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Creation of a unified management information system for three NGOs in the West Bank and Gaza

Health, Development, Information and Policy Institute

Creation of a Unified Management Information System for three NGOs in the West Bank and Gaza

The Health, Development,
Information and Policy Institute (HDIP)

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CONTENTS

ACRONYMS

ANE	Asia and the Near East
HDIP	Health, Development, Information and Policy Institute
ID	Patient Identification Number
IVCHS	Improved Village and Community Health Services
MEDA	Euro-Mediterranean Partnership
MIS	Management Information System
MOH	Ministry of Health
NGO	Non-governmental Organization
PFS	Patient's Friends Society
PHP	Pilot Health Project
TRC	Technical Review Committee
UHWC	Union of Health Workers Committees
UNFPA	United Nations Population Fund
UNRWA	United Nations Relief and Works Agency
UPMRC	Union of Palestinian Medical Relief Committees
USAID	United States Agency for International Development
WANA	West Asia and Northern Africa

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BACKGROUND

The West Bank/Gaza Pilot Health Project

High fertility with short birth intervals is a pressing health problem for both mothers and children in the West Bank and Gaza. While immunization rates are high and infant mortality is relatively low, the effects of early marriage, immediate and frequent childbearing, and high total fertility adversely impact maternal and child health. In addition, the Palestinian Ministry of Health (MOH) has recently documented that both breast and cervical cancer are the leading cancers among Palestinian women.

The goal of the Pilot Health Project (PHP) has been to improve the health status of Palestinian women and children. To do so, this project upgraded the quality of antenatal and postpartum services for mothers and their children in selected areas where three NGOs provide health care services. The pilot activity's design is based on an innovative strategy with synergistic approaches for reaching the mother and her newborn as a pair (the mother/baby dyad) during the antenatal and postpartum periods, when both are vulnerable to unfavorable health outcomes.

The PHP's Management Information System Participatory Process

The Health, Development, Information and Policy Institute (HDIP) was given the responsibility to develop a management information system (MIS) for the collection, storage, processing, and dissemination of information for PHP clinics. The PHP envisioned the creation of a unified system for the efficient and reliable assessment of data pertaining to the health of women and infants, as well as clinic operations. The MIS was designed to monitor the progress and impact of the PHP objectives, while also serving as a platform for future health care programs, (e.g., the forthcoming Improved Village and Community Health Services project).

In cooperation with the Palestinian MOH and various health care providers and MIS professionals, HDIP worked through a carefully organized and highly participatory process to design and develop the MIS for the PHP. This report reviews that process and presents the features of the MIS.

Coordination with the Palestinian MOH

HDIP worked in close cooperation with the MOH in the development of unified forms. The MIS, which was developed for the PHP, directly incorporated indicators from the existing MOH system in order to ensure compatibility in measurement. Representatives from the MOH's Women's Health Directorate and MIS specialists working with the MOH were key members of the project's expert group, which was responsible for the design of standardized client records and forms. The reproductive health variables drawn from the MOH client records were used as a starting point from which to develop PHP MIS indicators to ensure that the system would conform to records used at MOH service delivery points. MIS final reports produced by the MOH's system were also reviewed in order to determine the type of

reports that the PHP system should produce. In this manner, the indicators used in the MIS and in the reports it generates are directly comparable to the MOH system.

Coordination with IVCHS

In addition to working with the MOH, HDIP conducted several post-implementation review meetings with the staff of the USAID Improved Village and Community Health Services Project (IVCHS), which is the expansion phase of the PHP. HDIP conducted a detailed review of the unified patient record and MIS software with the IVCHS team and representatives of the MOH in order to receive their feedback and comments. Following the comments and requests by IVCHS and the MOH, HDIP made revisions and changes to the patient record and software, making the system compatible with the needs of the expansion project and the Ministry.

Consultation with other Agencies

HDIP participated in several consultative meetings in order to promote coordination and cooperation with other organizations working on health management information systems (MIS) in the region. HDIP carried out an investigation of United Nations Relief and Works Agency (UNRWA), United Nations Population Fund (UNFPA), and World Bank projects on health information systems, and the planned scope and objectives of the PHP's MIS were shared with their representatives.

HDIP also participated in a consultative meeting in October 2001. That meeting furthered the development of linkages between information systems in the Palestinian health care system and promoted coordination between governmental, donor and UN agencies, and NGOs. The meeting was attended by the Palestinian Minister of Health, and by representatives from USAID, the Population Council, the World Bank, the British Council, the Italian government, UNRWA, and the Euro-Mediterranean Partnership (MEDA) team (technical assistance to the Council Regulation Representative office). Each of these agencies presented information on the MIS systems currently in operation or under development. The meeting resulted in a proposed framework for coordination among donors and partners and a strategy for achieving standardization.

