

---

# UpDate

---

*UpDate is a section that will report developments in health policy issues and scheduled conferences of relevance to the field. This issue's section reports on a recent conference held at Project HOPE.*

---

## **Appropriate Health Care Technology Transfer to Developing Countries**

Project HOPE  
Institute for Health Policy Seminar  
Millwood, Virginia  
April 26-28, 1982

---

The less developed countries have serious health problems, which are being solved in part with help from modern medical technology supplied by manufacturers in developed countries. None of the parties involved, however, believes that the full potential of appropriate technology has been realized in these countries. Responding to widespread concern over the situation, the Project HOPE Institute for Health Policy convened a conference at the Health Sciences Education Center in Millwood, Virginia to consider the health needs of developing countries, the technology appropriate to those needs, and the problems that have impeded the transfer of technology.

To focus the deliberations, the conference was limited primarily to large middle-income growth nations, rather than all economic levels of less developed countries, and to the intermediate technology appropriate to those nations. Intermediate technology was narrowly defined for purposes of this conference to be the kinds of diagnostic, medical, and surgical technologies—procedures as well as equipment and the systems necessary to support them—which might be used in small and medium-sized hospitals, clinics, or mobile units serving large populations. Technologies likely to be limited to specialized medical centers or use at the village level were excluded, as were drugs.

The conference brought together representatives from lesser-developed countries and from industrial suppliers in the developed countries, as well as other experts in the fields of bioengineering, economics, medicine, and nursing, and representatives from international and U.S. government organizations. In the course of six panels the participants reviewed their experiences, their successes and failures in the transfer of

technology, and suggested ways to improve the process. At the end of the conference the participants separated into workshops to prepare specific recommendations for further action. These recommendations, presented in the final section of this report, are an important product of the conference, and provide the basis for continuing the dialogue begun there.

---

### **The Perspective Of The Lesser Developed Countries**

---

The goal of health policy in the lesser-developed countries is to improve the health of their people. The needs in health are mountainous, as Dr. William B. Walsh, president of the People-to-People Health Foundation, expressed it in his keynote address, and the major problems are diseases which have largely been conquered in developed countries: infectious and parasitic diseases, respiratory infections, problems related to childbirth, and diarrheal disease. In recent years the chronic diseases are also becoming major problems in some developing countries even as they have in many developed countries. These problems, to which much of the newer medical technology produced in industrial nations is addressed, are far down on the priority list of health care concerns in most developing countries. These countries are also burdened by a large and growing population of disabled people, many of them young, and of people who function and feel less well than they could because of the effects of past disease, or of current subclinical infection.

The constraints facing the lesser-developed nations as they attempt to meet these needs are severe: small budgets, the variable and often harsh conditions under which care is delivered caused by erratic or nonexistent electrical power supplies, primitive means of transportation, polluted water, unsanitary conditions, poor communications systems, tropical climates, and shortages of trained manpower. Moreover, conditions vary widely among regions within the country, so that technologies that work well in one area may be inappropriate in another. Great strides have been made in many countries in spite of these conditions, but much remains to be done.

The job remaining would be difficult even if the improvement of health were these nations' only goal, but it is not. These countries are striving to grow, to raise their standards of living, and their choices in health care are shaped by this overriding objective. Some of the policies that limit choices in health care include the need to conserve scarce foreign exchange, which might otherwise be used to import medical technology; the need to increase employment; the desire for more training and technical know-how, both as an end in itself—one of the fruits of growth—and as a base for further growth and technological development. Perhaps the concern expressed most strongly at the

conference by the representatives from lesser-developed nations was the desire to expand their industrial bases, to begin to participate in the production at home of some products they now must import or do without. Developing a nation's industrial base also contributes to the preceding objectives by reducing the need for imports, providing employment, and offering broader scope for the use of trained manpower and the development of a capacity for research.

Successful growth policies will loosen the constraints on the health sector in the future. Here again, choices are made as much with an eye to changing the conditions under which care is now delivered as to meeting current health needs. For example, the lesser-developed countries are actively seeking to train more people. They want technology transfer arrangements that promote more training and a national industrial base because these will contribute to more resources for the health sector in the future and because they are important to the larger goal of growth.

