).

When MRI was commercialized in the late '80s, one local hospital immediately acquired one. Now its major competitor can claim that its "new Elscint Gyrex S 5000 MRI system utilizes a 5,000 Gauss superconductive magnet far superior to the 650 and 2,000 Gauss

permanent magnets of other MRI systems in the Philippines... The whole procedure takes only 30 to 45 minutes, while other MRI systems require one to two hours."

CT/MRI and other cutting-edge technologies rapidly evolve and one can raise the issue of the value of investing in first-generation technologies when the superior second- or third-generation sets are not far behind. The incapacitating scarcity of knowledge in this field, both in government and in the private sector, ought to be addressed.

F. Use of Multiple Imaging Techniques

Hospitals with CT may also acquire the more expensive MRI, even if the marginal advance of MRI over CT is small. Literature on the use of multiple imaging technologies defend such practice by citing that while the different imaging modalities provide some overlapping services in terms of the information they convey, such imaging modalities also provide different services. CT and MRI may be substitutes, in one sense, since they both reveal in striking detail the structure of tissue and organ. On the other hand, CT and MRI can also be complements, with MRI revealing the function and biochemical properties of a tissue and organ not revealed by CT. In practice, most practitioners start with the least expensive diagnostic modality (conventional x-ray), then move on to CT if more structural detail is needed, and finally to MRI if information on both (i.e. a tissue's structure and function) is required.

CHAPTER III: MEDICAL TECHNOLOGY IN THE PHILIPPINES: PERSPECTIVES AND DIMENSIONS

The 1970s, 1980s and 1990s have brought a glittery and bewildering array of major new medical devices used in clinical practice in the U.S. and by diffusion in the Philippines:

- * Diagnostic imaging - digital x-rays; CT scanners; MRI; Doppler color ultrasound; angiography; magnetic resonance angiography; magnetic resonance mammography; Gamma camera systems;
- * Neurology - sleep disorder laboratory, electroencephalography, electromyography and nerve conduction velocity (EMG-ECV) studies, electronystagmography (NG) and transcranial Doppler sonography;
- * Neurosurgery - epilepsy pacemakers; percutaneous discectomy; high-power YAG lasers;
- * Urology - lithotripsy (extracorporeal, laser); laparoscopic gallstone removal; hemodialysis for end-stage renal disease; kidney transplants;
- * Ophthalmology - YAG lasers for capsulotomies; corneal transplants; glaucoma implants; refractive laser implants; electro-ocular implants;
- * Pulmonary medicine - brachytherapy, ventilators and ultrasonic humidifiers;
- * Cardiology - echocardiograms and cardiac catheter units; heart transplants;
- * Critical care - patient monitoring systems for ICUs and CCUs; electronic charts; continuous cardiac output; closed-loop fluid delivery; sensor technology for bedside blood gases;
- * Interventional medicine - angioplasty, arthroscopy, lasers; percutaneous drainage; percutaneous extractions (biopsies); intravascular electrocoagulation;
- * Rehabilitative medicine - electromyograms, speech therapy, and physical/occupational therapies;
- * Orthopedics - customized implants; bone growth stimulation; bond strength analyzers;
- * Oncology - hyperthermia (ultrasound, RF); patient-controlled analgesia; Cobalt-

60 therapy; linear accelerators; photodynamic therapy; prefilled chemotherapy pumps;

Dental care - lingual brackets; periodontal analysis; TMJ diagnosis; CAD/CAM crown or inlay manufacturing.

It is frequently claimed that the Philippines is "10 years behind the U.S." in technology but one frequently encounters large print advertisements¹⁴ announcing the installation of yet another top-of-the-line diagnostic or therapeutic device in the country. Examination of the services of three hospitals in Metro Manila alone indicates that majority (about two-thirds) of the above-listed technologies are being offered. Thus, despite the absence of empirical investigation on the level and diffusion of medical technologies¹⁵ in the Philippines, one could safely assume that certain sectors - what we call "medical enclaves" - are modernizing quite rapidly.

There should be little argument against rapid medical modernization per se. However, the nature and course of medical modernization in the Philippines raises issues on safety and efficacy; cost-effectiveness and medical inflation; resource allocation; the effects of insurance; and potential conflicts of interest involving providers.

I. SAFETY, EFFICACY AND EFFECTIVENESS

By tradition and due to the weak local capacity for medical technology assessment, the Philippines has relied on U.S. Food and Drug Administration (FDA) approval for the local diffusion of imported medical devices and procedures. But even with this passive stance, a number of technologies find their way in the Philippines without FDA approval. For instance, the commercialization of extracorporeal shock wave lithotripsy (ESWL) - a noninvasive procedure (machine) that disintegrates kidney and gallstones - was welcomed by Filipino urology departments. Four local hospitals immediately acquired the equipment but a study has shown that in 1989, three of them - St. Luke's EDAP LTOI, Cebu Doctors' EDAP LTOI, and Chong Hua's MPL (Multipurpose Lithotripter) 9000 - had not been approved by FDA. Only

¹⁴Though it is not the focus of this study, the ethics of advertising in medicine also deserve discussion. Some Philippine hospitals are known to advertise, keep marketing departments, and employ or retain PROs. For as long as these activities are limited to information widening, no ethical issues can be raised. Pro-active solicitation of clients, however, may already verge on the unethical.

¹⁵While we constantly use the term "medical technology", we really refer to all technologies in the health field, i.e., "health technologies" including promotive, preventive and rehabilitative technologies.

Manila Doctors' Siemens Lithostar had FDA approval at that time¹⁶ (Gatchalian: 1989).

Interestingly, in a comparative study done on the second-generation lithotriptors, it was found that the FDA-approved Lithostar had successful disintegration in 97% of cases; the non-FDA approved EDAP, 87% and MPL 9000, 91% (Gatchalian: 1989).

Effectiveness goes beyond efficacy in that it takes into account actual, non-ideal application of technologies. Most of the new medical technologies were designed for and implemented in industrialized countries. The wide disparity between laboratory conditions and the real world on one level, and between Western settings and Philippine conditions on another level, provides enough rationale for a closer look at imported technologies. Is the technology appropriate? Is it suitable to local conditions and does it take account of local factors, e.g., natural factors such as monsoon rains, flooding, dust, humidity, earthquakes; man-made factors such as power outages; and societal factors such as literacy, numeracy, Filipino management culture, and social acceptability?

One can build a case for strengthening Philippine capacity to assess and select medical technologies. Chapter IV of this paper deals with this issue by discussing the rationale, nature and other aspects of medical technology assessment (MTA).

II. COST EFFECTIVENESS AND MEDICAL INFLATION

If the technology has satisfied safety, efficacy and effectiveness considerations, is it cost-effective? At the micro level, cost-effectiveness analysts inquire whether (a) the new technology is cheaper than the existing one, given the same magnitude of effectiveness, or (b) the new technology costs the same as the existing one, but it has greater effectiveness.

There is currently very little effort at cost-effectiveness and cost-benefit analyses (CEA and CBA) of medical technologies in the Philippines. For instance, of the 2,288 entries in the Philippine Medicus Abstracts for the period 1987-90, only 3 articles dealt on CBA and CEA¹⁷.

At the macro level, the inquiry is focussed on the effect of new technologies on overall health-sector prices and expenditures. Curiously, while many technologies have been "demonstrated" to be cost-effective at the micro level abroad, together these new technologies have contributed significantly to overall health-sector inflation in developed countries.

¹⁶Interestingly, in a comparative study done on second-generation lithotriptors, it was found that the FDA-approved Lithostar had successful disintegration in 97% of cases; the non-FDA approved EDAP, 87%; and MPL 9000, 91% (Gatchalian: 1989).

¹⁷It may be the case that CEA and CBA work about Philippine medicine gets published abroad, part of our national colonial mentality.

The difficulty in assessing the inflationary impact of new technologies in the Philippines arises from the absence of medical price indices that are able to capture such factors as intensity of care, frequency of care, and location of care. The current medical price series is part of the consumer price index and thus, is able to capture only the most rudimentary medical care.

Nevertheless, there are two major but related views on the etiology of medical cost inflation. One is the "technological imperative" imbibed by Filipino physicians during their American-influenced training to provide, by an unwritten social contract, the "best possible care" to their patients. It is frequently claimed that physicians are driven by the "image of high quality medicine predicated on a scientific approach to problems, with modern technology constituting the instruments with which that approach is practiced" (Warner: 1982). The technological imperative drives physicians to greater specialization, and to look for the most sophisticated medical settings. The American education of the Filipino specialist instills medical aggressiveness incomparable to European practice¹⁸.

The pervasive American education of Filipino specialists, and the American-influenced Philippine medical education, must be subjected to serious study and reform. One wonders for instance what the picture of Philippine medicine would be if there were more British-educated physicians. Payer (1988) argues that British medical education is more conservative, more questioning and cynical towards technology, more oriented at bedside training, and more empirical than theoretical. British doctors are more aware of resource constraints as they are paid on capitation and salary, and the British philosophy underpinning medical care is that society as a whole should take precedence over the individual.

Another hypothesized cause of medical inflation is the pursuit of "hospital prestige". Because they have to attract the best physicians - and therefore patients - hospitals have to offer the most sophisticated armamentarium of care. Possession of the most up-to-date technology confers prestige to hospitals. It is small wonder that acquisition of such technology is accompanied by large-scale advertisements to create clients.

III. RESOURCE ALLOCATION

The resource allocation aspect of medical technology diffusion is multidimensional. One dimension relates to the distribution of society's resources across sectors; another dimension relates to the distribution of society's resources within the health sector. Crosshatching these dimensions are the distribution of society's resources across geographic regions, across social classes and income groups, and across time (hence, across generational

¹⁸For an interesting and instructive comparison of medical practices in the United States, England, West Germany and France, see Lynn Payer (1988). *Medicine and Culture*. Penguin Books.

groups).