EVALUATION OF EXISTING MANAGEMENT INFORMATION SYSTEMS AMONG PHP PARTNER CLINICS

The first step in the design and development of the PHP's management information system was an assessment of the women's and infant health information systems in use by PHP partner NGOs. This review provided information about the organization and quality of management information systems in the West Bank and Gaza, and suggested areas for improvement and coordination. HDIP also investigated, through field visits and consultations, the development of the MOH's MIS and the women's and infant health MIS currently used by UNRWA. In addition, consultations were held with executive staff of UNFPA, leading health service providers, and health research organizations in an effort to cooperate and collaborate on the development of a new MIS.

Methodology

In order to effectively manage and organize the information gathered through the field investigations implemented by HDIP's MIS review team, the following procedures were implemented:

Overview of Forms

Prior to visiting the MOH, UNRWA, and partner NGO clinics, the HDIP MIS review team obtained copies of all the forms relating to women's and infant health utilized by the clinics, including client records, daily logs, monthly reports, and maternal and reproductive health charts and reports.

Field Visits

Field visits to clinics were scheduled ahead of time with partner NGO staff, the MOH, and UNRWA, so that clinic staff were prepared and available to consult with the MIS team. During the field visits the team examined medical records, forms, reports, and filing systems. Extensive discussions were held with clinic staff regarding the utilization of forms and reporting procedures.

Review
Immediately following the field visits, each member of the MIS team completed a field visit form. This form was designed to remind investigators of the key indicators that would be included in the design of the new MIS. Based on observations, notes and comments were then combined into field reports. Each field report contains comprehensive and specific details on the information system of each institution (partner NGOs and other organizations).

Summary of Findings

This assessment revealed that PHP partners were collecting large amounts of data through the information systems that were in place, especially in the areas of maternal, child, and reproductive health. However, the accuracy and efficiency of data collection and reporting required improvement.

Areas of Weakness
The following summary reflects the major areas of weakness found within PHP partners' health information systems. The new MIS system was developed with the intention of improving upon these areas of weakness.

1. Data Aggregation and Analysis
Due to the lack of computerized databases at the clinic level, the aggregation of data for monthly reports was extremely time-consuming and created multiple opportunities for error, (health workers reported spending two to three days working on monthly reports). In addition, the manual retrieval of information from client records only allowed for the aggregation of a limited amount of variables. Due to the inefficiencies of a manual information system, much of the valuable information gathered at the clinic level was not aggregated for analysis.

2. Indicators and Trend Analysis
The information systems allowed for retrieval of a very limited number of indicators. Standardized definitions were not being used by the different systems. Indicators of outcome variables were usually analyzed for only limited managerial purposes (e.g., crude caseload estimates and broad categories) and for very limited time periods. Due to this lack of standardized indicators and analytic capacity, the potential for trend analyses was limited.

3. Data Flow
The PHP clinics needed to improve data flow procedures. A new system was needed to structure and standardize the flow of data beginning with the client's visit to the clinic and ultimately ending with trend analysis of clinic performance for management purposes.

4. Reporting and monitoring
Each of the PHP partner NGOs collect large amounts of pertinent and potentially useful data, but routine monthly and annual reports reflect only a small portion of that data. In addition, the analysis or monitoring of any one segment of a population could not be carried out easily because of the way data was organized. Differences in case definitions and collection procedures precluded comparisons between NGOs or analysis of PHP-wide performance.

5. Data Duplication

One of the major problems found within the existing clinic client records at the start-up of the PHP was that the same information regarding any individual client was being recorded in multiple places and in multiple (and different) record forms. This was especially true for client demographic information.

6. Missing Data

Previous systems suffered from incomplete or missing data. Client records were not always complete, especially with regard to information on socio-economic or demographic characteristics. This may be due to the fact that the same information was recorded on other record forms, and community health workers did not wish to repeat the information. However, the various forms were not linked or otherwise filed together.

7. Classification, Case Definitions and Training

The assessment clearly indicated that there were several discrepancies in the classification of postnatal care services between clinics and even providers. For example, monthly reports did not accurately reflect the number of postnatal care services rendered because: 1) home visits during which women receive postnatal care were classified separately from postnatal services; 2) family planning was not classified as a postnatal service; and 3) the case definition of postnatal care was not clear among health workers. Further, not all institutions have or utilize a guide that outlines the use of their respective information systems, and health workers in some clinics reported that they had not received any training on data recording beyond initial instructions on the use of forms.

