

TECHNOLOGY CONSULTING

IN THE GLOBAL COMMUNITY

Final Consulting Report

Palau Social Security Administration and Healthcare Fund

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Carnegie Mellon University



Republic of Palau Social Security Administration and Healthcare Fund Executive Summary

Student Consultant, Brittany Pruitt
Community Partner, Jonathan Eberdong

I. About the Organization.

The Republic of Palau Healthcare Fund (HCF) has the strategic objective of providing Palauans with the financial protection needed to access health services and achieve Universal Healthcare Coverage. The HCF was created through the National Health Care Financing Act of 2010 and is Palau's first national healthcare financing program.

The mission of the Healthcare Fund program is to promote the health and social welfare of the citizens of the Republic of Palau through the establishment of a healthcare financing system that provides free or subsidized healthcare for its citizens.

II. Design Database Structure for Medical Records Entry in Existing Online Clinic Interface

The healthcare landscape in Palau is changing rapidly, leading to the need for more expensive medical care which increases the pressure on Palau's national health insurance program. The primary goal of this project is to design a solution that will equip the HCF with access to the medical records data needed to get a better picture of the health of the population, specifically amongst the youth as an indicator of Palau's future healthcare demands. The HCF wants to have the ability to better predict what to expect by having a medical records database where information on members' diagnosis, treatment, medication and other clinical data can be shared between HCF and its healthcare provider network. This will be achieved by expanding the data structure in its existing database, which is currently accessed by authorized users through a webform, to accept entry of a subset of the medical records data collected during a patient's encounter. The advantages of enhancing the existing system are that it is accessible to both the providers and HCF staff as they are already authorized users and have experience entering data into the system. The system provides HCF staff with the ability to consolidate and view a member's medical records data across providers and grants them the ability to run queries and create reports on specific data fields of interests to inform decision-making.

The following outputs and outcomes were produced:

- Identification of key data needs and sources.
- Documentation of business requirements for medical records database.
- Assessment of on-island healthcare providers data management practices.
- Mapping of data elements to Belau National Hospital to facilitate the data integration process.

- HCF Medical Records Database Project Team to carry out additional project tasks of purchasing additional servers, testing, training, and operations and maintenance.

The following risks to sustainability should be considered by the HCF as development continues:

- The lack of a national standard for clinical data presents a risk of collecting unstructured data that will be difficult to analyze.
- Decisions made on terminology standards hospital’s development of an EMR system presents a risk to the integration process that is adopted for this system and will need to be monitored.
- The clinics will not have adequate human resources and time in their current organizational workflows to effectively adapt to entering medical data.

Additional Recommendations

Promote Establishing a Cross-Organizational Committee Responsible for Setting Policy and Standards on Health Information Exchange

Delivering quality healthcare services on a national level requires the setting and enforcement of healthcare standards that define the set of requirements (data structure, file format, protocol, procedures, processes, systems, etc). To be most effective, these standards must be met and agreed upon by all organizations within the health ecosystem. The core functions of this committee would be setting the healthcare information exchange standards the country will follow in the future and developing a national policy framework for the exchange of health information. This committee will lay the foundation for the HCF to meet its goal of an integrated national health information exchange in Palau that closes the data gap between government and providers.

Seek Technical and Capacity-Building Assistance from Regional Health Information Networks

Palau has the ability to partner with the regional health information network organizations to collaborate and receive assistance on developing their standards for healthcare data. Regional networks such as the [Asian eHealth Information Network \(AeHIN\)](#) or [Pacific Health Information Network \(PHIN\)](#) provides member countries with technical and capacity building assistance for developing a national digital health infrastructure that is specific to their country's context, while in collaboration with other nations in the region. By collaborating closely with these organizations the HCF will enable itself and its partners to reach its long term goal of an integrated national health information exchange.

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Brittany is a 2nd-year Global Masters in Public Policy and Management Student. She will continue her studies in Pittsburgh this fall.



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The mission of the Healthcare Fund program is to promote the health and social welfare of the citizens of the Republic of Palau through the establishment of a healthcare financing system that provides free or subsidized healthcare for its citizens.

Palau's program is modeled after Singapore's national healthcare program, which was established in 1984. The HCF was funded with an initial capital investment of \$50,000 on April 1, 2011. In the 10 years since its inception, the HCF has reached \$17.8 million in invested assets and \$3.1 million in cash for operations. The HCF provides health insurance coverage for 94% of the population with 18,309 people insured. Coverage now includes preventive services and inpatient care and Off-island referrals to healthcare provider partners in Taiwan and the Philippines. It has been stated that the Palau HCF is one of the "best-run national health insurance programs in the Pacific" with many governments in the region requesting copies of the landmark legislation "to adopt in their own jurisdictions". As far as the HCF staff knows it is currently the only active program amongst the Pacific islands.

Prior to the implementation of the HCF, the cost of health care delivery in Palau was high and prohibitive for most of the population. These cost issues were exacerbated by the rapid epidemiological transitions to more cases of non-communicable diseases which are costly to treat. As the program grows and Palau's healthcare needs shift, the wages in Palau are not increasing at the same rate. The costs to operate the HCF have increased almost seven fold to what's being contributed into the subscription costs which are a percentage of wages.

The primary goal of this project is to design a solution that will equip the HCF with access to the medical records data needed to get a better picture of the health of the population, especially amongst

the youth as an indicator of Palau’s future healthcare demands. The prevalence of non-communicable diseases (NCDs) in Palau have reached epidemic levels in the last 20 years, with over 70% of deaths in the country being due to NCDs. The Palau NCD Prevention and Control Strategic Plan of Action 2015–2020 (Palau NCD Plan) recommended coordination between government agencies, civil society, and the private sector to address the NCD epidemic. In order to address the core issues of the NCD epidemic and other population health concerns in Palau, national leadership needs to be able to see the trends in medical records data. Some of the major questions the HCF wants to answer are:

- What is the health outlook for the current generation of youth in Palau?
- What are the population health trends for non-communicable disease diagnoses?
- Will the amount of monetary contributions currently being made into the fund be sufficient to cover the anticipated costs in the future?
- What changes should be made to the HCF’s pricing model to optimize the Healthcare Fund to remain sustainable?

Facilities

Palau SSA and HCF are housed in two separate, but nearby buildings located on Koror Island. A brand new HCF office has been built by the HCF and was completed in November 2020, however the SSA staff is currently located in a temporary set-up and will be moving to the new facilities at a later date. The new building is a part of a government initiative titled “One Stop Shop”, where in the next year all related government servicing agencies will be in one place. The HCF building is partially used by the Palau Community Health Center.

Outside of storm season the facilities function well, however there are tropical storms about twice a year that can cause outages and break the electronic devices and servers. Palau HCF is currently working to install a backup generator for when there are power outages, which occur frequently throughout the year. The new HCF building is steel frame and typhoon proof and the network infrastructure is connected by fiber optic cables. All of these upgrades should ensure better response and recovery from natural disasters.

Programs

The main function of the HCF is to manage the insurance claims process and administer payments to providers. The HCF Staff also evaluates the performance of the Fund with regard to spending and collections to develop policy that ensures its effectiveness.

The HCF is made up of two components, individual Medical Savings Accounts which are funded by employee contributions and the employer-funded National Health Insurance. As contributions are mandatory deductions on earned income and collected in the same manner as contributions to the Social Security Trust Fund, SSA was chosen to administer the fund. Under this structure employees contribute a minimum of 2.5% of their remuneration into their Medical Savings Account which is meant to be used for outpatient medical treatment, prescribed medications, and private health insurance. Alternatively, the National Health Insurance, which can be used for inpatient treatment, Off-Island treatments, and transportation, is financed through employers matching 2.5% of the employee’s contribution.

