BHIS: to ensure a healthier population through timely information
Ministry of Health

Vision

We envision a national health care system which is based upon equity, affordability, accessibility, quality and sustainability in effective partnership with all levels (sectors) of Government and the rest of society in order to develop and maintain an environment conducive to health.

Belize Health Information System

Vision

By 2013 Belize will be the leader in Central America and the Caribbean with a national, integrated, reliable, information and communication technology supported system that provides quality information for evidence-based decision making. The system will promote the appropriate use of information for improving the quality of life for all Belizeans.
Hon. Pablo Marin, Minister of Health

“The Government of Belize is proud to share our experience in realizing a truly national health information system. It is a remarkable achievement but most importantly it is a tool that enables us to improve the quality and effectiveness of health care for all Belizeans. We invite you to learn from our experiences and to come and see our system in operation. It is our sincere hope that BHIS, which showcases Belizean innovation, will help contribute to the fight we are all waging in delivering improved and effective health care.”

Health Metrics Network:
A global partnership

Health Metrics Network (HMN) is a global partnership that facilitates better health information at country, regional and global levels. Partners include developing countries, multilateral and bilateral agencies, foundations, other global health partnerships and technical experts. Most importantly, HMN seeks to bring together health and statistical constituencies in order to build capacity and expertise and enhance the availability, quality, dissemination and use of data for decision-making.

Dr. Beverley Barnett, PAHO/WHO Belize Representative

“Health information is at the heart of the public health system. In promoting and protecting the health of the population, it is critical to know and analyze the health situation, especially of vulnerable groups. Without a reliable health information system that is user-friendly and which provides quality information that can be used in various ways, it is difficult to judge if the health system is doing the right things, and doing them right. The Belize Health Information System, a "bottom-up", home-grown system, will go a long way in ensuring that health of the people of Belize continues to improve. The Pan American Health Organization is pleased to support this effort, and to facilitate sharing the Belize experience and the lessons learned with other countries. We will continue to work with the Ministry of Health, the Health Metrics Network, and other partners to address this very important area.”
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Belize lies on the eastern or Caribbean coast of Central America, bounded on the north and part of the west by Mexico, and on the south and the remainder of the west by Guatemala.

There is a low coastal plain, much of it covered with mangrove swamp, but the land rises gradually towards the interior. The Maya Mountains and the Cockscomb Range form the backbone of the southern half of the country, the highest point being Doyle's Delight (1124 meters above sea level) in the Cockscomb Range.

Belize is often described as a "melting pot" of cultures, all intermingled to form the Belizean identity. Belize boasts several distinct ethnic groups like the Creole, Mestizo, Garifuna, Maya, East Indian, Chinese and Mennonite. These all blend to form a people with a wide diversity of cultures, traditions and beliefs.

There are many rivers, some of them navigable for short distances by shallow-draught vessels. A large part of the mainland is forest.

The area of the mainland and cayes is 8,867 square miles. The country's greatest length from north to south is 280 kilometres and its greatest width is 109 kilometres. The climate is subtropical, tempered by trade winds.
BHIS: to ensure a healthier population through timely information
The Belize Health Information System (BHIS) is a fully integrated health information system that provides every citizen with an Electronic Health Record and seamlessly supports individual and public health.

BHIS connects the Government with every citizen, hospital, clinic, lab and pharmacy in every corner of the nation. This system enables effective centralized management of national, regional, or local health sectors. BHIS uniquely addresses the global requirement for evidence-based health sector management by ensuring that relevant information is appropriately and immediately available throughout the sector.

Understanding that the central transactions within the business of health care are between clients and health care providers, the hub of BHIS is the Electronic Health Record.

From accounting to pharmacy, the entire cross-section of functional experts that comprise the health sector is put into motion by the result of the meeting between client and clinician.
The BHIS national and comprehensive approach facilitates an immediate improvement in clinical care, enables evidence-based decision making and offers actuarial analysis as a basis for performance improvement and a sustainable health information system solution.

BHIS is a web-based system designed to be used in any type of health facility, from hospital to health outpost.

The BHIS is a sector-wide information system. Whether the user is a clinician, administrator, supplies clerk or laboratory technician, BHIS automatically communicates the appropriate information to the rest of the team.

From outpatient encounters to vector control and from human resources to supply chain management, BHIS covers all key health sector management needs.

**Rationale**

The rationale behind BHIS is to improve individual health outcomes and public health performance, and optimize resource utilization.

