Outcome Assessment

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HOSPITAL HEALTH INFORMATION MANAGEMENT SYSTEM (HHIMS) PROJECT

Outcome Assessment of the HHIMS project produced on behalf of the Information and Communication Technology Agency (ICTA) , Sri Lanka

by;

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List of Abbreviations and Acronyms

ECG	Electrocardiogram
EMR	Electronic Medical Records
HHIMS	Hospital Health Information Management System
ICT	Information and Communication Technology
ICTA	Information and Communication Technology Agency of Sri Lanka
IMC	Inter-Ministerial Committee on ICT
M&E	Monitoring and Evaluation
MOH	Ministry of Health
OPD	Out Patient Department
PCU	Primary Care Unit
Rh	Rhesus factor in red blood cells
VDRL	Venereal Disease Research Laboratory

Executive Summary

Introduction – Information and Communication Technology Agency of Sri Lanka (ICTA) as the main government apex body, mandated to formulate policies and implement strategies to achieve the vision of digitally inclusive and prosperous Sri Lanka.

ICTA is presently functioning under the Ministry of Technology (MoT) which is operating directly under the preview of the His Excellency the President. In 2020, ICTA Board of Directors which includes veteran industry experts has prepared a comprehensive development strategy in consultation with various stakeholders for Digital Transformation for Prosperous Sri Lanka' which is fully aligned with the national policy framework "Vistas of Prosperity and Splendour" and already been presented to the H.E. the President and commenced in implementation with the approval of the Cabinet.

The Hospital Health Information Management System (HHIMS) Project, also known as e-Health or Digital Health Project, is one of such projects implemented by ICTA in collaboration with the Ministry of Health under the e-Sri Lanka Development Project. The goal of the project is to improve the quality, safety, efficiency and patient centeredness in service delivery of Sri Lankan state health sector using Information and Communication Technology. At the outset it has targeted establishing technology enabled hospital management systems in 300 hospitals in the country and to train 9,000 staff members attached to it by 2018.

Sri Lanka has a universal health care system that extends free healthcare to all citizens since 1930, which has been a national priority. OPD facilities are readily available in state hospitals situated in major cities, towns and rural areas, with medical and clinical facilities, laboratory and radiology facilities, ECG, X-rays, maternity wards are common in most of the hospitals. As of 2021, national healthcare system is having a total of 628 Hospital in different categories; National Hospitals, Teaching Hospitals, Provincial General Hospitals, District General Hospitals, Base Hospitals, Divisional Hospitals and Primary Medical Care Units. At present, the HHIMS project has accomplished establishing this system in 40 hospitals across the country that are graded under different categories.

The Objectives of the Study – Overall objective of the assessment is to learn the level of results generated through the implementation of this project. This is a preliminary study and it was planned to gather data by using rapid appraisal techniques. These outcomes include the improvement in quality, safety and efficient of health services due to the establishments of HHIMS in the hospitals under the study. Initially, the consultations with Project Manager and M&E Director of ICTA were conducted to understand the current progress of HHIMS and derive the specific objectives of this assessment. According the study methodology was designed to serve the following specific objectives;

- To assess the extent to which program initiatives had contributed towards meeting the intended objectives/outcomes
- To understand how project outcomes had been achieved or not achieved and related issues
- To examine the challenges faced by the staff during the implementation and recommend improvement for future projects.
- To identify the actions to be implemented to further improve the project results

Originally, it was planned to visit a sample of hospitals and conduct KIIs and FGDs with key personnel to collect relevant information while making the observation by the M&E team. In consultation with the ICTA, a sample of 10 hospitals was selected covering different hospital categories and representing the provinces.

However, due to the outbreak of COVID19 third-wave in Sri Lanka, most of the interviews conducted remotely with only four (4) hospitals being visited during latter part of March and early April 2021. The evaluation is also embedded the assessment of the short term, medium term and long-term expectations specified in the Log Frame that are included in the Chapter 4.

Key Findings of the Assessment

- With the introduction of this system, the efficiency of the hospitals has improved significantly. It was revealed that the waiting time of patients has been reduced and efficiency of the staff working through the system has been improved.
- Medical staff reported that the easy access to the patient's history and the ability to retrieve accurate information through the systems as the biggest advantage for them when diagnosing, prescribing and issuing medicine for patients.
- Pharmacists and dispensers reported that the system is quite helpful for inventory management of drugs. They can monitor the level of drugs, keep records, balance the quantities, and re-order when required with accurate information availability through the system. This has been a major improvement in increasing the efficiency and effectiveness of service delivery.
- It was also noted that medical staff is able to generate reports easily through the system for various purposes.
- Training sessions conducted at the initial stages were adequate to successfully address the improvements of attitude and behaviors of hospital staff towards the adaptation of technology.
- The research team hasn't observed any deviations in terms of the implementation of HHIMS based on the category of the hospital.
- There have been negative reactions and resistance of the staff at the initial stages on the HHIMS. However, at present they are highly satisfied with the system with the proven efficiency of it.
- It was also revealed that there are parallel information management systems other than HHIMS , operate independently in some of the hospitals.
- At present, persistent connectivity issues (through Wi-Fi) is reported as the main weakness of the system that hinders the functions of the hospitals at times. This is severed by the non-availability of dedicated IT staff at the hospital to troubleshoot the HHIMS.
- Some hardware issues were also reported with the absence of regular check-up for faults or bugs. It was reported that some laptops are faulty that cause delays in working with the system.
- In most of the hospitals, only a few units are linked with the HHIMS system. It was observed that all the hospitals have initiated the system at Out Patients Departments (OPD), pharmacy, wound dressing room, injection room, and laboratory. Some hospitals were able to extend the system in to clinics, patients' admission and Primary Care Units (PCU).
- There were no reports of serious system (software) issues. However, some of the users reported that it is incompatible with latest versions of browsers, unavailability of user profiles of all types of users (staff), inability to issue medical reports as some of the issues they experience with the system.

Recommendations

Based on the key findings discussed above and the expected outcomes of the projects as per the Logical Framework for HHIMS Project, the following recommendations are made.

- It is highly recommended to introduce the HHIMS to the balance 260 hospitals with required system improvements as initially planned.
- Connect all the functional units of the hospital including ward management with the HHIMS, while ensuring all the system requirements are met, especially the bandwidth and connectivity to the network.
- Health authorities should consider integrating all the parallel Health Information Management Systems that are in operation at some of the hospitals with the HHIMS, under the guidance and supervision of ICTA.
- Develop training manuals relevant to different modules/user profiles of HHIMS and conduct formal and uniform trainings to all users of the system.
- It is highly recommended to establish a dedicated technical team to maintain the system 24 x 7 in all hospitals.
- A competent authority should take necessary steps to establish a mechanism to monitor the system and conduct periodic reviews on the functionality of the system and areas to be further improved.
- Improve the role and responsibility of the Ministry of Health through the Inter-Ministerial Committee on ICT. There should be a strong IT leadership in the Ministry of Health, Department of Health and in Hospitals where the HHIMS to be introduced.

Chapter 1 – Introduction

1.1. Information and Communication Technology Agency (ICTA)

Information and Communication Technology Agency of Sri Lanka (ICTA) is the apex government institution, responsible for formulating policies and implementing projects towards digital development of the country. The Government of Sri Lanka (GoSL) has recognized the critical role that ICT can play in fostering social integration, peace, growth, and poverty reduction. The Government intends to use ICT to improve the reach and responsiveness of public services, reduce transaction costs to business, make government more transparent and accountable, and especially address the needs of the poor communities and citizens in geographically isolated regions. With the objective of fully leveraging the benefit of digital technologies in every sector of the country, ICTA commenced the implementation of "Digitalization of the Economy" initiative in 2016.

Currently, ICTA is in the process of implementing a number of national digitization initiatives including i) developing required digital infrastructure across the country to effectively serve all citizens irrespective of the geographical regions that they are living, ii) creating an enabling environment required for the knowledge economy; iii) delivering faster, more efficient, and more transparent government services to all citizens and businesses; iv) developing specialized ICT skills and broad ICT literacy across the society, v) promoting the competitiveness of IT and BPO industry and vi) promoting widespread ICT adoption and empowerment of citizens across the country. In order to achieve the outcomes of these initiatives, ICTA has already commenced over 80 projects in collaboration with various stakeholder organizations.

The Government of Sri Lanka recognized the critical role that ICT can play in fostering social integration, peace, growth, and poverty reduction. The Government intends to use ICT to improve the reach and responsiveness of public services, reduce transaction costs to business, make government more transparent and accountable, and address the urgent needs of poor communities and isolated regions. Therefore, Citizen Empowerment by taking the Digital Technologies and infrastructure to the Citizens and create an ecosystem for better delivery and consumption of the government and educational services for an overall economic development of the country and better living of the Citizens. These Citizen Empowerment initiatives include; Digital Libraries for Knowledge Enhancement, All children Coding System, Enhancement of Telecasters/Nenasalas, Public Wi-Fi, e-Village, e-Society, and e-Heritage Programme.

Introduction of Hospital Health Information Management System for state hospitals in Sri Lanka was also a part of this vision of becoming a technology enabled nation. The government invest a significant portion of public finances annually to maintain the healthcare system in the country, and through this Digital Health Project it was intended to increase the efficiency of the service delivery for the greater benefit of its citizens.

1.2. Healthcare System in Sri Lanka

Sri Lanka has a universal health care system that extends free healthcare to all citizens since 1930, which has been a national priority. OPD facilities are readily available in state hospitals situated in major cities, towns and rural areas, with medical and clinical facilities, laboratory and radiology facilities, ECG, X-rays, maternity wards are common in most. But most illnesses can be treated in

teaching hospitals in Colombo, Colombo South, Colombo North, Kandy/Peradeniya, Galle (Karapitiya Hospital) and Jaffna. All medical Officers and Nursing Staff in the government hospitals are qualified and trained, with some of the most experienced staff working at the teaching hospitals. For emergencies, especially accidents, it is highly recommended to go directly to general hospital accident services as they are equipped with the staff and facilities to handle emergencies.

Despite low levels of health expenditures, Sri Lanka's health indicators are comparable to more developed countries in the region. However, the facilities available at the state hospitals seems inadequate to cater the demands of public and reported having long waiting lists for specialized care and advanced procedures. Therefore, the demand for private healthcare facilities grew specially during the last two decades causing the emergence of many private hospitals, clinic centers and channeling centers. The improved economic conditions of the people and increased awareness on healthcare is also among the reasons for this shift. They provide much more luxurious service than government hospitals, but they are mostly limited to Colombo and main cities and also have high prices.

According to national health statistics, the state healthcare system is comprised with 628 hospitals belonging to various classifications spread across Sri Lanka. The breakdown of the government hospitals is given in the table 1.

Table 1: Types and Numbers of Government Hospitals in Sri Lanka

	Type of Hospital	No. of Hospitals	No. of Hospitals with HHIMS
1	Teaching Hospitals	16	02
2	Provincial General Hospitals	03	-
3	District General Hospitals	19	09
4	Base Hospitals – Type A	24	-
5	Base Hospitals – Type B	50	27
6	Divisional Hospitals – Type A	50	-
7	Divisional Hospitals – Type B	134	-
8	Divisional Hospitals – Type C	296	-
9	Primary Medical Care Units and Maternity Wards	11	-
10	Specialty Hospitals	25	02
	Total Hospitals	**628**	**40**

Source: Annual Health Statistics 2017, Ministry of Health, Nutrition and Indigenous Medicine, 2019

1.3. Digital Health Project (Hospital Health Information Management System – HHIMS)

The main objective of the HHIMS is to improve quality, safety, efficiency of the hospital services and primary patient care in the service delivery of Sri Lanka state health sector with the utilization of information and communication technology.

Through this project ICTA has supported to implement the HHIMS in 40 government hospitals so far. The project was started in 2016 and implemented in collaboration with the Ministry of Health, Nutrition and Indigenous Medicine. In order to ensure the engagement of key stakeholders in the implementing the project, a national steering committee, provincial level project steering committees and hospital steering committees were formed with the representative from the ministry, provincial departments of health services and ICTA.

The main outcomes and outputs of this project is illustrated in the table 2.

Table 2: Objectives and Outcomes of Digital Health Project

Project Objectives	Project Outcomes
1. To increase the Electronic Medical Records coverage of the selected hospitals up to 80% from the total patients who access the health services. 2. To ensure availability of updated, accurate information for patient care and planning of health services. 3. To improve quality and efficiency in service delivery, governance, accountability and effective use of resources of the government hospitals. 4. To improve the capacity of health authorities to detect emerging and re-emerging diseases and take necessary preventive actions.	1. Improved diagnosis based on the evidence based practice 2. Reduced patient waiting time to meet a doctor at the government hospitals 3. Improved patient satisfaction on government health care services 4. Improved Efficiency in healthcare service delivery system 5. Improved monitoring, evaluation and reporting mechanism of the health system 6. Improved capacity of the health staff to sustain the EHR systems in the government health sector 7. Improved management decision making based on reliable, accurate and real time data 8. Improved management of health resources including drugs and laboratory resources 9. Improved mobility of the patients' health records

Source: Logical Framework of Digital Health Project, ICTA, 2016

This project envisioned achieving following targets during its lifespan.

