Vital Wave℠

Assessment of EMR Systems in Malawi

Prepared for the Ministry of Health, Republic of Malawi

Initial Landscape Assessment

February 2019

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Project Goals

Project Goal

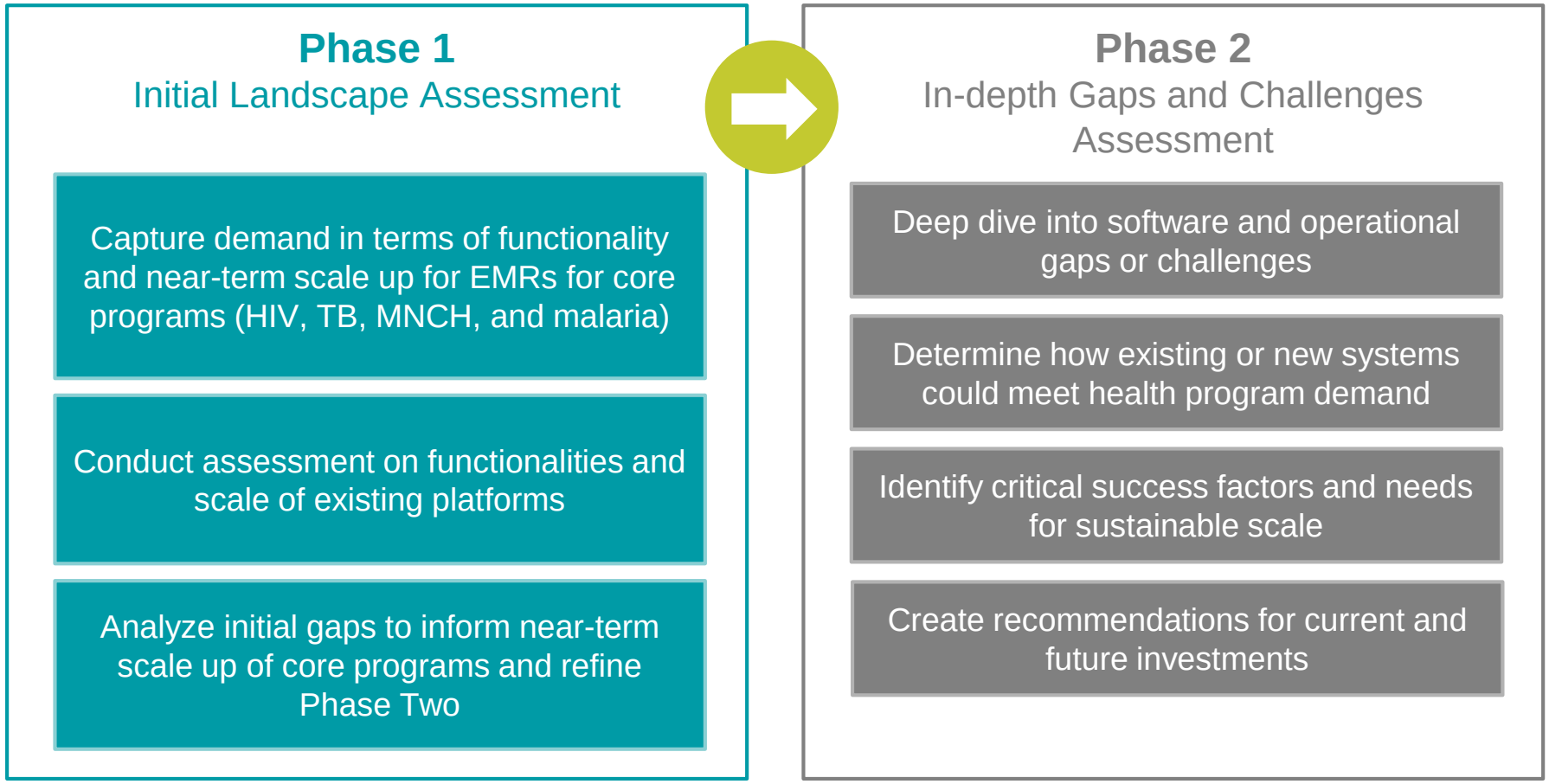
- Conduct a country-wide EMR assessment to further the successful use of EMRs and inform the Malawian Government's eHealth strategy.

Project Value

- Through this project, Vital Wave will:
  - Assess the demand for EMRs across the country
  - Assess what programs would use EMRs for what purpose and to what scale
  - Identify technical and operational gaps or challenges that prevent demand from being fully met
  - Identify implications for:
    - the Government's eHealth strategy
    - recommendations for future coordination between the EMR systems
  - Create an assessment approach and framework that is replicable across other countries

Activities by Project Phase

Phase 1 is an initial assessment, describing needs for EMRs and identifying key technical and operational gaps across four health programs. It also highlights areas that require further investigation in Phase 2.



Approach to Phase 1 and Methodology

Research Summary

64 in-person interviews conducted with a range of EMR stakeholders

Primary Research Scope

65 Stakeholder Interviews

17 Facility staff

5 Facilities visited

Including national hospitals, district hospitals, village clinics, and antiretroviral therapy (ART) centers

6 Implementers

4 EMR providers

16 Government stakeholders

5 Donors

Mix of health facilities visited

- Area 18 Health Facility, Lilongwe
- Dowa District Hospital, Dowa
- Kamuzu Central Hospital, Lilongwe
- Mtengo DREAM facility, Lilongwe
- Queens Elizabeth's Hospital, Blantyre

Government of Malawi Staff Interviewed

- Ministry of Health Directors, program leads, heads of ICT, and support staff of departments in TB, HIV/AIDS, Malaria, Reproductive Health, and Integrated Management of Childhood Illness (IMCI) programs, CMED, and the eGovernment Department

Key Stakeholder Groups

Key groups interviewed for Phase 1

Government Agencies

System owners, policy makers, and supportive supervisors

- National Tuberculosis Program (NTP)
- National Malaria Control Program (NMCP)
- Central Monitoring and Evaluation Division (CMED)
- Department of Reproductive Health
- Integrated Management of Childhood Illnesses (IMCI)
- Department of HIV/AIDS (DHA)
- Quality Management Directorate
- Department of ICT and Department of eGov
- Kuunika Project

Government of Malawi

Implementing Partners and System Providers

System developers, trainers, and technical assistants

dream Community of Sant'Egidio

Baobab Health

LIN

Partners In Health

d.tree Digital global health

HISP MALAWI

msh Management Sciences for Health

Partners in HOPE "Christ's Love in word and deed"