Individual health outcomes are improved when clinicians have highly accessible, standardized and accurate longitudinal health records. Better information enables better decisions.

Public health performance can be achieved by having an accurate view of the state of public health. This, in large part, is the aggregation of individual health outcomes.

Optimum use of resources is enabled by visibility of:

- health trends
- outbreaks
- supplies usage
- human resources
BHIS Modules

BHIS consists of a set of mostly interdependent modules surrounding the central Electronic Health Record (EHR) and Admissions-Discharge-Transfer functions. The following list briefly describes the chief functions of BHIS key modules.

EHR – ADT: Electronic Health Record and Admission Discharge Transfer

These two modules capture personal data for each client and record the key details of each of their encounters. The system records longitudinal health data both chronic and acute in nature.

COE: Clinician Order Entry

This module creates, dispenses, cancels and administers prescriptions. Integrated with EHR-ADT modules, for example, the COE module provides warnings based on patient allergies.

FIN: Financial

The FIN module determines the overall cost and price for a patient encounter by recording costs and prices for medical supplies, procedures, services and administrative activities, including source of payment. This module is highly adaptable, accommodating virtually any pricing or costing model.
MCH: Maternal Child Health
The primary purpose of this module is to help identify high-risk pregnancies. It records a wide, and client configurable, array of pregnancy and delivery details.

HIV: HIV/AIDS
This module records the data collected during pre/post testing counselling as well as HIV/AIDS clinic visits. It records client risk factors and history to aid in risk assessment and contact tracing. It utilizes the WHO staging criteria to help track the client’s progress.

LAB: Laboratory and Testing
Covering a broad range of typical laboratory tests, vitals and radiology, this module enables the user to create orders and record and publish results.

SCM: Supply Chain Management
The SCM module tracks the inventory of pharmaceuticals and medical supplies at each facility and across the entire nation. It enables administrators to reduce waste by tracking inventory in a First Expiry First Out (FEFO) manner. It is tightly integrated with the Clinical Order Entry.

PH: Public Health
This module records health activities that are not primarily focused on an individual client. The broad range of activities include environmental health, vector control and some client-based events such as, poisoning, domestic abuse and animal bites. It manages communicable disease notifications based on facility-specific thresholds.

HR: Human Resources
This module records the complete set of health sector jobs and job placements. Assists human resources departments to administer staff, jobs, performance/discipline reviews, leave requests, qualifications and continuing education credits.
Origins of BHIS

The Belize Health Sector Reform Project (BHSRP) was a US $30 Million project designed to provide universal health care access for all Belizean citizens. The project involved considerable capital and organizational changes.

In 1999 the Belize Health Sector Reform Project was in need of external project management guidance, which Accessstec Inc., of New Brunswick, Canada was retained to provide.

Accessstec's industrial engineering staff recognized that more than capital projects and organizational restructuring was required to effectively provide universal access.

From an industrial engineering viewpoint, nothing should be done unless it can be measured. The delivery of health is no exception.

Accessstec Inc. and the Ministry of Health came to realize that some type of national health information system was needed to support an effective Belize Health Sector Reform Project.
Realizing the Need

An information system was needed to ensure that appropriate information was available where and when people needed it. Following are some of the goals of the Belize Health Sector Reform that the system would support:

- universal access for patients
- following of protocols
- management of stocks
- correctly targeting public health interventions

Belize needed a single, sector-wide system which provided need-to-know data for:

- clinicians
- administrators
- logistics personnel
- policy makers and planners
- public health officers
- epidemiologists
- other actors in the health care sector

All actors in the health sector are producers and consumers of information. Belize needed a way to effectively and efficiently capture, share and use this information.

There were 'silos of information' systems for specific subject matter experts. However, these systems were not inter-connectable or widely used. Duplication of data entry was often required, with little return of information for the effort.

This system should allow the Chief Executive Officer of the Ministry of Health, Director of Health Services, District Health Officers, administrators and managers to understand what is happening in each region and facility.

Ultimately the system needs to measure the activities taking place in the health care system. This will facilitate management through information and improve resource utilization.
Belize Searches for a Solution

Under the direction of the former Ministry of Health CEO, Henry Anderson, the BHSRP team researched existing technologies and found that nothing appropriate existed.

Belize needed a health information system that would be:

- sector-wide
- multi-facility
- sustainable
- suitable for the Belizean environment

It would also allow one client: one record; and encompass the health sector from public health to individual health.

At that time, the vast majority of Electronic Health Record systems were designed for use within a single facility and had a particular focus.