The intrasectoral, intersectoral, geographic and social allocation of resources have been dealt with extensively elsewhere. One could ask, for instance: (a) whether it is appropriate for a relatively small number of people to benefit from public financing of an expensive technology (say kidney transplant) when a larger number of people could benefit from expenditures on a broader range of less expensive problems; (b) how much should society's commitment be for expensive life-prolonging technologies; or (c) what should be the criteria for allocating a technology to those who could potentially benefit from it (Kutner: 1990). These and similar issues have attracted discussions in the Philippines.

What has not been discussed extensively in the Philippines is the *inter-generational allocation* of resources, or the distribution of society's health resources across time. In the first half of this century, major medical breakthroughs occurred in the field of public health: sulfa drugs went into widespread use between 1935 and 1940, penicillin between 1940 and 1945, and terramycin and aureomycin just before 1950 (Gruenberg: 1982). These antibiotics, vaccines, malaria spraying, and other health interventions were mass-oriented. Public investments in these technologies improved the lot of people in general, but specifically of children.

In contrast, most of the major technological developments in medicine over the past two to three decades have been in devices and techniques related to personal, curative care. For instance, the modern era of organ transplants began in the early 1960s with the identification of azathioprine and steroids as an effective combination to prevent rejection of foreign organ. Later in the early 1980s, cyclosporine was introduced as a new, more powerful immunosuppressive drug (Kutner: 1990). These techniques are typically pain-reducing and life-extending and for the most part cater to older segments of the population.

Integration of new, safe and efficacious technologies can have significant effects on the size and composition of the population. Large investments in life-extending hospital facilities, for instance, could result in increasing the elderly population and thereby create a deflection of medical devices not only for these patients but for the numerous chronic and acute conditions concomitant to advanced age (Bronzino, et al.: 1991).

Sadly, in the battle for resource allocation, public health interventions always come out a poor second to high-tech medicine. To the popular mind, the millions of anonymous, statistical lives upheld by public health advocates remain abstract. On the other hand, the real-life story of one man, say the first Philippine heart transplant Mr. Rainier Lagman, easily captures the popular and political imagination.¹⁹

¹⁹Mr. Lagman died just after a few months of being out of the hospital.

IV. PROVIDER PAYMENT SYSTEMS AND INSURANCE EFFECTS

The effect of insurance and provider payment systems on the level of medical technology is very little understood and we can only scratch the surface of the issues here. The analytical problems start from the way the hypotheses are cast. It is difficult to untangle the problems because of the many confounding factors, e.g.:

- * The relative prices of capital and labor: labor may be unionized; capital may be obtained for less than its real resource cost, e.g., it may be subsidized wittingly or unwittingly - by the insurance system itself.
- * The level of R & D activities in medical technology, the manner by which it is conducted, the way it is financed, and the policies governing technological diffusion: for instance, the large-scale funding of medical research by the U.S. government is itself a major factor in the technological intensity of U.S. medicine, quite apart from any insurance effect on technological choices.
- * The training of physicians and prevailing "culture" in the medical establishment: Is it technologically aggressive or conservative? British medicine has greater reliance on the results of randomized controlled trials and is therefore more conservative; American medicine often makes do with observational studies.
- * The regulatory environment: Does the financing system rely on micromanagement of providers and patients and individual incentives as in the U.S. or in macromanagement, regional planning, and systemwide incentives as in Europe and Canada?

Chapter V of this paper deals with provider payment issues while Chapter VI deals with regulation of investment.

V. CONFLICT OF INTEREST

Conflict of interest in medicine arises especially in private or pluralistic health care systems like the Philippines, the U.S. and South Korea. It comes about from the multiple roles a physician (or any professional) plays in the course of his/her work. In its most common manifestation, conflict of interest occurs in the physician being the patient's agent or manager of care and at the same time one who has a financial stake in the setting in which care is received. This is a little appreciated phenomenon in Philippine medical practice; its magnitude is not known and we raise it here to encourage research and discussion. Chapter VII deals with conflict of interest regulation in medicine. It explains the nature of conflict-of-interest, cites examples, and provides options for managing the problem.

CHAPTER IV: ASSESSMENT AND SELECTION OF MEDICAL TECHNOLOGY

Although the term "medical technology assessment" (MTA) is not popularly used in the Philippines, policy- and decision-makers have expressed keen interest in developing and strengthening domestic capacity for medical technology assessment (DOH: 1994). Among the motivations and rationale for MTA are the following interrelated factors:

- The rapid pace of technological diffusion occurring worldwide and the proliferation of health care technologies locally: the need to protect public welfare.
- The increasing role of the government as a funder of health services and of social insurance programs²⁰, as purchaser of health services: the need to ensure government is a prudent purchaser of care.
- The increasing role of the DOH in health-sector regulation after it turned over majority of its service functions to local governments in the wake of devolution: the need to strengthen regulation.
- The increasing belief that free-market technology diffusion leads to medical inflation: the need to contain costs.

"Unlike many health issues, there is general consensus that some manner of technology assessment is desirable, or at least inevitable, reflecting the possibility that appropriate evaluation may offer higher quality care while moderating or reducing costs" (Foote: 1987).

I. NATURE AND RATIONALE

MTA is "any process of examining and reporting properties of a medical technology used in health care, such as safety, efficacy, feasibility, and indications for use, cost, and cost-effectiveness, as well as social, economic and ethical consequences, whether intended or unintended" (Banta: 1990, p. 381). It studies technological innovations before they are unquestioningly adopted and diffused into society (Foote: 1987). More specifically, MTA is a type of policy research which provides policymakers with information on policy alternatives, such as allocation of R&D funds, formulation of regulations, or development of new legislation" (Banta: 1990).

²⁰Specifically the Medicare Programs of the Social Security System (SSS) and the Government Service Insurance System (GSIS). There is a pending bill in Congress for the establishment of a National Health Insurance Program based on the current SSS/GSIS programs as well as local government health insurance initiatives.

MTA covers all medical technology, the latter being defined as "the drugs, devices, and medical and surgical procedures used in medical care, and the organizational and supportive systems within which such care is provided" (OTA: 1978). MTA²¹ is often misconstrued to involve only medical, curative "high-tech" products, devices, procedures and techniques. In practice, it covers the entire range of health technologies including those used in preventive, promotive and rehabilitative care. To accommodate these technologies, recent literature now uses "health technology assessment" instead.

MTA involves a complex set of activities that poses a real organizational challenge to any country. However, there are tasks within this range of activities that a developing country like the Philippines can do in order to strengthen its local MTA capacity. Towards the end of this section, we will consider organizational and institutional choices for MTA development in the Philippines.

II. LEVELS AND PROCESSES OF TECHNOLOGY ASSESSMENT

MTA involves clinical, economic, social, legal and ethical perspectives. It involves an entire array of studies. It begins with clinical tests; moves on to the conduct of cost, cost-effectiveness, and cost-benefit analyses; and culminates in studies pertaining to the social, legal, ethical aspects of the technology under investigation.

a. Clinical Trials - A medical technology being formally examined for MTA undergoes the following levels of (clinical) scrutiny (Banta: 1990). First, technical capability assessment: Does the device or procedure perform reliably and deliver accurate information. Second, diagnostic accuracy assessment: Does use of the device permit accurate diagnoses? Third, diagnostic impact assessment: Does use of the device replace other diagnostic procedures, including surgical exploration and biopsy and other invasive procedures? Fourth, therapeutic impact assessment: Do results obtained from the device affect planning and delivery of therapy? Finally, patient outcome assessment: Does use of the device contribute to improved health of the patient?

Clinical trials should establish the safety and efficacy of new and unestablished medical technologies. The technology's safety must meet the classical standards of beneficence (it must benefit the patient) and nonmaleficence (it must not harm the patient) (Bronzino, et al.: 1991). The technology must also be efficacious, i.e., it must benefit individuals in a defined population for a given medical problem under ideal conditions of

²¹According to Foote (1991), the concept of MTA was formally developed in 1965 by U.S. Congressman Emilio Daddario, then chairman of the House Subcommittee on Science, Research and Development.

use²².

Randomized controlled trials (RCT) are the standard used to test the safety and efficacy of medical technologies. Essentially, an RCT compares a "case" group (the experimental sample) with a "control" group (the comparison sample), with persons in both groups being randomly selected. (Preferably, both groups must have comparable socioeconomic and demographic characteristics). The case group receives the treatment or therapy while the control group may receive no treatment, a different treatment, the same treatment administered differently, or a placebo. The control group makes possible unbiased comparison with the case group²³.

While RCT is a touchstone of scientific investigation, it poses considerable ethical problems. A physician is obligated to provide the best available care to the patient. But under RCT, a patient under the control group is prohibited from receiving an available treatment. Intuitively, it is unfair to impose the burdens of experimentation on some who do not fully share in the benefits of an available technology (Bronzino: 1992). Thus, RCT poses the dilemma of trying to validate medical technology, but in the process withholding such technology to a group of people whose life probably depends on it.

Due to the "ethical issue" in RCT, a number of cutting-edge technologies have never been subjected to exacting technology assessments. Among these technologies are the Intensive Care Unit, the Coronary Care Unit²⁴, Neonatal Care Unit, and the early generation of CT and MRI scanners²⁵.

b. Cost, Cost-Effectiveness Analysis (CEA), and Cost-Benefit Analyses (CBA)
Cost studies are done to evaluate the financial requirements of the new technology and to

²²The literature on "efficacy" is extensive, and rigorous scientific definitions are available. We do not belabor the issue here as this study is focussed on the social aspects of technology rather than its scientific dimensions.

²³Again, we do not dwell lengthily on the principles and mechanics of RCTs as these are not the focus of this study. Interested readers are referred to basic textbooks in epidemiology, e.g., Judith Mausner and Shira Kramer (1985). *Epidemiology - An Introductory Text*, 2nd ed. W.B. Saunders Co., especially Chapter 8.

²⁴See, for instance, Gordis, L. L. Naggan and J. Tonascia (1977). "Pitfalls in Evaluating the Impact of Coronary Care Units on Mortality from Myocardial Infarctions", *Johns Hopkins Medical Journal*, 144(73).