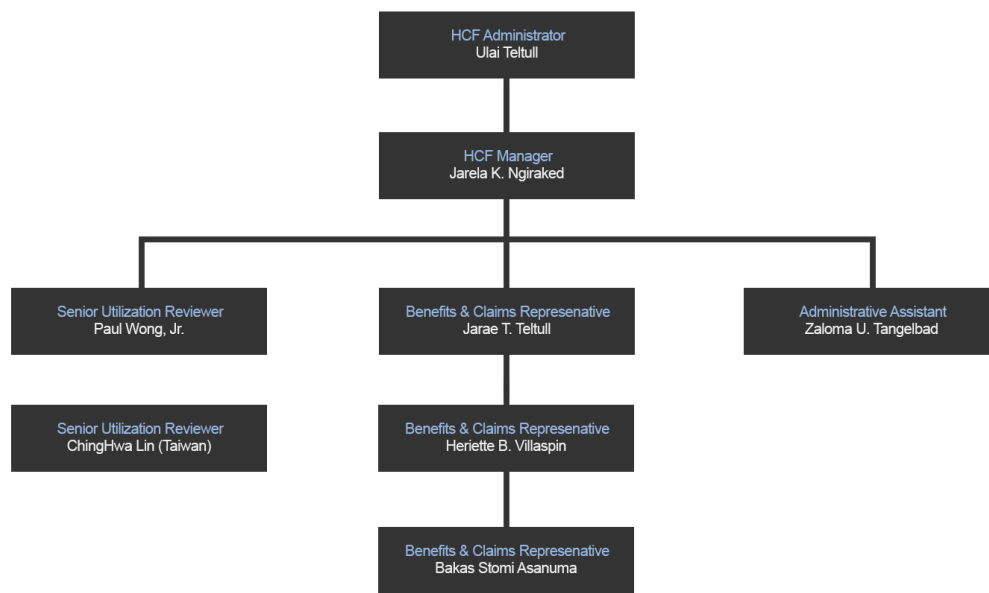
In July 2020, the HCF implemented an Online Clinic Interface (OCI) to improve its claims processing capabilities. The information is collected and stored in SQL Server where HCF Staff manage the

claims process only. Providers use Current Procedural Terminology (CPT) codes and descriptions to identify the procedures, medical records information (i.e., diagnosis, treatment, medications, etc.). Members are identified by their Social Security Number. Claims are submitted and processed then paid out weekly, with two statements stored for the MSA and NHI, respectively.

Staff

There are currently thirty-five staff members at the Social Security Administration and within that eight staff members work exclusively on administering the Healthcare Fund.

Republic of Palau Healthcare Fund Organization Chart



Jarela Ngiraked is the HCF Manager. Jarela joined the HCF in 2012 as the Fund’s first manager. In this role, she is responsible for reviewing policy and providing recommendation to the Administrator and Board Members, recommending enhancements to the HCF system to improve ease of use, working with the IT Manager to ensure the system functions in alignment with policy and updating the public regarding new policies and adjustments to the MSAs and NHI.

Paul Wong Jr. is a Senior Utilization Reviewer and has been with the HCF for three years. In this role, he is tasked with directly engaging with patients and medical service providers to manage in-hospital claims when patients are discharged. In order to do his role effectively, Paul conducts visits to the medical facilities to review patients’ medical charts and final statements to confirm the correct services are being charged. He also works with doctors and the Utilization Reviewer in Taiwan to determine if Off-Island medical referrals are medically necessary.

Jarae Teltull is a Benefits and Claims Representative and has been with the HCF for six years. Jarae’s role entails processing referral claims, sending transmittal document invoices and entering it

for wire payment. In the future, she will process checks from MSAs to pay patient’s private insurance premiums and MSA refunds to foreign workers who were HCF members when departing Palau.

Heriette Villaspin is a Benefits and Claims Representative and has been with the HCF for four years. In her role, she serves as the liaison between the client and the medical providers ensuring the correct MSA is being charged and confirming that the charge is for the actual services delivered. She is communicating with the clinics daily via email or call and monthly through in person visits.

Zaloma Tangalbed is the Administrative Assistant who has been with the HCF for two year, originally beginning as a Benefits and Claims Representative. In her current role, she is responsible for assisting with the coordination of Off-Island medical referrals and processing the paperwork to send to the hospitals in order to assist the medical referral committee and physicians in determining how to continue treatment.

Bakas Asanuma has recently joined the HCF in the role of Benefits and Claims Representative. They will be responsible for all claims from BNH.

ChingHwa Lin is a Senior Utilization Reviewer based in Taiwan. They work with the Palau-based Senior Utilization Reviewer to review and validate the necessity of medical referrals to Taiwan.

Technology Infrastructure

The technology infrastructure of the HCF is comprehensive and allows the staff to work effectively across the two office buildings. The organization is well equipped technologically with all staff members working from personal computers at their workstations, utilizing internet emails and work phones to communicate. The table below provides more specific details on the technology present at the organization.

Table 1: Technology Infrastructure Overview

Item	Description
Hardware	Dell Workstations: Dell Optiplex 7010 Desktop Servers: Dell PowerEdge 2900 Dell PowerEdge T110 PowerEdge R720xd
Network	<ul style="list-style-type: none"> - Local Area Network connects all users. - Virtual Network is over fiber optic lines connecting both offices. - Wide Area Network to the Internet with two types of firewall in place.

Internet Connection	<ul style="list-style-type: none"> - The Internet Service Providers (ISP) are Palau Telecom and Palau National Communication Corporation. - The office has 10 Mbps shared internet connection across all users.
Operating Systems	Microsoft Windows 10 and Windows Servers
Types of Software Programs Used	<p>Microsoft Office Package Online Clinic Interface (OCI):</p> <ul style="list-style-type: none"> - Backend in SQL Server (SQL 2014 Enterprise Standard). <ul style="list-style-type: none"> o Desktop applications developer's environment: Microsoft Visual Studio 2015 o Desktop applications main programming language: C# o Desktop applications components/technologies: Microsoft NET Framework, WPF(Windows Presentation Foundation), IdeaBlade DevForce ORM(Object Relational Model), Telerik WPF UI Controls - Front-end: <ul style="list-style-type: none"> o Developer's environment: Microsoft Visual Studio 2015-2019 o Main program languages: C#, JavaScript o Components/technologies: Microsoft ASP MVC, Microsoft NET Framework, IdeaBlade DevForce ORM(Object Relational Model), jQuery

Technology Management

All IT infrastructure, and equipment are managed internally by the IT staff which includes the following personnel:

Jonathan Eberdong, IT Manager – Jonathan is a Computer Hardware Engineer. He manages all of the organization's technology management and planning needs.

Reagille Takataro, IT Assistant- Reagille supports the IT team in responding to requests and updates.

Genya Shlyakhtov, IT Staff – Genya manages the Palau SSA and HCF webpages.

Beyond the internal IT team, Andrey Evsikov is a .Net and C# programmer based in Russia, who manages the operations and maintenance of the Online Clinic Interface and other SSA and HCF systems. He has remote access capabilities to Maintain, Debug, Update, and Enhance the systems, as requested.

HCF has a centralized process for managing the organization's technology. A request service call process is implemented for staff to submit operational tasks to the IT personnel to handle all updates and repairs. Operating system updates are executed automatically and Antivirus updates are done automatically by [AVG Antivirus](#), AVG Technologies antivirus software. Backups are also configured automatically along with an off-site storage in a safe deposit box document at the bank.

Technology Planning

The technology planning for the organization is done on an ad hoc basis where the technology needs are assessed as they come and considered in the budget. This entire process is handled internally by IT staff members. They prepare a budget submission and the budget is reviewed and approved by the SSA/HCF Administrator. In June, the needs for the upcoming budget cycle are assessed in preparation for the upcoming budget submission in August/September.

Communication

Information is shared internally via shared folders on the server and in manager and staff meetings. For external communication, files are shared via email accounts for which all staff have an account. The SSF/HCF emails and web pages are hosted by [Network Solutions](#), a cloud Web hosting service. Email and domains are managed by in-house IT staff.

Information Management

HCF manages information through a paper-based filing system and electronically in SQL Server. The electronic data storage can process paper files and standard images. The information that is critical to the organization are the following: client information, benefits management, health insurance records, invoices, accounting records, payment records and Social Security wages tax records. Data security mechanisms for the organization's desktop applications are in place through Microsoft files security settings. Due to inclement weather throughout the year, the organization faces the threat of paper files getting wet while in storage on location. This risk highlights the value of having electronic data storage to backup hard copies.

The HCF has a Memorandum of Understanding with Belau National Hospital (BNH), the country's largest hospital, to share data. BNH runs their own Health Information System (HIS) where they enter and store records such as patient medical encounter data, appointment schedules and billing information. Currently, HCF scans and uploads these records as images.

When the HCF began it was integrated into SSA's existing Fox Pro database and has now migrated to SQL Server, as of July 2020. This was developed by the aforementioned C# and .Net programmer. All current staff underwent training during the transition from Fox Pro to SQL Server and a manual was produced for new staff. All HCF staff were heavily involved in the development process and adapted well to the new technology.