8. Feedback

The information systems in place were not well structured and most institutions were not monitored. Feedback from the institutional centers to service providers was minimal and inconsistent.

9. Filing Systems

There was no standard filing system found among PHP partners, and not all of the clinics kept records pertaining to an individual woman together in one file. The volume of records and files kept by clinics was substantial and in need of reorganization to make information readily retrievable for purposes of research, planning, and monitoring.

10. Updating

There were several forms found at all the partner clinics with information that had not been updated, especially in the area of socio-economic and demographic variables. For example, once a family-based file is created, the information regarding the head of household collected during the initial visit was not updated to add possible changes, such as in occupation or residence. Also, because the age of the client is not recorded by birth date in some clinics, it was impossible to keep track of the age of the client without constantly updating the recorded age. The simple and routine elements necessary to maintain valid and reliable information on individual clients were absent in the previously used systems.

11. Community Data

All of the clinics assessed lacked recorded socio-economic and demographic information about the communities they serve.

12. Lack of a Holistic MIS View

The overarching issue confronting PHP partner NGOs was the lack of a holistic view of the structure, design, and potential use of a health information system. The data collected at the clinic level could not be fully utilized, as there was no structured system with protocols and procedures for data flow, aggregation, analysis, or feedback. For efficient, accurate, and beneficial use of such a system, all personnel require training in the overall structure of the MIS and its potential uses.

Strengths and Potential Capacities

Although several shortcomings in existing management information systems were revealed by the preliminary assessment, many programmatic strengths were also identified. Chief among these is the capacity of PHP partner clinics to effectively manage a computerized MIS. The following list reflects some of the other strengths found in the assessment:

1. Maternal and Child Health as a Priority

PHP partner NGOs and the MOH have clearly made maternal and child health a priority, both within their service provision and in data retrieval relating to antenatal, postnatal, and reproductive health.

2. Comprehensive Data Collection

The health records within the PHP partner clinics include all the pertinent information necessary for retrieval of the specific PHP indicators, as well as other important health indicators.

3. Personnel

The personnel with whom the MIS team met were extremely cooperative and informative, and clearly have the interest and capacity to upgrade their information systems.

4. Experience in Development of Forms

PHP NGO partners have experience in developing forms through previous projects conducted in cooperation with their centers and various funding agencies.

5. Enthusiasm toward Improvement and Development of Existing Systems

PHP partner NGO administrators and service providers have expressed their enthusiasm and need for an improved MIS among their clinics.

THE UNIFIED WOMEN'S AND INFANT HEALTH MIS

Objectives

The following objectives guided HDIP in the creation of an MIS for the PHP:

1. To measure PHP outcome and service performance indicators to monitor the health status of women and infants in PHP communities and the services provided by the PHP partners.

2. To provide a sustainable upgrade to existing information systems.

3. To unify and standardize client records and forms among PHP partner clinics.

4. To assure proper recording and storage of data at the clinic level.

5. To provide easy access to data.

6. To improve the validity and reliability of data for planning, research, and human resource development at three levels:

    a) The clinic level (for self-monitoring of service provision and health status of communities served);
    b) The NGO administrative level (to monitor service provision and health status of communities served);
    c) The MIS database center level (for overall management of the system, trend analysis, and feedback).

7. To serve as a platform to coordinate with the MOH's national information system that can be adopted by other agencies and projects in the future.

Outcomes

HDIP sought to achieve the following seven key outcomes in the MIS project:

1. Sustainability
The new MIS will be a sustainable upgrade of previous information systems and improve management use of data. Rather than burdening clinic health workers with more forms to be completed, the new system will have standardized and unified patient records and forms. Reports will be generated routinely so managers can clearly and concisely review service performance indicators.

2. Increase in Trend Analysis and Monitoring
The new MIS will increase the accuracy of data collection as well as the amounts of data stored. For those clinics that have been computerized, the system will allow for retrieval of disaggregated data on site by target population and other indicators. This capability increases

the frequency of clinic-level analysis of the health status of women and infants and monitoring of service statistics. Trend analysis of selected indicators will be continuously conducted by HDIP, as it will function as the main database center.

3. *Increase in Reliability*
   Unified and standardized patient records will improve the internal and external reliability of the PHP's data on routine clinic operations. Manuals for health workers and NGO managers will be developed for training in operational procedures. These measures, in addition to ongoing supervision and monitoring, will significantly reduce the number of inaccuracies found in previous systems.

4. *Retrieval of Specified Indicators*
   The system will be based on client records rather than service delivery log-books to allow for easy retrieval of PHP and other important health status indicators (see Box 1). This expanded database can serve as a platform for future research and broader management purposes. It represents a substantial investment in institutional capacity building that will yield benefits for research and management in the years to come.