1. Establish EHR systems in 300 hospitals across the country by end of 2018
2. Establish Laboratory and Pharmacy Management Systems in selected 300 hospitals
3. Train 9,000 hospital staff members to manage the EHR systems effectively
4. Provide personal electronic medical records for 80% of the patients who access the health services in the selected hospitals
5. Establish 9 Provincial e-Health Steering Committees and 300 Hospital e-Health Steering Committees

With the implementation of Digital Health Project, it was intended to implement the HHIMS system in 300 hospitals. Among them, 40 hospitals were selected to pilot the system during the first phase. Table 3 presents the information relevant to those 40 hospitals.

Table 3: 40 Hospitals Piloted the HHIMS

	Type of Hospital	Province
1	Base Hospital Karawanella	Sabaragamuwa
2	Base Hospital Balangoda	Sabaragamuwa
3	Base Hospital Warakapola	Sabaragamuwa
4	District General Hospital Trincomalee	Eastern
5	District General Hospital Ampara	Eastern
6	Base Hospital Nintavur	Eastern
7	Base Hospital Kalavanchikudy	Eastern
8	Base Hospital Mahaoya	Eastern
9	Base Hospital Kalmunai North	Eastern
10	Base Hospital Muttur	Eastern
11	District General Hospital Vavuniya	Northern
12	District General Hospital Mullaithivu	Northern
13	District General Hospital Mannar	Northern
14	Base Hospital Udugama	Southern
15	Base Hospital Tangalle	Southern
16	Base Hospital Kamburupitiya	Southern
17	Teaching Hospital Karapitiya	Southern
18	Base Hospital Elpitiya	Southern
19	Base Hospital Dompe	Western
20	Base Hospital Avissawella	Western
21	Base Hospital Panadura	Western
22	National Hospital for Respiratory Diseases Welisara	Western
23	Colombo National Hospital	Western
24	Base Hospital Homagama	Western
25	District General Hospital Kalutara	Western
26	Base Hospital Wathupitiwala	Western
27	Base Hospital Horana	Western
28	Base Hospital Teldeniya	Central
29	Base Hospital Dick-Oya	Central
30	District General Hospital Nuwara Eliya	Central
31	Base Hospital Dambadeniya	North Western
32	Base Hospital Galgamuwa	North Western
33	District General Hospital Chilaw	North Western
34	District General Hospital Polonnaruwa	North Central
35	Base Hospital Medirigiriya	North Central
36	Base Hospital Thambuttegama	North Central
37	Teaching Hospital Anuradhapura	North Central
38	Base Hospital Wellawaya	Uva
39	Base Hospital Diyathalawa	Uva
40	Base Hospital Mahiyanganaya	Uva

Source: Digital Health Project Records, ICTA

Chapter 2 – Objective, Approach and Methodology

2.1. Objectives of the Assessment

The primary objective of the assessment is to the assess the level of achievement of outcomes stipulated in the project log frame and to generate knowledge and learnings through the implementation process. Improvements made in to quality, safety and efficiency of health services are some of the outcomes identified in the planning stage of this assessment.

The findings of this assessment will be used to improve the HHIMS in the respective hospitals during the remaining period of implementation of the HHIMS. The evaluation will also facilitate to replicate any success factors and remedy/resolve any failures in the system and also to put the system in right direction with the guidance of the Inter-Ministerial Committee (IMC) on ICT.

The specific objectives of this assessment include;

- The extent to which program initiatives had contributed towards meeting the intended objectives/outcomes stipulated in the logical framework of the Digital Health Project.
- The manner in which the project outcomes had been achieved and if not achieved, related issues.
- The challenges faced by the staff during the implementation of the program and make recommendations for the improvement of future projects.
- What actions, need to be implemented to further improve the program results.

2.2. Study Methodology

In order to gather data within a short period of time and with limited resource, Rapid Appraisal Techniques were used. These methods include Key Informant Interviews (KIIs), Focus Group Discussions (FGDs), direct observations, document review and face to face interviews. To ensure the reliability and meeting the challenges of representativeness, all these methods were triangulated and draw a consolidated a holistic picture of achievement of outcomes.

At the inception stage, the research team consulted the Project Manager/ICTA on several occasions in planning for the study in accordance with the Terms of Reference (ToR) of the assignment. The present status of the HHIMS was also discussed with the project team members in addition to a review of secondary information of HHIMS to gain a better understanding about the project.

In collaboration with the ICTA project team, a sample of 10 hospitals representing all the provinces of Sri Lanka was selected to conduct this study. Initially, it was planned to visit all of these hospital locations physically and conduct key informant interviews (KIIs) and focus group discussions (FGDs). However, the re-emergence of COVID-19 third wave interrupted the physical visits, and the team had to conduct most of the data collection remotely through telephonic interviews. Physical meetings were conducted only in 5 locations (18 KIIs) and 29 KIIs in the other locations through virtual meetings were conducted resulting a total of 47 Key Informant Interviews. The Key Informant Interviews were conducted with Medical Officers, Nursing Staff, Pharmacy Staff, IT Administrators, IT Technicians, Cardiographers, and X-Ray Technicians.

2.3. Study Sample

In consultation with the ICTA, 10 Hospitals were selected to cover all the provinces of Sri Lanka at the inception stage. In drawing the sample, the attributes such as type of the hospital, number of patient registrations, number of episodes (patient visits) and specialty of the hospital were also considered.

Initially, the Karapitiya Teaching Hospital in Southern Province was in the sample but later had to replace it with Panadura Base Hospital, with increasing number of COVID-19 cases in the Southern province and Karapitiya Teaching Hospital becoming a major treatment center for COVID-19 patients in the region. Specific details of sampling are given in table 4.

Table 4: List of Sampled Hospitals

	Hospital	Province	No of Registrations	No of Patient Visits (Episodes)
1	Base Hospital Karawanella	Sabaragamuwa	57,968	94,822
2	District General Hospital Ampara	Eastern	205,297	775,205
3	District General Hospital Mannar	Northern	61,378	103,744
4	Base Hospital Panadura	Western	228,449	1,205,414
5	District Hospital Dompe	Western	105,123	593,351
6	National Hospital for Respiratory Diseases – Welisara	Western	123,817	396,858
7	Base Hospital Teldeniya	Central	74,119	220,903
8	Base Hospital Dambadeniya	North Western	253,951	421,782
9	Base Hospital Thambuttegama	North Central	52,190	101,405
10	Base Hospital Wellawaya	Uva	71,966	293,394
11	Teaching Hospital Karapitiya	Southern	445,434	485,419

Source: ICTA, Information as at 31 Mar 2021

2.4. Limitations of the Study

Even though it was intended to make physical observations of the system implementation and conduct face-to-face discussions with the hospital staff who were involved with the HHIMS, it was only possible to five (5) of the hospitals with the emergence of COVID-19 third wave of the country.

Due to the travel restrictions imposed by the government during this time, and considering the safety and security factors of staff involved, the rest of the interviews were conducted virtually as telephonic interviews.

Chapter 3 – Findings of the Assessment

The assessment of HHIMS was implemented based on a sample of 10 hospitals, with 47 personal interviews during the period from 22nd March 2021 to 13th May 2021. The details of the interviews are provided in annex 1. The following section contains an account of the findings from the assessment.

3.1. Status of Initial Stage of the HHIMS Implementation

Commencement of the system – In all of the hospitals in the sample, Health Information Management System (HHIMS) was established between 2016-2018. According to ICTA project officers, that situation is same in all the 40 hospitals that the system is in operation as of 2021. However, it was also reported that some hospitals commenced implementing the system in 2011/12, but delayed due to many technical challenges.

Parallel Health Information Systems – The research team learned through the ICTA project staff and from some of the key informants that another version of health information management system runs parallel in some of the government hospitals. That was introduced through the Ministry of Health prior to the rollout of HHIMS. This system was in operation in Ampara hospital and abandoned in 2009/2010.

Behavior changes in staff – It was revealed through the interviews with key informants and focused group discussions that most of the medical staff and paramedics had shown strong resistance for HHIMS during its early stages of the implementation. According to them, that was mainly due to lack of IT literacy and unfamiliarity of working in a computerized work environment. Therefore, several workshops focusing on both skills development and behavioral changes were organized and implemented during the initial stages of the project, including outbound training, training on positive thinking, and basic training in information technology. This yielded positive results and hospital staff now has become more familiar with the system. The study team observed that the hospital staff is highly positive towards the system and overtime they have changed their attitudes, behaviors and the actual usage of the system.

Initial system training – At the initial stages of the system implementation, ICTA has organized some training for hospital staff, but not all of them are retained within those hospitals at present. Most of the staff who received training has been transferred and the replacement staff including medical officers have not received a formal training and thereby they have no better understanding of the functionality of the system. The newcomers learn about the system from the existing staff, and from the ICTA project officers attached to those hospitals.

Awareness of the system – Initially, the patients' awareness of the HHIMS was poor and usefulness and the benefits of the system were not disseminated to the public and therefore, it took a long time to educate them on the system. However, currently the patients are well aware of the system. At the time the system initiated, no public awareness programmes were organized to aware to aware the public on the benefit of this system or on the usage of it. Also, they were not aware on the procedure to enroll to the system. Later on, hospitals have initiated posting notices on hospital notice boards on the procedures of enrolling into the system and basic requirements for it. In addition, the hospital staff (mainly the OPD staff) assisted the incoming OPD patients in the registration in the HHIMS of the

respective hospital. The barcode identification seems to be a novel approach for majority of public, who are not much IT literate.

3.2. Present Usage of the HHIMS

Operational Units – In all of the hospitals HHIMS is operational in OPD, OPD reading room, injection room, ECG room, X-ray room, blood drawing room, laboratory and pharmacy. In some of the hospitals like Dambadeniya, it is extended into clinics as well. In National Hospital for Respiratory Diseases in Welisara, it is implemented at TB Testing units and the Scooter Unit of the laboratory as well. Meanwhile, some hospitals (eg. Ampara and Dompe) have linked or initiating to link the Patient Admission and Primary Care Unit (PCU) in to the system.

In most of the hospitals the test reports of the Laboratory are shared through the system, except for Thambuttegama, Wellawaya and Karawanella Hospitals as they were not linked with the system due to the unavailability of internet coverage for the location where the laboratory is in operation.

ECG Reporting – Currently, the ECGs are prescribed by the Medical Officer of the OPD are ordered through the system to perform ECG and the results are given in a printed ECG Report to be shown to the OPD Medical Officer manually. ECG machines available in most of the hospitals are outdated and in order to perform this task, those machines need to be compatible with the system. It was revealed through the discussions with ECG technicians, even though some high-end ECG machines are capable of producing digital images and upload them into information management systems such as HHIMS, those types of ECG machines are not available at local hospitals. Due to this reason directly saving all patients ECG records to the system is problematic. Furthermore, additional facilities might also require performing this task, such as networking and hardware (servers) to directly upload reports to the HHIMS system.

Improved Access to Citizens Seeking Healthcare Services – There has been an opportunity for all the patients in the respective hospital area where HHIMS is installed and operating, to register with the hospital with full bio data, health history including recording allergies. It was revealed from the sample of 10 hospitals in the assessment , more than one million patients are with Electronic Medical Records (EMR) at those hospitals.

Efficient Service Delivery – The respondents of the assessment including the medical officers, and laboratory technicians revealed that the waiting time of the patients has been reduced, with the efficiency of the staff in handling the respective tasks being improved as they began working through the system. With ease of access to medical history of patients, the capabilities of medical officers have increased to diagnose the illnesses of patients faster. The processing of laboratory report generation requests , and drug issues are performed much efficiently and accurately.

The respondents stated that this system has greatly reduced the stress of medical and para-medical staff. Previously in certain days they were unable to complete the day's work and compelled to take office work home to complete them. There is no such a situation now. This system makes it very easy for them to relieve from hard work.

Monitoring of the Health System – At the national level, ICTA staff monitors the performance of the HHIMS, but there has been no evidence with regard to the monitoring efforts at the provincial or hospital levels. According to the Project Logical Framework, there shall be 3 levels of monitoring of the

HHIMS. Highest level is at National level monitoring and evaluation is undertaken by the ICTA M & E Division and this division extensively evaluate the system in different angles. However, it has been not seen any monitoring and evaluation by the next 2 levels; Hospital Level and Provincial Director of Health Services Level. In fact, mostly the HHIMS in respective hospitals are only monitored by the respective officers in charge of the hospitals.