II. Design Database Structure for Medical Records Entry in Existing Online Clinic Interface

Motivation

In the beginning of the project, the HCF noted that as Palauans are "getting sicker and sicker" there is a need for an efficient and effective healthcare insurance program that can meet the needs of the population. The HCF is currently able to process claims electronically for members when they receive treatment from On-Island and approved Off-Island healthcare providers, however there is no records collection process associated with the patient's diagnosis and medical treatment plan leading to a gap in data needed that could impact the HCF's operations. As a solution to their data gap challenges, the HCF determined that it would benefit from access to a subset of data fields in members' medical records data to perform data-driven analysis of HCF spending:

- Procedures
- Diagnoses
- Medications
- Laboratory Services
- Medical Imaging Results

The following key organizational challenges for the HCF were identified:

- Increasing costs of treatments and use of medical referrals for off-island placing more financial burden on the Fund while member contributions remain the same.
- Productivity loss by HCF staff spending additional time in their roles validating paper-based records and collecting requested data on patient's medical records in person or through phone/email.
- Challenges with continuity of care when treatments, procedures and tests aren't tracked and coordinated across the HCF and healthcare providers, leading to duplication therefore increasing the financial burden on the HCF.

An assessment on the current digital health landscape in Palau revealed that agreements exist to coordinate data exchange between HCF and on-island providers, however HCF does not have formal authority over how providers collect and manage their health records. A key challenge for obtaining the data needed by the HCF electronically is that half of providers manage their patients' records through a paper-based process. Then the providers who utilize electronic data management practices do not follow a standard and the HCF has no system to collect and analyze medical summary data from any of the providers.

Outcomes

In the first few weeks, the IT infrastructure was assessed and it was identified that a large amount of the HCF's work is supported by their Online Clinic Interface (OCI) which went online in July 2020. The OCI, which on-island providers use to input their MSA claims, allows the HCF staff to view a patient's claims details from their workstation and process the payments. The system allows users to begin typing the code and term they want to enter then autofills the correct CPT code and description.

After discussing the system's functionality with HCF and the TCinGC program directors it became apparent that it could be a feasible solution to collect medical records data from healthcare providers in Palau. From there, research was performed on global standards for the collection and exchange of health information. This included an assessment of practices in Taiwan, where the government-operated national health insurance program steered the development of a health information exchange. The approaches taken to implement and lessons learned from Taiwan's experience are in the appendix.

Implementing an electronic health information exchange system (HIE) is a best practice for improving quality and efficiency in a healthcare system. The benefits experienced in studies of HIEs include fewer duplicated procedures, reduced imaging, lower costs, and improved patient safety.¹ The analysis of the current digital health landscape in Palau revealed that there are

¹ <https://pubmed.ncbi.nlm.nih.gov/29718258/>

unresolved decisions on clinical data standards and technology capacity limiting their ability to achieve this vision.

Ultimately, a decision was made to pivot from investigating what system the HCF should invest in right now to developing the OCI back end in SQL Server to be able to store the specific subset of medical records data the HCF identified as critical to its mission. As discussed earlier in the report, the OCI currently provides value in its use by providers to process their MSA claims. The server provides HCF with the ability to integrate the subset of clinical data they desire from the patient's visit without taking providers out of the system or interfering with the existing claims process.

A mockup data entry screen was designed based on the existing OCI data entry screen and the requirements to provide a visual example for end-users to respond to that can then inform the development of the web form. An overview of the mockup is in the appendix. The HCF Manager and IT Staff reviewed and provided feedback on the form structure, suggesting that the users should still be able to enter free-text to describe the item.

Elilai Yano, the manager at Belau Medical Clinic, also reviewed and provided feedback on the mockup screen. While she found the collection of this data to be useful, she also expressed concern that it would likely mean a new role needs to be created due to it requiring more time and knowledge for accurate and complete data to be collected. In their current process, patients already have to wait additional time for their claims to be processed for their private insurer and for their co-pay charges to be calculated in the OCI.

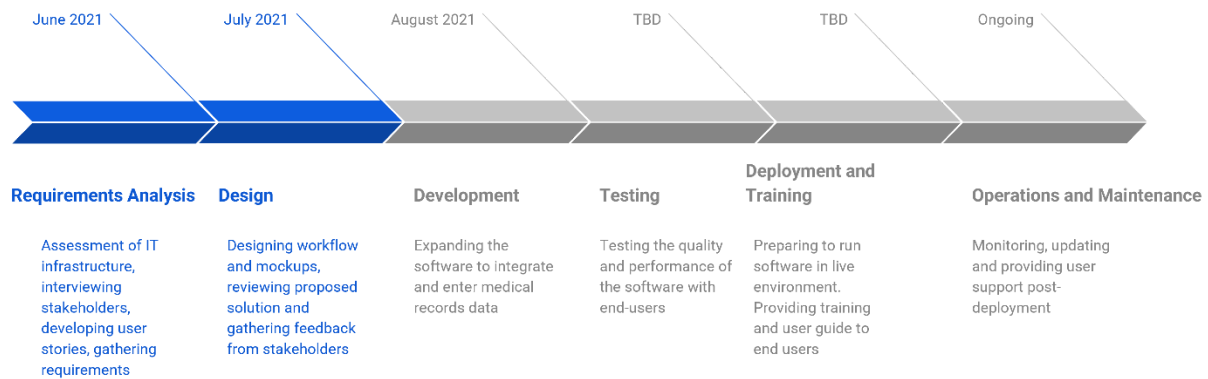
The concern of who would be responsible for entry at each clinic was also discussed with the HCF Manager, who noted that not all clinics have the means to create a new role. It was concluded that the approach each stakeholder adopts will differ based on their organization's workflow and human resources. Two other clinics were interviewed by Jarela, the HCF Manager and Jonathan, the IT Manager and when asked if they would be willing to participate in data entry, they responded that they would participate when requested as long as they are provided with training.

After a series of email exchanges, a meeting was held with John Macatangay and Douglas Cavan of the BNH IT team to discuss their capacity for sharing the requested data fields from their hospital information system (HIS). The hospital HIS currently collects medical records data on the procedures, diagnoses, and lab services, but the specific details on medications are collected in a separate system run by the pharmacy. A decision on how to retrieve and integrate this data has not yet been reached. A data mapping document was developed to identify the relationship between the hospital's data and the data tables in the HCF's database in order to fill out a member's medical record. The mapping will be applied to the integration process to reference the destination fields. This is located in the appendix.

Differing levels of stakeholder capacity and lack of data standardization present risks to sustainability that the HCF must address. This can be done by providing support at appropriate levels to providers to carry out the tasks required to integrate their medical records. This can also be achieved through training and the development of a user guide for end-users to reference. HCF has indicated their capacity to work with the contracted programmer to continue the development for the data structure and web form for data entry so that user acceptance testing can be carried out. A diagram of the stakeholders and the approach the HCF should follow when engaging with them is in the appendix.

In acknowledgement of the additional storage burden that adding medical records data from BNH and the clinics will present to the OCI, Jonathan is currently undergoing the process to purchase new servers. The decision on the servers should factor in the variables of anticipated data storage growth, capital and operational expenditure, security, reliability and scalability. As discussed in the IT Infrastructure overview, the SSA IT team already manages three on-premise servers to support its current data storage needs. Due to this, adding another on-premise server will provide HCF with a storage solution that aligns with their existing environment.

As this consulting engagement comes to an end, the testing of data structure that was designed and the creation of the webform for data entry has not yet been reached and the data integration plan for importing data from BNH into HCF system remains to be fully implemented. The timeline below captures the current status of the project and the remaining work to complete before implementation.



It is recommended that the team take on the following tasks to continue the development process and achieve the project goal:

- Conduct internal usability testing on the data entry process.
- Establish a data integration plan with BNH and conduct integration tests with a sample of BNH medical records into the database structure.
- Conduct user acceptance testing with external stakeholders.

IV. Additional Recommendations

Promote Establishing a Cross-Organizational Committee Responsible for Setting Policy and Standards on Health Information Exchange

In Palau, there are currently a variety of provider-specific approaches to data management leading to the challenges the HCF experiences in sharing data. The HCF is not the principal owner of the data, but has the right to access the patient's data. In accordance with the Palau National Code Act (PNCA),

the HCF has rights to access patient's medical records and the confidentiality of those within the care of the HCF is safeguarded under *Act 41 PNCA Section 960. Privacy*.