Donors

USAID FROM THE AMERICAN PEOPLE

Norad

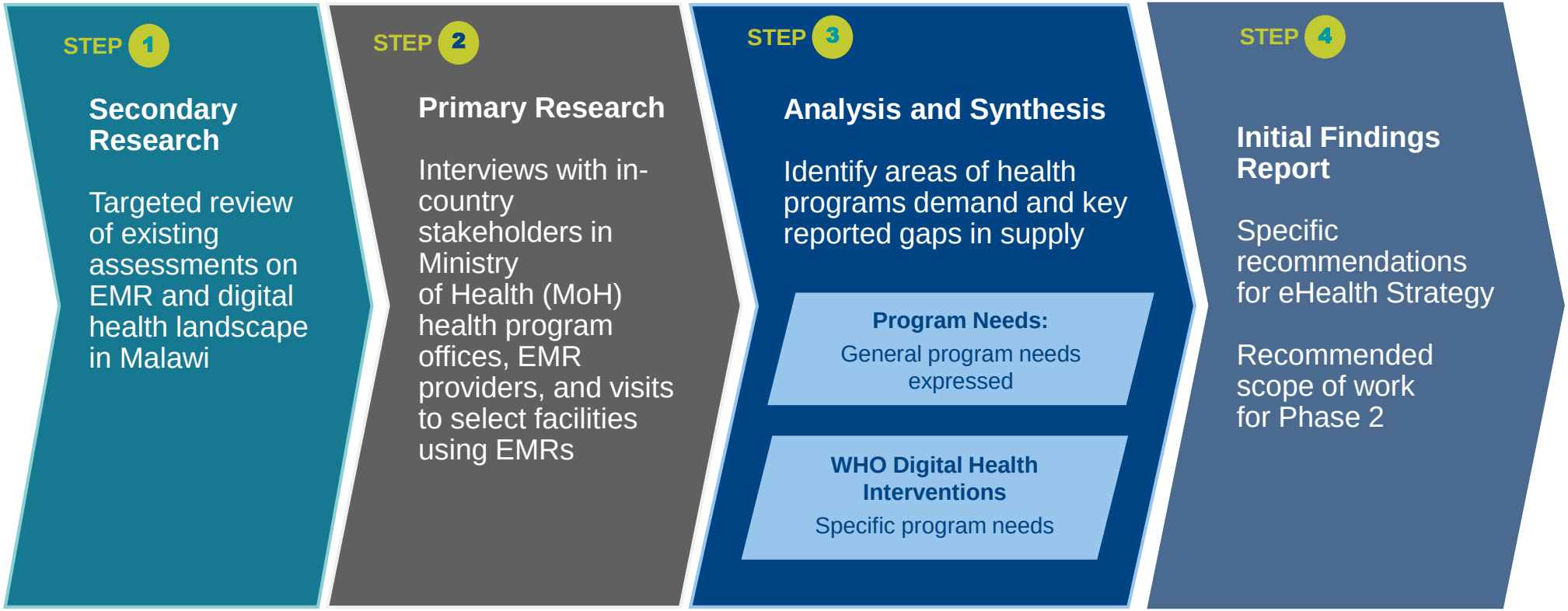
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

CDC Centers for Disease Control and Prevention

USAID FROM THE AMERICAN PEOPLE | CDC | U.S. President's Malaria Initiative

Approach to Phase 1 Research

Phase 1 entailed assessment of demand for EMRs across four health programs (HIV/AIDS, TB, maternal and child health, and malaria) and identification of potential barriers to scale for existing EMR systems in Malawi



Limitations

- This assessment lays out preliminary findings based on reported stakeholder perceptions of the current state of EMRs in Malawi, identified through in-country research.
- The findings listed here cover reported challenges that will be further vetted and validated in Phase 2

Vectors of Analysis

Two categorizations used to evaluate needs for health programs, one for higher-level themes and needs and another for specific functionality. The EMR landscape was evaluated against systems' ability to meet common needs across programs

Common Health Program Needs

- Identified common health program needs are grouped into the following categories and used to assess supply of EMRs and identify gaps to scale

- Reliable Fit-For-Purpose Infrastructure & Technology
- Timely & Adequate Technical Support
- Timely, High-Quality Data
- Easy Data Collection
- Easy Report Generation
- Data Use Culture
- Patient-Centric View
- Decision Support
- Clear Ownership and Sustainability

Specific Health Program Needs

- **Classification of Digital Health Interventions** developed by the **WHO** categorizes the different ways in which digital and mobile technologies are being used to support health system needs. This assessment utilizes and adapts this classification to identify specific areas of need for health programs in Malawi

- Targeted client communication
- Client identification and registration
- Client health records
- Healthcare provider decision support
- Health worker activity planning and scheduling
- Prescription and medication management
- Laboratory and Diagnostics Imaging Management
- Supply chain management
- Civil Registration and Vital Statistic
- Data collection, management, and use
- Data coding
- Data exchange and interoperability

For full list of Digital Health Intervention see:
https://www.who.int/reproductivehealth/publications/mhealth/classification-digital-health-interventions/en/

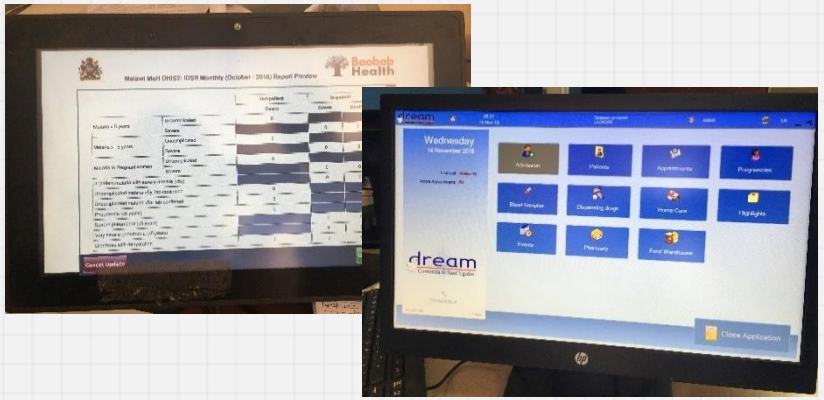
Exploration of Demand and Supply Perspectives

Dual perspectives helped to identify gaps between what health actors need from EMRs and current systems' ability to meet those needs to scaling EMRs

Demand

Determine the need and value of EMRs for health programs

Supply



Identify barriers preventing the scale of EMRs

Assessment of gaps and identification of opportunities for investment and strategic focus for sustainably scaling EMRs in Malawi

Executive Summary: Malawi EMR Assessment

Supply and Demand Summary Findings

All health programs expressed a demand for EMRs to support their needs for reasons ranging from program reporting, to ensuring continuity of care, to commodities tracking. However, a diverse set of challenges exist on the supply side that impact implementation at scale

Demand Findings	**Patient Focus and Program Alignment**	While acknowledging that each health program has specific workflows and data needs, many stakeholders expressed a desire for integrated EMR solutions that function across disease areas, integrate with other systems and provide a full view of a patient's health to improve care and reporting.
	Ownership and Sustainability	There was a significant demand among all Government stakeholders for greater ownership and leadership of EMR systems and a better understanding of the costs required to maintain and support the systems over time should donor resources be withdrawn in future.
	Reliability and Sustainability	Program staff expressed an appreciation of the value of EMRs and would like them to scale to support more facilities and health programs. However, concerns exist about the infrastructure needed for scale, the reliability EMRs, and the sustainability of maintaining EMRs across the country.
	Value of EMRs	EMRs provide an opportunity to improve data collection, especially at high burden sites, which is needed by the HIV/AIDS program due to onerous PEPFAR reporting requirements. Other health programs saw value in EMRs to support reporting needs, to improve continuity of care, and for decision support for health workers in facilities.
Supply Findings	**Scale and Evolution**	Investment in EMRs has been primarily focused on HIV/AIDS and is currently characterized by a disease-specific, 'one-size-fits-all' solution approach for high, medium, and low burden facilities which has raised concerns regarding sustainability and appropriateness among some Government health program staff in the DHA.
	Infrastructure and Resourcing	There has been significant investment in power and connectivity backbone infrastructure to support existing EMRs. However, sources have experienced continuing challenges around connectivity, extended power outages and lack of technical support that result in unreliable EMRs.
	Integration	Current EMRs provide varying degrees of functionality at the point-of-care but there is a need for integration and interoperability between EMRs and other point-of-care systems to allow a patient's health records to travel with the patient across facilities and disease areas.
	Data Quality and Reporting	Issues of data inaccuracy and incompleteness were reported as being a significant problem for Government health facilities using EMRs and that program reporting was delayed because of EMR data. The DHA reported only experiencing stock-outs in facilities with EMRs as a result of poor data.