3.3. Benefits to the Hospital Staff

Customizing Different Units – Almost all the respondents, including medical and paramedic staffs expressed very positive thoughts on working through the system, despite some minor challenges (These challenges will also be discussed under the operational issues section). They acknowledged the ease of working through the system, ability of it to retain historic records, and the overall improvements in to the efficient service delivery enabled through the HHIMS system. Also, the different units of the hospitals and consultants expect that the system should be customized for each division addressing their concerns.

Ease of Access to Patients' History in Prescribing Medicine – Prior to the initiation of the HHIMS, a manual record for each patient is maintained and whenever a patient is visiting the hospital for medical treatment, he has to obtain this medical record from the Medical Record Room and meet the Medical Officer. Then the Medical Officer prescribes the tests and medicine and when the patient is leaving the hospital, he/she has to return the medical record to the record room. The HHIMS is electronically provide a token for the patient to meet the Medical Officer on first come first serve basis. The Medical Officer then prescribes the respective tests and medicine.

The system provides the facility of recoding the diagnosed illnesses of patients, the tests performed, prescribed medicines and quantities within the system. As revealed through the discussions with hospital staff, prior to the implementation of HHIMS medical officers had to depend on the blurred recalls of patients, or scattered pieces of prescriptions and medical records that patients brought in determining the medical history of them. However, after the implementation of the HHIMS the medical officers at the OPD could retrieve accurate information through the system for patients with recurring visits. In addition, medical officers also have the ability to view the available stocks of medicines in the pharmacy and prescribe accordingly.

For pharmacy staff, it is possible to view the queue of prescriptions as soon as the medical officer finalize a prescription. Without waiting for a patient to arrive at the counter, pharmacist is able to prepare the list of medicines prescribed for that patient.

It was also revealed through pharmacists that they were relieved from scanning through illegible handwritten prescriptions by medical officers as a result of HHIMS, while saving more time and energy, also increasing the accuracy in issuing medicines.

Ease of Managing of Drug Stocks – The system facilitates the easy management of drug stock in the pharmacy. Pharmacist are able to enter the numbers of stocks received by the main store into the pharmacy, and it is was revealed that the system reduces the human errors and daily a stock count can be taken easily. This has contributed significantly to reduce their daily workload and they mentioned they were able to utilize their time more efficiently and productively.

The pharmacists explained that the pharmacy stock records are automatically update end of the day when the stock records are closed. Previously, they were compelled to work overtime hours to balance

the record books until the physical and book balances tallies. This facility has relieved the work of the pharmacist and he was able to spend more time to advice patients.

Less Administrative Burden / Reduced Paperwork – It was evident through the discussions with every hospital staff member that the HHIMS has made significant contributions in increasing the efficiency of the medical and para-medical staff as it reduces the paper work, use of automated printed stickers (barcodes) for tracking and identification purpose of medical records, drugs, etc. This has resulted in increased efficiency, and accuracy with minimizing human errors.

According to the expressions from the staff interviewed, this system in the hospitals has helped to make the entire hospital process more efficient. They all agreed that the system being very convenient for them as it contains all the details relevant and necessary information to the patient. In the past, it was a cumbersome task to locate old records of patients or it's a task completely avoided. This system can even activate the issuance of patients' diagnosis cards without any hassle.

According to them, the system has proved vastly beneficial amidst of the COVID-19 pandemic as it minimized the exposure of hospital staff to patients and vice versa. With most of the prescriptions, and laboratory requests transferred through system itself, hospital staff were relieved from handling anything at the counters

Ease of Generating Reports – The research team was informed of the capabilities of the system in generating useful reports such as daily patient registrations, daily patient attendance at the OPD, patient admission and discharges in respect of the wards, details of the quantities of medicines available, the quantities of medicines issued and the daily balances, number of ECGs taken, number of injections given. In addition, it could be helpful for the hospital administration and healthcare professionals to generate analytical reports to observe the trends in diagnoses, flow of medicine stocks, demand for health infrastructures, and to make proactive decisions based on it. However, it was revealed through the discussions, hospital staff are yet to fully exploit such capabilities of the HHIMS.

3.4. Benefits to the Patients

Onetime Registration of Patients – When a new patient arrives at a hospital, a profile of the patient will be created at the registration desk by entering very basic information of patient into the system such as name, address, date of birth, NIC number, marital status, and contact number. A unique barcode identification is created for the patient to be referred in every other encounter to recall that record of the patient. Once the patient is diagnosed by a doctor, patients diagnose records, blood group, health history and special cases such as allergies are being entered to the system by a medical officer.

According to the observations made, patients were relieved from repeating their basic information and medical history over and over again with medical officers having access to those from the system. As discussed previously, not only the medical officers, patients also benefitted from this ability of the system as they do not have to carry all the prescriptions and medical reports, also with the increased accuracy of details.

Reduction in Waiting Time – It was revealed that there have been significant reductions in waiting time of patients at OPD and clinics with the implementation of HHIMS. Some patients reported that they can fulfill their treatment and return within 45 mins – 1 hour. According to the baseline survey conducted in January 2017 by ICTA, average waiting time of a patient was 98 minutes to complete their treatment.

A patient interviewed at Dompe Hospital revealed that they had to spend at least 5 – 6 hours when they visited the OPD facility at the hospital prior to the introduction of this system, i.e., 7 – 8 years ago. They acknowledged that they can meet the doctor and take the medicine within 1-2 hours with the improved conditions. Unlike in the past now there are no queues and hospital environment are very clean and convenient to patients. Doctors and hospital staff are kind to patients and quality of the treatment has also significantly improved. Overall, the patients are very pleased that the hospital has become a pleasant place comparing with the situation earlier.

There were instances where the patients had to take the earliest possible public transportation option to arrive at the hospital to obtain an appointment, or arrive on the day prior to the consultation and stay in a rented accommodation or on a hospital bench. This resulted in incurring more time and cost for the patient. After the system being implemented, patients were greatly benefited as they could arrive at the hospital at their convenience and fulfill their requirements consuming a minimum time at the hospital.

e-Channeling Facility – Seven (07) hospitals (Dompe Divisional Hospital, Polonnaruwa District Hospital, Wellawaya Base Hospital, Castle Street Maternity Hospital, Ampara Base Hospital, National Hospital for Respiratory Diseases in Welisara, and Mental Ward at Wellawaya Hospital) in the country have made provisions to create pre-appointments to consultant medical officers/specialists through e-channeling via www.echannelling.com and four of them are within the sample of HHIMS hospital. This is very convenient approach to consult medical professions without wasting time. Through an interview with a patient, it was revealed that this facility is very useful to them. Doctors and hospital staff mentioned that this approach help them to use their time more efficiently and effectively and it will help to citizens to save time, which could be used for productive economic activities and thereby to contribute for the country economic development.

Ability to Obtain Reports on Medical History – It was made known to the research team, the ability of the system to generate and issue reports containing the medical history of a patient, which would be immensely beneficial when a patient changes residence to another area. Then the patient is able to produce the medical history to the new hospital when he seeks treatment. It will significantly help the doctor to carry out proper diagnostic by saving their time as well as to improve the quality of the treatment which leads to improve the effectiveness of the health system.

Improved Patients' Satisfaction – It was revealed from the interviews with the hospital staff that the patients are highly satisfied with the current service delivery process, mainly due to reduction in time spending in the hospital for medical treatments. In addition, availability of the health history in the system facilitates the Medical Officer and the Pharmacist to examine the patient and issue of medicine.

It was found that one hospital (Ampara District Hospital) has evolved a system of verifying user satisfaction through a Patient Satisfaction Survey. This survey has been conducted by the OPD Unit with open ended questionnaire. They conduct this survey periodically; once in three months. The results of the survey shows that the patients are highly recognized the HHIMS in Ampara Hospital. The

hospital administration is very careful with the areas where results are not up to the standard and immediate action is taken to remedy them

3.5. Operational Issues in the HHIMS

Compatibility Issues Other System Software – HHIMS runs on a Linux platform. The assessment team was made aware of compatibility issues with regard to linking some of the medical equipment with HHIMS, which were procured through different vendors. This has occurred in District Hospital of Ampara in connecting OPD Analyzers with other Analyzers supplied by a different vendor. The hospital staff had observed this as a major limitation of the system, as they're not being able to fully integrate the medical services through HHIMS.

Connectivity Issues and System Failures – It was observed that all the hospitals are having connectivity issues, and weak signal strength in some of the key functional areas such as laboratories, pharmacy, etc. There were reports of very frequent system failures mainly due bad weather conditions as well.

During system failures, hospital staff continue to work manually and caused to lose the credibility and reliance of the system to some extent. There is no provision in the system to record these manually performed activities in the system. Hence the system cannot be considered to contain all the medical records at present. In other words, the records of patients diagnosed during such system failures would not be updated in the system and medical officers could review such information on their next visit to the hospital.

Software Issues – It was revealed through the discussions with hospital staff that they have experienced few issues with the software as well. Those issues were addressed by the ICTA officers. They include the required report generation by consultants (e.g.; categorizing patients according to their clinic/disease) and in some instances, the system did not allow to convert the generated report in to the PDF version.

Hardware Issues – The equipment and accessories supplied by ICTA is now somewhat old and they give more troubles now; the need repairs and replacements. The batteries of the laptops and UPSs need immediate replacement. This situation has been identified as a major challenge to the hospital HHIMS as the funding these activities have to be borne by the Department of Health. There must be a mechanism to escalate the requirement to the relevant section of the MOH and allocate appropriate budget to replace the equipment.

Absence of a Dedicated Technical Team – It has been observed that most of the hospitals which have installed the HHIMS do not have a dedicated technical team to oversee the system and its hardware, except the Ampara Hospital, Panadura Hospital and the Dompe Hospital. At times of system failures, or at minor software or hardware issues, it takes considerably long time to rectify those issues due this problem. At present, most of the IT issues are attended by the general staff members (mostly minor staff) and mostly they do not have IT exposure.

Training of Hospital Staff – Training sessions for hospital staff have been provided mostly at the inception stage on the basic computer skills and on the use of HHIMS by ICTA staff. This training was not a continuous process and therefore the new comers to the HHIMS have been trained by the existing staff in the system. It was said that this training was sufficient as the system somewhat simple but

some of the respondents express that the training was inadequate. However, training have not been provided on EMR Solutions.

Negative Attitudes and Practices by Staff – Even though the attitudes of most of hospital staff were largely positive towards the system, the research team observed some staff still with negative attitudes of working in a computerized environment. One particular hospital reportedly not utilize the system on Sundays and public holidays for no apparent reason. It was observed they manually provide consultations and other services during these days and those records would not be entered into HHIMS in anyway. Some of the issues discussed earlier have caused to demotivate the staff of this particular hospital and to lose trust with the system.

Non-Availability of User Profiles to Login to the System – There are instance where all the users of the system have not provided with the user profiles to login to the system. This shortcoming is mainly due to non-availability of a dedicated system administrators .

Incompatibility of Latest Browser Versions – The photo taken during the patient registration is not active with the latest version of browsers. Therefore, the system needs to be updated. (e.g., photos are not supported to the Firefox updated versions, camera does not get access to http versions)

Inability to Issue Medical Reports – Currently, there is no mechanism to issue medical reports as required by the employers and other appropriate parties from the system.

3.6. Suggestions for Improvements by Hospital Staff

Expand the HHIMS into Entire Hospital – In most of the hospitals, other than Ampara and Dompe, all the functional units are not interconnected with the HHIMS. It is present mostly in OPDs, pharmacies, laboratories, injection rooms, ECG units and blood drawing rooms only.
Some investigations are still done manually. Investigations such as VDRL and Rubin & Rh, where the records should be sent to the blood bank are still done manually. The ECG Reports are still handled manually. Some laboratories are not yet connected to the system. The system is not operative during a power failures or system failures, and the work is done manually and the manually operated data is not entered in to the system.

The hospital staff has realized the importance of expanding this system into other functional areas, such as clinics, primary care units (wards), ICU, operating theatres, etc. The hospital staff is the view that it would be better to include the wards administration in to the system so that the diagnosis of these in-patients can be added to their health history and medicine prescribed to such patients can be added.

Customize the System – It is suggested to customize the system to suit a particular hospital as well as the different units of the hospital, and availability of medical professionals. However, there has been a different opinion expressed, where they suggest that a unique system should be established for all the hospitals in HHIMS.

Integrate Parallel Systems with HHIMS – If any computerized information system is operational in a particular hospital, it would be better to integrate it with the HHIMS. The other information systems are mostly involved with the patient admissions.

Provide Training to All the Staff – A formal training is only provided to the persons who were involved with the system at the inception may be comprehensively. However, those who had these training has been mostly transferred and those positions have been filled by untrained personnel and they have received informal training from the other staff working in the system. When untrained personnel is operating the system there might difficult situations can be occurred.