While this policy sets a precedent for the exchange of health care, a lack of health IT adoption across the provider network hinders the ability to access the types of information the HCF needs to make informed policy decisions. In order to establish a legal framework and policy, a formal partnership must be formed with representatives from across the Palauan health services sector to determine how sensitive healthcare data will be recorded, analysed and exchanged between providers, patients, payers and regulatory bodies.

Seek Technical and Capacity Building Assistance for National Health Information Exchange from Regional Health Information Networks

This recommendation falls outside of the scope of work performed during this project, but holds the potential for significant improvements in Palau's ability to apply international standards to harmonize their clinical data and achieve interoperability between healthcare providers. This will provide HCF and the rest of the healthcare organizations in Palau with the opportunity to receive technical assistance to develop Palau's overall healthcare technology landscape. There are two regional networks established to provide varying levels of technical and capacity building assistance to countries seeking to develop their national health IT infrastructure. The [Asian eHealth Information Network](#) (AeHIN) or [Pacific Health Information Network](#) (PHIN) provides member countries with technical and capacity building assistance for developing a national digital health infrastructure that is specific to their country's context, while in collaboration with other nations in the region. As the HCF continues development of their internal system, they should also use their strategic position to steer the national approach toward establishing a strong health IT infrastructure.

AeHIN's [Standard and Interoperability Lab-Asia](#) (SIL-Asia)

With sponsorship from the Asian Development Bank (ADB), the AeHIN-operated Standards and Interoperability Lab (SIL-Asia) provides ADB member countries with capacity building and technical assistance in the development of national eHealth strategies. During the labs, the SIL-Asia team provides healthcare representatives from the nation with support in selecting standards, training healthcare providers and program administrators, and achieving interoperability which allows healthcare systems to talk with each other.

As a government program, HCF can submit a request letter to the regional ADB center. This outreach can be led by the HCF, however the maximum benefit for engagement will come from a coordinated approach including the Ministry of Health/Belau National Hospital and the on-island healthcare providers.

About the Consultant

Brittany Pruitt is a second-year Masters of Public Policy and Management student at Carnegie Mellon University - Heinz College of Information Systems & Public Policy. After taking part in the Technology Consulting in the Global Community internship she will return in the Fall to complete her studies at Heinz.

Appendix A: Business Requirements

Business Process Overview

The business requirements below address the process of integrating Healthcare Fund Members' medical records data through the Online Clinic Interface. This process involves the following steps:

1. The HCF member visits a healthcare services provider in Palau or an approved off-island provider.
2. The provider documents the details of the encounter using their current internal process.
3. The provider or staff member in charge of submitting claims into the Online Clinic Interface will enter select fields capturing that medical encounter's diagnosis, any treatments and lab tests ordered, and upload any medical imaging documents.
4. For Medical Referrals or Local Inpatient Encounters, where there is no MSA transaction required, a designated SSA/HCF staff member will enter the medical record data for the encounter into the Online Clinic Interface when received.
5. The record is loaded into the HCF's SQL Server database.
6. The HCF staff will access the data to run queries and develop reports in SQL that support their business intelligence needs. These reports will be used in policy decision-making, to validate the services rendered against the claims submitted and for processing medical referral requests.
7. The patient (HCF member) will be able to request a report of their data in the system for their personal health records.

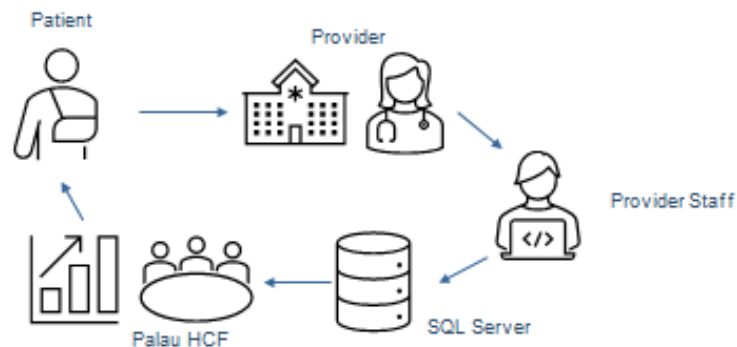


Figure 1. Business Process Diagram

Detailed Business Requirements

This list of business requirements was developed through interviews with Palau Healthcare Fund staff to determine the gaps in their current processes and their desired functionality for the future. The business requirements are categorized using the following scale- *Mandatory*, *Desirable*, *Optional*, *Removed* – beginning with requirements that will deliver the largest benefits to the Healthcare Fund.

As the project progresses and new requirements are added, the priorities will be re-assessed and prioritized based on stakeholders' needs.

Number	Description	Type	Raised by
1.	Integration of Belau National Hospital medical records for all HCF members are into HCF's database.	M	HCF Administrator
2.	Ability to convert and bulk import member's medical records data submitted by providers.	M	HCF Administrator
3.	Records can only be entered, altered, and accessed by authorized users.	M	All
4.	Ability for users to enter data as free-form text for each medical records data field (diagnosis, procedures, medications, laboratory services, etc.)	M	HCF Manager
5.	Drop down selection of diagnosis and procedure codes and descriptions using standard terminology.	M	HCF Manager
6.	Drop down selection of medications generic name and dosage using standard terminology.	M	HCF Manager
7.	Drop down selection of laboratory services using standard terminology.	M	HCF Manager
8.	Ability to run statistical analysis on specific diagnoses and treatments administered sorted by demographic data (age, gender, etc.)	M	HCF Manager
9.	Ability to run statistical analysis on specific diagnosis and treatments administered over time.	M	HCF Manager
10.	Ability to run saved queries to retrieve data for analysis.	M	All
11.	Ability to export individual health records for review and sharing with the patients and other authorized providers or HCF staff.	M	All

12.	Ability to pull individual health records for reference during the medical referral requests process.	M	HCF Staff
13.	Ability to upload and store medical imaging data (Dental X-rays, CT scans, etc.).	M	HCF Manager
14.	Ability to export medical imaging data at provider's request.	M	HCF Manager
15.	Ability to perform code lookups for matching medical standards (ICD, LOINC, Drug Codes) on data entry front end.	M	HCF Staff
16.	Ability to pull individual health records for reference during the benefits and claims validation process.	D	HCF Staff
17.	Access to provider's notes from an encounter and their comments on diagnoses and treatments.	D	HCF Staff

Type Key

M – Mandatory

D – Desirable

O – Optional

R - Removed

Appendix B: Stakeholder Analysis and Engagement Plan

Stakeholder Overview

The healthcare landscape in Palau includes a variety of service providers ranging from several private owned clinics and pharmacies to the Belau National Hospital which is a public hospital operated under the Ministry of Health. In order to design a solution that keeps all stakeholders needs in mind it was important to understand what level of influence and impact they had on the development of the new process. In the figure below, a stakeholder onion diagram was created to visualize the placement of each stakeholder and what impact the solution of “HCF Member Medical Record Entry Process” will have on their organization.

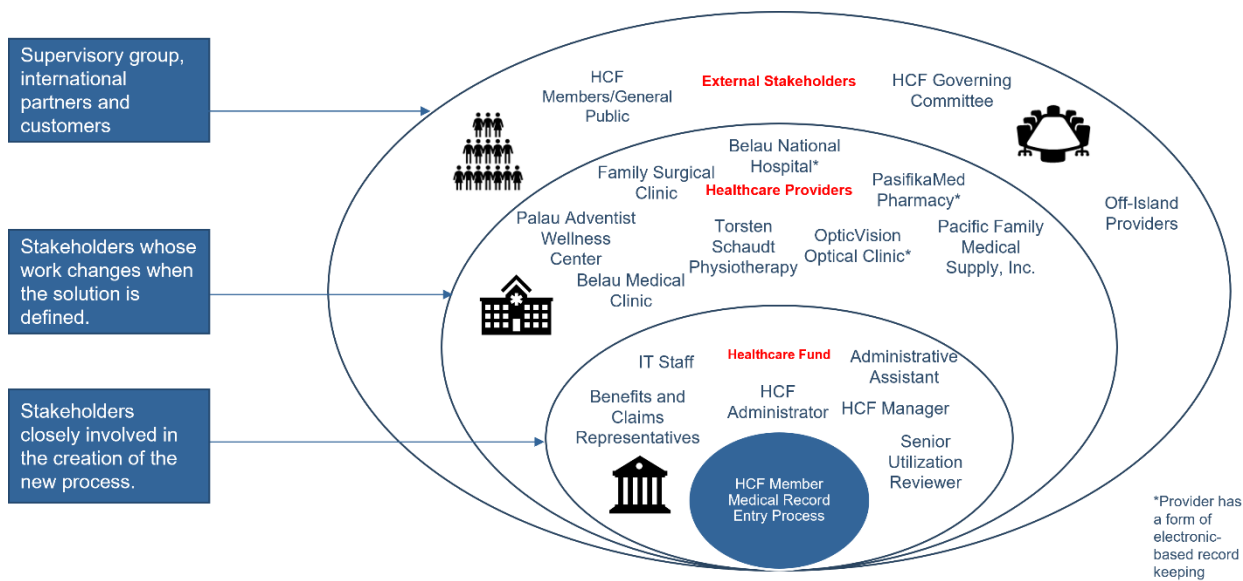


Image 1: Stakeholder diagram

On-Island Healthcare Providers

The levels of maturity in terms of data management and technological capability varies across the healthcare services sector in Palau. Acknowledging that the healthcare providers are at different starting points and have different priorities allows the HCF to provide them with the appropriate level of support and involvement from the beginning.