5. *Elimination of Filing Problems*
   The new MIS will reduce the amount of space needed for filing records and forms by ensuring that all information regarding any one patient is stored in one place.

6. *Elimination of Data Duplication*
   The unified records will be designed such that data is not entered into more than one field. This will also lead to a decrease in the amount of missing data.

7. *Recording of Community Data*
   The system will be designed to store demographic data, socio-economic indicators, and health status indicators for surrounding communities allowing clinics to target particular health issues and enhance overall service provision.

Box 1: PILOT HEALTH PROJECT INDICATORS

Outcome Indicators

- Caseload by reason for visit (antenatal or postnatal care, family planning, newborn or child follow-up visits, day 40 clinic visits, home visits by community health workers)
- Percent of women and babies who return to the clinics for postpartum care (including day 40 visits) out of those who received antenatal care
- Percent of women who accept a family planning method out of those who made return visit to the clinic for postpartum care
- Percent of low-parity women (with 1-2 living children) who accept a family planning method
- Average birth interval (months since last live birth)
- Number of antenatal visits during pregnancy
- Week (in pregnancy) of first antenatal visit
- Percent of pregnant women with at least two tetanus immunizations
- Percent of babies under four months old breastfed exclusively
- Number of living children at first use of a family planning method
- Number of living male children at first use of a family planning method
- Percent of women of reproductive age (15-49) using family planning by method used
- Number of new acceptors of family planning by method used/month
- Number of health education sessions conducted at the clinic by topic/month
- Monthly number of Pap smears conducted at clinic or referrals given
- Monthly number of breast examinations conducted at clinic
- Percent of high risk pregnancies referred to high risk center or clinic

Service/Health Indicators

- Place of delivery of last child (hospital, clinic, home, other)
- Family planning use by woman's current age
- Percent of babies with low birth weight during last pregnancy (less than 2,500g)
- Prevalence of anemia among pregnant women
- Percent of births attended by skilled health personnel at last delivery (excluding traditional birth attendants)
- Number of children born alive that later died
- Outcome of last pregnancy (live birth, still birth, abortion)
- Current illness of baby (diarrhea, respiratory, hospitalization)
- Immunization of baby
- Number of positive results found in Pap smear tests and breast examinations

Socio-Economic Indicators

- Woman's current age
- Woman's years of education completed
- Children ever born alive by sex and mother's age
- Number of living children by sex and mother's age
- Woman's work status
- Age at first marriage
- Age at first birth
- Percent of women married to relatives (first cousin on father's or mother's side or other relative) and percent married to non-relatives
- Husband's age
- Husband's years of education completed
- Husband's work status
- Average household size
- Percent of households with electricity
- Percent of households with running water
- Percent of households with indoor toilet

MIS DEVELOPMENT STEPS

Following the assessment of existing health record keeping systems in the West Bank and Gaza, HDIP began to develop the Pilot Health Project's management information system in cooperation with the MOH. This new, unified MIS directly incorporates the seven key principals articulated above. The development process involved a series of stages which included reaching consensus among PHP partners on the objectives and design features of the new MIS, the formation of a technical review committee, development of the unified patient record, development of the computerized patient record (software), and training, pilot testing, and implementing the new system. A series of post-implementation review meetings were held with the PHP partners, the MOH, UNRWA, and the IVCHS project team, after which the unified forms and software were revised according to the comments and needs of partners.

Step 1: Define Objectives of the PHP's MIS

The HDIP organized a series of meetings with PHP partners, including the MOH, and it was decided in August 2000 that the MIS should be built upon medical records existing in Palestine, using the MOH records as a foundation. PHP partners agreed that the MIS should be both expandable and sustainable, and that it should provide comprehensive data on key maternal and child health indicators. PHP partners also decided that the MIS should be developed as both paper forms and computerized software.

Step 2: Development of the MIS

Unified Client Record

In May 2000, HDIP and Population Council staff visited the MOH headquarters in Gaza to learn about the details of their existing MIS. At that time, all MOH medical records were collected and used as a foundation for developing the PHP's MIS.

In December 2000 a technical review committee (TRC) was formed consisting of MOH, UNRWA, and all PHP partner representatives. During December 2000 and January 2001, this TRC carried out a series of technical workshops and corresponded to reach a consensus on the content and design features of the unified patient record. Special consultation took place between HDIP and MOH representatives in order to ensure that the new MIS would be based upon MOH records.

In February 2001 all of the PHP partners reviewed a draft of the unified patient record. HDIP incorporated their comments and in March 2001 the final draft of the unified patient record was sent to the MOH and all PHP partners for final review. HDIP next began working with consultants on the computer programming of the record. In July 2001 the first version of the MIS software was presented to the PHP Coordinating Council.