What sort of technology is appropriate for these countries? A number of possible characterizations were considered. Simplicity of operation and maintenance is clearly important in many cases. For any technology, low cost is desirable in view of limited resources. Labor-intensive technologies may be preferred in countries with large numbers of unemployed or underemployed people. There was, however, general agreement that the crucial question is: Does the technology meet the needs of the country? Depending on the situation, the appropriate technology—the technology that best meets the need—might be simple or complex, low or high cost, labor-intensive or capital-intensive. Further, there was general agreement that technology means know-how, not just machines, and that technology transfer must include the knowledge required to use a piece of equipment and to maintain it. Some would also include the knowledge to manufacture it, at least eventually.

---

### **The Perspective Of The Producers/Suppliers**

---

The question of importance for producers and suppliers is: Is there a market in the developing countries? Can medical technology manufacturers and suppliers from the developed countries help the lesser-developed countries achieve some of their objectives in health and in economic growth, and earn a reasonable return on their investment in the process?

Opening a new market requires considerable investment. Research and development may be necessary to adapt a product to local conditions or to create a new one that can operate in spite of harsh weather, erratic power supplies, or other problems. A service organization must be created, either directly or through a national affiliate, to provide information about the product, make sales, supply spare parts, ensure

maintenance and repair, and train buyers in the use and maintenance of the equipment. Companies with experience selling to lesser-developed countries have found that customer education is even more important there than in developed countries. Equipment maintenance was mentioned repeatedly by participants at the conference as a critical problem.

Equipment service organizations are thus very important in lesser-developed countries but conditions in those countries can make them particularly expensive. Transportation, communications, lack of trained manpower, and lack of local suppliers of components can all be problems. Spare parts may be difficult to bring into the country because of import restrictions, and some countries levy import fees on educational services. Translating user and service manuals into the national language is expensive. If service is provided through a foreign affiliate, it can be difficult to enforce high standards. Many manufacturers are simply too small to be able to afford service organizations in each country in which they do business, or would like to. In some countries the market is too small to support such a large investment by any supplier.

Setting up production facilities in the country runs into some of the same problems and some new ones. For example, while import restrictions on the final product are no longer a problem, restrictions on the import of materials needed to produce it often are. These materials must be imported when they are not available in the country in sufficient quantity or quality, but both transportation and tariffs add to the cost of manufacture. Investment in new markets is not only expensive, it can take years to complete. Before committing themselves to the investment, potential suppliers need to know: Are the markets in these countries likely to be large enough? Can arrangements be made that are stable enough to make this investment an attractive prospect? What are the prospects for success, the risks of failure or loss of investment?

---

### **Is There A Meeting Ground?**

---

A question central to the conference was: Is there a meeting ground between these two perspectives? Are there opportunities for mutually beneficial arrangements? Representatives of the suppliers and of the countries described a number of successful technology transfers. But there have also been failures, too many failures, leading to disappointment on both sides. Many moderately advanced countries own a wide variety of intermediate level and sophisticated medical technology. Yet even when the equipment is located in leading hospitals or medical schools, it often stands unused for lack of maintenance. For the technologies that were the focus of the conference, intermediate technologies intended for use outside major medical centers, equipment appropriate to the conditions of the country may not be available, and when it is,

training, maintenance, and service systems are often even less adequate to the task of ensuring that it is used properly. In case after case, the reasons for total or partial failure of a project came down to inappropriate choice of equipment initially, misuse of it, or to extraordinary difficulties in keeping equipment in good running order. Again and again, the need for technical training and for better maintenance and repair service was stressed.

In many cases, the poor choice of equipment could be traced to a lack of information about the range of available alternatives on the part of the buyer, or to a lack of the technical expertise needed to evaluate the alternatives. Sometimes the initial specifications were poorly drawn. In other cases, political pressures were responsible for the purchase of showcase equipment without concern for how, or whether, it might be a good use of resources. Misuse of equipment often stemmed from a lack of user training.

Whether the equipment is well or poorly chosen, keeping it working and working properly is a major problem in lesser-developed countries. The buyers sometimes fail to plan beyond the initial purchase, and frequently funds are not budgeted for repair and maintenance. Shortages of trained people are a problem at all levels—for proper calibration of the equipment, maintenance, repair, and use. When trained people are available, it can still be difficult, sometimes impossible, to obtain spare parts or service and operating manuals. Repair service for problems that cannot be handled by local technicians is often hard to get. If the equipment has become obsolete in the producing country, spare parts may be unavailable anywhere. The result is that many pieces of medical equipment acquired by lesser-developed countries stand useless much of the time.