²⁵Hillman (1986) notes that the first rigorously controlled studies of CT's value to patient care were not published until 1978, or five years after they were introduced in the U.S. For MRI, four years after they were introduced, rigorous evaluations remain scant.

assess alternative technologies. CBA evaluates the technology's social costs and social benefits in terms of improvement in the quality of life years (QALY) and other measures. In the absence of appropriate benefit measures, the simpler CEA is resorted. CEA evaluates the "effectiveness" of the technology under real (outside clinical) setting.

c. **Social, Legal and Ethical Assessment of Actual and Potential Effects of Medical Technology** - This stage involves assessment and evaluation of the technology's social and cultural acceptability, the legal impediments/constraints, if any, and ethical issues involved in its widespread application.

Generally, MTA entails the following processes (Banta: 1990): identification - monitoring technologies, determining which need to be studied, and deciding which to study; testing - conducting the appropriate analyses or trials; synthesis - Collecting and interpreting existing information and the results of the testing stage, and usually, making recommendations or judgements about appropriate use; and dissemination - providing a synthesis of the information to the appropriate parties who use medical technologies or make decisions about their use.

Obviously, given the plethora of medical technologies, not all of them can be evaluated. Table 25 provides a convenient selection criteria for technology assessment studies.

III. ORGANIZATIONAL CHOICES TO DEVELOP MTA CAPACITY

The vast range and intimidating nature of new and upcoming medical technologies and the complex set of MTA activities pose a real challenge on how to structure the institutions that will undertake assessment activities. Blumenthal (1983) provides a framework for assessing choices in the development of MTA capacity. The option depends on what specifically needs to be done, i.e., the particular activities that will be within the scope of local MTA. Under this model, there are three component activities of MTA:

- * Knowledge development - involves clinical trials, CEA and CBA, and assessments of the social, legal and ethical effects of particular technologies;
- * Knowledge processing - includes systems for gathering, validating, interpreting and disseminating information to public and private audiences; and
- * Regulation - involves direct control and regulation of the development, dissemination, and use of health care technologies.

To be sure, given the country's limited financial and scientific/intellectual resources, not all of the MTA tasks can be done locally; nor is it prudent to do so.

Table 25: Possible Selection Criteria for MTA Studies

Type of Technology	Example/Description
Technologies by function	Preventive, diagnostic, therapeutic, rehabilitative
Technologies by physical nature	Drugs, devices, procedures
Technologies in different stages of development and diffusion	Established, new, emerging
Technologies from different areas of medicine	General medical practice, pediatrics, radiology, surgery, etc.
Technologies that address medical problems that are important because of their high frequency or significant impact	High social costs or high social benefits
Technologies with associated high costs because of high volume or high individual costs	Low-cost, high-volume-of-service technologies; Capital-intensive or import-dependent technologies
Technologies that provide informative material relating to the broader policy and methodological issues of CEA and CBA	
Technologies with sufficient "evaluable" literature	

Source: Adapted from Luce (1981).

In the area of knowledge development, the Philippines does not have the capacity to conduct clinical trials for many if not all of the high-tech devices. But the Philippines must strengthen its capacity for CEA and CBA, and must definitely conduct assessments of the social, legal and ethical impact of particular technologies. These can be done by government agencies, medical schools, academic/research entities or consortia, providers (singly or jointly) interested in adopting a technology, or professional societies. A few activities are being done under the Philippine Council for Health Research and Development (PCHRD), Research Institute for Tropical Medicine (RITM), and the Clinical Epidemiology Unit of the U.P. College of Medicine, but the current level of activities is severely low. For instance, of the 2,288 entries in the Philippine Medicus Abstracts for the period 1987-1990, only three articles

dealt on CBA and CEA²⁶.

In the area of knowledge processing, one is tempted to suggest that the Legislative²⁷ and Executive²⁸ branches of government take the lead, as is the case in the U.S. But the Legislative option in the Philippines is dangerous, given the Legislature's penchant to politicize; the worst thing one can ask for is to allow medical technology to be subject to political intramurals²⁹. A preferred option would be through professional/ trade associations; academic/ research entities; or consortia.

Government control via regulation of medical technology diffusion and use is not practicable and in the long run becomes counterproductive. Moreover, while certain areas/ institutions in the Philippines may be subject to overinvestment in new technologies, it is obvious that the bigger challenge in many areas is technology inducement. Given this dualistic nature of medical sector, self-regulation among hospitals and professional groups may be more appropriate. A joint government-private sector activity or body tasked with MTA and related activities is a good starting point.

One last issue has to be dealt with: the role of social insurance funds and major payors of health care services. Strictly speaking, MTA activities only address questions pertaining to whether or not to pay (or provide insurance coverage to) a particular technology. MTA does not address provider payment/reimbursement (how much, how to reimburse, and to whom payment should be made). The MTA body or agency may recommend that a technology be covered, or covered with certain restrictions or guidelines. The final decision whether or not a diagnostic or therapeutic technology should be covered, and at what level, should be the responsibility of the social insurance fund³⁰ (AH CPR: 1990).

²⁶CEA and CBA in the Philippines have been done more as (a) evaluative efforts of already existing government programs, e.g., family planning, or as (b) justification for foreign-funded projects in the health, population and nutrition sector. In the latter case, such analyses end up as perfunctory sections in the "Economic Analysis" annexes of project papers.

²⁷As is the case with the Office of Technology Assessment, which is under the U.S. Congress.

²⁸As is the case with the Agency for Health Care Policy and Research, which is under the U.S. Department of Health and Human Services.

²⁹The economic rents accruing from the introduction of new major medical technologies are much too high to be left to political processes; we feel that between a free-market solution and a political solution, the former may be preferable in the Philippine context.

³⁰In the early discussions on the National Health Insurance bill in November-December 1993, we suggested the creation of a Provider Practice and Payment Commission (PPPC) to be an advisory body of the National Health Insurance Corp.(NHIC). PPPC would have been the

CHAPTER V: PROVIDER PAYMENT REGULATION

The impact of health insurance - or more generally, provider payment or reimbursement system - on the diffusion of medical technology is little appreciated in the Philippines because of the historically limited financial coverage of the Medicare Program and its noncoverage of high-tech procedures. It is not even clear to this author whether Medicare reimburses providers for their capital costs. In countries with more mature health insurance programs, however, the payment system has a tremendous influence on the diffusion and use of medical technology. The insurance payment system - especially if it is fee-for-service, cost-based, and retrospective - is also a major cause of medical inflation.

As the Philippines prepares for a nationwide health insurance program, the question to consider is how its payment system should be designed such that it provides incentives for doctors, hospitals, and clinics to use technologies that are cost-effective. How can cost-saving technologies be induced, and how can the diffusion of cost-increasing technologies be controlled? The questions are not simple for they involve first, the choice between quality of care and cost and, second, the distribution of resources in the health sector: to doctors, remunerations and careers; to hospitals and clinics, the level of profits and surpluses.

I. REVIEW OF PROVIDER PAYMENT SYSTEMS

Heuristically, provider payment systems can be classified according to whether health care providers operate on a pluralistic environment as in the U.S. and the Philippines, a national health insurance system as in Canada, or a national health service as in the U.K. and other European countries.

A. The U.S.: Pluralism and Micromanagement

* Cost-Based Reimbursement System

A cost-based reimbursement system is typified by the U.S. up until the early 1980s. Under this system, hospitals are paid based on the actual cost they incur in treating patients.

body mandated to make recommendations to NHIC on, among others, the new medical technologies that should receive reimbursement/payment under the national health insurance program. The suggestion did not materialize, and what was adopted - at least in the latest version of the bill - was the (present) direct representation of providers (physicians and hospitals) in the NHIC Board, a clear case, to us, of conflict-of-interest. (It is like Caltex, Shell and Petron having membership in the Energy Regulatory Board.) A second-best solution would be to disallow provider-representatives to vote on issues related to the level of reimbursements.

Such system is a virtual blank-check for hospitals which have the incentive to provide services for as long as the marginal revenues from those services exceed their marginal costs.

As purchasers of technology, U.S. hospitals were liberally reimbursed, including those for interest payments on capital investment. Reimbursement of interest payments, however, lowers the effective cost to hospitals below the true interest rate, thus encouraging overinvestment in marginal projects. The reimbursement mechanism also failed to distinguish resource-saving from quality-enhancing or service-expanding technologies.

Under a cost-based reimbursement, physicians are paid based on the usual, reasonable, customary or prevailing rates. As users of technology, providers under this system are subject to moral hazard. Cost-reimbursed physicians are indifferent to costs that are not borne by themselves or by their insured patients. In fact, as suppliers of services in a fee-for-service setting, physicians often have a positive economic incentive to overutilize profit-generating tests and other services (Warner: 1982). Moral hazard in the U.S. was somehow mitigated by copayment mechanisms, but this added to the complexity of health insurance and somehow did not dampen demand significantly.

The Philippine Medicare Program, as well as local non-HMO private health insurance indemnity plans, continues to operate on a cost-based provider reimbursement system. The inflationary potential of this payment system is large; it has not loomed in the Philippines simply because of Medicare's high copayment rates (low support values) and the general scarcity of resources in the health sector. However, in Manila's and Cebu's "medical enclaves" awash with resources, the inefficiency of this payment system is beginning to show visibly through large investments in technology.

Prospective Payment Systems

In 1983, the U.S. federal government introduced the Diagnosis-Related Groups (DRG) system as prospective hospital payment system for Medicare. Such system is based on a detailed classification of diseases founded on diagnosis, the computation of real resource costs involved in treating each DRG, and the provision of the same prospective payment for each DRG. Thus, hospitals knew beforehand (i.e., prospectively) how much they are going to be paid for each patient. Hospitals that can provide care for the patient within the DRG reimbursement rate realize profits; those who spend beyond the reimbursement rate incur a loss. Unlike the earlier U.S. payment systems, the DRG therefore places the hospital at financial risk for the Medicare patients it treats.