Step 3: Training and Pilot Testing by PHP Clinic and Management Staff

The unified patient record and computerized record-keeping program were pilot tested in two clinics for one month. The results of the pilot test were used to fine-tune the MIS. For example, some variables and case definitions needed to be clarified and unified among service providers. Beginning in July 2001, HDIP held a series of training sessions for PHP clinic management and staff. Training was conducted on use of the unified patient record, basic computer (Microsoft Windows) applications, and the computerized patient record.

Four community health workers and one doctor from each of the two UPMRC clinics in the Hebron area were trained to use the new patient record, Windows applications, and MIS software. In the Jenin area, 28 UPMRC and PFS community health workers, two nurses, three doctors, and one primary health care supervisor were trained to use the patient record, and 10 community health workers were trained on Windows applications and MIS software. In Gaza, four UHWC community health workers, five nurses, two doctors, and two midwives were trained to use the patient record, and three doctors and three nurses were trained on Windows applications and MIS software. Comments and feedback received from health providers during the trainings were taken into consideration during the revision and re-programming stages of the development of the MIS.

Step 4: Implementation and Follow-up

By September 2001, all PHP clinics were using the new MIS and data entry was underway. HDIP hired staff in Jenin and Gaza to collect data from clinics with computers, enter data from paper forms, and send the data to HDIP once a month. Data collectors also provided follow-up and supervision at clinic sites. HDIP's MIS specialist worked with community health workers, nurses, and partner NGO managers to follow-up on training, trouble-shoot, and guide system users through any difficulties with the records or software.

Step 5: Post-implementation Review

After PHP partners had used the MIS for several months, HDIP made every effort to gather comments and feedback from the system users, partner NGO management, and the MOH, UNRWA, and IVCHS teams. A survey was carried out among partner NGO system users and

managers to assess the patient record and software, ensure that all case definitions were clear and that forms and software were simple and easy to use, and that procedures and data flow were clear and carried out properly.

A post-implementation review was also carried out with the IVCHS team and MIS experts from the MOH and UNRWA to ensure that the MIS was suitable for use by these agencies in the future.

Following the post-implementation survey and review meetings, HDIP used the comments and feedback received to revise the unified patient record and MIS program. This revision included condensing the forms to avoid any possibility of duplication, increasing the level of automation in the software program (so that system users would be able to have a comprehensive view of all files relating to an individual patient at once), and revising the record flow for logical sequence according to standard clinic procedures.

Step 6: Re-programming, Re-installation and Training

After finalizing the revised patient record, the computerized version was updated to adjust to the final changes in the forms. The finalized program was then re-installed at clinic sites, and HDIP carried out a follow-up training for system users to familiarize them with the revisions made to the record and software. HDIP data collectors gathered previously completed patient records and re-entered the data into the revised system.

THE UNIFIED WOMEN'S AND INFANT HEALTH MIS SYSTEM DETAILS

Unified Patient Record

- Family File
  The PHP unified patient record for women's health services includes a family card that contains information on the household unit, including demographic and socio-economic variables relating to the husband and wife. This card contains information on all women's health service clients residing within the same domicile.

- Maternal Card
  Stored within the family file, the maternal card is completed for every antenatal case and contains important information about the client's medical and pregnancy history. The card is updated regularly and all other case-related files are kept with it.

- Pregnancy Card
  This card is filled out as the first step to any maternal clinic visit. The health professional uses this card to identify the type of visit (i.e. first visit, new case, follow-up) and the nature of the case (i.e. antenatal, postnatal, gynecological, family planning, breast exam, Pap smear, or counseling). The woman's health information is recorded, including menstruation, pulse, blood pressure, and weight, as well as any diagnosis, treatment, or referral.

The unified patient record also includes the following files, classified by the nature of the visit, with information on case histories, diagnosis, and referral:

- Antenatal
- Antenatal Home Visits
- Postnatal
- Postnatal Home Visits
- Gynecology
- Family Planning
- Medical Exam Card
- Breast Cancer Prevention Card
- Community Activities

The Computerized Patient Record

The unified patient record has been computerized and integrated within a software program for the MIS. This MIS program was developed with a front-end/back-end methodology. Programming was carried out using Visual Basic as the front-end, and Microsoft Access and SQL Server as the back-end for storing data. Data is stored in Access tables at each of the computerized clinic sites and gathered periodically and sent to HDIP headquarters, where it is replicated on the Microsoft SQL Server.