What We Heard

Stakeholders report that the need of EMRs is clear, but that the capacity to support and sustainably maintain current systems over time are potential challenges to scale

> **[The EMR] helps us to work as a team and helps with time management because I don't have to go around and tell the clinicians about the information of the child, which can also get lost.**
>
> **— Nutritionist on value of DREAM system**

> **We rely on [the EMR] now, it is critical to us.**
>
> **Whenever we encounter a problem we report it, but the response we are given is not fruitful. [One] problem has taken 10 days without a solution.**
>
> **— ART clinic nurse on BHT system**

> **We have not given enough confidence to the user that if we use this system my life will be easier.**
>
> **— Government official on reasons for lack of buy-in from users**

> **We are under strain to provide adequate support to the ministry and have a shortage of IT personnel.**
>
> **— Government official on ICT human resource capacity**

> **It's a necessity, and we would not have managed without it.**
>
> **— Department of HIV/AIDs staff member on the value of the BHT system in high burden sites**

> **We need to move away from a module approach, towards a holistic solution.**
>
> **— Government official on what a future EMR should look like**

Key Demand Takeaways for EMRs in Malawi

Investment in disease-specific modules (HIV/AIDS) has dominated the EMR space in Malawi creating a siloed landscape, but interest exists within health programs in using a system that both meet their specific needs and provides a more comprehensive patient view

KEY FINDINGS	IMPLICATIONS
Stakeholders recognize value of EMRs for collecting data from high-burden clinics, for better visibility into point-of-care interactions, to support health workers, provide continuity of care, and track commodities	Opportunity to explore EMRs that can be deployed to cover the demand expressed by all health programs
While demand for EMRs exists for all health programs, the type of demand varies, with HIV/AIDS requiring a heavy focus on reporting due to PEPFAR requirements and others like malaria needing to track incidences and commodities	Need to consider the difference in need in terms of the type of EMR that is deployed and needed for each health program as some needs may be met through existing solutions while others may require more program-specific attention
The TB program is investing in its own solution to target program-specific needs	Need to consider how the development of innovative disease-specific solutions can support and interoperate with a single multi-disease solution to satisfy program needs
Holistic solutions are desirable to avoid over-burdening health workers with multiple vertical tools that are unable to provide a 360 degree view of the patient	Opportunity to evaluate holistic EMR solutions that meet different health program needs
Majority of challenges faced by health programs require investments into EMR solution performance and the supporting infrastructure, and to a lesser extent specific software functionality	Opportunity to think strategically about where to focus investments in order to create the right enabling environment for EMRs to scale
Lack of clear, unified vision across programs and stakeholders regarding the value and purpose of EMRs (reporting- vs. patient- vs health worker-support)	Opportunity to take a multi-stakeholder approach that considers conflicting stakeholder requirements to reduce their impact on design and resulting functions of an EMR system
The need to reduce health worker and HMIS officer workloads with regards to HMIS reporting was frequently mentioned	Explore interoperability options between EMRs and aggregate-level data systems such as DHIS2

Demand Across Health Programs

All health programs expressed a demand for EMRs although primary motivations vary from better data management and reporting, to better visibility into commodity management, to ensuring continuity of care

"Without an EMR we cannot manage the data from high-burden HIV/AIDS facilities. It helps to ease pressure in terms of workload"

HIV/AIDS

Demand for scalable and reliable EMR that can be used in high and medium burden sites to support the collection of disaggregated data and that can be run and managed by Government staff in the long-term

MATERNAL AND CHILD HEALTH

Demand for an EMR that supports continuity of care, tracks key MNCH-indicators, and gives greater visibility into data currently collected across multiple paper registers

"Currently they are too many registers to follow. We hope that the EMR will let us collect all the different information from the separate registers"

"EMR is a good way of doing things, because you are able to identify that the patients that were given treatment had a positive diagnosis"

MALARIA

Demand for an EMR that supports health workers to adhere to malaria protocol for diagnosis and treatment of malaria incidence and for drug commodity tracking

TB

Demand for an EMR that captures TB specific information that support continuity of care, can be deployed in communities and in health facilities, and interacts with patients

"You cannot have a TB Control Program without looking at patient level information. You need individualized diagnosis to determine which bug you have which will determine the antibiotics you need. But paper-based systems don't allow you to take notes and share them. It's very difficult to have interaction with paper"

Common Health Program Needs

See slide 20 for how this maps to the current landscape

Despite varying motivations, programs share a number of needs in common, including a need for timely, quality data, reliable, well-supported systems and clear Government ownership and sustainability

COMMON NEEDS	DESCRIPTION OF NEED
Reliable Fit-For-Purpose Infrastructure & Technology	Need for reliable power and connectivity, and available hardware necessary for EMRs to be used efficiently, keeping health workers engaged and motivated
Timely & Adequate Technical Support	Need for system uptime, responsive and timely technical software support from IT support resources including Government staff and EMR providers to address any issues that arise or support them in their program needs
Timely, High-Quality Data	Need for data to be available in a timely way and to be of reliable, good quality, without gaps or errors for both reporting and patient care
Easy Data Collection	Need for an easy and fast way to electronically collect patient data that can be used to inform patient care in subsequent visits
Easy Report Generation	Need to fulfill reporting requirements by automatically generating routine indicators, eliminating the need for manual calculation, and generate custom indicators at facility or central levels as needed
Data Use Culture	Need the value of data to be understood, and for that data to be used for decision making including care, planning, and policy making by stakeholders at various levels of the health system
Patient-Centric View	Need for a more comprehensive view of the patient at the point of care, using data from multiple sources, to streamline the experience for health workers and inform care decisions
Interoperability	Need for EMRs to be able to exchange data with other systems (e.g. DHIS2, laboratory, and PACS systems) as well as with each other to share patients records between facilities
Decision Support	Need for EMRs to support health workers in adhering to health program protocols and guidelines to improve quality of care for patients and ensure proper diagnosis and treatment
Clear Ownership and Sustainability	Need for clearly defined ownership and accountability for EMRs that can be owned and supported by Government staff in the long-term

Common Health Program Needs and Specific Functionality

The 'Common Health Program Needs' identified in the previous slide can be broken down further to highlight specific EMR needs requested by health programs using the WHO Digital Health Intervention Classification

	WHO Digital Health Interventions											
Common Health Program Needs	Targeted client communication	Client identification and registration	Client health records	Healthcare provider decision support	Health worker activity planning and scheduling	Prescription and medication management	Laboratory and diagnostics imaging management	Supply chain management	Civil registration and vital statistic	Data collection, management, and use	Data coding	Data exchange and interoperability
Reliable Fit-For-Purpose Infrastructure & Technology	**Cross-cutting need**											
Timely & Adequate Technical Support	**Cross-cutting need**											
Timely, High-Quality Data								X		X		
Easy Data Collection								X	X	X		
Easy Report Generation								X	X	X	X	X
Data Use Culture				X				X		X		
Patient-Centric View	X	X	X			X	X			X		X
Interoperability							X	X		X		X
Decision Support			X	X	X	X	X	X		X		
Clear Ownership and Sustainability	**Cross-cutting need**											

Need for Specific Functionality Across Health Programs

All health programs expressed a demand for an EMR that can support multiple interventions with the exception of targeted client communication, vital statistics, and data coding which were each mentioned by one program; Desired functionality points to two primary forms of value for EMRs across health programs: supporting health workers and using data to support ministry staff and donors*

WHO Digital Health Intervention	MNCH	Malaria	HIV/AIDS	TB
Targeted client communication				■
Client identification and registration	■		■	■
Client health records	■		■	■
Healthcare provider decision support	■	■	■	■
Health worker activity planning and scheduling	■		■	
Prescription and medication management		■	■	■
Laboratory and diagnostics imaging management		■	■	■
Supply chain management		■	■	
Civil registration and vital statistic	■			
Data collection, management, and use	■	■	■	■
Data coding			■	
Data exchange and interoperability	■	■	■	■

Majority of specific needs fall under supporting health workers to do their jobs and improve the quality of care to patients