The DRG system has mystified a number of Filipino physicians and analysts as an alternative hospital payment mechanism. Unknown to many, there are incipient local efforts to pay hospitals *a la* DRG. For instance, "package deals" for normal and Caesarian Section delivery and other simple surgical operations are being offered by a growing number of hospitals; these are, in essence DRGs. Thus, while the construction of a comprehensive DRG

system is a daunting exercise, it is not a remote possibility.

What can the Philippines learn from this payment system in terms of its impact on the diffusion and use of technology? In response to a per-case reimbursement system *a la* DRG, hospitals can be hypothesized to behave as follows:

1. Cost-cutting: Administrators will have to make stronger appeals to physicians to limit lab and radiological tests and other procedures, and to shorten length of stay. Cost-cutting may reduce quality of care, although reduction of unnecessary services may in fact raise quality of care. Premature discharge of patients is a possibility.
2. "DRG creep": Hospitals will have the incentive to expand their caseload, and to focus on cases with the highest rates of DRG reimbursement. At the worst, they may decide to specialize on such high-DRG-rate cases and ignore the unprofitable DRGs.
3. Cost-shifting: Assuming DRG is instituted only for Medicare patients, with low DRG rates, hospitals may shift costs to non-Medicare patients, or cater to non-Medicare patients altogether.
4. More outpatient care: Since DRGs only cover inpatient hospitalization, hospitals may be encouraged to operate more outpatient settings to take care of pre-admission and post-discharge requirements of patients. With these settings, hospitals effectively escape the constraining DRG rates.

In 1992, the U.S. federal government also introduced a Resource-Based Relative Value Scale (RBRVS) as a prospective payment system for physicians to replace the then-existing charge-based system. Essentially, RBRVS is a system of paying physicians based on their use of resource inputs including total work input performed for each service; practice costs including office overhead and a practice premium, and cost of specialty training including opportunity costs. The calculations yield values of services relative to each other, hence procedures are scaled against each other. These relative value scales must be assigned a monetary value to be translated into a fee schedule.

A major impact of the RBRVS derives from its recognition that cognitive services are just as important as procedures. Thus, fees for primary care and non-surgical specialties have increased relative to surgical specialties and more intensive/ invasive procedures. Over the long run, RBRVS is expected to have significant supply effects in terms of both individual physician's work-versus-leisure choices and the overall supply of skills in the medical marketplace.

B. Canada: Global Budgetting
under National Health Insurance

Canada's national health insurance is financed through a complex shared federal and provincial tax revenue formula and is viewed by many to be more progressive than the European health insurance systems (Rodwin: 1990). Each province manages its health insurance program independently, but there is portability of access.

Physicians in ambulatory care are paid predominantly on a fee-for service basis according to fee schedules negotiated between physicians' associations and provincial governments. The basic structure is a bilateral monopoly: on the one hand, providers are organized in strong associations and have strong monopoly power; on the other, the monopsony power of a single-payer (the national health insurance program) keeps providers' interests in check (Rodwin: 1990).

Unlike the U.S., most acute-care hospitals in Canada are private, nonprofit institutions. These are paid by the provincial governments' health insurance programs on a global budget basis. In 1969, Ontario Province replaced its line-by-line budgetting with a global budgetting system to finance hospital expenses. The global budget excludes capital expenditures which each hospital must apply for separately. Every year, each hospital in the province receives a fixed sum, usually an increase over the previous year's budget, adjusted for the current expenditure trend in the provincial budget (GAO: 1991). The Provincial Government monitors actual hospital expenditures periodically, although it requires no detailed accounting.

By being able to control capital and operating funds, the Provincial Government is able to control hospital expansions and increases in the number of beds. Ontario follows bed allocation guidelines - 3.5 and 4.0 beds per 1,000 population for Southern and Northern Ontario, respectively - that ensure equitable distribution of inpatient beds.

The Ministry of Health acts as a single payer in the province. It increases the annual allocations to each hospital by a common base percentage to adjust for inflation (GAO: 1991). Hospital administrators allocate these funds according to internal priorities. MOH may provide additional funds for small acute care hospitals to recognize smaller economies of scale; hospitals that experience increase in workload or growth in patient volume for special services; and hospitals with approved new or expanded programs.

Among the lessons that the Philippines can cull from Ontario's experience with global budgets are:

1. **Predictability and flexibility:** Hospital administrators have greater autonomy in making allocation decisions. Global budgetting encourages hospitals to cut costs and use funds more efficiently, e.g., by shifting patients to outpatient settings; bulk purchasing; contracting out laundry services; and merging departments with complementary functions (GAO: 1991). On the other hand, some administrators complain about underfinancing and draconian control over their budgets (Rodwin: 1990).

2. Longer length of stay: To stretch their funds, Ontario hospitals have the incentive to admit and retain as long as possible low-cost patients. These "bed-blockers" prevent physicians from using acute care beds to treat short-term patients.

3. Lower service intensity: Ontario hospitals tend to use less labor, supplies, procedures and equipment than their U.S. counterparts, in practice which tends to favor intensive, high-technology services.

4. Organizational innovations: There has been no effort to devise new form medical-care practice (e.g., HMOs) or new institutions to handle emerging problems, e.g., with the elderly. Global budgets also tend to reinforce the traditional organizational structure which separates inpatient and ambulatory care (Rodwin: 1990).

C. British and European Systems:
Regionalization and Global Budgetting
under National Health Service

Britain's National Health Service typifies the centralized system in Europe. It is financed almost entirely through general revenue taxation and is accountable directly to the Parliament. It provides universal entitlement to all British subjects. Moreover, health facilities are government-owned and managed.

The Parliament determines the global budget which is in two parts: for new construction and capital equipment, and for current operations. Authority to move funds between categories is strictly limited (Aaron and Schwartz: 1985).

The NHS is characterized by a tripartite structure (Rodwin: 1990). The Regional Health Authorities are responsible for allocating budgets to their regions. Hospital physicians (called consultants) are paid on a salary, with distinguished clinicians receiving merit awards. Physicians can see a limited number of private pay patients.

The Family Practitioner Committees, which are outside the Regional Health Authorities' budget, are responsible for paying general practitioners, ophthalmologists, dentists, and pharmacists. GPs act as gatekeepers and are paid on a capitation basis, with additional remuneration coming from special practice allowances and fee-for-service payment for specific services (immunizations, night visits).

The Local Authorities, which are outside the budget of Regional Health Authorities and Family Practitioner Committees, are responsible for the provision of social services, public health services, and certain community nursing-services.

The key aspects of this system are macromanagement and regionalization. In contrast to the American preference for micromanaging providers and patients through fine-tuned

financial incentives, Britain and the European countries guide their health care systems through direct, regulatory edict, e.g., strict limits on the overall capacity of the hospital sector to grow and strong controls on the compensation of providers through price ceilings (Reinhardt: 1989).

Regionalization is realized through planning designed to distribute health care equitably among regions and social classes. Since 1977, allocation of NHS funds across regions has been done through a formula developed by the Resource Allocation Working Party - a formula that represents one of the most far-reaching attempts to allocate health care funds as it incorporates regional differences in health status.

Britain's NHS yields useful lessons for the Philippines as we embark on the design of a national health insurance program:

1. Underfinancing: The NHS, like any publicly-funded social service, is subject to chronic lack of funds. Its resources are extremely scarce by Western standards.

2. More equitable technology diffusion: Although inequities remain, the regional allocation formula has resulted in more even and rational distribution of technological resources. CT and MRI, for instance, were developed in Britain but their diffusion is far less than that in the U.S.

3. "Overreferral" and concomitant inefficiencies: The tripartite NHS structure creates perverse incentives, especially for borderline cases, for GPs to shift/refer patients to hospital consultants (e.g., for diagnostic services), or for consultants to shift cases to social security (e.g., sending aged patients to nursing homes), or for consultants to keep long waiting lists and thereby increase demand for their private services (Rodwin: 1990).

4. Recent strategies to deal with inefficiencies: Cautious attempts were made to "denationalize" the NHS but strong political opposition prevented this from being realized. More recent attempts involve encouraging competition and market incentives (increase in private beds, tax incentives for the purchase of private insurance, contracting out of NHS services like laundry, cleaning and catering); limitation in the list of reimbursable drugs; reduction in the pharmaceutical industry's rate of return; creation of "internal markets" within the NHS; and transformation of larger NHS hospitals into independent self-governing trusts.

II. THE IMPACT OF PAYMENT SYSTEM ON MEDICAL TECHNOLOGY: THE CASE OF KIDNEY DIALYSIS IN THE U.S. AND BRITAIN

The impact of the payment system on medical technology is exemplified by the differential diffusion of kidney dialysis in the U.S. and in European countries. Information about this new technology is more or less simultaneously available in these countries so that

the same opportunities for adoption exist. Thus, differences in rates of adoption and methods of diffusion can be explained primarily by the characteristics of health care financing systems, including availability of resources (Jonsson: 1989).

Dialysis was introduced as treatment for end-stage renal disease (ESRD) in the 1960s. In 1970, the rate of treated people per 1 million population was 25 in the U.S., about the same as the rates in the U.K. (23), France (26) and Finland (25) though lower than that of the Netherlands (36). In 1972, however, the U.S. federal government authorized Medicare to fund treatment of ESRD patients and correspondingly the treatment rates from such therapy dramatically increased. More importantly, the incentive structure shifted treatment from home-based care to hospital- or center-based care. By 1984, the U.S. rate (393 per million) had far exceeded those of Europe: 200 per million in the U.K. and 293 per million in the Netherlands.

The ESRD treatment is expensive and when it became available, it was obvious that it cannot be accommodated under the existing medicare program. Due to a strong lobby to increase access to this new technology, the U.S. government assumed this burden through a special ESRD program. Such program encouraged the growth of dialysis centers because it paid for out-of-pocket costs up to a set maximum fee that covers all costs at centers, including a payment to the physician for each visit. Because patients had been almost fully relieved of the cost of treatment, and physicians had been assured full reimbursement, the rate of dialysis treatment in the U.S. shot up (Aaron and Schwartz: 1985).