Conduct Awareness Programs among Hospital Staff and Public*:* There should be a comprehensive awareness program should be implemented for all the hospital staff, patients and the public.

Improve the Role of the Ministry of Health: The Ministry of Health should take the lead role and provide funding for the maintenance of software and hardware and also other provision such as appointing a dedicated team of technicians to oversee the HHIMS in each hospital. For the continuity of the HHIMS, there should be a strong IT Leadership from the healthcare sector.

Provide additional hardware to use in emergencies*:* It is suggested that it is essential to have additional hardware and accessories in place for use in emergency breakdowns and malfunctioning of equipment.

Review the System Frequently: The system should be reviewed at least once in six months and any short falls or errors should be rectified and updated the system. This updated system should be extended to all the hospitals. However, all the existing problems should be resolved and introduce an updated system with a comprehensive training to the users of the system. Patients' information in specialized clinics such as psychiatrics is highly confidential and they should be kept protected with a specialized security system.

3.7. Unintended Negative Impacts

Negative Impacts During the Inception – There has been resistance at the time of establishing the system from the Medical Staff as well as Para-medical Staff may be due to their poor literacy in IT and the unfamiliarity of the system. However, it has been gradually reduced and now it is very hard for them to operate the respective functions without the system. Currently there is no negative impacts on the system and the hospital staff and the patients are very favorable of the system. ICTA team has done an array of activities to manage the resistance and improve the adoption.

Since the initial implementation of this system in 2012 was failed in few hospitals, the medical staff and the para-medical staff has lost the confidence of the system; but during the second phase of the program all issues have been resolved and implemented well.

Negative Attitudes of Old Age Staff – Another issue was that the old age staff was reluctant to switch on to this new system at the initial stages which is very common in digital transformation programs.

Chapter 4 – Recommendations

Based on the main findings of the assessment, the following recommendations are presented to with the view of improving the efficiency, effectiveness, and impact of the HHIMS.

1. Strengthen the Operations of Existing HHIMS to Overcome the Identified Shortfalls

1a) Address the Connectivity Issues – The research team could conclude most of the negative perceptions of the system among hospital staff stemmed from the connectivity issues and some frequent failures in hardware and the system is highly vulnerable for power failures. Therefore, it is highly recommended to ensure every single unit/department connected to HHIMS is having adequate access and bandwidth of the server at the hospital. It also important to rectify any issues with power supply, either through generators or UPSs to continue to system uninterrupted even during power failures.

1b) Resolve Issues with Hardware and Peripherals – There has been sever issues on hardware, which include the need for repair and replacement, replacement of batteries of laptops and UPSs, and the expiry of warranties. Therefore, it is highly recommended to take immediate steps to repair and replace the obsolete equipment and ensure the continuity of the system smoothly.

1c) Integrate All the Parallel Information Systems with HHIMS – It is highly recommended all the hospitals to execute HHIMS, integrating all the parallel information systems with it. This action would benefit the public healthcare system largely, with the ability of amalgamating all the health-related information at one source.

1d) Assign a Dedicated Technical Team – Hospital administration should take necessary steps to establish a dedicated technical team, with qualifications in the permanent cadre of the hospital in consultation with ICTA. Currently, in most of the hospitals the technical issues are handled by a staff member in the hospital, who 's with some IT knowledge, but without any qualifications. This has caused serious issues and stress among the staff who are operating the HHISM. This should be implemented through the Inter-Ministerial Committee on ICT.

1e) Continuous Staff Training – It is highly recommended to provide training for anyone who joins with HHIMS, and to conduct refresher sessions time to time. Training modules could be customized based on the functions of staff members. The research findings confirmed that even the experienced users of the system, do not fully utilize the system capabilities and these trainings to be a part of their capacity building plans. It is also recommended to provide a printed training guide/manual for users of the system.

2. Rectify Minor Software Issues

2a) Resolve the Issues in Integrating some Medical Equipment with HHIMS – As the findings from the research confirmed, some of the medical equipment such as laboratory analyzers seems incompatible with the system. Therefore, it is highly recommended to improve the system capabilities to integrate a wide array of medical equipment with third party drivers with the system. ICTA should look at the compatibility of these software and provide advices in going ahead.

2b) Incompatibility with Latest Browser Versions – It was reported that the HHIMS is incompatible with some latest versions of browsers. Therefore, the system needs to be updated. (e.g., photos are not supported to the updated Firefox versions – camera does not get access to http versions)

2c) Establish a Mechanism to Gather User Feedback – Hospital staff, who are the users of the system expressed some areas to improve within the interface of the system. The research has come across several medical officers, and staff members who were having experience working in similar systems in developed countries. Therefore, it is highly recommended to establish a mechanism to gather their feedback on the system on regular basis, and make steps to rectify those.

2d) Release Software Updates Periodically – It is observed that the software updates were not taken place once it was established at hospitals. With feedback from the users at hospitals, ICTA project team should establish a mechanism to release minor updates, or major upgrades to the system based on the necessity.

3. Expand the HHIMS into Other Areas of the Hospital

3a) Ward Administration through HHIMS – It is recommended to include wards administration in to the system even at the next stage. Only a very few hospitals are having this feature at present, while majority of the hospitals utilize the system to manage out patients mostly. The hospital staff is of the view that it would be beneficial to include the wards administration in to the system so that the diagnosis of these in-patients can be added to their health history and medicine prescribed to such patients can be added.

3b) Entire Hospital Functions under HHIMS – Hospital administration in consultation and collaboration with ICTA should integrate all the functions of the hospital with HHIMS. Since, HHIMS proved beneficial in improving the efficiency, effectiveness, and user satisfaction it is highly recommended to follow the same across all the units of the hospital.

3c) Provide Additional Hardware to be Used in Emergencies – It is highly recommended to have additional hardware and accessories at hospitals, for use in emergency breakdowns and malfunctioning of equipment. This equipment should be in good condition under the custody of the dedicated system administrators to be placed at every hospital.

4. Steps for Increased Patient Satisfaction

4a) Establish a Mechanism to Gather Patient Satisfaction Information – It is highly recommended to gather and analyze the level of satisfaction of patients of the service delivery on on-going basis. According to research findings, only a very small number of patients are aware of a computerized system in operation at these hospitals. Therefore, for increased citizen awareness and engagement it is highly recommended to establish some mechanism to know their level of satisfaction of the service they received at the hospital. For an example, this could be done through an automated SMS service.

4b) E-Channeling Facility – It was observed some of the government hospitals with HHIMS in operation is included with one of the pioneering e-channeling service already. Therefore, it is highly recommended to expand this service for all the other government hospitals with HHIMS in operations, and any new additional hospitals in the future.

5. Plan for Further Expansions and to Ensure Sustainability of Operations

5a) Extend the HHIMS for Other Hospitals – Based on the findings of this assessment, it is highly recommended to establish this system in other 260 hospitals, which were in the initial proposal, and then go beyond that for all the public hospitals in Sri Lanka. It is also recommended to further invest in this with required modification as per previous recommendations. By implementing the system in another 260 hospitals, the government can save huge amount of money with improved efficiency of the hospital system and saving time and effort of the citizen and hospital staff.

It is extremely important a solid and fully operative system should be established, after having all errors in the software being corrected by ICTA and then replicate that system to other hospitals for better functioning. This system development should be supported by the specialists in the medical science in different fields.

5b) Ensure Strong IT Leadership at Hospitals – A strong IT leadership should be ensured at hospitals to lead the HHIMS within it. In order to lead this digital transformation process, it is vital that the head of hospitals administration be the driving force with effective leadership skills. Therefore, necessary it is essential to take necessary steps to ensure the buy-in of the leadership in every hospital for HHIMS implementation.

5c) Monitoring and Periodic Reviews – A target-oriented mechanism should be in place to periodically review the progress of the system implementation, with regular monitoring being done at regional and at individual hospital levels.

5d) Improve the role of the Ministry of Health – The Ministry of Health should take the lead role and provide funding for the maintenance of software and hardware and also other provision such as appointing a dedicated team of technicians to oversee the HHIMS in each hospital. According to the findings, most of the issues have been created mainly due short of financial provisions in the hospitals. Hence, in order to avoid this issue from repeating it should be taken up with the Inter-Ministerial Committee on ICT and make adequate financial provisions to implement the HHIMS.

Annexures

Annex 1 – Details of Interviews Conducted

No	Name of the Hospital	No	Interviewee	
1	Ampara District General Hospital	1	Medical Officer	06.05.2021
		2	Pharmacist	06.05.2021
		3	Nursing Officer	06.05.2021
		4	OIC – Dressing & Blood Drawing Rooms	10.05.2021
		5	System administrator	10.05.2021
2	Dompe Divisional Hospital	6	Medical Officer – OPD 1	23.04.2021
		7	Medical Officer – OPD 2	23.04.2021
		8	Patient Registration Officer (Nurse)	23.04.2021
		9	Nursing Officer	23.04.2021
		10	Laboratory Officer	23.04.2021
		11	Ward Officer	23.04.2021
3	Karavanella Base Hospital	12	Medical Officer - OPD	05.05.2021
		13	Pharmacist	05.05.2021
		14	Cardiographer	05.05.2021
4	Panadura Base Hospital	15	Medical Officer	05.05.2021
		16	Pharmacist	13.05.2021
		17	Nursing Officer	13.05.2021
5	Teldeniya District Base Hospital	18	Medical Officer	06.05.2021
		19	ECG Technician	06.05.2021
		20	OPD Nursing Officer	06.05.2021
		21	Pharmacist 1	06.05.2021
		22	Pharmacist 2	06.05.2021
6	National Hospital for Respiratory Diseases – Welisara	23	Nursing Officer 1	23.04.2021
		24	Nursing Officer 2	23.04.2021
		25	Pharmacist	23.04.2021
		26	Laboratory Officer	23.04.2021
7	Wellawaya Base Hospital	27	Dispenser	11.05.2021
		28	Cardiographer	12.05.2021
8	Dambadeniya Base Hospital	29	Medical Officer – OPD 1	22.03.2021
		30	Medical Officer – OPD 2	22.03.2021
		31	Public Health Nursing Officer	22.03.2021
		32	Family Medicine clinic In-charge	22.03.2021
		33	Administrative Officer	22.03.2021
		34	Medical Laboratory Technician	22.03.2021
		35	Pharmacist	22.03.2021
		36	Management Service Officer	22.03.2021
9	Mannar Base Hospital	37	Deputy Medical Superintendent	23.03.2021
		38	Physician	23.03.2021
		39	Nursing Officer	23.03.2021
		40	Health Service Assistant	23.03.2021
10	Thambuttegama Base Hospital	41	Medical Officer – OPD 1	28.03.2021
		42	Medical Officer – OPD 2	28.03.2021
		43	Dispenser 1	28.03.2021
		44	Dispenser 2	28.03.2021
		45	Cardiographer	28.03.2021
		46	Nursing Officer - Injection Room	28.03.2021
		47	Nursing Officer – Registration Counter	28.03.2021

Annex 2 – Location Reports of Hospitals

1. District General Hospital – Ampara
2. Divisional Hospital – Dompe
3. Base Hospital – Dambadeniya
4. Base Hospital – Mannar
5. Base Hospital – Thambuttegama
6. Base Hospital – Karawanella
7. Base Hospital – Panadura
8. District Base Hospital – Teldeniya
9. National Hospital for Respiratory Diseases – Welisara
10. Base Hospital – Wellawaya

District General Hospital – Ampara

1. **Interview details:**
   Date: 6th & 10th May 2021
   Interviewees:
   - A Medical Officer
   - A Pharmacist
   - A Nursing Officer
   - The OIC, Dressing & Blood Drawing Room
   - The System Administrator

   Interviewers: Gamini Bambaradeniya, Hasithi Samarasinghe, Mr. Chathura Peiris, Janidu Kumarage

2. **Present usage of the Hospital Health Information Management System (HHIMS):**

The HHIMS in Ampara District General Hospital has linked with OPD, OPD reading room, injection room ECG room and the pharmacy. This system has allowed patients' record keeping and all the records for the past 4 years are available. But this system has not been developed fully for the ward system.

In the ECG section, there is only one machine is linked to the system. Even though there is a facility to transfer ECG reports through the system, currently, it is not functioning.

Initially, the system was used by the laboratory for OPD analyser which was linked by ICTA. Then the hospital hired another company to connect other analysers as well. Over a period of time, they failed to maintain the system and all the analysers were out of operation including the OPD analyser. Later, ICTA re-linked the OPD analyser to the system and it's still in operation.

3. **Benefits derived to the hospital medical staff:**

OPD staff is very cooperative and satisfied about the system. However, still, the ward staff (Eg: ENT) and consultants are not satisfied with the system and have minor issues. It is suggested that the system should be customized for the wards and the consultants separately, addressing their concerns as well.