The value of EMRs to support the collection, use, and reporting of data was also very high among program priorities

Value Expressed in Discussions with MOH Programs:

■ Yes Not mentioned

*Based on discussions with programs on what they would like an EMR to do and their data needs. Program demand will likely expand to other areas with greater exposure to EMR value and through further investigation

Key Supply Takeaways for EMRs in Malawi

Stakeholders interviewed reported perceptions of foundational challenges to scaling EMRs related to sustainability, reliability, and ownership of solutions

KEY FINDINGS	IMPLICATIONS
Rollout of a mature EMR is underway nationally, with a focus on HIV/AIDS	Increased footprint of a single EMR platform across ART clinics reduces risk of fragmentations, though some concerns about provider monopoly and impact on innovation persist
A clear coordinating function for EMR deployments within the Government is lacking, with limited coordination among health programs and conflicting interests in system ownership and functionality	EMRs are driven by donor priorities and deployed in vertical silos, offering only partial care support solutions to health workers
Quality of data from EMR sites varies by provider and facility type, with some being of questionable quality with gaps or inaccuracies recorded when compared to paper–based sites	Frustration exists with EMRs and lack of trust in data quality requires health workers to maintain paper records, increasing the workload in health facilities
Frequent and lengthy loss of power and network connectivity is the most commonly reported challenge	Gaps exist in the data collected in EMRs due to lack of reliable back-data entry as a result of to limited time and motivation of data clerks
There is a lack of specialized ICT skills and capacity at the national and district levels to support EMRs	The Government is unable to support EMRs without over-reliance on system providers
Clarity is lacking on the cost of deployment and maintenance of existing solutions, and cost requirements for scale	The MOHP is concerned that the resources required to maintain and sustain the national EMRs at scale may put sustainability and Government ownership of EMRs at risk
One-size-fits-all solution is currently being implemented by EMR providers	The inability to tailor solutions based on need across low- and high-burden facilities creates concerns about cost, sustainability, and appropriateness

Gap Analysis: Demand vs. Supply

The current EMR environment is in a formative stage. A number of health program needs are already partially met but EMRs will need to further evolve to meet the majority of needs for different health programs.

COMMON HEALTH PROGRAM NEEDS	GAPS IN SUPPLY TO MEET NEED
Reliable Fit-For-Purpose Infrastructure & Technology	Custom power and connectivity solutions have been deployed but elongated grid-power outages and connectivity remains a challenge. Lack of variable deployment packages (e.g., for mobile workers and low-burden facilities) impact ability to scale
Timely & Adequate Technical Support	Users reported varying degrees of support mechanisms with some Government facilities experiencing delayed support when technical problems arise
Timely, High-Quality Data	Quality of data varies significantly across EMR sites whereby some EMR sites require a significant data cleaning effort to produce usable data for supportive supervision and cohort reporting
Easy Data Collection	EMRs are tailored towards clinical workflows at the point-of-care providing an easy-to-use data collection mechanism for the patient record but health workers must maintain paper records due to lack of reliance on EMR data
Easy Report Generation	EMRs enable generation of pre-configured reports but there are still challenges with the timeliness and level of effort required to generate those reports in some facilities and with the ability to generate customize reports for health programs
Data Use Culture	The value of EMRs and their use is well-understood but stakeholders report that data use remains largely centralized with health facilities lacking the incentive or ability to use the data resulting in EMRs in some facilities being primarily used by data clerks to back-enter data
Interoperability	Need for a more comprehensive view of the patient at the point of care, using data from multiple sources, to streamline the experience for health workers and inform care decisions
Patient-Centric View	Significant effort has gone into aggregate-data systems and the development of the National Health Information Exchange, but there is an opportunity to expand this to focus on interoperability with and for systems operating at the patient-level
Decision Support	EMR systems are being used to provide decision support at the point-of-care and follow Government protocols and guidelines, though the decision support is only enabled for specific vertical programs and specialist clinics
Clear Ownership and Sustainability	There is no clear unified direction for the value, design, and deployment of EMRs, agreement on ownership of EMRs, nor a clear pathway for long-term maintenance and sustainability of EMRs by the Government

Largest gaps found in reliable infrastructure and technology solutions, the creation of patient-centric solutions, and creating clear ownership and sustainability of EMRs in Malawi

Extent to which need is met: Fully met | Partially met | Not met

eHealth Strategy Recommendations

Range of short to long-term recommendations that will strengthen the technical and operational environment for EMRs and improve Government ownership and sustainably in the longer term

Encourage Data Use and Simplified Collection	► Experiment with new approaches to data collection (e.g., minimizing data points to be collected, different timings or roles for data entry) and data use cultural change (e.g., different incentives for workers, different performance indicators) in select locations to identify what works best
Understand the Environment and Define Appropriate Solutions	► Develop a maturity model for facility- and community-based deployment that defines the optimal technology packages that best fit Malawi's variable environment. Work with EMR providers to offer variable packages, including expansion of appropriate infrastructure
Focus on the Patient	► Design a standardized patient-centric model for data collection across all programs, including methods to uniquely identify patients and improve patient record linkage across disparate systems
Support Interoperability	► Assess HIE readiness of point-of-care systems and recommend context-appropriate modifications to enable standards-compliant sharing of data across disparate systems for patient-level and aggregate-level data
Build Internal IT Capacity	► Develop and cost human resource strategies to centralize IT support skills and knowledge within the Government or designated providers, including capacity for ad hoc report generation
Strengthen Ownership and Governance Models	► Define ownership and governance model for all patient-centric systems across multiple health programs. Evaluate resourcing needs to enable the Ministry of Health to own the evolution and scale of EMR systems

Estimated time till recommendation is fully recognized: Short-term (6 months – 1 year); Medium-term 1 – 2 years; Long-term (2-3 years)