The Europeans, especially the British, dealt with the dialysis technology in a vastly different way. The British NHS accommodated this new therapy within the existing system of resource allocation based on a global budget, i.e., it competed with other services for financing, and hospital dialysis competed for limited hospital space. Although dialysis machines themselves did not seem to be a bottleneck, British nephrologists must secure hospital space, obtain the machines, and get permission to hire and train nurses to run them. To get around these hurdles, a high proportion of patients was simply treated with home dialysis. Such home-based care is easier than starting or enlarging a center.

Interestingly, prior to the Medicare's ESRD program, 40% of the dialysis treatments in the U.S. was home-based, but because non-physician home-based care was not covered, doctors had no incentive to steer patients to this less-expensive treatment setting. By 1979, 87% of all dialysis in the U.S. were already being done in hospitals or centers, with respective annual costs of US\$25,000 and US\$20,000; only 13% was being done at home at an annual cost of US\$15,000. In contrast, in 1977 about two-thirds of British dialysis treatments are done at home (costing US\$11,500) while only about a third are done at hospitals (costing US\$18,000). Clearly, the ESRD reimbursement system in the U.S. shifted the treatment modality with very little assessment of marginal costs and benefits.

III. SYNTHESIS: INSURANCE, PROVIDER PAYMENT SYSTEMS AND

DIFFUSION AND USE OF MEDICAL TECHNOLOGY

The impact of insurance and provider payment systems on the diffusion and use of medical technology is a complex subject with many confounding factors. The temptation of a number of analysts has been to conceive, at the most rudimentary level, a profit-maximizing physician as a solo entrepreneur reacting to the incentives provided by insurance reimbursement and choosing his/her production function based on factor costs. Such models, however, are applicable only in insurance settings. A more useful approach, and the one we have taken here, is to review health care systems and the institutional parameters of their corresponding payment systems and cull lessons that can be used in the design of the Philippine health insurance program. The brief review yields the following syntheses which should be read as impressionistic observations rather than conclusive statements.

A. Health as Market-Provided vs. State-Ensured Consumer Good

Health care systems that treat health services like any ordinary market-provided good (U.S.) tend to use technology more intensively than systems in which the state ensures, actively supports, or directly provides health as a good (Canada, Europe). In market systems, the binding constraint is the patient's ability to pay or the private insurer's reimbursement rate, which is usually retrospective (paid after) and therefore cost-escalating, while in state-insured or state-provided systems, it is the global budget/regional allocation, which is prospective (set in advance) and therefore cost-containing.

Market systems are also likely to have multiple payers (multiple financial spigots) while state-ensured systems are likely to have single payers. Single payers tend to manage health care costs - and by implication, technology use - better than multiple payers. Market systems with single payers (as in Maryland and New Jersey sometime in the 1980s) also tend to manage overall health care costs better than their multiple-payer counterparts.

The exact manner in which individual physicians are paid - fee-for-service, fee-per-case, capitation, salary - appears to be a secondary factor. For instance, comparison of U.S. and Canadian experiences shows more technology-intensity in the former even if physicians in both systems are paid on a fee-for-service basis. Similarly, comparison of U.S. HMO and British NHS experiences shows more technology-intensity in the former even if both systems are paid on a capitation basis. Choices within the "technology frontier" is really determined foremost by the amount of resources available in a health care system and only secondarily by the way providers are paid.

B. Micro- vs. Macro-Management

The inflationary tendency and resource-intensity of the U.S. market/private system has been met with micro-management, in what appears to be anachronistic to its private,

pluralistic, competitive nature. U.S. regulators and private insurers have used an expanding array of instruments to influence providers (DRG, RBRVS, volume performance standards, HMO capitation, utilization review, quality assurance, etc.) and customers (copayments, premium rates). In contrast, Canadian and European systems have relied more on macro-management using global budget and regional planning. Global budgets and allocations tend to have better-managed the overall diffusion and geographic distribution of technologies.

C. Regulation vs. Negotiation

Despite expressed misgivings about regulation, the American system appears to be stuck with this mode. While it seems contradictory, regulation has always followed competition. DRG regulation - the "price control" for U.S. hospitals - occurred at the height of the anti-regulatory Reagan Administration. Regulation fills the void that government presence would have filled. In contrast, because of pervasive government presence in Canadian/European systems, negotiation with providers has been the preferred mode. Also, these systems tend not to have any qualms about controls.

CHAPTER VI: REGULATION AND PROMOTION OF INVESTMENTS

Managing the diffusion and distribution of medical technology in the Philippines, as in any developing country, is difficult because of the unevenness of the health sector. While there is pervasive underinvestment in technology and undercapitalization of primary and secondary hospitals in most areas, there are "medical enclaves" that are quite obviously overinvesting, especially on the latest gadgetry and staff specialty training. This "medical dualism", to be sure, is just a manifestation of the overall economic dualism in a developing country.

In the past few years, the DOH has been alarmed over this state of affairs; in many workshops, there have been expressions of the need to "regulate" technology and for the DOH to assure that the acquisition and use of technology be "need driven" rather than "market driven"³¹. However, as far as can be ascertained, there has not been a thorough discussion of the rationale of investment regulation³²; nor has there been formal articulation of what exactly

³¹See, for instance, "Mandate for Hospital Services", DOH Office of Hospitals and Facilities Services, item 3.6.

³²The rationale for investment regulation, especially of high-tech equipment, can be couched in terms of the perceived cost-increasing impact of such technologies; the need to rationally allocate limited societal resources between curative and preventive care; and the need to geographically distribute such technologies more evenly.

the government should do, and how it should do it.

I. INVESTMENT REGULATION

In this section, we focus on the issue of regulating medical investments. We will review the experiences of the U.S., South Korea and Canada in trying to control high-technology investments in health. Does investment control work? Under what conditions is it successful? What emerges from this brief review is that investment regulation alone may not bring about the desired reduction in the diffusion of high-tech devices; medical technology diffusion can be managed only if the provider payment system is similarly directed to achieve that goal.

A. Prior Government Approval: U.S. Experience with Certificate-of-Need

To put a brake on the perceived overinvestment in medicine, the U.S. federal government mandated each state in the late '60s and early '70s to adopt "certificate-of-need" (CON) programs within their jurisdictions. Essentially, CON required hospitals to obtain approval for capital investments exceeding a particular threshold, such as \$100,000, including investments aimed at expanding the number of beds and equipment. Its stated purpose is to eliminate unnecessary investment in expansion of capacity and to halt offerings of new services that were deemed to duplicate existing ones (Rice: 1991).

The CON regulation was carried out by local Health Systems Agency (HSA) boards, consisting of consumer and provider representatives in the area. The HSA boards granted CON approvals purportedly on the basis of their assessment of regional requirements. A facility that expands without a CON approval is subject to legal sanctions. CON regulations were in effect in U.S. states throughout most of the late 1960s and early 1970s but by the mid-70s, it was becoming obvious that CON has failed.

Numerous evaluations on CON show that such regulations were ineffective in controlling total hospital expenditures (Rice: 1991). Econometric estimates of CON impacts using three different measures of investment - change in plant assets, change in bed supply, and change in assets per bed - show that CON programs restricted investment in new beds, but seemed to have inadvertently stimulated investment in modernization and in special equipment and facilities, thereby increasing assets per bed (Salkever and Bice: 1976). Estimated coefficients indicate that although there was a reduction in beds of about 3.5%, assets per bed increased by about 10%, implying greater technology-intensity which ran counter to the cost-containment goals of the CON law.

One reason cited for the failure of CON regulation is pre-emptive investment: hospitals bought more equipment when they faced a constraint on beds. There was also an inherent conflict-of-interest among HSAs which may have seen hospitals as their primary constituency; also, state and local HSA boards often viewed hospital expansion as a positive

step for their communities. Finally, there was no incentive for HSAs to control costs since they were not at financial risk. In view of these negative evaluations, the U.S. Federal Government terminated funding for HSAs in 1986, although majority of the states still maintain some form of CON requirement for capital investment approval.

B. Prior Government Approval: South Korean Experience

Like the U.S., South Korea's health care financing system relies on fee-for-service system of payment to providers. Historically, coverage on the utilization of high-tech medical equipment has been liberal, engendering medical cost escalation. In the 1980s, the Korean government took contradictory directions with regards medical technology: it modernized its public national and municipal hospitals, health centers, and subcenters as part of its Fourth Five-Year Economic and Social Development Plan (Lee: 1990).

But sensing the cost inflation in the private medical sector due to the unabated diffusion and use of high-tech equipment, in 1981 Korea established a National Committee to examine the justification and approve the importation of high-tech medical devices. The Committee, headed by the Deputy Minister of the Ministry of Health and Social Affairs, meets four times a year and decides whether to permit the importation of instruments and devices with a value of over US\$ 140,000 (based on 1988 prices). The devices to be scrutinized include brain and whole-body CT, MRI, gamma camera, ultrasound machines, chemical auto analyzers, laser systems, angiography, lithotriptors, digital subtraction analyzers, hyperthermia, Cobalt 60, linear accelerators, and cancermia.

Table 26 shows the cumulative approvals and disapprovals of high-tech medical equipment in Korea until 1989. From most indications, the policy of obtaining prior government approval for the listed medical equipment does not seem to have succeeded in putting a brake on the importation of these equipment. As of 1989, a total of 1,901 applications with a total value of US\$ 281.3 million have applied for permission, and about 90% of the total value of applications was approved (the average price of equipment being US\$ 147,000). Only 10% of the applications were disapproved.