This analysis utilized a combination of stakeholder interviews and a questionnaire as tools to gauge the data maturity level of each stakeholder organization in order to inform how to engage throughout the project lifecycle. The following questions were included:

- **Data Management**
 - How are patients' individual health records stored?
- **Identity Management**
 - Does the provider use a unique identifier for patients and identity managements.

- **Standards of Interoperability**
 - Which data standards are adopted and applied to the individual health record?
- **Data Quality**
 - What is the provider's level of data quality (e.g. completeness, consistency, accuracy, timeliness, interpretability)?

From these responses a ranking system was developed to classify the process based on the recommendation for how to engage with the different levels of stakeholders. The stakeholders were then placed on a scale of Low-Level Data Maturity (Level 1-2.5) to High-Level Data Maturity (Level 3.5-5). Their placement on the scale is highlighted in the image below. No healthcare organization has reached the highest-level of data maturity within their internal data management and IT practices, however in Palau’s context the Belau National Hospital has the highest-level of data maturity. All providers have gaps with standardization of terminology, issues with completeness and accuracy and availability of the data, and the use of a national ID for patients across all providers

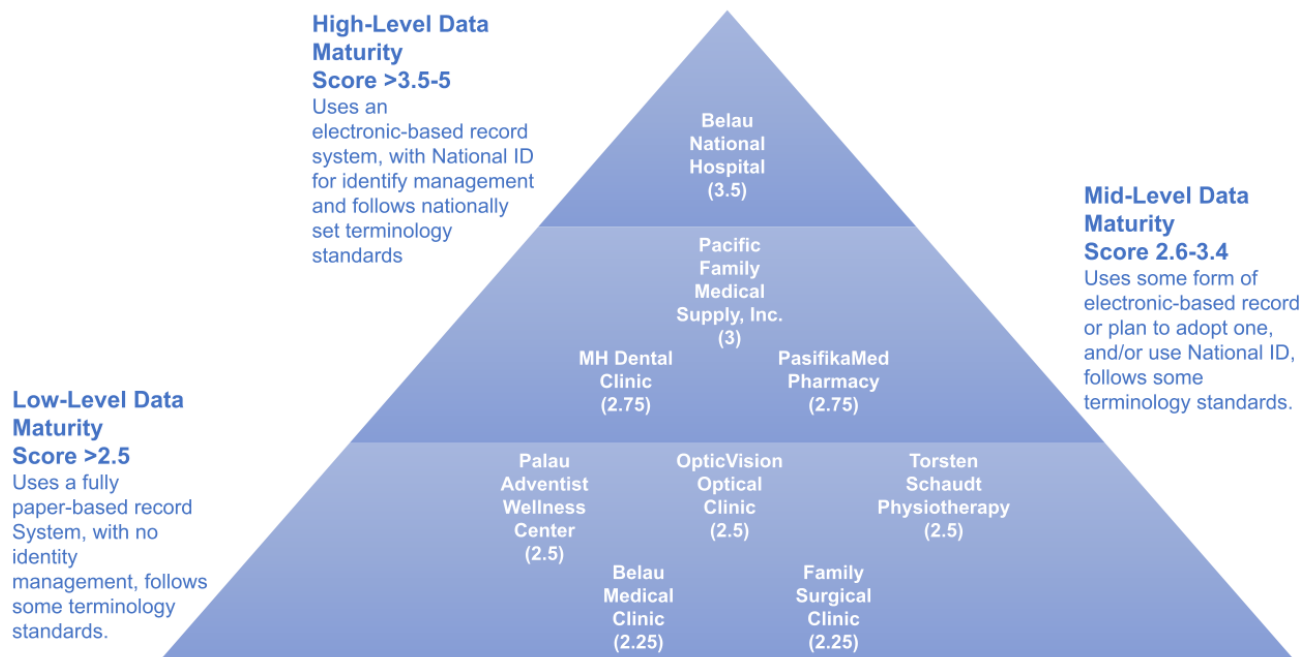


Image 2: Results from a data maturity questionnaire, provided to on-island providers. The questions were derived from the [World Health Organization/Pan-American Health Organization’s Data Maturity Model Country Tool](#) with the aim to identify the provider's level of data maturity as it pertains to data management and technologies.

High Level Data Maturity: Data Integration Approach

Data integration refers to the technical and business processes used to combine data from multiple sources to provide a unified, single view of the data.² For the HCF, data integration will provide access to the data sources that are managed by stakeholders who are not end-users of the Online Clinic

² <https://www.omnisci.com/technical-glossary/data-integration>

Interface – Belau National Hospital and off-island providers. By establishing a data integration process, the HCF will be able to collect data from disparate sources and use them to generate meaningful insights. The data integration approach applies to stakeholders with high-level data maturity, meaning that they have the capacity to extract the data from their internal electronic records system to be loaded into the HCF system through data integration.

Engaging with Belau National Hospital

The Belau National Hospital uses a hospital information system (HIS) to manage its patient medical records. As of August 2, 2021, the Belau National Hospital had 668,511 encounter records. Each of these records includes some of the information that the HCF requires to perform its analysis, however medication data is captured separately in the Pharmacy's internal system. The terminology standards that are used by the HCF and the providers around Palau come from the Hospital which is using Current Procedure Terminology (CPT) for procedures, medications, and lab work, and ICD10 for diseases.

The HCF should consider the following when engaging with BNH:

- Schedule a meeting to define the terms of the integration plan and update on project progress.
- The Palau Ministry of Health has [recently partnered with Beyond Essential Systems](#) to redesign the health system using four technologies, DHIS2, mSupply, Tupaia MediTrak and the Tupaia platform. The development is estimated to start at the end of the year and it is projected to take over a year to completely implement. This development should be monitored by the HCF to identify points of collaboration on setting terminology standards.

Low- to Mid-Level Data Maturity: Data Entry Approach

The end users with low- to mid-level data maturity are characterized by their largely, paper-based or non-standardized data management practices. The users will require the HCF to have a more hands-on approach in the development, testing and training segments throughout the project lifecycle.

Engaging With Healthcare Providers

User Acceptance Testing (UAT), also referred to as beta or end-user testing, is one of the most important aspects of this development process. In order to determine if the solution meets business needs and provides value, the target users must be involved in the testing and discovery process. For this development project, UAT will include three major use cases: data entry, data integration, and querying and reporting. These use cases represent the core business requirements identified throughout the requirements analysis; however, these should not preclude any other useful use cases from being applied to the UAT.

Ideally, the testing participants will represent realistic users of the product and apply use cases to their testing exercise. The goals of the use cases must be understood and specific to the objectives of the end-user. According to [Usability.gov](#), a use case is a written description of how users will perform tasks on your website. Use cases are typically written as simple steps from a user's point of view, starting with their goal and ending when the goal has been accomplished. The use case below is the data entry process for a staff person from a clinic.

Use Case for Executing for Data Entry

Actor: Clinic Data Entry Staff

Goal: Entering A New Patient Encounter Record

1. Login to OCI account
2. Navigate to screen for entering a subset of the patient's medical data
3. Enter the patient medical record data
 - a. Use autofill to select most appropriate code
 - b. Use reference link to code lookup lists, if needed
 - c. Enter additional details for each field in free-text box
4. Submit record
5. Return to view of patient medical record data profile
6. New encounter is added to patient's profile

Data Entry	Data Integration	Querying and Reporting
Test medical encounter data entry process	Test the integration of data from different sources	Test running and saving queries and building reports
Actor: Low-Mid Level Data Maturity Users	Actor: Belau National Hospital and Off-Island Providers	Actor: HCF Staff
Measure of success:	Measure of success:	Measure of success:
Medical data is submitted into patient record	Data from source file are successfully loaded into the medical record data target tables	Users can create and save queries
Patient record format is acceptable for business needs	Patient medical record is populated with new encounter data	Reports meet business needs
		Flat files and reports can be exported

Image 3: This image shows three of the core use cases that will confirm the usability of the system for each type of end-user.