Initial Findings: Demand for EMRs

Key Demand Takeaways for EMRs in Malawi

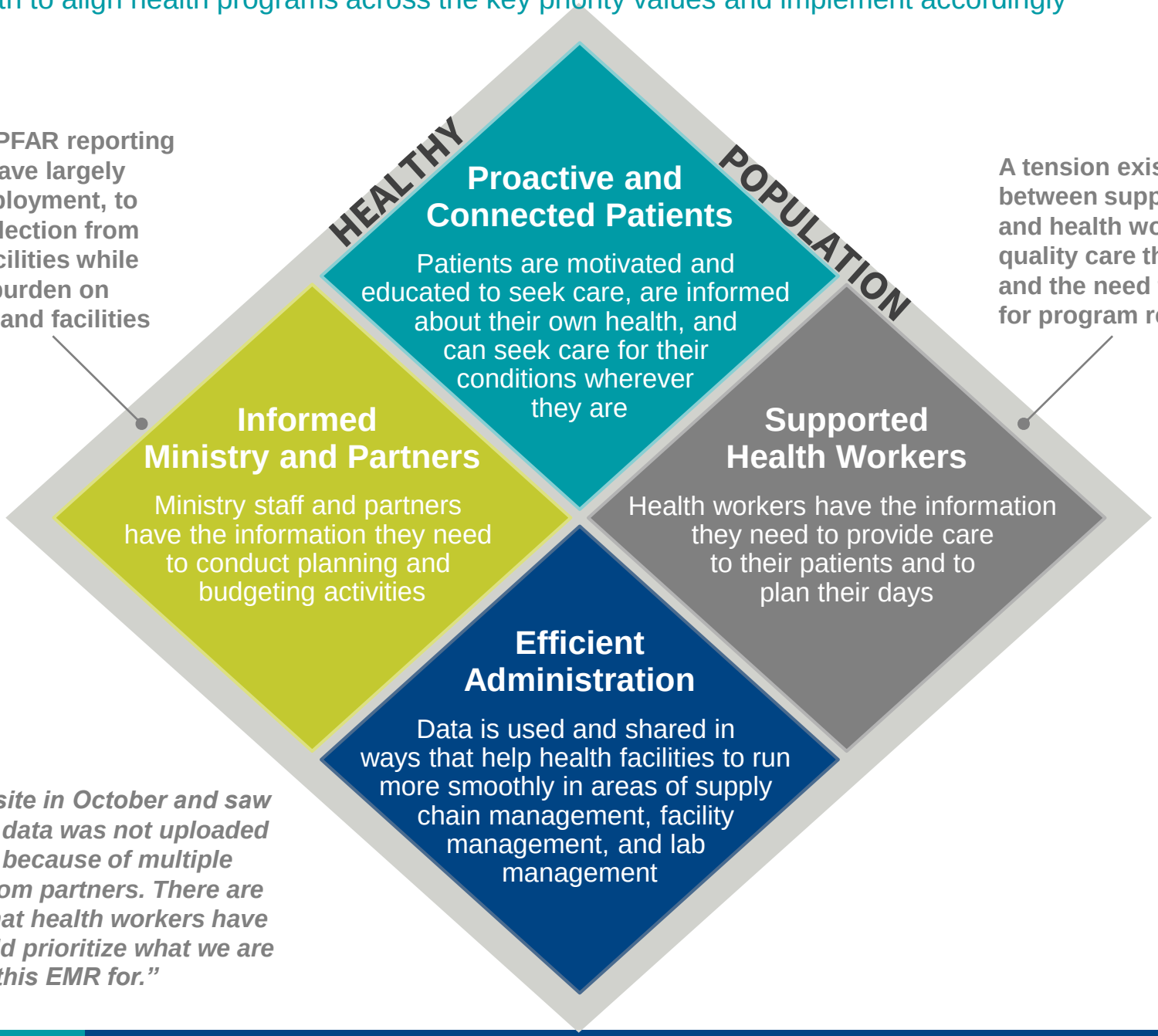
Investment in disease-specific modules (HIV/AIDS) has dominated the EMR space in Malawi creating a siloed landscape, but interest exists within health programs in using a system that both meet their specific needs and provides a more comprehensive patient view

KEY FINDINGS	IMPLICATIONS
Stakeholders recognize value of EMRs for collecting data from high-burden clinics, for better visibility into point-of-care interactions, to support health workers, provide continuity of care, and track commodities	Opportunity to explore EMRs that can be deployed to cover the demand expressed by all health programs
While demand for EMRs exists for all health programs, the type of demand varies, with HIV/AIDS requiring a heavy focus on reporting due to PEPFAR requirements and others like malaria needing to track incidences and commodities	Need to consider the difference in need in terms of the type of EMR that is deployed and needed for each health program as some needs may be met through existing solutions while others may require more program-specific attention
The TB program is investing in its own solution to target program-specific needs	Need to consider how the development of innovative disease-specific solutions can support and interoperate with a single multi-disease solution to satisfy program needs
Holistic solutions are desirable to avoid over-burdening health workers with multiple vertical tools that are unable to provide a 360 degree view of the patient	Opportunity to evaluate holistic EMR solutions that meet different health program needs
Majority of challenges faced by health programs require investments into EMR solution performance and the supporting infrastructure, and to a lesser extent specific software functionality	Opportunity to think strategically about where to focus investments in order to create the right enabling environment for EMRs to scale
Lack of clear, unified vision across programs and stakeholders regarding the value and purpose of EMRs (reporting- vs. patient- vs health worker-support)	Opportunity to take a multi-stakeholder approach that considers conflicting stakeholder requirements to reduce their impact on design and resulting functions of an EMR system
The need to reduce health worker and HMIS officer workloads with regards to HMIS reporting was frequently mentioned	Explore interoperability options between EMRs and aggregate-level data systems such as DHIS2

Value of EMRs

EMRs bring four key areas of value with the ultimate aim of improving the health of a population. Tensions exist in Malawi regarding what the priority value of EMRs should be due to a lack of clear Government leadership. Opportunities exist for Ministry of Health to align health programs across the key priority values and implement accordingly

Demanding PEPFAR reporting requirements have largely driven EMR deployment, to enable data collection from high-burden facilities while reducing data burden on health workers and facilities



A tension exists between between supporting patients and health workers to deliver quality care through EMRs and the need to collect data for program reporting.

"I travelled to a site in October and saw that most of the data was not uploaded for 2 months because of multiple requirements from partners. There are multiple tools that health workers have to use. We should prioritize what we are using this EMR for."

Demand Across Health Programs

All health programs expressed a demand for EMRs although primary motivations vary from better data management and reporting, to better visibility into commodity management, to ensuring continuity of care

"Without an EMR we cannot manage the data from high-burden HIV/AIDS facilities. It helps to ease pressure in terms of workload"

HIV/AIDS

Demand for scalable and reliable EMR that can be used in high and medium burden sites to support the collection of disaggregated data and that can be run and managed by Government staff in the long-term

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Common Health Program Needs

See slide 38 for how this maps to the current landscape

Despite varying motivations, programs share a number of needs in common, including a need for timely, quality data, reliable, well-supported systems and clear Government ownership and sustainability

COMMON NEEDS	DESCRIPTION OF NEED
Reliable Fit-For-Purpose Infrastructure & Technology	Need for reliable power and connectivity, and available hardware necessary for EMRs to be used efficiently, keeping health workers engaged and motivated
Timely & Adequate Technical Support	Need for system uptime, responsive and timely technical software support from IT support resources including Government staff and EMR providers to address any issues that arise or support them in their program needs
Timely, High-Quality Data	Need for data to be available in a timely way and to be of reliable, good quality, without gaps or errors for both reporting and patient care
Easy Data Collection	Need for an easy and fast way to electronically collect patient data that can be used to inform patient care in subsequent visits
Easy Report Generation	Need to fulfill reporting requirements by automatically generating routine indicators, eliminating the need for manual calculation, and generate custom indicators at facility or central levels as needed
Data Use Culture	Need the value of data to be understood, and for that data to be used for decision making including care, planning, and policy making by stakeholders at various levels of the health system
Patient-Centric View	Need for a more comprehensive view of the patient at the point of care, using data from multiple sources, to streamline the experience for health workers and inform care decisions
Interoperability	Need for EMRs to be able to exchange data with other systems (e.g. DHIS2, laboratory, and PACS systems) as well as with each other to share patients records between facilities
Decision Support	Need for EMRs to support health workers in adhering to health program protocols and guidelines to improve quality of care for patients and ensure proper diagnosis and treatment
Clear Ownership and Sustainability	Need for clearly defined ownership and accountability for EMRs that can be owned and supported by Government staff in the long-term

Common Health Program Needs and Specific Functionality

The 'Common Health Program Needs' identified in the previous slide can be broken down further to highlight specific EMR needs requested by health programs using the WHO Digital Health Intervention Classification

	WHO Digital Health Interventions											
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Reliable Fit-For-Purpose Infrastructure & Technology	**Cross-cutting need**											
Timely & Adequate Technical Support	**Cross-cutting need**											
Timely, High-Quality Data								X		X		
Easy Data Collection								X	X	X		
Easy Report Generation								X	X	X	X	X
Data Use Culture				X				X		X		
Patient-Centric View	X	X	X			X	X			X		X
Interoperability							X	X		X		X
Decision Support			X	X	X	X	X	X		X		
Clear Ownership and Sustainability	**Cross-cutting need**											

Need for Specific Functionality Across Health Programs

All health programs expressed a demand for an EMR that can support multiple interventions with the exception of targeted client communication, vital statistics, and data coding which were each mentioned by one program; Desired functionality points to two primary forms of value for EMRs across health programs: supporting health workers and using data to support ministry staff and donors*