Table 26: Cumulative Permits and Disapprovals of High-Tech Medical Equipment in South Korea: 1981, 1985 and 1989

Items	Unit	As of 1981	As of 1985	As of 1989
Permits	No.	110	1,188	1,706
	\$000	27,432	138,182	252,079
Whole-body CT	No.	11	43	91
Brain CT	No.	8	51	55
Magnetic resonance imaging or NMR-CT	No.	0	0	5
Gamma camera	No.	13	58	83
Ultrasound system	No.	38	694	873
Chemical auto analyzer	No.	22	246	352
Laser diagnostic system	No.	0	0	57
Angiography	No.	8	29	51
Extracorporeal shock wave lithotripsy	No.	0	0	29
Digital subtraction analyzer	No.	0	0	3
Hyperthermia	No.	0	0	2
Cobalt-60	No.	1	6	6
Linear accelerator	No.	7	20	30
Cancermia	No.	0	41	10
Others	No.	2	41	59
Disapprovals	No.	13	126	195
	\$000	1,629	13,437	29,192

Source: Lee Kyu-Sik (1990).

The failure of the policy to control medical equipment imports is probably due to the absence of clear criteria applied by the Screening Committee (Lee: 1990). While the Committee examined the applying hospital's financial capability as well as the hosting region's economic condition, there was no overarching national policy on medical technology, a policy that would have included a more comprehensive medical technology assessment and selection program as well as more prudent provider reimbursement levels.

At present, Korea is contemplating excluding the use of expensive equipment from health insurance reimbursement. Already, the national health insurance program excludes payment for treatment by laser operation, CT, MRI, lithotriptors among others.

C. Prior Government Approval: Canadian Experience

In Ontario Province, prior government (Ministry of Health) approval is required for the acquisition of certain high-tech equipment and specialty services, including CT, MRI, lithotripters (GAO: 1991). If approved, the hospital receives funds to cover some of the costs of the new service. If not approved, the hospital does not receive operating funds for the equipment or service. Since most hospitals' operating funds come from MOH, hospitals have strong financial incentive to obtain approval before making major expansions or purchases of expensive technology.

Hospitals must also obtain MOH approval of any significant volume change in specialty services such as cardiac surgery, transplantation, and dialysis in order to receive additional operating funds.

The results of this system is government control over capital and operating funds which has resulted in: (a) less distribution of high-tech services among hospitals; (b) cost containment; and (c) queuing for elective procedures.

D. Synthesis: Do Investment Controls Work?

This brief review of the experiences of three countries show that:

1. Direct control of investments is not a feasible means of regulating the diffusion of expensive medical technology under an uncontrolled fee-for-service provider payment system. Such strategy seems better suited under a global budget payment system where the approver has control of both the capital investment and its operating-cost requirements.

2. Regulation of capital imports and investments cannot be made in isolation. It must be part of an overall strategy in medical technology, including the manner of paying providers, and the level at which they will be paid.

3. Where control of investment has been successful, costs have been contained but the system must be prepared for some adverse effects, e.g. longer queues, postponement of elective surgeries.

II. PROMOTION OF CAPITAL FORMATION IN HEALTH

The problem of controlling high-tech investments in Philippine hospitals is probably not as serious as the problem of encouraging investments in resource-poor settings. The plethora of undercapitalized and technology-starved facilities is well-known, but there has been little effort to study why these facilities fail to invest in the requisite technologies. Among the possible reasons that can be cited are:

- * these facilities are just "physicians' workplaces" - the hospital itself may be losing but the physician-owners are profiting from practicing there;
- * they are too small and lack the necessary scale and scope of services to justify investments in the requisite technologies;
- * the Medicare reimbursement rules provide perverse incentives; in fact, current Medicare reimbursement rules do not explicitly cover capital costs;³³
- * they face effective competition from government hospitals;
- * certain tax, licensing and other regulations inhibit their growth;
- * they are saddled with large volumes of "uncompensated care" or "patient receivables" which later turn out as bad debts in their accounts;
- * the capital and credit market is not responsive to their needs.

Proving or disproving any of the above hypotheses is beyond the scope of this paper, although more analytical efforts to examine these issues are highly recommended. Instead, in this section we will review factors related to promoting capital formation. We will also examine a number of financial mechanisms and organizational trends that have emerged - or are emerging - which encourage diffusion of medical technologies hopefully in less-served areas.

A. Financing Medical Equipment:

³³In a misguided effort to provide access (technology) to rural areas, Medicare in the 1970s and up to the mid-1980s constructed its own facilities, rather than reforming its reimbursement system so that already-existing private providers are encouraged to establish facilities.

The Supply of Credit

There are basically four modes of financing medical equipment in the private sector: equity financing, debt financing, capital lease, and operating lease³⁴. In the Philippines, hospitals have historically relied on equity financing (for smaller facilities which are typically started by doctor-entrepreneurs) and debt financing (for larger facilities organized as corporations).

The supply of credit is a critical determinant in the acquisition of major medical equipment. In his review of the credit market for health care, Griffin et al (1992) find a long-standing government recognition - particularly by government financial institutions - of the need to provide development financing for private hospitals in order to enhance growth in the industry and encourage dispersal of health services to the provinces. However, macro-economic difficulties and micro-economic shortcomings of certain borrowers³⁵ conspired to make the credit market unstable in the 1970s-80s. Concessional credit windows by the Government Service Insurance System, the Development Bank of the Philippines, and the Employees Compensation Commission were closed one after the other. Thus by 1990 only the Social Security System had a concessional loan window devoted to hospital development. Today, hospitals are mostly left to compete with other industries in the commercial loan market.

B. Alternative Options for Accessing Equipment

Lease arrangements should provide alternative options for accessing capital equipment. Capital lease is a purchase agreement whereby the risks and benefits of ownership are transferred to the lessee; operating lease is an arrangement whereby the risks and benefits of ownership are not transferred to the lessee and the payments to the lease contract are not sufficient to purchase the leased equipment. Leasing equipment presents a number of positive features, especially in medical care (Eastaugh: 1992):

1. An alternative source of funding when debt or equity funding is unavailable - Leasing reduces the immediate drain on funds associated with a major purchase. As such, it offers flexibility in financing. Also, lease financing establishes a new line of credit that is useful as a supplemental financing source in times of high interest rates and limited borrowing opportunities.

³⁴A fifth method, "fee per use" has been proposed by entrepreneurs to cover sundry hospital items, but this is really a small-scale variation of a lease.

³⁵For example, distressed hospitals in the 1980s showed relative over-borrowing, failure to build effective management, and inability to generate an adequate number of patients.

2. Hedge against technological obsolescence - The hospital can lease equipment for the duration of the equipment's useful life which is frequently less than the item's physical life. The possibility that the cost of future obsolescence will be built into the contract price is partly offset by the higher residual value the equipment may have for the leasing company, which has greater access to resale markets.

3. Better service - The hospital administrator may apply leverage on the leasing company through future lease payment options to force it to provide better maintenance service. Hospital labs with leased equipment tend to have lower downtime and lower maintenance and repair costs.

On the other hand, there are certain features in lease arrangements that are not readily apparent and could reduce its appeal (Eastaugh: 1992):

1. Leasing does not necessarily conserve capital. For example, the lease payments are frequently larger than the combined principal and interest payments on debt necessary to buy equipment. Unfortunately, many hospital administrators are not familiar with approaches to correctly determine the charges associated with leasing. Hospital administrators should force the leasing company to break out the costs that can be expensed rather than capitalized. Such costs include service arrangements, shipping and installation charges, training, and supply fees. (There are certain suppliers who are willing to cover for these.)

2. Leasing does not necessarily have an intrinsic cash-flow advantage. Some lease contracts require the medical care institution to borrow a sum (for security purposes) in advance, which is comparable to a loan repayable in arrears in annual installments.

3. Claims by lessors that leasing rates are lower than borrowing rates are not always valid. For example, miscellaneous leasing charges can effectively increase the effective interest rate over the quoted rate for the term of the lease. Leases often include hidden charges such as late payment penalties.

The upshot of this discussion is that there is a need to carefully review the financial implications of alternative financing options. An analysis must be made of the net present cost of a lease to find the effective rate of interest and then compare this mode of financing with other alternatives. It is important to note that the net present cost estimates of various options are sensitive to discount rates, interest rates, the time span of the lease or loan, the amount of the down payment, and the estimated salvage value of the equipment.

C. Privatization

Privatization can be defined variously. In health care, there is growing consensus that privatization is a spectrum of activities and arrangements. "Full" privatization involves complete divestiture, the transfer (sale) of publicly-owned assets to private individuals or firms

after which the government bears no responsibility for the operation of the assets. "Partial" privatization, on the other hand, is the transfer of a function or activity from the public to the private sector. Examples of partial privatization are:

1. Leasing arrangements, in which the government rents out a public health facility (or a component thereof) to a private entity for a fixed period of time and an agreed-upon rate.
2. Franchising arrangement, in which the government - acting as franchisor, assuming it has property and legal rights to do so - allows private health providers to produce some or all health services in a given area and disallows other providers to operate legally.
3. Service contract arrangements for support services (e.g., laundry, dietary, janitorial and security services in a public hospital) or discrete administrative functions (e.g., personnel recruitment, billings, accounts, information systems, computer maintenance, claims processing and "administrative services only" services of private insurance companies to Medicare).
4. Management contract, in which the government draws up an agreement with a private firm which lays down in detail specific performance standards that the firm is expected to meet and for which the managers will be held responsible.
5. Voucher system, in which the government provides specific population groups (e.g., indigents, cultural minorities, high-risk pregnant women) with vouchers that reimburse private providers for providing voucher-holders with specified health services.
6. Partial divestiture of public corporations, in which the government sells a share of the assets to individual or corporate buyers.

In all of the above examples, a health facility's medical technology will be profoundly affected by privatization. The privatized facility's new owners, co-owners, managers, contractors, or stakeholders will have their own mandates, plans, and arrangements but the specific effects of these changes on the acquisition, diffusion, and use of medical technologies cannot be pre-determined³⁶.

³⁶At the extreme, full privatization may result in the new owners' decision to get rid of a health facility altogether and operate a completely new line of business. This seems to be the (valid) fear with regards the "privatization" of the four specialty government hospitals in Quezon City which are located in prime real estate.