In some instances, it was difficult to read the Medical Officers prescriptions has been avoided by this system where the prescription is typed in the system.

It is very easy to do a stock count of the drugs in the pharmacy.

The system is instrumental to increase the efficiency of the medical and par-medical staff and it reduces the human mistakes. Earlier more time has been used for labelling investigations by hand, now it is done by a sticker with the sticker printing machine is much quicker.

The system has allowed efficiency to be increased in many ways. Doctors can investigate more cases per day and can access patient's history easily. There is an option called "my favorites" which allows doctors to create selected drug lists. So, in times where infectious diseases prevail, it's easier for them to prescribe from the same drug list just by selecting it rather than writing the same again and again.

In the medical clinic, usually a patient receives drugs enough for 4-5 weeks and the same list repeated in his/her next visit as well. Doctors can easily follow up on this list because of the easy access to the patient's history.

There is less paperwork due to the system and the clinic doesn't have to issue X-ray cards as well. This is much needed in this COVID situation because it reduces staff-patient exposure.

4. Benefits derived to the patients of the hospital:

Patient's waiting time in the hospital has been reduced drastically. They can get the treatment and leave the hospital within 15-20 minutes.

The OPD section of the hospital conducts "patient satisfaction survey", which resulted a higher satisfaction of the patients of the hospital services.

5. Pre-requisitions/challenges faced by the hospital at initial stages of HHIMS:

The HHIMS system in Ampara District General Hospital was established in April 2016. In 2005 WHO had introduced a similar system for admission purposes but there was no OPD module included. This WHO system was handed back to the ministry by WHO, was abandoned around 2009/10 due to lack of development and maintenance by the ministry.

At the inception of this system, there has been resistance from the staff due to a lack of IT literacy and unfamiliarity. But now it's hard for them to operate without the system.

The hospital has conducted some seminars and workshops on the system for the staff and they had good training. But if the system introduces advanced options, they will need further training on those.

There is no formal training of the system provided and no understanding of the overall functionality of the system. It would be more appropriate if a complete training program on the system is provided. At present these programs are available to doctors but not to other staff.

6. Operational problems encountered in the implementation of HHIMS:

Encountered several software problems most of the time; ICTA addressed those issues (Eg. Drug issuing related) but still, there are some remaining issues regarding report generations for consultants (Eg. Categorizing patients according to their clinic/disease). And in some instances, even though the report is generated, the system doesn't allow to convert them to a PDF version.

The hospital has a dedicated technical team working on the system (3 personals) called "Digital Health Unit" and they are competent enough to address networking and hardware issues arising. The system breakdowns few times due to power failures and lightning . Such incidents happened, the technician inform the Director and the other staff through the director. Then the staff starts manual recording procedures including prescription writing and pharmacy registrations. These records are not entered into the system again.

Although the Digital Health Unit handles the networking and hardware issues, the hospital need support from ICTA to handle the software issues. And so far, the hospital is happy with the services of ICTA. The Digital Health Unit consists of 4 rooms/units.

1. Server room
2. Maintenance room, which deals with networking issues and computer repairs
3. Service room providing IT facilities such as typing
4. Office

Once the drug doses entered into the system (receipts or issues) it cannot be changed. If the drug issues or receipts erroneously entered a higher quantity than the actual quantity it cannot be edited and remain the error in the system but record the error in another book.

7. Proposals for further enhancement of the system:

It is suggested to customize the system to suit a particular hospital as well as the different sections and staff personnel.

Further it is suggested to integrate LIMS System (a System introduced by the Ministry of Health, currently using in certain sections) with the HHIMS.

Conduct training on the functions of the respective units in parallel to the implementation of the system.

Currently, it is advisable to update the system at least once every 6 months having a good understanding of the current errors in the system.

The staff and the patients must be fully aware of the system.

This is a good system. However, having evaluated the system technically, all corrections should made to the system and unique updated system should be established to all the hospitals and all the hospitals should integrated, so that a patient can get treatments from any hospital in the country.

8. Negative impact identified:

Beginning of the HHIMS started in 2016 there has been resistance from the Medical Staff as well as Para-medical Staff due to their poor literacy in IT and the unfamiliarity of the system. But it has been gradually reduced and now it is very hard for them to operate the respective functions without the system.

9. Suggestions to sustain the system:

The system is not fully functional. Some investigations are still done manually. Investigations such as VDRL and Rubin & RH, where the records should be sent to the blood bank are still done manually.

This is definitely a good system. But the Ministry of Health should provide guidelines to adapt a unique system that can be implemented in all the hospitals in the country rather than customizing it to each hospital. First, this unique system should be implemented in a hospital like Colombo National Hospital and develop well, linking all the hospital operations. As the second step they can introduce the well-developed system to the other hospitals and integrate all the hospitals. This will save money as well and allow patients to get treatments from any hospital in the country.

Usually, a system like this needs on-time technical assistance. Hiring external parties for this task is time consuming and not sustainable. In order to maintain the system sustainably, there must be a dedicated technical team attached to the hospital who is responsible for addressing networking and hardware issues.

When implementing such a system, there should be proper awareness programmes and training.

A strong leadership to the system should be appointed to oversee and a technical support unit must be introduced to each hospital.

10. Message to other hospital to plan and implement HHIMS:

HHIMS is a user-friendly system which can be used easily. In the first instance, all parties in the hospital, including Medical and Para-medical Staff and the patients including the public should be educated the functionality of the system and its usefulness.

Divisional Hospital – Dompe

1. **Interview details:**

   Date: 23rd April 2021

   Interviewees:

   - Two Medical Officers
   - A Patients Registration Officer (Nurse)
   - A Nursing Officer
   - A Laboratory Officer
   - A Ward Officer

Interviewers: Nimesha Gunasinghe and Janidu Kumarage

2. **Present usage of the Hospital Health Information Management System (HHIMS):**

The HHIMS in Dompe Divisional Hospital is currently implemented in the OPD Unit, ECG Unit, injection room, dressing room, laboratory and the Dispensary. In addition to these usages, the registration of indoor patients and also the wards are linked to the system. In this regard, the admissions of patient to the wards, making the departure and their records (diagnostic cards) are entered into the system for future reference. The system does not include medications given during the hospital stay.

The system has the provision to enter the test reports of the laboratory for the medical officer to review them. This will help the medical officer to monitor the patient's past records.

3. **Benefits derived to the hospital medical staff:**

The system has provided immense convenience to the medical and para-medical staff to reduce the paper work in their locations and work up-to-date. Meanwhile the internal efficiency of the medical staff has considerably increased. This system has enabled the hospital staff to provide a more efficient and systematic service with less effort.

The system also facilitates the management of adequate drugs in the store, as all issues and receipts are recorded. Therefore, steps can be taken to avoid possible medication expiration or any other irregularities in the drug issues.

The system can generate useful reports such as daily patient registration, daily patient attendance and daily patient registration, admission and exit in respect of the wards, details of the quantities of medicines available, the quantities of medicines issued and the daily balances.

In fact, this system in the hospital has helped to make the entire hospital process more efficient. This system is very convenient as it contains all the details related to the patient. In the past it was very difficult to find their old records when a patient came. Because of this system it happens easily. This system can even activate the issuance of patients' diagnosis cards without any hassle.

4. **Benefits derived to the patients of the hospital:**

The patients are registered in this system "Once in a lifetime Registration Concept" where, the patients' bio data, health history, parental health history, allergies etc. are recorded in the respective page of the patient and which can be retrieve by the Medical Officer to prescribe medicine. The patients need not to repeat the history of their health when they come for treatment. Availability of patients' history ensures the safety of the patient and patient care.

There has been a reduction in waiting time of the patients who avail themselves for medical treatment; it has been reduce from 95 minutes to 35 minutes. Hence the patient's stay in the hospital is very short.

This hospital has made provisions for e-channeling for the patients to make appointments from home and come to the hospital. This e-channeling provision is available through www.echannelling.com where 7 hospitals (Wellawaya Mental Hospital, Dompe Divisional Hospital, Polonnaruwa District Hospital, Wellawaya Base Hospital, Castle Street Maternity Hospital, Ampara Base Hospital and Welisara Chest Hospital) are included and Dompe Hospital is one of them. In addition, Dompe Hospital has provided a Hot Line 0715225225 to make prior appointments from the hospital.

When the patient is moved out to another area or hospital, a report containing patient's history and details can be issued to be presented to the new hospital.

When a patient received residential treatment and when he leaves the hospital, a system-generated diagnosis card is issued to the patient for future reference and use. That card is an accepted document for insurance companies or other purposes.

5. Pre-requisitions/challenges faced by the hospital at initial stages of HHIMS:

Dompe Divisional Hospital (A Grade) has commenced implementation of the HHIMS in 2011.

Beginning of the HHIMS implementation in 2011, it was extremely difficult to change the attitudes of the medical staff as well as the para-medical Staff; hence it was essential to organize training workshops including outward bound training, trainings on positive thinking, and basic training in Information Technology and a staff appraisal system was introduced. This training was included software training as well. Initially the employees of the hospital objected to the system claiming that their overtime pay will be curtailed and they will be kept in surveillance in their job profiles. When the employees were really undergoing these change management, they understood the real need of this system for the benefit of the Medical Staff, Para-Medical Staff as well as the patients and system was accepted by all.

Currently, 90% of the patients' management of the hospital is covered in the system. Since this hospital is recognized as a success project in e-Government initiatives of the government, the hospital is visited by many institutions in Sri Lanka, including university students, SLAS officers, various technical training institutes and other public and private sector institutions. Apart, this hospital is also recognized as a success model at the University of Queensland, Australia under the private, and public and community sector partnership development initiative and so far, representatives from 24 foreign countries have visited the Dompe Divisional Hospital to evidence the success story.

Initially, system users had a problem with speed. Usually, they all have a little resistance to change as a habit, for better or worse. But after getting used to working with the system, they are now able to work more satisfactorily and efficiently. Simply say, that they treat the system and the system treats them.

6. Operational problems encountered in the implementation of HHIMS:

Although there is a general working knowledge of IT, in some instances there are problems in the management of technical errors in the system has to be resolved through the help of a technician. It is possible to avoid those problematic situations as there is currently a technical team in the hospital. However, the technical team had 3 technicians in the past and currently it has reduced to one.

This system, which is operational in hospital, is more than ten years old and the equipment give more troubles; hence they need to be replaced or updated. This situation has been identified as a major challenge to the hospital as the funding level of the Government Budget is minimal.

Usually, the doctors in the hospital are constantly being transferred and new doctors are coming. In such cases, providing training to the new comers to the HHIMS is an issue.

7. Proposals for further enhancement of the system:

The hospital is initiating to link all patients in the ward into the system. The diagnosis of these patients and their health history to be added to this system and medications prescribed to be included in the system.

The hospital has the intention to computerize the entire hospital system including operation theatre, laundry and kitchen.

Patients' information in specialized clinics such as psychiatrics is highly confidential and they need to be protected with a specialized security system.

8. Negative impact identified:

There have been no remarkable negative impacts except the challenges face at the inception stage in 2011.

9. Suggestions to sustain the system:

A special team to be appointed to oversee the entire system and all the departments, supervise them for smooth functioning.

Extended warrantee to be obtained for the hardware supplied by ICTA, to avoid any mal-functioning of the system.

It is essential to have additional hardware and accessories for use in emergencies.

Deploy a dedicated technician or technical team with specialized training in this system to work with the hospital; one person for at least 03 hospitals or working 24 hours a day.

10. Message to other hospital to plan and implement HHIMS:

This system should be introduced as a developmental initiative and not as the usual IT solution. Finally, it triggers down to the economic development with cost benefit consequences.

The system should not be introduced as a whole; it should be introduced as part by part and finally connect or integrate them.

Strong Information Technology leadership should introduce prior to the introduction of this system to a hospital. It is extremely important a solid and fully operative system should be established by ICTA and replicate that to other hospitals for better functioning. This system development should be supported by the specialists in the medical science in different fields.

Base Hospital – Dambadeniya

1. **Interview details:**

   Date: 22nd March 2021

   Interviewees:

   - Medical Officer – Dr. Athula Balasooriya
   - Medical Officer – Dr. Milroy
   - Public Health Nursing Officer – Mrs. W.H.R. Priyadarshani
   - Family Medicine Clinic In-Charge – Mrs. N.A.C. Mallawarachchi
   - Administrative Officer – Mrs. P.H.S.I.P. Samanthi
   - Medical Laboratory Technician – Mrs. Kumari Wijayanayake
   - Pharmacist – Mr. Harith Karunarathna
   - Management Service Officer – Mr. T. Ishan

   Interviewers: Indika Sovis, Janidu Kumarage

2. **Present usage of the Hospital Health Information Management System (HHIMS):**

At Dambadeniya Base Hospital, the HHIMS is in operation since 2013. It is linked to OPD, Family Health Clinic (one of the clinics), pharmacy, dressing room, X-Ray/ECG room, and medical laboratory at present. After registering at the counter, a patient can access the OPD or Clinic for consultations then proceed into obtaining other services based on the diagnosis.