WHO Digital Health Intervention	MNCH	Malaria	HIV/AIDS	TB
Targeted client communication				Yes
Client identification and registration	Yes		Yes	Yes
Client health records	Yes		Yes	Yes
Healthcare provider decision support	Yes	Yes	Yes	Yes
Health worker activity planning and scheduling	Yes		Yes	
Prescription and medication management		Yes	Yes	Yes
Laboratory and diagnostics imaging management		Yes	Yes	Yes
Supply chain management		Yes	Yes	
Civil registration and vital statistic	Yes			
Data collection, management, and use	Yes	Yes	Yes	Yes
Data coding			Yes	
Data exchange and interoperability	Yes	Yes	Yes	Yes

Majority of specific needs fall under supporting health workers to do their jobs and improve the quality of care to patients

The value of EMRs to support the collection, use, and reporting of data was also very high among program priorities

Value Expressed in Discussions with MOH Programs:

Yes Not mentioned

*Based on discussions with programs on what they would like an EMR to do and their data needs. Program demand will likely expand to other areas with greater exposure to EMR value and through further investigation

Initial Findings: Supply of EMRs

Key Supply Takeaways for EMRs in Malawi

Stakeholders interviewed reported perceptions of foundational challenges to scaling EMRs related to sustainability, reliability, and ownership of solutions

KEY FINDINGS	IMPLICATIONS
Rollout of a mature EMR is underway nationally, with a focus on HIV/AIDS	Increased footprint of a single EMR platform across ART clinics reduces risk of fragmentations, though some concerns about provider monopoly and impact on innovation persist
A clear coordinating function for EMR deployments within the Government is lacking, with limited coordination among health programs and conflicting interests in system ownership and functionality	EMRs are driven by donor priorities and deployed in vertical silos, offering only partial care support solutions to health workers
Quality of data from EMR sites varies by provider and facility type, with some being of questionable quality with gaps or inaccuracies recorded when compared to paper–based sites	Frustration exists with EMRs and lack of trust in data quality requires health workers to maintain paper records, increasing the workload in health facilities
Frequent and lengthy loss of power and network connectivity is the most commonly reported challenge	Gaps exist in the data collected in EMRs due to lack of reliable back-data entry as a result of to limited time and motivation of data clerks
There is a lack of specialized ICT skills and capacity at the national and district levels to support EMRs	The Government is unable to support EMRs without over-reliance on system providers
Clarity is lacking on the cost of deployment and maintenance of existing solutions, and cost requirements for scale	The MOHP is concerned that the resources required to maintain and sustain the national EMRs at scale may put sustainability and Government ownership of EMRs at risk
One-size-fits-all solution is currently being implemented by EMR providers	The inability to tailor solutions based on need across low- and high-burden facilities creates concerns about cost, sustainability, and appropriateness

Electronic Medical Record Landscape

Multiple EMRs exist in Malawi that support different health program areas to varying degrees, with some EMRs functioning across multiple disease areas and at scale

Mobile based solution

TB

- dream Community of Sant'Egidio — Custom system used for TB screening and treatment
- Baobab Health — Focusing on TB/HIV co-infection management
- IMOSYS — Mobile-based EMR system for supporting TB management services

HIV/AIDS

- dream Community of Sant'Egidio — Custom system used for HIV and child nutrition management services
- Baobab Health — Modules for ART and HIV voluntary testing
- Partners In Health / OpenMRS — EMR system for supporting HIV services
- LIN — Using BHT HIV EMR system and hardware platform

Maternal and Child Health

- Baobab Health — EMR system for ANC. Maternity services in pilot. Family Planning services planned
- msh / dimagi — Mobile Village Toolkit: mobile-based EMR for managing ANC, FP, IMCI services
- dream Community of Sant'Egidio — Custom system used for child nutrition management services
- giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH / OPENSRP — Planned implementation by GIZ
- d.tree Digital global health / mangológic — Mobile-based EMR for managing ANC, FP, IMCI services

Malaria

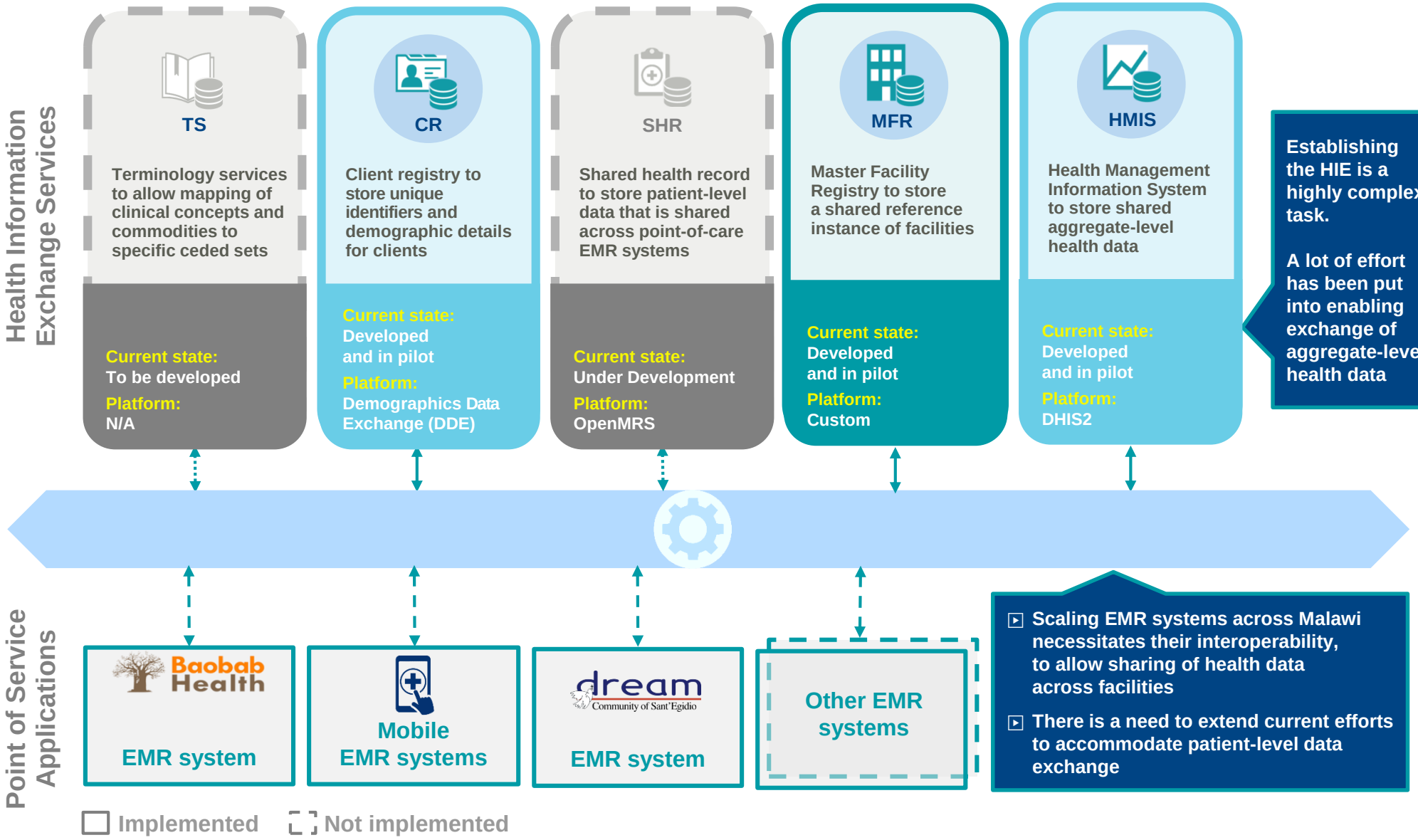
- LIN — Outpatient module that can be used to track notifiable diseases and **report to IDRS**
- Baobab Health — EMR system for tracking Malaria incidents (**not in use**)