Assuming away this extreme case, however, privatization - the emulation of market principles - is often believed to rationalize a government facility's equipment and technology acquisitions as these have to be based on a demand test, rather than on politico-bureaucratic

D. Build-Operate-Transfer (BOT) Scheme

BOT is a "contractual arrangement whereby the contractor undertakes the construction, including financing, of a given infrastructure facility, and the operation and maintenance thereof. The contractor operates the facility over a fixed term during which it is allowed to charge facility users appropriate tolls, fees, rentals and charges sufficient to enable the contractor to recover its operating and maintenance expenses and its investment in the project plus a reasonable rate of return thereon. The contractor transfers the facility to the government agency or local government unit concerned at the end of the fixed term which shall not exceed fifty years. For the construction stage, the contractor may obtain financing from foreign and/or domestic sources and/or engage the services of a foreign and/or Filipino constructor".³⁷

BOT can be applied in the construction or rehabilitation³⁸ of government health facilities. As an alternative financing scheme, BOT reduces the cash-out financial burden of the government and thus helps in easing the tight fiscal situation. The BOT contractor has complete control over the design, construction, and operation of the project and would presumably be more efficient and cost-conscious than a government entity undertaking such project. The much-vaunted innovative orientation of the private sector is also expected to foster technology transfer (Briones, et al: 1992).

Four years after the BOT policy was spelled out, however, no project of this sort has been initiated in the Philippine health sector. A possible reason for this is the high cost of financing. BOT financing is commercial in nature and therefore carries market interest rates, driving project costs upward. On the other hand, equity investors expect high returns, comparable to or better than alternative investments. Given the generally perceived lower rates of return for social sector projects, it is clear why BOT has not taken off in this sector.

E. Hospital Cooperatives

Hospital cooperatives are emerging as the latest organizational form for financing and delivering health care. Based on scanty information, there are different types of these cooperatives:

decisions.

³⁷This legal definition of BOT is provided for in Section 2(a) of Republic Act 6957 entitled "An Act Authorizing the Financing, Construction, Operation and Maintenance of Infrastructure Projects by the Private Sector, and for Other Purposes". The Act was passed in the Third Regular Session of Congress on July 9, 1990.

³⁸In which case the scheme becomes rehabilitate-operate-transfer.

1. Cooperative of health workers and patients³⁹ - This may be exemplified by the Cooperative Hospital and Cooperative Health Fund in Davao City, organized in 1991 by Dr. Jose Tiongco of the Medical Mission Group. This model has diffused to Bohol⁴⁰ and Quezon Province (Gumaca and Lucena). In fact, it is likely that cooperative hospitals, organized as a group, can be operated as chain hospitals. While this terminology has not been used, it appears from news accounts that these hospitals are moving in that direction.

2. Cooperative of doctors - This is exemplified by the Mother Seton Hospital Doctors Cooperative⁴¹. The cooperative was organized by 39 doctors in April 1994 for the purposes of capital formation, funds generation, medical care delivery, among others.

3. Cooperative of patients - At a rudimentary level, this is just a "patient feeder system" to hospital. Cooperative members may receive hospital discounts.

4. Cooperative of private hospitals - In Bulacan, 31 private hospitals have organized the first Bulacan Medical Services Cooperative, Inc. to address the scarcity of medical facilities in the province. To date, bona-fide members include 13 out of the 24 towns in Bulacan. Hospital owners have signified interest in establishing a capital asset base of more than P2.0 billion in the cooperative.⁴²

The hospital cooperative movement is in a state of flux and it is difficult to make assessments at present. In terms of technology diffusion and use, the following observations can be made: (a) Significant cost savings can be realized if cooperative hospitals, acting as an organized group, purchase equipment and supplies in bulk. (b) The incentive structure in a cooperative is such that from the supply side, member-providers will be induced to be more efficient. From the demand side, however, patients may tend to over-utilize services unless appropriate copayments are imposed, or rewards for non-utilization are given.⁴³ (c) Pure

³⁹The Cooperative Health Fund of Davao provides health coverage including inpatient hospitalization, dental services, medicines, eyeglasses, and lab exams. Contribution is P1,200 a year.

⁴⁰In Bohol, the city government of Tagbilaran is reported to have turned over the city hospital to a cooperative of hospital workers which will lease it for P20,000 a month. It is not clear what the contribution of patient members will be, but the city government is expected to appropriate P500,000 annually to the hospital for charity patients.

⁴¹Information based on Certificate of Registration with the Cooperative Development Authority.

⁴²Medical Observer, April 1994, p. 34.

⁴³For instance, awards for "Healthy Members of the Year".

doctors' cooperative pose monopoly issues, especially if such doctors' cooperative succeeds in getting majority of doctors in a specific location. Their ability to control prices then becomes a public issue.

F. Managed Care Arrangements

Health maintenance organizations (HMOs) have been in the Philippine health care scene since the late 1970s. Up until recently, however, they remained as fiscal agents, collecting contributions from members and organizing care to be delivered by existing hospitals and clinics. In terms of technology, therefore, their impact has been felt in the use of existing capital stock. HMOs' focus on preventive care, gatekeeper concept, and generally conservative approach to medicine implies that this sector has had a sobering effect on hospitals' penchant for expensive and high-tech equipment.

Managed care as a concept and as a policy framework, however, has not caught fire in the Philippines⁴⁴, probably because of its complexity but more likely because of entrenched "fee-for-service" interests.

G. Clinic Franchising

The franchising of health services is another novel mechanism for bringing technology to underserved areas. In the Philippines, this is being undertaken by two national family planning (FP) NGOs as a way of restructuring their relationship with their respective clinics (Picazo: 1994).

A franchise is a continuing long-term relationship between a franchisor and its franchisees in which the franchisor's knowledge, image, products and services, and marketing techniques are supplied to the franchisee for a monetary consideration. The franchise arrangement is built on the cornerstones of franchise identity, operating system, and financial relationship. The operative principle is the standardization of image, menu of products/ services, processes and protocols, price, and financial system.

Under the model FP clinics developed for the NGOs, clinics are provided with a standard benefit package consisting of equipment, training, service protocols and manuals, training and technical assistance, and long-term loan. The clinic-franchise in turn is expected to generate a set volume of clients and revenues, and to repay whatever loan or lease it incurred. This system has been shown to work in various sites in the Philippines and is a sustainable way of bringing public-health technology and services in areas not usually covered

⁴⁴Compare this situation with Thailand whose Social Security Scheme started in 1991 and by 1993 has begun capitation as a payment system for providers, organized along the principles of managed care.

by higher-end providers.

H. Other Methods of Accessing Technology

Two other methods of accessing medical equipment in the Philippines are "networking" and donation.

1. "Networking" - Networking is a catch-all word to capture the various resource-sharing arrangements that hospitals formally or informally have. The networking arrangement may be between two or more public-private hospitals, private-private hospitals, or public-public hospitals. Areas of cooperation have been in bulk purchasing, training, equipment sharing, or other endeavors of mutual benefit. Little documentation and assessment on "networking" exists in the public domain. Its chief virtue appears to be scale-enhancement. On the other hand, private hospitals may be unnecessarily being subsidized by their government counterparts. Absence of information on the quantified costs (administrative and service expenses) and benefits of such arrangements, however, precludes firm conclusions.

2. Donation - No data exists on the magnitude of medical equipment accessed through donation. Donations may be through official bilateral channels (surplus equipment, "tied aid", etc.) or private initiatives. There are no official policies on donated equipment, but government decisionmakers must always "look a gift horse in the mouth". High-tech equipment, though donated, also entails local installation and training costs and tends to worsen the recurrent-cost problem of the government. "Tied aid" or "tied loan" equipment also has stringent supplier restrictions so that when such equipment bogs down, the government is forced to buy supplies from the donor country, usually at non-market prices and engendering long downtimes. This can have serious adverse effects on a government hospital's ability to provide care.

In the private sector, donations from abroad are contentious. The private sector has long asked for tax and tariff exemptions from such imported donated equipment but if granted, they can easily be abused. On the other hand, an under-equipped hospital in some remote area may have a valid reason for asking such exemption because it cannot have access to such technology otherwise.

I. Tariff and Import Valuation

As of the writing of this report, the tariff rate on imported equipment is being reviewed by the Tariff Commission. At present, the rate is 10% to 20%. The review is expected to reduce the tariff to a uniform rate of 3%.

The import valuation formula is also under review. The home consumption value (HCV) system is currently in use but a presidential directive calls for a shift to an internationally accepted one. Proposals include: (a) the transaction value mandated by the

General Agreement on Tariffs and Trade (GATT), which is the price actually paid for the imported goods in a free market; and (b) the Brussels Definition of Value (BDV), which is the price the imported goods would fetch in a free market. Decision on the formula would have to await the Senate Ratification of the GATT.

CHAPTER VII: CONFLICT OF INTEREST IN MEDICINE

Conflict of interest arises from the bifurcation of a person's interests as a professional and stockholder (or stakeholder) in a business entity. It occurs when such professionals are simultaneously owners, employees, consultants or stockholders of companies, or have any financial stake in a decision for which their opinion or expertise is being sought. Examples of conflict of interest in medicine:

- * A scientist hired by the government to evaluate the clinical efficacy of a firm's new technology is himself a part-owner, an employee, or a consultant for that firm.
- * A private hospital administrator becomes a member of a local health board which is mandated by the local government unit to screen new hospital construction or expansion.
- * A physician is owner or co-owner of a laboratory and diagnostic center which he uses to refer to his patients.

In this chapter, we analyze four specific cases of actual or potential conflict of interest: the physician-investors, kickbacks arising from patient referrals, practitioner-regulators, and self-dealing hospital officials. Most cases of conflict of interest have been documented and analyzed in the U.S., but a number of similar cases are now emerging in the Philippines and should be the subject of policy discussions.

a. Self-Referrals - A growing stock of medical equipment (e.g., ultrasound) in the Philippines is being owned by practicing physician-investors, sometimes in partnership with venture capitalists. These may be housed in the hospital where they are practicing, or in free-standing laboratories or "diagnostic centers". If physician-investors refer patients to their diagnostic equipment or centers, a potential conflict of interest exists for it is possible, even likely, that physician-investors "over-refer" patients to their facilities.