One of the primary objectives of this MIS program was to simplify the process of gathering and entering data by the health professional. The new process eliminates duplication, decreases the possibility of human error, unifies the data entry forms among NGO clinics, and guarantees data collection on the major health indicators the PHP needs for research, analysis and reporting. To achieve these goals, the MIS software was designed to be as user-friendly as possible. With pull-down menus, list-boxes, check boxes, option-buttons, and enforced automation, typed data entry is kept to a minimum, decreasing the possibility of human error and enhancing the ease of data entry. Eight clinics were supplied with personal computers with internal zip drives, and two laptops were used in other clinics. Other features were built into the MIS program to increase efficiency, including grouping related data, matching computerized forms with printed forms, using WHO ICD10 for standardization of diagnosis, and logically sequencing and structuring the forms. The final program was developed using the One Stop Shop design. The user can click on the patient tab, and information from all files related to that patient appears on the screen to view, access, or print.

The MIS search engine enables system users at each of the clinic sites to retrieve reports about a particular patient or aggregate data on the 42 system indicators (see Box 1), sorted by program (i.e. antenatal, postnatal or family planning) or time period (months or years). This capacity allows health service providers, supervisors, and managers access to comprehensive information about the cases at their clinic in order to assess patients' needs and define treatment priorities.

The search engine will also allow the administrators at the MIS headquarters to generate reports showing data related to 42 indicators, sorted by region, by clinic, or comprehensively for all PHP clinics as well as by month or year, as specified by the user. These reports can provide important information for feedback to the institutional headquarters of the various health service providers.

Data Collection Procedures for Computerized and Non-computerized Clinics

Manual data recording
Each PHP clinic was provided printed copies of the unified patient forms to record information during patient visits regarding women's and infant health, including family planning. These records are completed and filed manually at the clinic level.

Computerized data entry
As part of the PHP's MIS project, computers were provided to those clinics with the highest caseloads. Four computers were provided to the Union of Palestinian Medical Relief Committees (UPMRC), three to the Union of Health Work Committees (UHWC), and one to the Patient's Friends Society (PFS). PFS also received

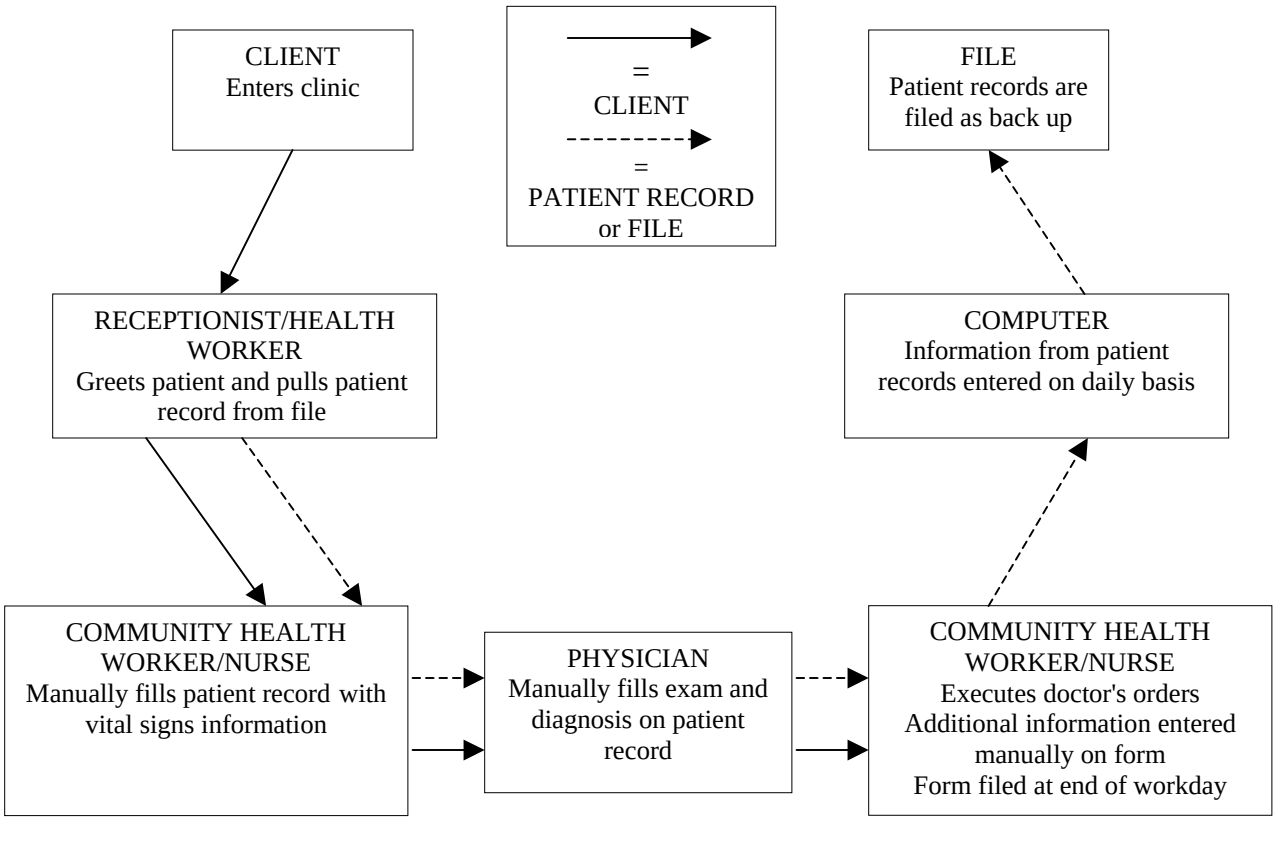
two laptop computers that are used by physicians during clinic visits for data entry. Clinic health workers or nurses in clinics with computers enter data from the patient records into the program daily or weekly, depending on caseloads.