Other Disease Areas

- LIN — Picture Archiving and Communication System (PACS) used for TB imaging in Radiography Department and out-patient module
- Q.E.C.H. — Developed in-house for surgery department
- Partners In Health / OpenMRS — EMR system for chronic non-communicable diseases
- Baobab Health — Module for outpatient diagnosis (OPD), inpatient diagnosis (IPD), diabetes and hypertension management
- dream Community of Sant'Egidio — Custom system used for hypertension, cervical cancer, and diabetes

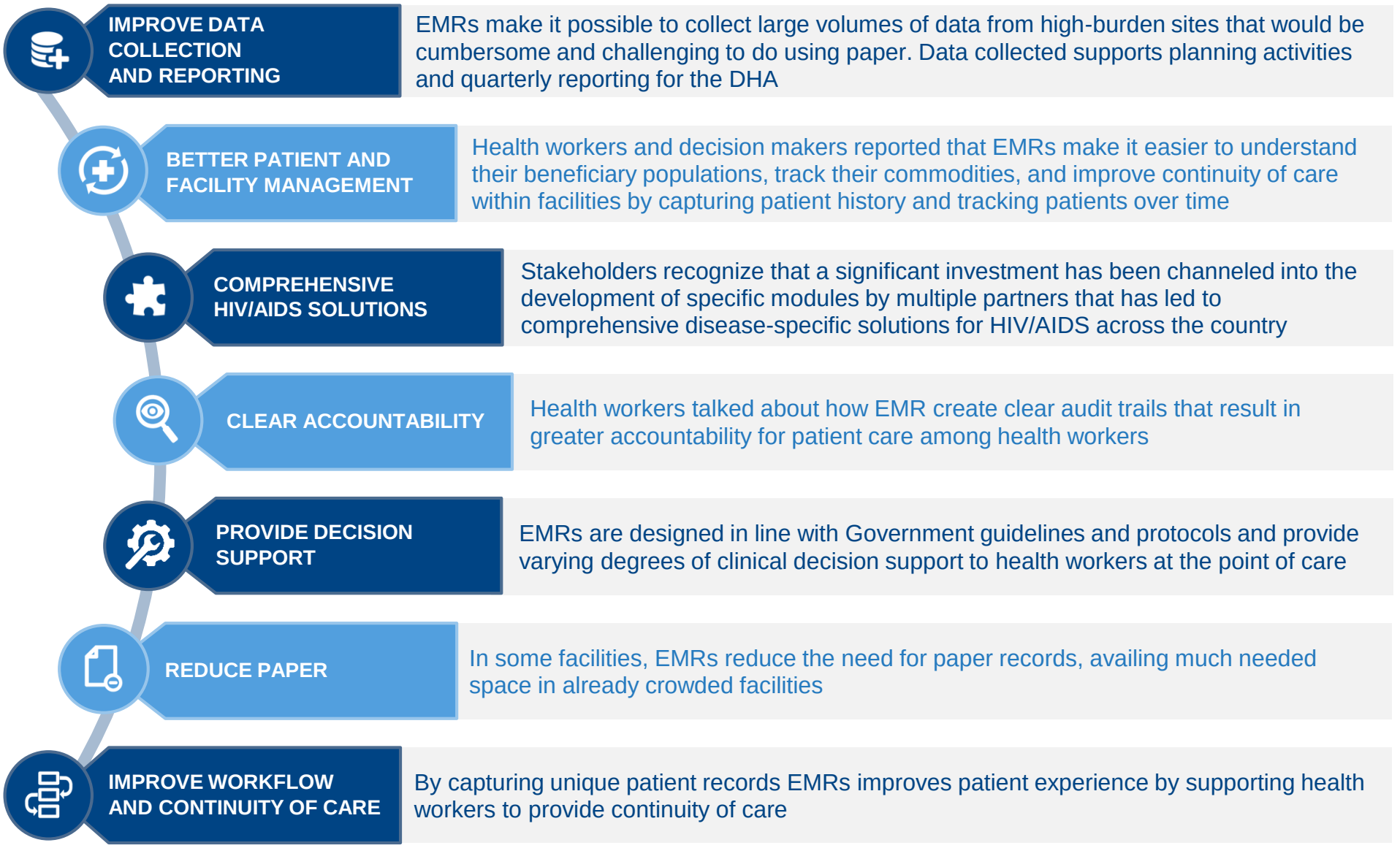
The National Health Information Exchange (HIE)

Significant investment has been made on aggregate-data systems, but opportunities exist to support interoperability at the patient level to deliver patient-centric care



What People Say is Working Well Today in the EMR Landscape

EMRs bring significant value to the Malawi health sector, particularly by making data available and accessible to health workers and Government decision makers



EMR Challenges to Scale

Lack of ownership and sustainability stand out among the barriers to scale conveyed in interviews

Identified Needs Category	Reported Challenge	Details about Reported Challenge
Reliable Fit-For-Purpose Infrastructure & Technology	Lack of power	Elongated power outages impact reliability and stability of EMRs. Outages force health workers to switch to paper registers and back-data-entry can be sporadic, resulting in incomplete and erroneous data and low health worker motivation
	Lack of connectivity	Connectivity within and between facilities is not always available due to unavailable or non-functional telecommunications equipment
	Lack of variable deployment packages	Concerns regarding a one-size-fits-all workstation approach to deploying EMRs which may be more costly for medium- and low-burden facilities and does not support health workers during ward rounds or community visits
Timely & Adequate Technical Support	Unresponsive support	Lack of timely technical support demotivates health workers from using the systems and can create gaps in data collected due to unfixed bugs and system downtime
Timely, High-Quality Data	Poor data in EMRs	Quality of data varies significantly by EMR system and facility type (CHAM vs. non-CHAM), with DHIS reporting that majority of non-CHAM EMR facilities experiencing issues of delayed, poor quality data compared to CHAM facilities and those using paper records
Easy Data Collection	Maintaining paper and eRecords	Unreliable EMR data means that health workers must maintain paper Master Card records while also using the EMR, creating double the work
Easy Report Generation	Inaccessible reports	Perception that reports are inaccessible by facilities and to Ministry without support from EMR providers
	Delayed reporting	Customized (non-PEPFAR) reports for the DHA were reported as being difficult to access and often delayed. Regular reports can also be delayed due to issues with data quality
Data Use Culture	Lack of feedback	There is often a lack of feedback to health facilities who are not able to use the data they report to make decisions
Patient Centric View	Lack of cross-facility EMRs	Systems only capture details of care delivered in the facility department and do not relay important patient information across facilities, departments, or disease areas creating siloed EMRs and obscuring a holistic patient view to clinicians
Interoperability	Lack of interoperability	Systems are not interoperable with community-based care and HIS systems requiring manual reporting into DHIS2 and potential for double-counting. Integration with other patient care systems (e.g., labs and PACS) is limited and varies by platform
Clear Ownership & Sustainability	High staff turnover	High staff turnover in the health facilities requires frequent training as health workers reportedly refuse to use system without being trained and receiving allowances
	Lack of IT staff	Lack of qualified national and district Government IT staff to support, delaploy, or maintain EMRs, with even basic requests for data and user configuration needing to go through EMR providers
	Unsustainable costs	Uncertainty regarding cost of deployment and maintenance of existing systems has created concerns among Government staff about sustainability of running EMRs without significant donor support
	Lack of clear leadership	Lack of clear coordinating authority that provides EMR standards and guidelines and a cohesive direction for all stakeholders
	Lack of ownership	Indication that the Government, especially the MOHP, does not own the EMRs, with a lack of consensus regarding who is responsible for EMRs

Foundational Infrastructure and Policies

eGovernment Department plans for the expansion of infrastructure and the development of policy that will improve support to and scalability of EMR services across Malawi and health programs