All the physicians at the OPD utilize this system, and every patient at the OPD is prescribed drugs through the system. Out of the three Clinics offered at the hospital, one of the clinics is linked with the HHIMS system.

The general feedback among the medical staff of Dambadeniya Hospital on HHIMS is very positive and everyone is pleased with its functions and the ways it supported them to become more efficient. There were two staff members who had the exposure into more advanced systems in Europe and Australia, and they mentioned it is essential to bring the entire management of the functions of the hospitals under this system, while further developing the features of it.

However, M&E team also noted that utilization of system is challenged during power failures, sometimes due to network issues, issues with the computers and rarely with system failures. During such events, hospital staff compelled to follow manual procedures to avoid inconveniences to patients. However, such records are not recorded in the system even retrospectively.

3. **Benefits derived to the hospital medical staff:**

Everyone interviewed agreed that the system had contributed immensely to improve the efficiency of daily routines in the OPD, Clinic, dressing room, pharmacy, laboratory, etc. The accuracy of the diagnosis of illness has improved with access to medical history of a particular person, and accuracy in prescribing and dispatching medicines also said to be improved with the system.

It was also convenient for the hospital staff to keep track on the stocks, inventory control, analyze the numbers of patients accessed the OPD, and clinics and the trends in diagnosed illnesses.

4. Benefits derived to the patients of the hospital:

The greatest benefit received by patients as per the hospital staff was the reduction in time consumed at the hospital. However, this is a perception-based finding and while there might some other factors to reduced time spent at the hospital; influence of the HHIMS is one of the positive factors towards it according to their expressions.

In addition, patients also benefitted as physicians having access to their medical history in diagnosing their illnesses and prescribing medicines. Patients do not have to carry all the past prescriptions as they come to the hospitals, as all the record are available in the system.

5. Pre-requisitions/challenges faced by the hospital at initial stages of HHIMS:

Main challenge in implementing the system was the lack of familiarity among the hospital staff to work in a computerized work environment at the initial stages of the implementation. However, most of the staff had got to know that fact from the early initiators of the system, and almost all the staff joined Dambadeniya hospital while the system was in operation.

At present, all the interviewed hospital staff expressed satisfaction in using the system in comparison to manual procedures that they practiced earlier. However, they also expressed some operational challenges, which will be discussed under the challenges section.

6. Operational problems/challenges encountered in the implementation of HHIMS:

The main challenge in operating the system is the connectivity issues with the server. It was noted that most of the interviewees expressed their concerns over the bandwidth/wi-fi connectivity in accessing the system, which seem to be a persistent issue since the initiation of the system.

The other main challenge was the power failures. The M&E team was informed that in the event of a power failure it takes five to ten minutes to system reboot. Even though the hospital is having a generator, it takes a little while to shift to generator power and vice versa. It was also found that server UPS is not functioning well, and most of the batteries of laptops also having issues.

Hospital staff mentioned that they cannot freeze every work in the event of a power failure or any other system issue. Then they switch to manual mode without keep the patients until the system reboot. However, those records won't be updated once the system is back and running.

Absence of a dedicated IT officer at the hospital also mentioned as a challenge for the smooth functioning of the system. Sometimes, a minor , day-to-day technical issues could cause the entire system to freeze without a competent person to attend to those problems. Even for a minor issue they have to coordinate with the ICTA project officer. Sometime, when breakdown or repair needs arise, they have to transport the machines to Colombo or Kurunegala, which consume 2-3 days minimum.

7. Negative impact identified:

All the interviewed staff spoke highly of the system and no negative feedback was received. However, they pointed out several persistent issue to corrected to increase the productivity. Other than that, no one mentioned that they were better off with a manual system.

8. Proposals for further enhancement of the system:

Physicians mentioned that some features of the software could be improved to save time. For an example, one physician with the experience of working in UK mentioned that if a patient is diagnosed with multiple illnesses/symptoms, they do not have the facility to indicate that in the system in a single screen. Types of illnesses are displayed in dropdown menus (where only one selection could be made), where it should have been more convenient for them to indicate them in checkboxes.

It is also proposed to have a dedicated IT person to address the day-to-day problems, in order to ensure smooth functionality of the system.

Issues of power failures, internet /wi-fi connectivity through LGN, and maintenance of computers and peripherals to be addressed in order to meet the desired objectives of the project. M&E also got to know that warranty period of the devices was expired recently and hospital was in negotiation of the service provider to continue their service.

In addition, health staff suggested it should expand into other areas of the hospital, including other clinics, and wards as well. However, they also mentioned that the biggest issue in expansion would be the connectivity/bandwidth issue.

It was also suggested that this system should be mainstreamed across all the government hospitals in Sri Lanka, where a patient can conveniently obtain services from multiple locations with a unique identifier. Two medical staff (a doctor and a nurse) were with the exposure into health systems in developed country such as UK, Germany, Australia and expressed how these countries harnesses the technology into healthcare sector.

Base Hospital – Mannar

1. **Interview details:**
   Date: 23rd March 2021
   Interviewees:
   - Deputy MS – Dr. Ranjani Anton Sisil
   - Physician – Dr. Supun Samarasekera
   - Nursing Officer – Mrs. T.P. Braizee
   - Health Service Assistant – Mr. S.H.M. Ilham

   Interviewers: Indika Sovis, Janidu Kumarage

2. **Present usage of the Hospital Health Information Management System (HHIMS):**

At Mannar Base Hospital, the HHIMS is currently linked to OPD, pharmacy, dressing room, injection room, and medical laboratory. At the registration desk, a patient can obtain a barcode/identifier and proceed into obtain services from the OPD, and other departments based on the diagnosis. It was observed at the registration counter, it is not compulsory for recurring patients to bring their barcode or identifier. The staff member at the registration counter, simply search the name/or ID number of a recurring patient and provide a printed copy of the barcode upon entering the hospital.

HHIMS is not operational for any of the clinics or wards at present. Entire functions of the OPD are done through the HHIMS and the general feedback of the functionality of the system among the interviewed staff is very positive. The Deputy MS of the hospital also very pleased with system, and of the support it has been in managing the services of the hospital efficiently and effectively.

The main challenge in operating the system was the poor connectivity of it associated with the LGN. Hospital staff mentioned that signal strength in some of the places is very weak, and therefore they face difficulties in completing their tasks through the system. The condition of laptops and peripherals also not in good condition, and not maintained well in the absence of a designated person for IT support.

3. **Benefits derived to the hospital medical staff:**

Medical practitioners at the hospital agreed that the HHIMs was supportive in improving the efficiency of the hospital functions. Having access to accurate medical history of a patient through the system was mentioned as the biggest advantage for the physicians in diagnosing illnesses and prescribing medicines. In addition, nursing officers mentioned that it eliminates the risks in misreading the specific tests or medicines due to illegible handwritings of doctors.

Also, hospital staff mentioned that the improvement in user experience; the ability to direct patients towards necessary sections through the systems is a great benefit of the hospital staff. In addition, ability of the system to record all the proceedings, performance of each section of the hospital is mentioned as another advantage for healthcare administration.

4. **Benefits derived to the patients of the hospital:**

Interviewed staff mentioned that the ability of patients to being diagnosed accurately, with physicians having access to accurate medical history, as the biggest advantage for patients. In addition, according

to health staff patients are now enjoying a hassle-free service as everything is directed through standardized procedures through the system. It is also reported that time consumed by a patient at the hospital is reduced with these improvements in service delivery. However, this is a perception-based finding and while there might some other factors to reduced time spent at the hospital; influence of the HHIMS is one of the positive factors towards it according to their expressions.

5. Pre-requisitions/challenges faced by the hospital at initial stages of HHIMS:

No significant challenges were mentioned as significant during the early initiation period. Most of the staff interviewed were came on board after the system being introduced to the hospital. They mentioned that the ICTA project officer was helpful in many ways, especially in getting familiarizing with the system. No specific training event were organized, but the project officer has provided guidance as and when required (on demand).

6. Operational problems/challenges encountered in the implementation of HHIMS:

The main challenge in operating the system is the connectivity issues with the server. It was associated with LGN server, which seem to be a persistent issue since the initiation of the system. The other main challenge was the power failures. The M&E team was informed that in the event of a power failure it takes five to ten minutes to system reboot. Even though the hospital is having a generator, it takes a little while to shift to generator power and vice versa. Some of the laptops are having problems, especially issues with batteries.

Hospital staff is helpless during system failures (during power failures and system break-downs), and until it gets resolved. They can't help but switching to manual operations during such occasions. However, those records won't be updated once the system is back and running.

Absence of a dedicated IT officer at the hospital also mentioned as a challenge for the smooth functioning of the system. Sometimes, a minor, day-to-day technical issues could cause the entire system to freeze without a competent person to attend to those problems. ICTA project officer is the key contact person for such issues, and he's also not readily available at the hospital as he is overlooking several other hospitals in the region as well.

7. Negative impact identified:

None of the interviewees mentioned any negative impacts of the system.

8. Proposals for further enhancement of the system:

It was mentioned that for smooth functioning of the system, it is essential to get rid of the connectivity issues with the server. The bandwidth of the LGN server to be increased ensure smooth functionality of the system.

Issues of power failures, having a dedicated IT person to address the day-to-day problems, and maintenance of computers and peripherals to be addressed in order to meet the desired objectives of the project . M&E also got to know that warranty period of the devices was expired recently and hospital was in negotiation of the service provider to continue their service.

Hospital administration is positive about expanding it to other functional areas of the hospital, such as clinics, ward management (in patients), etc. However, they mentioned that it is essential to address the bandwidth and connectivity issues before any expansions.

Base Hospital – Thambuttegama

1. **Interview details:**
   Date: 28th March 2021
   Interviewees:
   - Medical Officer – Dr. G.M.C. Sooriyabandara
   - Medical Officer – Dr. H.W. Chandrasena
   - Dispenser – Mrs. S. Indrani
   - Dispenser – Mr. D.S. Samaranayake
   - Cardiographer – Ms. Shashini Chamarini
   - Nursing Officer (Injection Room) – Mrs. U.G.C.S. Somadasa
   - Nursing Officer (Registration Counter) – Mrs. D.M.C.M. Rathnayake

   Interviewers: Indika Sovis

2. **Present usage of the Hospital Health Information Management System (HHIMS):**

The HHIMS was established in Thambuttegama Base Hospital in 2017. At present it is functional in the areas of OPD, pharmacy, injection room, and wound dressing room. However, hospital has relocated its injection and wound dressing rooms to a separate location, and now facing a severe challenge in connecting with the server as they lack the connectivity. During the time of the visit (28/03/2021), injection and wound dressing rooms are not utilizing the HHIMS.

The visit to the hospital was done on a Sunday, OPD was in operation and there were number of patients waiting to be served as well. However, none of the units including the OPD was not utilizing the HHIMS during that day. Upon inquiring the reason for it, they mentioned as a practice hospital doesn't use HHIMS on Sundays.

The general feedback among the staff on the HHIMS was not so positive, especially among the medical doctors. Other staff members mentioned the system is useful, but also discredited it with the connectivity issues and slow processing time.

It was also learned that this Thambuttegama area is experiencing frequent power failures and power fluctuations that seriously affect the smooth functioning of the HHIMS system. Therefore, M&E team also noted that utilization of system is challenged during power failures, sometimes due to network issues, and issues with the computers.

3. **Benefits derived to the hospital medical staff:**

Hospital staff is benefitted by having HHIMS as it is convenient to retrieve the medical histories of patients in diagnosing illnesses and prescribing medication, especially for physicians. In addition, some of the staff members pointed out that the procedures are clear when it handled through the system.

4. **Benefits derived to the patients of the hospital:**

According to hospital staff, patients are benefitted as physicians having access to their medical history in diagnosing their illnesses and prescribing medicines. Patients do not have to carry all the past prescriptions as they come to the hospitals, since all the record are available in the system.

5. Pre-requisitions/challenges faced by the hospital at initial stages of HHIMS:

Main challenge in implementing the system was the lack of familiarity among the hospital staff to work in a computerized work environment at the initial stages of the implementation. However, that problem seems to be continuing as several staff members, especially doctors spoke negatively of the system. The operational challenges mentioned by the hospital staff is described under the next question.

6. Operational problems/challenges encountered in the implementation of HHIMS:

The main challenge in operating the system is the connectivity issues with the server. It was noted that most of the interviewees expressed their concerns over the bandwidth/wi-fi connectivity in accessing the system, which seem to be a persistent issue since the initiation of the system.

The other main challenge was the power failures. The M&E team was informed that in the event of a power failure it takes five to ten minutes to system reboot. Even though the hospital is having a generator, it takes a little while to shift to generator power and vice versa. It was also found that server UPS is not functioning well, and most of the batteries of laptops also having issues.