Computerized clinic procedures

Clinic clients receive a client card with a family file number, a patient file sub-number, and a personal identification (ID) number. When the client first enters the clinic, she is greeted by a receptionist or community health worker who pulls her patient record from the files based on her ID number or family name. The client then sees a physician who manually records data on the form based on the examination. At the end of the visit the client returns the form to the community health worker or nurse for any additional information that needs to be recorded.

The patient's form is set-aside until the end of the day for data entry. The clinic nurse or community health worker enters patient data into the computer during a period designated for data entry. If the patient is new, the nurse or health worker will create a computer file for her. After the data is entered, the patient record is returned to the files for storage (see Box 2).

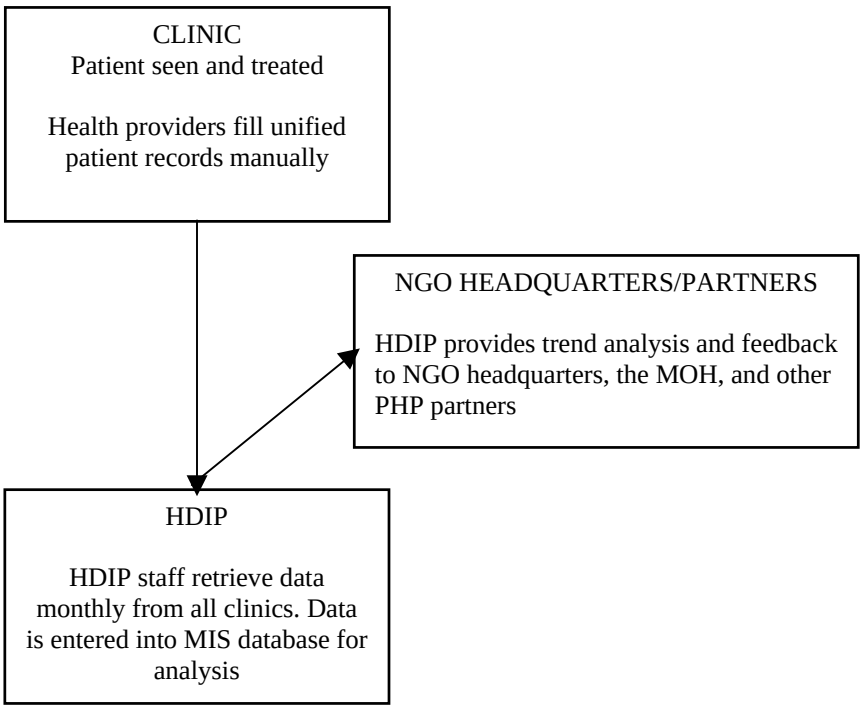
Box 2: PROCEDURES AT COMPUTERIZED CLINICS



Data retrieval

Two data collectors were hired by HDIP (one in the Jenin area and one in the Gaza area) to copy data from the computers at the clinics in these regions and send it to HDIP on a monthly basis. These data collectors also retrieve data from clinics without computers through field visits, using laptops to enter data directly from patient records into the MIS (see Box 3). The laptops are circulated among the clinics in accordance with work schedules and caseloads. The data collectors also monitor data entry procedures and provide on-site technical assistance and support to system users.

Box 3: DATA FLOW



The HDIP MIS specialist worked closely with the data collectors. They mapped the locations and operating schedules of the clinics prior to data collection in order to determine the most appropriate routes and timing for field visits. Because it was often impossible to travel within the West Bank and between the West Bank and Gaza, the MIS specialist communicated by phone on a daily basis with the data collectors to supervise the data entry process and provide technical assistance and support.