---

### **Areas Where Change Might Begin**

---

Are there reasonable policy changes that can improve the chances for successful transfers of technology? Two major areas seemed to the conference participants to offer the best prospects, especially in the longer term—the systematic use of planning for technology acquisition, and increases in the numbers of biomedical engineers and technicians in the developing areas of the world.

There was general agreement on the importance of systematic planning. Planning helps decisionmakers to clarify their needs and priorities, and to be sure that all important aspects of a decision are taken into account. Several panelists pointed out that, while the problems in a developing country may be different from those in developed countries, requiring different solutions, the same problem-solving techniques can be used. They offered checklists, drawn from their own experiences, for

the orderly consideration of the steps involved in purchasing an item of medical equipment. In general, the lists began with a consideration of priorities, and proceeded through the evaluation of alternative pieces of equipment, budgeting (including budgeting for maintenance), preacceptance testing, training, and the development of maintenance and repair policies, to the establishment of policies to ensure that supplies for operating the equipment would be available. Stress was laid on the important final step of checking back to be sure that each previous step had been completed.

One speaker pointed out the value of the technical specifications written into the contract both as a way to prompt more careful planning by the buyer and as a way to ensure that the equipment will perform as expected and that supplier services are provided with it. The technical specifications can detail such matters as the types of manuals to be provided, the language in which they are to be written, and the training to be given. Through the specifications, the contract offers buyers in a developing nation an opportunity to set out clearly what is needed in a binding agreement with the supplier.

Increases in the number of biomedical engineers and technicians would complement the planning process. Trained in engineering and familiar with biomedical equipment, these engineers can serve as technical advisers in the purchase of equipment as well as providing the expertise required to run programs of calibration and maintenance. In lesser-developed countries even more than in developed ones, it is important to have trained people oversee repairs by outside service organizations to make sure they are done properly. A program of training was outlined, ranging from a university degree program for full-fledged engineers to programs of two to four years for technicians, and short courses for doctors, nurses, administrators, and others who need a general familiarity with the operation of medical equipment.

Throughout the conference, more specific suggestions were offered, sometimes on the basis of experience, sometimes as an idea worth trying. Many participants mentioned the value of greater standardization in simplifying planning, training, and maintenance. One private corporation assigns its hospitals in other countries to "sister" hospitals in the United States, where they can obtain help with training and the supply of spare parts. It was suggested by one participant that a short-term solution to equipment maintenance and use could be the organization of a traveling repair team which could visit a country several times a year to repair all equipment identified by the country. Routine maintenance contracts and the provision of a package of spare parts along with a new piece of equipment were suggested, although some participants noted that it was not always easy to persuade purchasers that these were really needed and worth paying for.

**A**t the end of the conference the participants were divided into workshop groups and asked to consider what the countries, the manufacturers, and organizations like Project HOPE might do to improve the transfer of appropriate technology. The charge to the workshops had two parts: to identify specific problems and recommend actions to deal with them that could be taken in the next three years; to make other recommendations for future action, not necessarily as specific or short-term as the first set of recommendations, such as further conferences, surveys, and ways to improve cooperation among the groups involved in technology transfer. These recommendations were presented at the final sessions of the conference and are summarized here.

*Information and Training for Decisionmakers.* The conference participants were concerned about the need to improve the decision-making process in some developing countries. It was suggested that an interested organization or agency might sponsor a meeting on decision-making techniques, which would stress not only the need to specify health problems and set priorities for their solution, but the need to recognize the constraints to solution, to evaluate alternative technologies, and to specify and plan for the technological support required to maintain them. Project HOPE and other international organizations, with the help of experts from various countries, could provide technical assistance in problem-solving techniques to lesser-developed countries. This assistance should include an emphasis on the value of contracts as a way to specify training and backup needs, as well as the equipment to be purchased, and to create a clear binding agreement between buyer and supplier.