It was revealed that no formal orientations into using the system was given for the medical staff, other than ICTA project officer individually training everyone at their desks. Absence of a dedicated IT officer at the hospital also seen as a challenge for the smooth functioning of the system.

Medical staff complained about the quality of the laptops and peripherals, but it was not evident that they have taken actions to rectify those issues. Some of the machines are said to be extremely slow and some others battery won't last long.

7. Negative impact identified:

One of the younger medical doctors was highly critical about the system, connectivity and slowness of machines. He particularly mentioned that system is not helpful and they could work faster manually without having to feed data into the system.

Some of the interviewees were with the impression that the HHIMS system impedes their ability to work efficiently. They mentioned that system is slow and they can diagnose patients much faster if they do not have to feed information into the system. As a practice, they do not use the system during Sundays and public holidays

M&E team found it is beyond the reasonable explanations not to utilize the system during Sundays or public holidays in this particular hospital. The claim of the physician raised further questions on the attitudes and aptitudes of those medical personnel to work in a computerized environment.

8. Proposals for further enhancement of the system:

Provide with good connectivity, speedy machines and some solution to frequent power failures/fluctuations.

Having a dedicated IT staff for troubleshooting and maintenance of IT equipment.

Base Hospital – Karawanella

1. **Interview details:**
   Date: 5th May 2021
   Interviewees:
   - Medical Officer, OPD
   - A Pharmacist
   - A Cardiographer

   Interviewers: Gamini Bambaradeniya, Chathura Peiris, Hasithi Samarasinghe, Janidu Kumarage

2. **Present usage of the Hospital Health Information Management System (HHIMS):**

The HHIMS in Karavanella Base Hospital is currently implemented in the OPD Unit, ECG Unit, injection room, dressing room and the Dispensary. There are 3 counters in the dispensary and 3 medical officers in the OPD examine patients and they use the HHIMS in addition to the ECG Unit, injection room and dressing room.

When the patient scans his Bar Code, s/he will be directed to a OPD Medical Officer where s/he will be prescribing ECG or injection or dressing and such activities completed s/he will be re-directed to the OPD Medical Officer, where he prescribes medicine from the pharmacy. Then patient collect the medicine from the pharmacy. However, ward medicine is not included in the HHIMS but it will be managed manually.

When the ECG is prescribed to a patient it reaches the ECG Unit online. Then the Barcode of the patient scanned at the ECG Unit and then the ECG conducted and the report is physically given to the patient to meet the Medical Officer again. However, there is no facility yet to present the ECG Report online in the HHIMS.

3. **Benefits derived to the hospital medical staff:**

The system has provided immense convenience to the medical and para-medical staff to reduce the paper work in their locations and work up-to-date. Meanwhile the internal efficiency of the medical staff has considerably increased.

This system is user friendly and easy to work. Stock management is convenient. Report generation such as dispensed medicine from each counter and all 3 counters and balance stock reports can be easily generated. Efficiency of work has been increased and work has become very easy.

This system is very helpful and safe to carryout work during this pandemic period. It avoids the paper handling coming through from different persons which may cause carrying Corona Virus.

4. **Benefits derived to the patients of the hospital:**

The main benefit to the patients is the drastically reduction of waiting time. According to the Baseline Survey conducted in January 2017 by ICTA, it was revealed that the average time between reaching the hospital and receiving the token was 98 minutes and average time in the queue to take a token was 33 minutes. Since the system was fully operative the waiting time of the patients is almost zero.

Since the system provides bio data of the patient and also other information such as patient's allergies, medical reports, diagnostic details, medicine prescribed previously will help the Medical Officer to examine the patients and the Dispensers to issue correct medicine easily.

5. Pre-requisites/challenges faced by the hospital at initial stages of HHIMS:

The HHIMS in Karavanella Base Hospital has been initially implemented in 2012 in a very low profile due to many issues in the system as well as in hardware. Therefore, the system was not used for some time and now they have been sorted out and functions smoothly.

The ICTA has delivered training programs on the system software adequately but it was not continued for the replacement staff after transferring trained staff. If a new person joins the unit, training will be provided by the existing staff members in the unit, and a new user account creation will be done by ICTA hospital coordinator.

Initial stages, the patients' awareness of the system was lacking and the hospital took a long time to educate them on the system. However, currently the patients are well aware of the system.

6. Operational problems encountered in the implementation of HHIMS:

The Karavanella HHIMS is frequently face system failures mainly due to bad weather conditions and during this period they continue work manually. These manually written prescriptions are not entered in the system and the medical staff maintain separate records during system failures. Besides, the patient's records are not updated in the system. Hence, the Medical Officers have an issue of recognizing the medicine prescribe in the previous occasion where the system went down. However, some hospitals, the patients maintain a clinical book where the Medical Officer write the prescribe medicine in it.

The HHIMS does not have the provision or authority for the Dispenser to edit records when the number of medicines received are mistakenly enters a higher number. (When 50 tablets are received entered as 500 tablets) This error remains in the system without correction.

Hardware provided by ICTA are fairly old and they go out of order frequently and therefore, need continuous maintenance.

There are two Cardiographers in the ECG Unit of hospital; but they have only one user profile to login to the system. Therefore, the other Cardiographers need to login, s/he use to login from a user profile belongs to a Medical Staff. This needs immediate attention.

7. Proposals for further enhancement of the system:

It is suggested that the X-ray Unit and the Laboratory Unit needs to be connected to the HHIMS of the hospital. Currently, the laboratory is located in another building at a distance place and the network connection of the system is not available to the laboratory.

It is also suggested to connect the wards of the hospital with the HHIMS system and this will help to maintain accurate medicine stocks and to keep records.

8. Negative impacts identified:

Since the initial implementation of this system in 2012 was failed, the medical staff and the para-medical staff has lost the confidence of the system; but gradually, during the second phase all issues have been resolved and implemented well.

Another issue was that the old age staff was reluctant to switch on to this new system.

9. Suggestions to sustain the system:

The hospital do not have a dedicated technical support system for smooth functioning. Currently when the system fails, the working staff is in a stressful condition until they resolve.

10. Message to other hospital to plan and implement HHIMS:

HHIMS is a user-friendly easy system to use. However, the patients must be educated in advance, how to use the system with potential benefits.

Base Hospital – Panadura

1. **Interview details:**
   Date: 5th & 13th May 2021
   Interviewees:
   - A Medical Officer
   - A Pharmacist
   - A Nursing Officer

   Interviewers: Gamini Bambaradeniya, Chathura Peiris, Janidu Kumarage

2. **Present usage of the Hospital Health Information Management System (HHIMS):**

The HHIMS in Panadura Hospital is linked with the OPD Unit, Clinics, ECG Room, Dressing Room, X-ray Room, Laboratory and the Pharmacy. Laboratory investigations are reported through the system but X-ray and ECG reports are given to the patients to show them to the OPD Medical Officer and they are not reported through the system.

No paper-based prescriptions are given to the patients. In case if the prescribed medicine is not available in the dispensary, a written prescription will be given by the doctor to obtain medicine from outside the hospital.

Currently, the system is being initiated to use in the wards (Primary Care Unit - PCU) and in one pediatric ward as well, where patient's admission and basic management is being done. However, it is not used in the wards.

3. **Benefits derived to the hospital medical staff:**

It helps the medical staff as well as the para-medical staff to reduce work and improved efficiency. The additional time saved by the medical staff will be used for patient care. The paper work has been drastically reduced and reports such as daily patient total, total daily injections given, ECGs taken, daily drug issues/stock records can be generated.

4. **Benefits derived to the patients of the hospital:**

Mainly the patients have reduced waiting time in the hospital drastically to receive medical treatments. Patients' health history is recoded in the system and it is not required to repeat the health history to the Medical Officer as and when the patient seeks medical treatments.

This hospital has made provisions for the patients to make appointments with the Medical Officer from home. However, during the pandemic, this service is temporarily abandoned.

5. **Pre-requisitions/challenges faced by the hospital at initial stages of HHIMS:**

The HHIMS in Panadura Base Hospital was implemented in 2014.

Initially this initiative had so many negative feedbacks from the staff mainly due to the lack of computer literacy. Staff was very reluctant to use the system but after few months of work staff tend to like the system and now, they are unwilling to go back to the manual process even at the system failure.

Positive feedback and the motivation of the young staff members are high compared to staff with less computer literacy

Training was adequate. When this system is implemented in a new unit, ICTA provides training and if any issues arise, staff can contact them easily to receive assistance.

6. Operational problems encountered in the implementation of HHIMS:

There were minor issues in the Primary Care Unit (PCU) and in one pediatric ward was sorted; hence it is planning to expand the system to rest of the wards in the hospital.

In order to link the bio chemistry analyzer machine at the laboratory to the HHIMS system; staff had to connect the machine through a third-party software. Linking these two systems was bit of a problem due to compatibility issues and this process took a long time (nearly one year) to get resolved. In order to connect these platforms; HHIMS system, bio chemistry analyzer machine and the additional servers are being maintained by 3 different stakeholders. Time was taken to join all 3 stakeholders due to unavailability, but this issue was sorted out few months back and now the system is functioning smoothly.

In case of a system failure, OPD patients' data will not be updated to the system, once the system is back online. Work starts from the place where the system was stopped and will be continued. But information during the failures is recorded manually.

Laptop Computers and other equipment are now fairly old are needed constant repairs.

As for now, the main issue is with the networking. There are instances where, the network breaks down while using the LGN. Sometimes printers and barcode readers stop working due to work overload. System breakdowns do not happen often, but it occurs for few hours and during that period the hospital operations run manually. Meanwhile, if all the machines are connected to the network, the network become very slow.

7. Proposals for further enhancement of the system:

Since the system is working 24 hours in the hospital (in PCU wards), it is better to have a dedicated person/s to handle any sudden system errors and malfunctions even at late night. If the system is having an issue, the whole process goes back in to the manual mode until the problem is resolved.

It is better to provide a strong wireless network coverage so that the system will work more efficiently without any interruptions.

8. Negative impact identified:

There has been no specific negative impact on the system. However, at the initial stages of the system implementation there has been negative feedback from the staff mainly due to lack of computer literacy and they were reluctant use the system and subsequently they with the working experience, they like the system due to its usefulness and currently they are not willing to go back to the manual system even in a system failure.

The pharmacist who responded at the interview is somewhat negative of the system. According to him there has been no benefit to the pharmacy from the system, patients are at a disadvantage as they are unable to verify their past records, the system consume more time than the manual system, there is no reduction in paper work, the system is a waste of time, the stock management is mostly done

manually, the display of dispensing drugs is somewhat ambiguous and during power failures issue of drugs is not possible.

9. Suggestions to sustain the system:

Update and maintenance of hardware is important to proceed with the system uninterrupted. Adequate budgetary provisions should be made available to maintain the system.

A dedicated technical team should be established with good technical competence.

System errors should be rectified immediately and link the system to the wards as well.

10. Message to other hospital to plan and implement HHIMS:

The system is user friendly, easy to operate system. However, all errors identified in the system even in other hospital should be incorporated and establish a unique system for all the hospitals.

This system is really good. It should move forward with other industries such as banking. And this system helps to protect privacy of patients while giving a chance for the hospital staff to understand the system better. There will be obstacles at the implementation stage but eventually, all the issues will be resolved.

All the hospitals should implement this system as it is a really good initiative and special training programs should be conducted on the system, covering all the hospital staff.

District Base Hospital – Teldeniya

1. **Interview details:**

   Date: 6th May 2021

   Interviewees:

   - A Medical Officer
   - An ECG Technician
   - An OPD Nursing Sister
   - Two Pharmacist

   Interviewers: Gamini Bambaradeniya, Hasithi Samarasinghe, Chathura Peiris, Janidu Kumarage

2. **Present usage of the Hospital Health Information Management System (HHIMS):**

Patient Registration, OPD Unit, Medical Clinics, Injection Room, Dressing Room, Laboratory, ECG Unit and the Pharmacy are linked to the system.

Currently, the ECGs are prescribed by the doctors of the outpatient department are ordered through the system to perform ECG and the results are given in a printed ECG Report to be shown to the OPD Medical Officer. There are specific machines are available where ECG Reports can be entered in to the system, but the hospital do not have such machines. The process would be much easier if such a machines are available.

This system has made it possible to provide the patient with a safer and quality service in the midst of an existing corona epidemic.

3. **Benefits derived to the hospital medical staff:**

Previously, prescriptions are written by the Medical Officer, given to the patient to collect the medicine. Some instances when it reaches the Pharmacy, the prescription cannot be read or disfigured due bad handling. Further, if there is any mistake of the medicine prescribed, it can be vouch from the patient's data which is included in the system. These hassles are avoided with the HHIMS system implemented.