CHALLENGES

The political situation in the West Bank and Gaza during the past two years has made the implementation of this project a great challenge. The Israeli siege and closure of all Palestinian towns and villages and widespread destruction of infrastructure made movement within the occupied territories nearly impossible. HDIP was challenged to develop creative solutions in order to implement the activities necessary to develop this MIS. The medical staff and health professionals of the Pilot Health Project service delivery NGOs were frequently unable to reach their clinics due to the sieges, and likewise, access was often denied to patients trying to reach these clinics.

The first obstacle that had to be overcome by HDIP in the early stages of the project occurred because PHP partners could not reach Ramallah to attend the MIS training program. Therefore, HDIP had to hire trainers in the Nablus area for those NGO staff in the Jenin district and separate trainers in Gaza. A "training of trainers" was conducted by phone and email. HDIP staff were able to reach the Hebron area and train clinic staff there. The second round of training on the revised forms and software had to be carried out by consultants who were trained by the HDIP MIS specialist by telephone and email.

Distributing patient records to the 27 partner NGO clinics and installing the software at NGO computerized clinic sites was also very difficult; even though individuals in some cases were able to get around Israeli checkpoints and blockades, trucks and cars most often were not. A special courier service was hired to transport patient records and computers to Jenin, Hebron, and Gaza, and program installation took place using a program called PC Anywhere, which allows for data transfer by telephone. Telephone and electrical wires were frequently damaged, which made follow-up difficult and forced data entry at the local levels to fall behind.

Collecting data from the clinics also presented a major difficulty for HDIP staff. Rather than have them travel back and forth between checkpoints and roadblocks, HDIP frequently had to reserve hotel rooms so that data collectors could stay near the clinic sites until all data entry for that area was complete.

During April 2002, the West Bank was under complete military occupation and curfew. The HDIP office was occupied for three weeks, used as a military operation center by Israeli soldiers, and was severely damaged. The curfew in Ramallah and the destruction to the office delayed work for two months.

Despite these substantial constraints and extraordinarily difficult circumstances, HDIP was able to develop a unified patient record that is currently in use in all PHP clinics. The MIS computer software is completely operational at computerized clinics and at HDIP system headquarters. However, some of the activities originally planned for this project were not implemented due to delays caused by the challenges described above. HDIP could not generate management reports for trend analysis and feedback for partners as had they planned because not enough time had passed after the system was revised and re-installed to produce and enter sufficient data (see Box 4). Additionally, HDIP was unable to carry out a final post-implementation dissemination

meeting to discuss the results of the MIS project with local and international partners and agencies working in the MIS field.

Box 4: REPORTS GENERATED BY THE UNIFIED WOMEN'S AND INFANT HEALTH INFORMATION SYSTEM

Patient files	• Patient profile (records and cards) • Summary of patient visits
Management reports	• Women registered in women's health • Monthly caseload
Analysis reports (monthly or yearly)	• Number of clinic visits for each program • Number of clinic visits for each type of case (first visit, new case follow-up) • Reports according to selected program (dynamic selection) • Cross tab reports for the clinics and all programs in different years • Number of clients in a clinic by year
Accounting	• Clinic • Patient • Storage
Daily reports	• All programs • Family planning program
Reports in graphics	• Graphical reports according to clinic • Graphical reports according to case • Graphical reports according to program
Notification reports	• Preventive test follow-up • High-risk pregnancies or alert pregnancies • Postnatal home visits
Home visits reports	• Postnatal • Antenatal • Community activities

RECOMMENDATIONS

Health management information systems are essential instruments in the development of health systems and general services. If properly utilized, health management information systems allow service providers to monitor clients' needs, as well as monitor and prioritize service provision effectively. Health information systems also allow primary health care practitioners to participate in the policy making process. The data retrieved by this system can be vital for both researchers and policy makers in order to assess community health needs and balance priorities at a national level.

HDIP recommends that this MIS be installed at all Palestinian MOH women's health clinics and that the MOH serve as a centralized national information system. The MIS should eventually be distributed to all major service delivery structures, and systems should be developed to provide data at the district level as well as the national headquarters. Developing a national MIS would require human resource development for system users and data analysts at local and national levels.

HDIP further recommends developing a unified referral form that should also be computerized and incorporated into the MIS program. A referral system must be developed where the data flow would start at the primary health care center, with referral to secondary and tertiary care centers and feedback to the original center. The referral form should also be used between service providers in the country.

In the future, this information system should be further developed to include child health indicators, as well as all other primary health care service indicators. Furthermore, this MIS system can be universalized, incorporating all health services with primary health care centers as the entry point.