Appendix C: Mockup Data Entry Form

This mockup was developed to provide a sense of the front end screen a user would see upon entering the medical records section of the database and use to enter patient encounter data into the system. The online version of the mockup can be accessed [here](#).

Healthcare Fund Member Medical Record

Encounter Information

Visit Date

 Date

Visit Type

Provider Name

First Name

Last Name

Reason for Visit

Symptoms

	Symptoms Code	Symptom Description	Symptom Details
Enter symptom	<input type="text" value="▼"/>	<input type="text" value="▼"/>	<input type="text"/>

Procedures

	Procedure Code	Procedure Description	Procedure Details
Enter procedures performed	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>

Diagnoses -<https://icd.who.int/browse10/2010/en>

	Diagnosis Code	Diagnosis Description	Diagnosis Details
Enter Diagnosis	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>

Cause of Death -<https://icd.who.int/browse10/2010/en>

	Diagnosis Code	Diagnosis Description	Diagnosis Details
Enter Cause of Death	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>

Treatment

	Treatment Code	Treatment Description	Treatment Details
Enter Medical Treatment Prescribed	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>

Medications

	Medication Code	Medication Name	Dosage	Strength	Medication Details
Enter Medications Prescribed	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>

Laboratory Services

Lab Code	Lab Description	Lab Details
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Submit Medical Imaging Files (CT Scans, MRIs)

Browse Files

Add .dcm (digital imaging) files

Referral Requested

Yes

No

Additional Provider Comments

Type here...

Submit

Appendix D: Data Dictionary

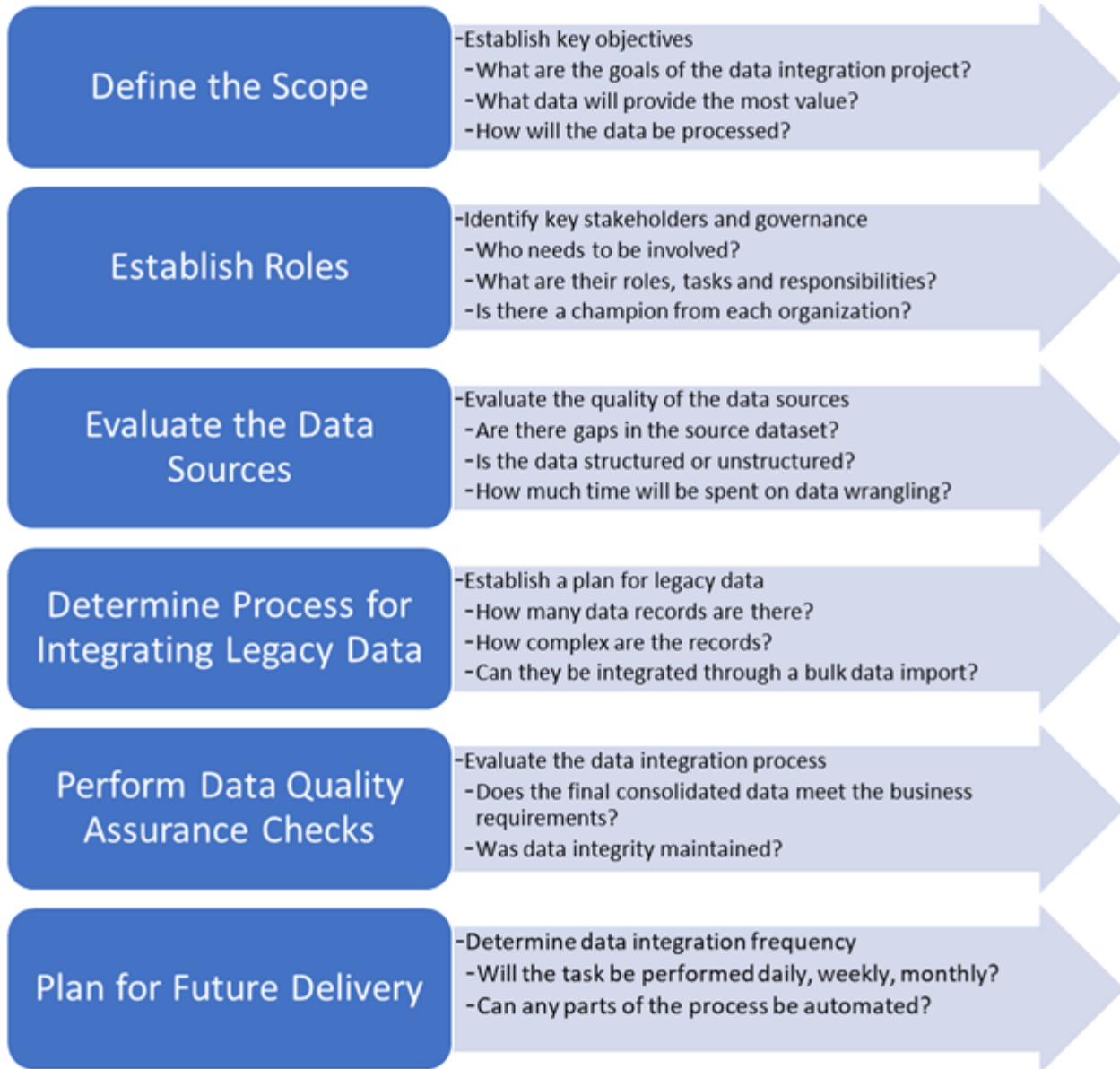
The data structure designed during this project, was considerate of the current state of the healthcare landscape in Palau regarding data management. It was important to the HCF to remain in sync with the Hospital's use of CPT codes for labs, medication, radiology and using ICD10 for diagnosis. The reference lists used by the hospital for these terminologies already exist in the OCI so they can be connected to the tables in the medical records data structure which are outlined in the data dictionary below.

Table Name	Attribute Name	Definition/Contents	Data Type	PK/FK	Foreign Key Referenced Table
Medical Event					
	EventID	Unique ID	int	PK	
	Type	The type of visit: inpatient, follow-up, referral, home health	text		
	Event Date	The date of the medical encounter	date		
	Doctor's Round	The name of the doctor seeing the patient	text		
HCF Member Record					
	PatientID	Unique ID	int	PK	
	SSN	Patient's Social Security Number	varchar		
	First Name	Patient's first name	varchar		
	Last Name	Patient's last name	varchar		
	Hospital Number	Hospital ID number used by Belau National Hospital to identify patients	int		
	Date of Birth	Patients date of birth	date		
	Gender	Patient's gender	text		
	Age	Patient's age	int		
	Citizenship	Patient's country of residence	text		
Procedures					
	ProceduresID	Unique ID	int	PK	
	Code	CPT code from the existing list in OCI to classify procedures performed	int		
	Description	CPT description from the existing list in OCI to classify procedures performed	varchar		
	Details	Free text	text		
	EventID	Links the procedure to the medical event	int	FK	'Medical Event'
Diagnosis					
	DiagnosisID	Unique ID	int		
	Code	ICD10 code to classify the diagnosis given during encounter	varchar		
	Description	ICD10 description to classify the diagnosis given during encounter	varchar		
	Details	Free text	text		
	EventID	Links the procedure to the medical event	int	FK	'Medical Event'

Medications					
	MedicationsID	Unique ID	int	PK	
	Code	CPT Code for Medication Category (A-H)	varchar		
	Description	Medication category	varchar		
	Details	Free text	text		
	EventID	Links the procedure to the medical event	int	FK	'Medical Event'
Lab Tests					
	LabsID	Unique ID	int	PK	
	Code	CPT Codes for labs (80004 to 90000)	varchar		
	Description	Pathology and laboratory description	varchar		
	Details	Free text	text		
	EventID	Links the procedure to the medical event	int	FK	'Medical Event'
Radiology Procedures					
	RadiologyID	Unique ID	int	PK	
	Code	CPT Codes for radiology 70030 to 76942	varchar		
	Description	Diagnostic radiology description	varchar		
	Details	Free text	text		
	Imaging File	Image file	varbinary		
	EventID	Links the procedure to the medical event	int	FK	'Medical Event'

Appendix E: Data Integration Checklist³⁴⁵

The following checklist was designed to facilitate the preparation for data integration to achieve sustainable and successful results. Conducting these steps prior to implementation will ensure challenges and risks are identified and resolved leading to successful data integration.