The staff is happy about this system as it saves time and increase efficiency and it helps to serve more time for patient care.

Since the Medical Officer of the OPD prescribe medicine to a particular patient it will reach the pharmacy on line prior to the patient reach the dispensary. Hence, the dispensary can pack the medicine for the patient in advance, hence time taken for dispensing medicine is reduced.

The system has made easy on the medicine stock management; stock balancing can be done daily with the use of the system and it is easy.

Especially, in this COVID context, it reduces the risk of exposure as it omits the use and exchange of papers (Even the ID is handled only by the patient him/herself).

4. Benefits derived to the patients of the hospital:

Since the health history of the patients are included in the system, the patients are not required to repeat the health history every time when they visit the hospital for treatments.

This system has facilitated the hospital staff to give quick service to patients and reduce the time spent in the hospital.

5. Pre-requisitions/challenges faced by the hospital at initial stages of HHIMS:

The HHIMS in Teldeniya Hospital implemented in 2017/2018.

At the time of installation of this system in the Teldeniya Hospital, some of the hospital staff had some negative attitudes. However, those negative attitudes were changed over time and currently they are more willing to work in the system.

The only officer who was assigned at the time of installation of the system has provided the necessary training. Since then, no training programs or refresher training programs have not been implemented.

Although few staff members are given initial training there was no full training on the system. It would be better if all the relevant staff members get proper comprehensive training. In fact, no formal training was given to the pharmacy staff.

6. Operational problems encountered in the implementation of HHIMS:

There is no particular person appointed to deal with the system. In case of system failures or other system issues, it is rectified by a hospital staff member using his knowledge. This is not possible all the time and staff face stressful situations.

The main challenge right now is that most of the laptop computer chargers do not work as a result a charger of another laptop is used temporarily. The warranty period of these computers has been expired and basically, they require replacement.

There have been great issues on maintenance of laptops and barcode readers, the warranty period of many equipment has been expired; hence waiting for a budget for extended warranty, damaged devices have to be sent to Colombo for repairs and delay is too much, faults in batteries and charges, non-functioning of UPSs which result system failure during power failures, Expiration of UBUNTA Software and requirement of sticker rolls are the main shortcoming in the hardware and material required.

7. Proposals for further enhancement of the system:

If this system can be implemented for wards as well, it will be a more effective operation. Then all systems are connected so there will be a high efficiency. However, this was not possible due to unavailability of internet connection to connect wards.

In addition, it is necessary to increase awareness of the system among the hospital staff and the patients.

It is better to connect HHIMS system with the medical store, so that availability of medicine can be vouched by the Medical Officer and the Pharmacist.

8. Negative impact identified:

The negative impacts were revealed at the inception of the project and they were gradually settled. Current situation is that they do not like to work without the system, even during a system failure there are issues.

9. Suggestions to sustain the system:

There is no system in-charge-person in the hospital and the hospital depends on one person who assist the system using his own experience. Therefore, a separate technical team is required to be attached to the hospital system to address problematic situations and to maintain the sustainability of the system.

10. Message to other hospital to plan and implement HHIMS:

If this system is to be implemented in another hospital, all existing initial problems should be resolved and introduce an updated system with a comprehensive training to the users of the system.

National Hospital for Respiratory Diseases – Welisara

1. **Interview details:**
   Date: 23rd April 2021
   Interviewees:
   - Two Nursing Officers
   - A Pharmacist
   - A Laboratory Officer

   Interviewers: Nimesha Gunasinghe, Lochana Wijeratna, Chathura Periris, Janidu Kumarage

2. **Present usage of the Hospital Health Information Management System (HHIMS):**

Currently, only the Patient Registration, OPD Unit, the dental unit, X-ray unit, clinics, pharmacy, TB Testing Unit and the Scooter unit of the laboratory are connected to the (HHIMS) system, which is the one section of the laboratory is connected.

3. **Benefits derived to the hospital medical staff:**

Previously, a large number of records had been maintained for each patient. When patients arrived, it took long time to extract such reports from the documentary drawers because the different reports were kept separately. But now with this system it is possible to see all the reports very easily and quickly from the system. This usually saves about half an hour per patient.

In fact, this system has greatly reduced the stress as compared to previous situation which undertake all activities manually.

4. **Benefits derived to the patients of the hospital:**

This system has made it possible for patients to reduce the waiting time in the hospital. It was an additional stress as patients had to be provided with the necessary infrastructure seating arrangements, drinking water, and toilet facilities during their long stay in the hospital. But now that the service is fast, that the pressure to provide them is lessened.

Although in the past it took more than two hours for some patients to receive medication, but now all the work can be completed in less than half an hour. Meanwhile, due to the high workload in the past, there was less focus on patients, and now there is more time to consider about the patients. (Patient care). When patients make inquiries, the hospital staff are able to answer with the satisfaction of the patients.

This hospital has made provisions for e-channeling for the patients to make appointments from home and come to the hospital. This e-channeling provision is available through www.echannelling.com where 7 hospitals (Wellawaya Mental Hospital, Dompe Divisional Hospital, Polonnaruwa District Hospital, Wellawaya Base Hospital, Castle Street Maternity Hospital, Ampara Base Hospital and Welisara Chest Hospital) are included and Welisara Chest Hospital is one of them. As patients to this hospital come from different areas of the country, the e-channeling service is a great convenience for patients. Time slots are distributed to ten people at a time, making it easy for them to get the service done quickly and efficiently.

Patients have the opportunity to reach the medical treatments through a bar code system, so they can get a quick, tidy and friendly service from the hospital. There are also times when they can get their work done in as little as 15 minutes.

5. Pre-requisitions/challenges faced by the hospital at initial stages of HHIMS:

The HHIMS has been installed in Welisara Chest Hospital in December 2017 and currently being developed for OPD and clinics. The system operates for only one section of the laboratory.

Since this is not a more complex system, the basic training given on it has been sufficient. When new employees arrive, the trained staff and the technicians in the hospital provide the necessary support.

When a system crash occurs, the assistance of external agencies is sought when the assistance of internal technicians is not sufficient. There, coordinators of ICTA provides a reliable and fast service.

6. Operational problems encountered in the implementation of HHIMS:

The photo taken during the patient registration is not active with the latest version of browsers. Therefore, the system needs to be updated. (Eg. Photos are not supported to the Firefox updated versions. - camera does not get access to http versions)

Most of the instances, the patients misplace the Barcode ID or forgotten to bring the Barcode ID when they come for treatments. Such instances the patient get a new registration without mentioning misplacement or mentioning forgot to bring it. Therefore, system should have an option to reach the patients page in the system and avoid consequences.

The equipment provided at the beginning of this system is now considerable old but still in operation. Sometimes they do not show expected functionality and are not up to date, which is a major challenge. At present the hospital administration is providing necessary assistance to overcome those issues. As the warranty period of these equipment is over 03 years, the arrangements is now underway to obtain extended warrantees or the necessary technical assistance from the equipment vendors. The Ministry of Health has been informed about this.

Some staff of this system still works manually and keep records, due to the fact that they lack adequate IT knowledge. Hence, this system is not 100% function throughout the hospital. Hence suitable training is suggested.

There have also been instances where technical difficulties have caused some inconvenience. For an example, there is often a difference between a balance drug stock in the system and a stock balance prepared manually. There, again and again they have to calculate manually to maintain accuracy, which causes some kind of time consuming and extra stress. Then again reports and stock requests have to be compared according to the old methodology. So they have to maintain a book about the issues of medicines.

This system feels like a very good and effective process if all the systems are updated.

The main challenge now is that records can only be entered in to the system once per patient. However, since this unit tests few samples at least 3 times, there is a need to update the system separately, unlike in a normal laboratory report.

7. Proposals for further enhancement of the system:

The main point is that the blood test unit in the laboratory is not yet connected to the system. If it is connected, further service can be provided faster. It still happens in a manual process.

At present there is no mechanism for the issue of medical report as required by the employers and the other appropriate parties. It is suggested to deploy a mechanism to issue such medical reports.

8. Negative impact identified:

None.

9. Suggestions to sustain the system:

It is required to update the system time to time after a careful evaluation. Further the modifications to a particular hospital are made, it should be replicated to other hospitals as well.

The hospital does not have a dedicated IT department or staff. Currently, the system operates on the contribution of several staff members from the hospital who have the IT knowledge good experience in the system. Hence it is suggested to establish a dedicated IT Unit to oversee the system.

As the requirements for each sector vary, it would be more appropriate to conduct a preliminary study and coordinate with the officers in the divisions and customize the system as required.

10. Message to other hospital to plan and implement HHIMS:

This is a user-friendly system which can be operated by any person with quick hands-on experience even without good IT Knowledge. However, prior to introducing this to other hospitals, all system errors sold be resolve and replicate them.

Base Hospital – Wellawaya

1. **Interview details:**
   Date: 11th & 12th May 2021
   Interviewees:
   - A Dispenser
   - A Cardiographer

   Interviewers: Gamini Bambaradeniya, Chathura Peiris, Hasithi Samarasinghe

2. **Present usage of the Hospital Health Information Management System (HHIMS):**

The system is currently operational in the OPD Unit, Clinics, Injection Room, Blood Transfusion Unit, pharmacy, ECG Unit of the hospital. In addition, currently the infrastructure has been set up for the admission of patients; but the wards are not included.

The main problem encountered before the system was installed was the need to notify the physicians at the beginning of the day about medications not available in the pharmacy (Out of stock). In the present system, the stock details of the medicine are shown in the system so that the doctors can attend to the prescription accordingly.

3. **Benefits derived to the hospital medical staff:**

The unique advantage gained from the installation of this system is the ability to provide the best possible safe/secure health service to patients during the current Covid – 19 epidemic situations.

The time reduction in allocated work due to this system implementation; there is enough time for patient care; advising and giving more information on drugs.

The staff efficiency has been increased; stock balancing has become an easy task with less time consumption.

Patients' contact is minimal and it is a very high benefit to the medical staff during the Covid-19 pandemic.

4. **Benefits derived to the patients of the hospital:**

The patients' health history has been included in the system and they are available to the medical officers as well as par-medical staff and further repetition is not required in subsequent visits. Apart, the medicine allergic to a patient is also available in the system.

Patients' waiting time in the hospital for obtaining medical treatments has been drastically reduced.

This hospital has made provisions for e-channeling for the patients to make appointments from home and come to the hospital. This e-channeling provision is available through www.echannelling.com where 7 hospitals (Wellawaya Mental Hospital, Dompe Divisional Hospital, Polonnaruwa District Hospital, Wellawaya Base Hospital, Castle Street Maternity Hospital, Ampara Base Hospital and Welisara Chest Hospital) are included and Wellawaya Base Hospital is one of them.

5. **Pre-requisitions/challenges faced by the hospital at initial stages of HHIMS:**

The HHIMS in Wellawaya Base Hospital started in 2017 and commenced operations in April 2018.

The main problem that arose in the early stages of this system was the low computer literacy of the hospital staff.

Although there were some resistance and negative attitudes among the hospital staff at the beginning, these problems have been resolved as they are now well adapted to the system at present.

Special training programs were not implemented on the use of this system. But when the need arises, ICTA officials visit and provide guidance. Currently, the technical team working at the hospital is training new officers. Since the system is powered by UBUNTU software, it would be best to provide some training in this regard.

6. Operational problems encountered in the implementation of HHIMS:

A major issue with the system was that the photograph required for registration was not linked to the Firefox update version. This needs to be updated.

Currently the system is running through LGN (Lanka Government Network) and if there is any problem arises in that system the whole process will stop. During such periods number of patients queue up in the pharmacy as soon as the doctors prescribe the medicine prior to the breakdown of the system. Then there is some congestion.

There has been a major issue of the maintenance of equipment already provided by IVTA. They need constant repairs.

There is no dedicated technical team to attend to software and hardware issues in the system has caused great inconvenience to rectify the errors. Currently they are rectified by the general hospital staff those who have IT knowledge.

7. Proposals for further enhancement of the system:

This HHIMS system is operational in Wellawaya Base Hospital and another similar system (HIMS system) introduced by the Ministry of Health for the surrounding regional hospital is operational. Those hospitals also issue barcode ID Cards as they register patients. As it would cause some inconvenience to patients, it would be more appropriate if a single system and a database could be implemented for all hospitals.

It is suggested that this system should be introduced to the entire hospital including the wards.

8. Negative impact identified:

There has been negative attitudes at the inception stage of the system implementation.

9. Suggestions to sustain the system:

The system should be implemented in all the sections of the hospital including the wards.

It is essential to provide formal training on the system to all employees who are operating the system.

10. Message to other hospital to plan and implement HHIMS:

The system is user friendly and easy to use. However, all errors in the system should be identified, in the 40 hospitals in which the system is currently implemented, and then the system should be updated. Then conduct training on this unique updated system and then install.