Many decisionmakers need more scientific advice to help them choose among alternatives in making purchasing decisions. The conference participants recommended that more nationals from intermediately developed nations be trained in bioengineering. Wherever possible, it was suggested, this training should be conducted in universities in those countries, rather than in developed countries. To fill the need in the shorter term, a pool of bioengineers might be made available to developing countries under the sponsorship of an international group. At the same time, decisionmakers in some developing countries need to know more about the value of bioengineers' advice, so that they will seek such counsel when making decisions.

Even when the expertise is available, lesser-developed countries often have difficulty getting the information necessary to make good decisions. As partial remedies, the participants suggested that trade conferences, trade fairs, and exhibitions were good ways to disseminate information about medical technology. A more permanent source of information might be created in the form of a nonprofit information center, perhaps

operated under the auspices of an international organization.

*Information and Training in Maintenance and Use.* The conference participants were particularly concerned about difficulties experienced in maintaining equipment in lesser-developed countries and training people in its proper use. Here again, the training of more bioengineers was seen as part of the solution. Several groups stressed the value of the contract specifications as a way of insuring that the supplier provides training in the maintenance and use of the equipment.

Some developing countries are creating training centers. The conference participants believe this is a promising approach and recommended that additional centers be established, perhaps under the auspices of regional or international organizations. Manufacturers might be able to donate equipment to such centers. An organization such as Project HOPE could help to coordinate such an effort, as well as to develop the educational programs. If training in equipment maintenance could not be provided in the country, trainees might be enrolled in the programs run by manufacturers for their own service people. It was recommended that training should take place in the country whenever possible, so that the trainer would have a better idea of the conditions under which the equipment would operate.

The difficulty of obtaining satisfactory maintenance manuals and user training manuals was mentioned repeatedly during the conference. One recommendation dealt specifically with this problem by suggesting the creation of an international library, ideally with regional branches, which would keep lists of the manuals available and help obtain copies.

*Local Production and Foreign Exchange Problems.* The conference participants sympathized with the desire of the lesser-developed countries to produce more medical technology locally, but could not see any way to promote major changes in the current situation. A survey of countries to find out what equipment they might have the potential for producing or assembling might stimulate further thinking on the subject. It was also suggested that trade conferences bringing together local manufacturers from the lesser-developed countries with suppliers from developed countries might create contacts that could ultimately lead to joint production ventures. To the extent that foreign exchange is a problem, it may make more sense to increase foreign exchange earnings in other sectors of the economy rather than to try to develop local production to match and replace medical products that are currently imported.

*Surveys.* The conference participants recommended several types of surveys to guide planning in the area of technology transfer. The survey of potential possibilities for local production has already been mentioned. In addition, participants recommended that Project HOPE or some other international organization should sponsor a regular survey of medical technologies to determine which are most appropriate for use in



lesser-developed countries. The results should be widely disseminated to policymakers in these countries, where they could be helpful in the formulation of plans for the development of the health delivery system. The survey might incorporate measures of health and health care in its evaluation of technologies, to suggest which are most useful for specific problems. Surveys of the needs of individual countries were also suggested as potentially useful for planning.

*Conferences.* The conference participants agreed that the mix of people represented at this symposium was particularly useful because it brought the diverse groups primarily involved in the transfer of technology face to face to discuss their mutual problems. It was particularly recommended that producers and suppliers be included in future conferences on this subject. Participants urged that future conferences be planned in cooperation with other interested groups, in order to avoid duplication. The following types of conferences were specifically recommended:

- ◆ Project HOPE should repeat this type of conference in other areas of the world, to bring local policymakers and health providers together with representatives from international suppliers;
- ◆ A high-level meeting should be held to focus on the potential for markets in medical technology in the less developed countries, and the problems of developing those markets;
- ◆ A series of conferences should be organized to examine in more detail some of the problems identified at this conference, such as those related to decisionmaking, to manpower training, to joint ventures, and to lending and granting institutions.
- ◆ Finally, it was recommended that the results of this conference be communicated as quickly as possible to a wide range of international organizations.