³ <https://www.thesmsgroup.com/data-integration-checklist-6-steps-to-success/>

⁴ <https://blog.pythian.com/definitive-data-integration-checklist/>

⁵ <https://www.etlsolutions.com/new/how-to-create-a-successful-data-integration-plan/>

Data Mapping with Belau National Hospital

Data mapping is an important part of the data integration process as it will be used to identify the relationship between the hospital's data and the data tables in the HCF's database in order to fill out a member's medical record. The mapping will be applied in the integration process to reference the destination fields. The mappings in the table below are meant to be used as a reference and will need to be revised upon completion of the database structure.

Data Mapping between BNH and HCF Medical Records Data

Target Data: Medical Data Record Tables				Source Data: BNH HIS Medical Records Data Fields			
Target Table	Target Column	Nullable	Data-type	Source Table	Source Column	Data-type	Notes
Event Type	Type	Not Null	Text	BNH HIS Medical Records Data Export	Visit_Type	Text	Outpatient, Inpatient, Referral, HomeHealth
	Event Date	Not Null	Date		EncounterDate	Date	
	Doctor's Round	Not Null	Text		ProviderName	Int	
Patients	Patient SSN	Not Null	Int		Patient SSN	Int	
	Patient First Name	Not Null	Text		FirstName	Int	
	Patient Last Name	Not Null	Text		LastName	Text	
	Patient Hospital Number	Not Null	Int		Hospital Number	Text	
	Patient Date of Birth	Not Null	Int		DOB	Text	
	Patient Gender	Not Null	Date		Gender	Date	
	Age	Not Null	Text		Age	Int	
	Citizenship	Not Null	Text		Ethnicity	Text	
Procedures	CPTCode	Nullable	VarChar		CPTCode	VarChar	
	CPTDescription	Nullable	VarChar		CPTDescription	VarChar	
Diagnosis	ICD10Code	Nullable	VarChar		ICDCode	VarChar	
	ICD10Description	Nullable	VarChar		ICDDescription	VarChar	
Cause of Death	ICD10Code	Nullable	VarChar		ICDCode	VarChar	
	ICD10Description	Nullable	VarChar		ICDDescription	VarChar	
Medication	CPTCode	Nullable	VarChar		CPTCode	VarChar	
	CPTDescription	Nullable	VarChar		CPTDescription	VarChar	
Lab Services	CPTCode	Nullable	VarChar		CPTCode	VarChar	
	CPTDescription	Nullable	VarChar		CPTDescription	VarChar	
Medical Imaging Data	CPTCode	Nullable	VarChar		CPTCode	VarChar	
	CPTDescription	Nullable	VarChar		CPTDescription	VarChar	
Medical Interventions	No Map	Nullable	Text		No Map		Not collected in HIS
Symptoms	No Map	Nullable	Text		No Map		Not collected in HIS

Integrating Data from Belau National Hospital into HCF Database

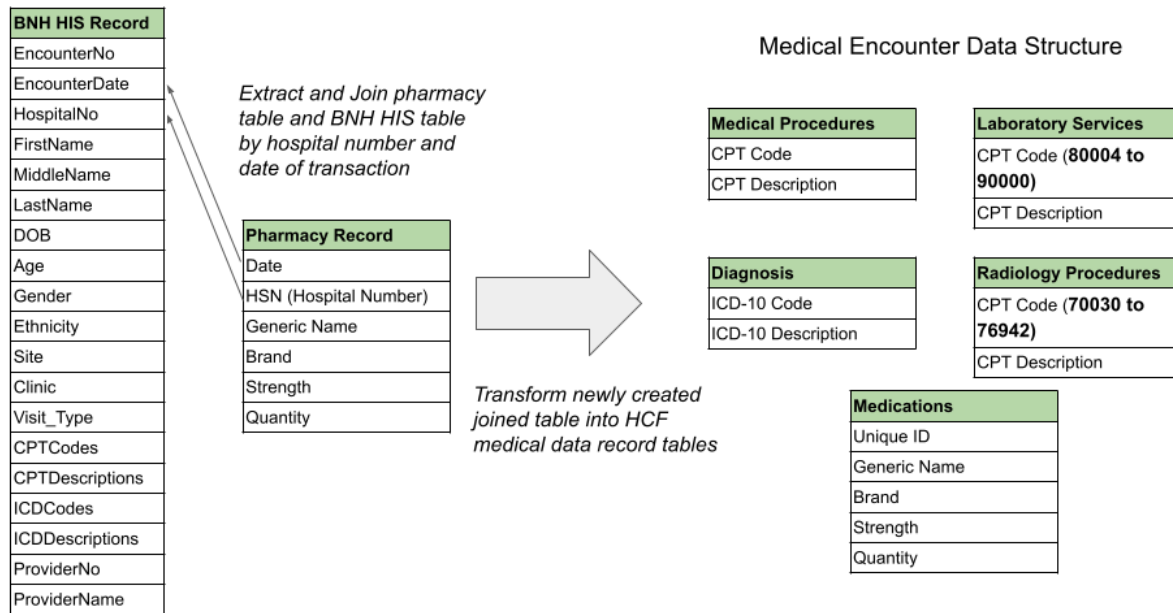
The HCF's system includes an ETL tool called SQL Server Integration Services (SSIS), which is used to achieve data integration. Microsoft describes SSIS as a platform for building enterprise-level data integration and data transformations solutions. It helps users achieve the following:

- Solve complex business problems by copying or downloading files
- Loading data warehouses
- Cleansing and mining data
- Managing SQL Server objects and data

The platform is recommended for HCF to use to integrate the files it receives from stakeholders by taking them through the process of transforming and mapping data from disparate sources into their database. The following approach can be used by the BNH and SSA IT teams to extract and transform the hospital’s data in the future HCF system:

1. Extract and Join the Pharmacy data table with the BNH medical record by the Patient Hospital Number and Date of Transaction.
2. Integrate newly created table into the new HCF database for medical records
3. Details on the procedures, diagnoses, medication, laboratory tests, medical imaging would be split into the data tables that are linked to each medical encounter.

Data Integration: Joining and Transforming into Data Structure Tables



SQL Server Integration Services Resources

The following are resources for the Using the SQL Server Integration Services to import and export data:

[SQL Server Integration Services](#)

[Creating a Basic Package \(SQL Server Video\)](#)

[SSIS How to Create an ETL Package](#)

Security Considerations

The maintenance of security is critical when transferring files between the Healthcare Fund and providers. The key considerations are the protection of patients' sensitive medical records data and ensuring only the sender and the intended recipient can read the files. The following are options the HCF can implement for secure file transfers depending on the stakeholder who is sharing data with HCF.

Secure File Transfer Protocol (FTP) over Shared Network

A Secure FTP over a shared network is the recommendation for integrating medical records data from the Belau National Hospital. The HCF has a shared network with the hospital that can be accessed without the internet making it a reliable and secure option.

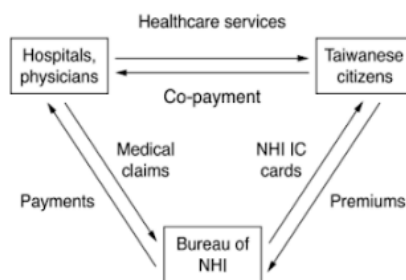
Box Web File Transfer

Box file sharing uses encryption in-transfer with Transport Layer Security (TLS) and multi-layered encryption at-rest with AES 256-bit. Box supports the [US health IT](#) security and privacy regulations—Health Insurance Portability and Accountability Act of 1996 (HIPAA) and Health Information Technology for Economic and Clinical Health (HITECH) Act. This solution would be suitable for file transfers from on- and off-island providers.

Appendix F: Comparative Case Analysis

Taiwan's Implementation of National Electronic Health Information Exchange

Taiwan has one of the world's most efficient healthcare systems managing the healthcare needs of 99% of its 23 million population who can visit a network of more than 20,000 clinics and 501 hospitals and experience a seamless and secure exchange of their medical records data. Healthcare in Taiwan operates under a government-administered single-payer healthcare system which was adopted in 1995 and known as National Health Insurance or NHI. It is administered by the National Health Insurance Administration (NHIA). The coverage rate covers all Taiwanese citizens as well as travelers who are staying over 6 months. NHIA provides every member with an integrated circuit card or IC card. This card identifies the person, stores a brief medical history, and is used to bill the national insurer.