Recognizing both the limitations of existing systems and the necessity for a new approach, the Government of Belize chose to work with Accessstec Inc. in introducing a revolutionary new health information system that would connect the entire nation’s health sector and seamlessly support individual and public health.

Accessstec's Solution

Accessstec Inc. is a Canadian industrial engineering firm that specialises in international information technology development and has experience that spans 27 nations and nearly 4 decades.

The Accessstec hypotheses are:

- Clinician interface is the central transaction of health care.
- Comprehensive, high quality and standardized data should be captured as close to the source as possible.
- Individual and public health provision are inseparable.

Accessstec Inc. approached the design of a health information system as one that puts clinical information at the centre of effort and provides reliable system access in a challenged network environment.

Most other systems were and are extensions of scheduling, accounting or logistical systems and therefore placed clinical data capture at the periphery of the product. This is a failure to recognize that every service within health care is designed to support care provision, not vice-versa.
Joint Application Development

With the input of health care leaders and experts from across Belize, the Ministry of Health and Accesstec’s team of industrial engineering and software architects embarked on a Joint Application Development to define detailed requirements of the Belize Health Information System.

The group visited different areas of Belize and met with doctors, nurses, pharmacists, clerks, epidemiologists, administrators, a wide variety of support personnel and subject matter experts. These meetings were used to describe the vision of the Belize Health Information System and to capture requirement needs from all system stakeholders.

Accesstec Inc. created a system requirements specification (blueprint) for the BHIS based on the Joint Application Development outcome.
BHIS Tenets

**Individual health care provision and public health are inseparable**
It is a mistake for either a clinician or a public health officer to imagine that their practices are entirely distinct or separate.

**Single Instance Capture**
Capture data once and then share it. Data is best captured as close as possible to its source, in a standardized format.

**Sustainability**
Fiscal, technical and human resource sustainability is required.

**Standardization**
The captured data must be understandable and sharable; selection of data standards must be done with this in mind.

**Availability**
Local system availability must approach 100%. The system must be operable in the event of internet outages.

Replication

BHIS approaches network coverage via an innovative data replication system. The BHIS networking technology provides system functionality even when connectivity fails.

Each care facility has a complete and secure version of the BHIS database on its node server.

Each facility node server is continuously seeking to synchronize with the central master data store, usually located at the Ministry of Health, to upload and download the data created since the last synchronization.
Phases Approach

The Ministry of Health and Accesstec Inc. approached this project with an implementation strategy that sought to find successes early and often.

The experienced project management team understood that the vision of a truly national health information system ideally required network connectivity and resources that simply did not exist.

They decided that the best approach was to design a system that could eventually be implemented in all areas of the country, but that could begin wherever existing resources could support it and grow from there.

The implementation was a continual balance between planning, consensus and action.

Phase 1

Phase 1 of the BHIS project delivered the following:

- formation of the BHIS-IT unit
- selection of standardized datasets
- capacity strengthening for the BHIS-IT unit
- end-user training
- go-live at the national referral hospital

Phase 2

This Phase extended the reach of BHIS both geographically and technically.

Phase 2 included the following:

- introduction of additional modules
- capacity strengthening for the BHIS-IT unit
- end-user training
- go-live at multiple facilities
Phase 3

Phase 3 activities were completed almost entirely by the BHIS-IT unit with some remote support from Accessstec Inc.

During this Phase the BHIS-IT unit dramatically expanded the reach of BHIS. This expansion included:

- facility networking

- hardware procurement and installation

- end-user training for hundreds of individuals

- national system go-live

- constant support for end-user

The Supply Chain Management Module, as an example, is now fully configured and is used throughout the country.

BHIS now captures in excess of 80% of national individual health encounters. The quality and scope of this information ensures its daily utility in planning, policy and operations.

The operational scope of BHIS was also expanded greatly during this Phase. The BHIS-IT team’s unending enthusiasm and dedicated efforts have lead the sector to begin operational use of more and more BHIS modules.
Phase 4

Phase 4 is the future of BHIS.

In keeping with the balance between planning and doing, BHIS is constantly evolving.

The system support team is tasked each day with supporting the facilities and health sector actors across Belize who depend upon the system. Concurrently, the system will continue to evolve as a performance management tool.

The system will be evolving to further aid the users in the performance of their functions. Through an integrated digital experience and utilization of appropriate metrics, the system will be embedded in the sectors institutions as an integral tool in their daily work life.

We are optimistic that BHIS will be a productive tool in the health sector in Belize for a long time.
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