Louise B. Russell, Senior Fellow  
The Brookings Institution

## PARTICIPANTS

David J. Aho, J.D., Manager, Business Government Issues, American Hospital Supply Corporation; H. David Banta, M.D., Assistant Director, Office of Technology Assessment, Congress of the United States; Howard L. Binkley (Conf. Chmn.), Director, Institute for Health Policy, Project HOPE; Wang Binseng, Sc.D., Bio-Medical Engineer and Electrical Engineer, University of Campinas, Sao Paulo, Brazil; Thomas E. Bray, Manager, Technimatic Program, Medical Systems Operations, General Electric Company; Nancy Chandler, R.N., Associate Professor, School of Nursing, Vanderbilt University; Douglas L. Cocks, Ph.D., Manager, Corporate Affairs Research, Eli Lilly and Company; John Daly, Ph.D., Science Administrator, Agency for International Development, U.S. Department of State; Jose Rodriguez Dominguez, Ph.D., Chief, Department of Research, Centro Universitario de Tecnologia, Goyoacan, Mexico; Murray Eden, Ph.D., Bio-Medical Engineering Department, National Institutes of Health; Ahmed Gaber, Ph.D., Director, Abbasiya Center for Equipment Repair, Ministry of Health, Cairo, Egypt; B.B. Gaitonde, M.D., Medical Officer, World Health Organization, New Delhi, India; John C. Goodman, Ph.D., Center for Health Policy Research, University of Dallas; Purdue L. Gould, M.D., Medical Advisor, Hospital Corporation of America; Joseph Gray, World Travel Business Planning, Biomedical Systems, International Business Machines; He-Quen Hong, M.D., Visiting Associate Professor, Department of Surgery, School of Medicine, University of Pittsburgh; P.H. Hutapea, M.D., Chief, Hospital Development, Ministry of Health, Jakarta, Indonesia; A. Everette James, Jr., M.D., Professor of Radiology and Radiological Services, School of Medicine, Vanderbilt University; Richard J. Johns, M.D., Department of Bio-Medical Engineering, Johns Hopkins University School of Medicine; Donald C. Kaminsky, M.D., Associate Director, Strategic Planning, Project HOPE; Tarek Khalil, Ph.D., Professor of Industrial and Bio-Medical Engineering, University of Miami; Mort H. Levin, Manager, Quality and Regulatory Affairs, Hewlett Packard; Alejandro S. de Leon, M.D., College of Medicine, University of Philippines, Manila, Philippines; Kenneth D. McCauley, Marketing Manager, Analytical Instrument Group International, Beckman Instruments, Inc.; Robert M. Moliter, Manager, Government and Industry Affairs, Medical Systems Operations, General Electric Company; Theo Morgenstern, Vice President, Hospitalia International; Kenneth C. Mylrea, Ph.D., Department of Electrical Engineering, University of Arizona; Jorge Ossanai, Ph.D., Public Health Specialist, Inter-American Development Bank; Luis Patino, Ph.D., Director, Technical Services—Diagnostics, International Division, Warner-Lambert Co.; Fred M. Reiff, Division of Environmental Health Protection, Pan American Health Organization; Uwe E. Reinhardt, Ph.D., Professor of Economics, Princeton University; George A. Roper, Chairman, Science Department, College of Arts, Science and Technology, Kingston, Jamaica; Louise B. Russell, Ph.D., (Rapporteur), Senior Fellow, The Brookings Institution; Ira D. Singer, Policy Analyst, Project HOPE Center for Health Information; Rajko Tomovic, Ph.D., Faculty of Electrical Engineering, University of Belgrade, Belgrade, Yugoslavia; Russell L. Trimble, P.E., Director, Clinical Engineering and Bio-Medical Safety, Henry Ford Hospital; Wouter Van Biene, Vice President, International Projects and Development, American Medical International, Inc.; William B. Walsh, M.D., President and Medical Director, Project HOPE; William B. Walsh, Jr., Vice President, Strategic Planning, Project HOPE; William J. Walsh, III, Coordinator for Bio-Medical Research and Health Affairs, U.S. Department of State; Herman R. Weed, Director, Bio-Medical Engineering Center, Professor of Electrical Engineering, The Ohio State University; Charles Weiss, Jr., Science and Technology Advisor, Projects Advisory Staff, International Bank for Reconstruction and Development; Zhen-Min Yang, M.D., Visiting Professor, Department of Anesthesiology, School of Medicine, University of Pittsburgh; Victor M. Zafra, Director, Bureau of Medical Devices, Food and Drug Administration; Jing-Fan Zhang, M.D., Visiting Professor, Department of Anesthesiology, School of Medicine, University of Pittsburgh

Reproduced with permission of copyright owner. Further reproduction prohibited without permission.