The financial structure of Taiwan's National Health Insurance Program. Source: [PubMed](#)

Observations of population and financial risks impacted the Taiwan NHI decision to improve its access to up-to-date, accurate clinical data for program planning and operations management.

- **Population Demographics:** The rapidly aging Taiwanese population has led to high medical needs for the elderly and increasing medical costs.
- **Resource Constraints:** There was an increasing risk of overuse of the available medical resources due to no formally set limitation on consultations. The number of doctor consultations per year per person is around 15.
- **Continuity of Care:** The NHI observed a lack of continuity of care for patients when they visited a new provider and their medical records did not follow them. Without an interoperable system that could share a patient's record, there was duplication of tests and prescriptions, burdening the NHI program.

Implementation of an Inter-institution EMR Exchange

In order to address these concerns, Taiwan passed the "Plan for accelerating the implementation of electronic medical record systems in medical institutions' (2010–2012; a 3-year plan)." The focus of this plan was to establish a National Electronic Medical Record Exchange Centre (EEC). Under this, patients will be able to use their IC card and the physician's medical certificate IC card to retrieve

complete important medical records for the past 6 months from other participating hospitals. Their goal was to meet eHealth standards by integrating patient information through electronic health records (EHRs) to reduce unnecessary medications and tests and enhance the quality of care.

Taiwan's Exchange Center adopted the Health Level 7 Clinical Document Architecture standard to generate clinical documents and the Integrating the Healthcare Enterprise (IHE) Cross-enterprise Document Sharing (XDS) profile for the communication infrastructure. The HL7 (Health Level 7) Clinical Document Architecture (CDA) is an XML-based markup standard intended to specify the encoding, structure and semantics of "clinical documents" for the purpose of exchange between healthcare providers and patients. It defines a clinical document as having the following six characteristics: 1) Persistence, 2) Stewardship, 3) Potential for authentication, 4) Context, 5) Wholeness and 6) Human readability. HL7 is one of several standards in the healthcare arena that are accredited by the American National Standards Institute (ANSI) and International Standards Organization (ISO).

Lessons Learned

Upon review of the process undertaken in Taiwan it is apparent that the following factors in their approach played a key role in the implementation of an inter-institution EMR exchange:

Utilizing existing health IT infrastructure:

All hospitals and clinics were already connected with the National Health Insurance through a Virtual Private Network. This was done to manage the Health Insurance IC Card that replaced the paper-based insurance cards.

Establishment of an inter-institutional development committee:

An EMR Development Committee was established in 2010 to draft policies for promoting EMR systems, establish relevant exchange and communication standard specifications, approve annual plans and assess the results. The 20 members that sit on the committee represent a diverse group of stakeholders:

- 30% government officials
- 50% from industry, including hospitals
- 20% from academic research institutions
- The committee is chaired by the deputy minister of the Ministry of Health and Welfare

The approach Taiwan took to address the inefficiencies in their healthcare system can serve as a useful guide post for developing a solution that best suits the HCF's needs for a seamless connection between the members' health records across their network of On- and Off- Island healthcare providers and the HCF.

Learn more about Taiwan's approach [here](#).

Appendix G: Recommendations for Data Reporting Tools

In the process of identifying a medical records database solution to suit the HCF's data analysis needs, it was made apparent that utilizing the reporting functionality in SQL Server Reporting Services (SSRS) would not be suitable for the HCF staff to utilize effectively. To address this, preliminary research was performed to identify more user-friendly Business Intelligence Reporting tools for the HCF to consider purchasing to carry out business user level reporting and analysis. Business Intelligence (BI) Reporting tools enable end-users to gather and analyze data to find actionable insights. For HCF, using a tool to collect, analyze and visualize its data can improve its ability to track spending and activities to make more data-driven decisions.

The following key considerations were made during the selection of the tools presented in this recommendation:

- Data connectivity to SQL Server
 - Does the solution include connectivity to SQL Server?
- Security standards
 - Are standards in place to secure client data?
- Deployment environment
 - Does the software operate in an on-premises environment or in a cloud environment that is managed by either the vendor or the organization?
- Self-service analytics
 - Is the solution self-service analytics. According to Gartner, self-service analytics is a form of business intelligence (BI) in which line-of-business professionals are enabled and encouraged to perform queries and generate reports on their own, with nominal IT support.⁶
- Data reporting capabilities
 - Does the tool include reporting functionality to create the reports HCF will need for data analysis?
- User-friendly interface
 - Does the interface cater to users at different levels of tech savviness?
- Used in healthcare environment
 - Has the tool been used in healthcare environments, especially by government agencies or healthcare payers?
- Customer service and support
 - Is the customer service and support response reliable?
- Subscription pricing/Total cost of ownership
 - Does the tool provide flexible deployment options?

⁶ <https://www.gartner.com/en/information-technology/glossary/self-service-analytics>

The following tools met the minimum requirements:

Microsoft Power BI - Power BI is a collection of services, apps and connectors used to turn data sources into visualizations, reports and dashboards.

Tableau Server - Tableau is a data visualization and analytics solution that provides enhanced data discovery and understanding to different users.

Qlik Sense - Qlik Sense is a self-service analytics and visualization tool that allows users across the spectrum to perform data exploration to meet organizational needs.

Product Comparison Chart

	Power BI	Tableau	Qlik Sense
Key Features	<ul style="list-style-type: none"> Transform and clean data to create a data model in built-in Power Query Editor Q&A question button that allow users to explore data with natural language queries 	<ul style="list-style-type: none"> Natural language query feature which allows users to use plain language to ask questions of their data Simple drag and drop feature that allows users to set their data how they want. 	<ul style="list-style-type: none"> Qlik Associative Engine which allows users to identify unexpected relationships in their dataset without hiding or losing other data points.
Deployment	<p>Cloud - Power BI Desktop, Power BI service (online SaaS (<i>Software as a Service</i>), Power BI mobile apps</p> <p>On-premises - Power BI Report Builder and Power BI Report Server</p>	<p>Flexible deployment - can be deployed on-premises, public cloud, or SaaS</p>	<p>Cloud - Qlik Sense Enterprise on Kubernetes on a public or private customer-managed cloud infrastructure; Qlik Sense Enterprise SaaS on Qlik-managed cloud infrastructure.</p> <p>On-premises - Qlik Sense Enterprise on Windows</p>
Security	<p>Uses the standard windows authentication and single sign on, with row-level security.</p>	<p>Role-based permissions and row level security. Can integrate with clients existing security protocols</p>	<p>Standard windows authentication protocols and attribute-based access control</p>

<p>Pricing (in USD)</p>	<p>Power BI Report Server and Builder - can be sourced through a SQL Server Enterprise License has MS Software Assurance</p> <p>Power BI - free version (Limited storage and sharing capabilities)</p> <p>Power BI Pro - \$9.99/user/month (10GB storage capacity; can share across organization)</p> <p>Power BI Premium - \$20/user/month (individual users have access to advanced AI and larger storage capacity)</p> <p>\$4,995/ capacity/month (full organizational capacity, requires Power BI Pro license)</p>	<p>Viewer - \$12/user/month</p> <ul style="list-style-type: none"> • View data and filter/drill down for specific details • Subscribe to a view to get that snapshot regularly and receive alerts • Post comments for other viewers or system users to see <p>Explorer - \$35/user/month</p> <ul style="list-style-type: none"> • View and download underlying data • Edit visuals and design dashboards <p>Creator - \$70/user/month</p> <ul style="list-style-type: none"> • Clean, standardize and export data for others to use 	<p>Qlik Sense Business - \$30/user/month(includes up to 5 shared users)</p> <p>Qlik Sense Enterprise - contact sales team for price quote (increase user capacity)</p>
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Appendix H: Additional Resources

Throughout the course of researching solutions for the Healthcare Fund, a collection of guides, toolkits, and courses established by organizations in the Health IT space have been compiled below for the HCF and partners to reference.

[AeHIN/SIL-Asia Digital Health Terminology Guide](#)

[WHO/PAHO Information Systems for Health \(IS4H\) Toolkit](#)

[Johns Hopkins University Health Information Technology Standards and Systems Interoperability Course](#)

[Office of the National Coordinator \(ONC\)/ U.S. Department of Health and Human Services \(HHS\) Health IT Playbook](#)