The ethical and cost implications of this "self-dealing" arrangement has not been adequately examined in the Philippines. In the U.S., research investigators have shown that physicians who invest in labs and other sources of care utilize them more intensively than those physicians without such investments. For instance, Hillman, et al. (1990) compared the frequency and costs of imaging exams as performed by primary physicians who used imaging equipment in their offices (self-referring) and as ordered by physicians who always referred patients to radiologists (radiologist-referring). They found that (a) the self-referring physicians obtained imaging exams 4.0 to 4.5 times more often than the radiologist-referring physicians; (b) for imaging exams of similar complexity, the self-referring physicians charged significantly

more than the radiologists; and (c) the combination of more frequent imaging and higher charges resulted in average imaging charges per episode of care that were 4.4 to 7.5 times higher for self-referring physicians.

In view of the increasing entrepreneurial interest of Filipino physicians in labs and diagnostic centers, their "self-referrals" should be closely monitored and comparative studies similar to the Hillman analysis should be conducted. Appropriate ethical standards should be developed, e.g., physician disclosure of his/her financial interest, advance disclosure to the patient of such interest, or giving the patient a range of facilities to choose from.

b. Kickbacks and Fee-Splitting - Fee splitting is a situation where one physician pays another (in the form of "kickback") in return for patient referrals. This practice is regarded as unethical and illegal in most cases; in some states in the U.S., the practice is considered fraud and abuse.⁴⁵ No empirical study has been done on this issue in the Philippines.

c. Practitioner-Regulators - Potential conflict of interest exists when practitioners sit in regulatory and planning bodies and vote upon issues that are favorable to them, or unfavorable to their competitors. Examples:

- * Provider representation in government health-payor institutions (Philippine Medical Care Commission, Employees Compensation Commission, local health insurance funds), especially as discussions/ voting relate to provider compensation.
- * Hospital owner/ officer in Local Health Boards who participates in discussions/ voting barring the entry of competitor hospital.

Our informal interviews with providers indicate that physician representatives have not unduly influenced government regulatory⁴⁶ and planning bodies.

⁴⁵In a theoretical analysis of this problem, Pauly (198x) has shown that in a principal-agent context - which is the patient's relationship with the physician - it is possible for fee-splitting to offer incentives which actually improve patient welfare. Fee-splitting may induce the first-contact physician to refer to a specialist physician instead of performing a lower-quality procedure himself. Fee-splitting, thus, can also be a tool for eroding the monopoly power of specialists.

⁴⁶In the early discussions of the National Health Insurance initiative, we proposed that instead of being represented in the board of what will become the national health insurance entity, medical groups should negotiate with the entity on the appropriate levels of hospital payment and physician fees. This proposal does away with the problem of conflict of interest.

d. "Self-Dealing". Hospital Trustees/ Officials - Membership in the board of non-profit or government hospitals is deemed a public service, and such service should not be turned into private profit. Thus, standards imposed upon hospital board members regarding investment of trust funds, self-dealing transactions, or personal compensation may be stricter than for directors of business-for-profit corporations (Pozgar: 1979).

A hospital director, trustee or officer is deemed to have a conflict of interest as a result of a contract or other transaction if she/he, or an immediate family member, is: (a) the party or one of the parties contracting/dealing with the hospital, or (b) has a significant financial or influential interest in the entity contracting or dealing with the hospital, or (c) will benefit financially from such transaction (Baker and Hostetler: 1992).

"Self-dealing" occurs in any of the above instances. The problem can be managed with required disclosure (Pozgar: 1979), i.e., any trustee having an interest in a contract or other transaction to the board for authorization, approval or ratification should make prompt, full and frank disclosure of their interest. The trustee should disclose any relevant or material facts about the contract or transaction that might be construed to be adverse to the hospital's interest. The board must determine whether such a conflict of interest does exist, and if it does, the concerned trustee should be excluded from voting and constituting a quorum where the contract or transaction is under discussion.

The issue of conflict of interest in medicine has not attracted attention in the Philippines but we think it will become a serious public issue in the future. Expectedly, as far as we know, no effort has been made to study this problem, document and classify the types of cases, or quantify their effects. We strongly recommend future social-science and legal research and public discussion in this area.

Apparently, however, such problem is not considered major.

CHAPTER VIII: SYNTHESIS OF ASPECTS, ISSUES AND OPTIONS ON MEDICAL EQUIPMENT AND TECHNOLOGY

This section synthesizes the various issues on medical equipment and technology in the Philippines and presents options to address them. The options must be seen as possibilities rather than a comprehensive policy recipe. We know very little of the current state of Philippine medical technology and how this subsector operates to be able to present a consistent reform program. Our objectives are much more modest: to identify policy tools that can be used to deal with sectoral problems and possibly to stimulate public debate on them.

a. **R.&D.and.Local.Manufacturing** - Health product R & D in the Philippines is severely inadequate and the local industry is very weak. There may be a need to develop/ support local course on biomedical engineering, to provide faculty support, and to fund graduate-level scholarships. Comprehensive support must also be given for the development and fabrication of targeted products. The Health Product Development Group initiated in the mid-1980s should be revived.

b. **Technology Assessment and Selection** - The first set of problems in this area has to do with poorly developed product definitions and data base and the weak local capacity for assessing and selecting medical technologies. There is a need to provide (legal/ generic/ professional) definition of medical technology, medical devices, and medical procedures and to generate regularly updated data on major medical equipment covering imports (new, used), donations (new, used), and where these are installed.

A local capacity for medical technology assessment must be established involving the DOH, research and academic institutions, professional and trade associations, medical NGOs, and major funders/ insurers. The possibility of a joint public-private endeavor must be explored. Such MTA body - whether organized on a formal or informal basis - must conduct literature search on emerging medical technologies, establish an information resource base and clearinghouse on established, new, and emerging technologies, and support studies on cost-effectiveness and cost-benefit analyses. It must coordinate better with the U.S. Food and Drug Authority, the Office of Technology Assessment, and the Agency for Health Care Policy and Research as well as the WHO.

The second set of problems in this area has to do with the rapid and unmanaged flow of imported new technologies. DOH moral suasion on physicians and reorientation of hospital administrators are called for, but these are usually toothless. Stronger policy possibilities include the development of an "essential device list" which can be patterned after the "essential drug list"; the development of a "negative list" of halfway technologies; the formulation of an overall policy on donated and foreign-funded capital equipment; and over the long-term, the formulation of a "medical devices act" which should encompass the above possibilities.

c. **Technology Acquisition** - There are strong indications of an excessive stock of capital equipment in certain Metro-based hospitals leading to cost inflation. Initial activities should focus on generating a data base on the current stock of expensive medical technologies; reporting of these technologies should be part of the DOH licensure and PMCC accreditation and renewal. Further analytical and planning efforts should be made to develop medical equipment-to-population ratios for new technologies, to exercise moral suasion on private providers and LGUs to heed ratios, and to formalize arrangements for technology-sharing.

At present, no policy governs the importation of sophisticated medical equipment. However, with the recent upsurge of imports of expensive high-tech equipment, some sectors in the medical community are beginning to voice the need for greater regulation. As shown in this paper, many possibilities exist in the regulatory field, with varying efficacies. These include certification-of-need; import regulation; and ceilings on hospital expenditures for equipment.

While Metro Manila and other highly urbanized areas are experiencing possible excessive capital formation in medical technology, many peripheral areas are handicapped with inadequate equipment leading to poor patient access. Geographically-specific tax and other fiscal incentives can be tried, but these are looked down by the Department of Finance due to budget deficits. A range of innovative financing schemes, however, holds the promise of bringing technology to underserved areas: cooperative hospitals, clinic franchises, lease and lease-purchase arrangements, payment on a per-use basis, and BOT. Technology-sharing schemes should also be promoted to solve problems with economies of scale.

d. **Technology Utilization** - Overutilization of capital equipment leads to medical cost inflation and/or unnecessary care. To arrest this potential problem, physician reimbursement rules can be reformed to alter physician behavior. Payment systems a la RBRVS can reduce unnecessary technology use, provided balance billing is zero, i.e., patients do not pay the difference that Medicare will not cover. Specialist care, to a certain extent, can be capitated. Studies must be initiated on physician profiling to identify heavy utilizers of technology. Practice guidelines must be further developed with regards use of technology, and possible professional penalties for documented overuse.

Hospital reimbursement rules can also be reformed to alter hospital behavior. One possibility is a cap on hospital revenues for specific equipment. Global budgets and hospital capitation schemes are less intrusive policies that result in less use of technology.

Further studies on conflict of interest in medicine must be made as conflict of interest almost always leads to technology overuse. A data base must be established on nonhospital-based diagnostic centers/ laboratories and the medical professionals who have financial or other interest in these entrepreneurial arrangements. Studies must be initiated on self-referral utilization. Legal research must be undertaken on existing statutes on conflict of interest in medicine. Where warranted, regulation of self-referrals and other forms of conflict of interest

must be formulated. In the end, however, greater patient education is the major factor to counteract potential technology overuse.

While technology overutilization may be taking place in some hospitals, underutilization of (installed) capital equipment is a problem in others, especially in public hospitals. This problem occurs almost invariably due to the politicized nature of public hospital construction where buildings and equipment are placed in areas without economic or market justification. Better location standards, planning and implementation can assist in preventing this problem from happening, but for as long as public investments are a matter of political control, there is very little that can be done.

Devolution has opened up the hornet's nest of each LGU buying its own set of devices to equip its hospitals with little regard for referral setup. To arrest this possibility, the regionalization of medical diagnostic imaging and other expensive technologies must be a policy priority.

e. Resource Allocation - Public resource allocation is outside the scope of this study but it is a major factor in technology planning and management. In general, there is a poor level of allocation for capital outlay in public hospitals. Moreover, given the available capital outlay, hospital construction is probably overallocated while equipment and instruments are underallocated. Again, the etiology of these problems are largely political.

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