Data Centre

- There are existing efforts that aim at establishing a high-end data centre that will be managed by the eGovernment Department
- Budget vote for the work has already been passed in Parliament
- Work will be completed in three months once funds are disbursed

IMPACT ON EMRs

- Opportunity to host EMRs on reliable and Government-owned infrastructure
- Opportunity to train Government IT staff on the management of EMRs

Government Wide Area Network (GWAN)

- GWAN aims at connecting all offices of the District Councilsin all 28 districts and Capital Hill
- All District Council offices except four are currently connected via the GWAN
- Budget vote already passed in parliament to extend connectivity to remaining four council offices and metros

IMPACT ON EMRs

- Opportunity to leverage the GWAN for connectivity, which is key to addressing the need for interoperable HISs
- Connectivity endpoints on the GWAN, at the District Office, will be available for connection of health facilities to shared digital health infrastructure

Security Policies

- The Digital Foundations Project that is being championed by the department aims to improve the current Data Protection Act
- The plans are to include MOHP as stakeholders to allow for informed opinions on inclusion of provisions for digital health data

IMPACT ON EMRs

- Opportunity to include data protection and privacy frameworks for digital health in national regulatory framework
- Possible extra burden on providers to implement security protocols

Community eRegisters

The eRegister landscape is fragmented and problematic; Plans to develop one holistic tool that will provide point of care support and patient tracking at the community level are underway and led by CMED

Current State and Challenges

- Multiple digital and paper registers currently collecting patient level data in the community
- Tools are currently program specific (e.g., family planning, malaria) but wantto move towards one holistic tool that covers all disease areas and provides supervision support
- Concerns about availability of data and accessibility by Government
- Currently difficult to fully understand the situation on the ground due to fragmented and paper based registers, hope to change that with single tool

Planned Activities and Desired Outcome

- Plan to create one holistic mobile village tool to support HSAs across disease and program areas, and for decision making at community, district, and national level
- Five digital solution partners are competing to be the vendor of choice, decision will be made towards end of 2018
- Plans to link tool with DHIS2 for seamless reporting and to provide MoH with better visibility and access to data
- Data will be used to provide feedback to the community and the health workers who can compare actual data with their targets and other communities

"Systems on the ground are only capturing small information on their program."

"I should be the one to bring the key, not waiting the key. Government should be the one to use it. It should be transparent. That is the way we want it to happen"

Gap Analysis

Gap Analysis: Demand vs. Supply

The current EMR environment is in a formative stage. A number of health program needs are already partially met but EMRs will need to further evolve to meet the majority of needs for different health programs.

COMMON HEALTH PROGRAM NEEDS	GAPS IN SUPPLY TO MEET NEED
Reliable Fit-For-Purpose Infrastructure & Technology	Custom power and connectivity solutions have been deployed but elongated grid-power outages and connectivity remains a challenge. Lack of variable deployment packages (e.g., for mobile workers and low-burden facilities) impact ability to scale
Timely & Adequate Technical Support	Users reported varying degrees of support mechanisms with some Government facilities experiencing delayed support when technical problems arise
Timely, High-Quality Data	Quality of data varies significantly across EMR sites whereby some EMR sites require a significant data cleaning effort to produce usable data for supportive supervision and cohort reporting
Easy Data Collection	EMRs are tailored towards clinical workflows at the point-of-care providing an easy-to-use data collection mechanism for the patient record but health workers must maintain paper records due to lack of reliance on EMR data
Easy Report Generation	EMRs enable generation of pre-configured reports but there are still challenges with the timeliness and level of effort required to generate those reports in some facilities and with the ability to generate customize reports for health programs
Data Use Culture	The value of EMRs and their use is well-understood but stakeholders report that data use remains largely centralized with health facilities lacking the incentive or ability to use the data resulting in EMRs in some facilities being primarily used by data clerks to back-enter data
Interoperability	Need for a more comprehensive view of the patient at the point of care, using data from multiple sources, to streamline the experience for health workers and inform care decisions
Patient-Centric View	Significant effort has gone into aggregate-data systems and the development of the National Health Information Exchange, but there is an opportunity to expand this to focus on interoperability with and for systems operating at the patient-level
Decision Support	EMR systems are being used to provide decision support at the point-of-care and follow Government protocols and guidelines, though the decision support is only enabled for specific vertical programs and specialist clinics
Clear Ownership and Sustainability	There is no clear unified direction for the value, design, and deployment of EMRs, agreement on ownership of EMRs, nor a clear pathway for long-term maintenance and sustainability of EMRs by the Government

Largest gaps found in reliable infrastructure and technology solutions, the creation of patient-centric solutions, and creating clear ownership and sustainability of EMRs in Malawi

Extent to which need is met: Fully met | Partially met | Not met

eHealth Strategy Recommendations and Implications for Phase 2

Preliminary Insights into Investment for Scale

Targeted, feasible investments to support scaling of patient-centric solutions across the country and health programs in ways that support holistic patient centric care

CURRENT STATE

Strong appetite for use of existing EMRs, but fragmented systems limit holistic patient-care

- Limited internet connectivity and intermittent power across the country
- No standard protocol or solutions available for sharing patient records
- Limited use of EMRs across the country
- Health data interoperability framework under development
- EMRs are HIV focused
- Data from EMRs is not of consistent quality
- Concerns about EMR implementation sustainability and ownership by Government

INVESTMENT

Investment ininfrastructure, capacity building, and IT systems

- Finance connectivity (backbone and GPRS) across health facilities and health management units
- Define protocol for patient-level data exchange and sharing across the digital health landscape
- Train health personnel to help them adopt digital tools for use at the point-of-care
- Train MOHP IT personnel to implement, manage and maintain solutions
- Define minimum standards for EMRs
- Increase EMR system configurability to cater for other programmatic and healthcare use cases
- Develop solutions that are apprioriate for different contexts
- Define governance and ownership models

DESIRED STATE

Integrated, interoperable SHR harnessing all electronic medical records

- Interoperable EMRs in all facilities across Malawi
- Patient-level data exchange framework for Malawi
- Certification standards for EMR system providers
- Increased use of patient-level data for clinical decision support
- Increased data use for routine planning and monitoring
- Better quality data and seamless reporting
- Clear ownership and governance models defined and implemented with sustainability plans in place

Implications for the eHealth Strategy and Phase 2

Research has identified key areas for consideration when developing the eHealth Strategy and for further investigation in Phase 2

COMMON HEALTH PROGRAM NEEDS	eHealth Strategy Implications	Implications for Phase 2
Reliable Fit-For-Purpose Infrastructure & Technology	Work with the eGov department to improve infrastructure at facilities and define health facility maturity model to identify requirements by type	Assess existing hardware packages, system performance, environmental conditions, and extent of power and system outages
Timely & Adequate Technical Support	Consider establishing centralized IT helpdesk for EMR systems	Assess provider ability to provide technical support to meet demand across health programs, review provider backlog
Timely, High-Quality Data	Build strategy to evaluate data quality, build confidence in electronic records, and define protocols for switch from paper to electronic records	Compare accuracy and completeness of data between paper-based and EMR facilities
Easy Data Collection	Define policy and guidelines for reduction of data collection burden on health workers	Visit EMR-supported sites and observe health workers using EMRs and document best practices and constraints
Easy Report Generation	Develop strategy to align and consolidate reporting needs across donors and health programs to simplify the requirements for technology providers	Assess reporting request processes and identify opportunities and ideal architecture for integration with national HIS and requirements to implement
Data Use Culture	Develop strategy for building understanding of data value and incentivizing use at all levels of care and the health system	Assess current perceptions of data value, barriers to use, and misalignment of incentives
Patient-Centric View	Harmonize and consolidate EMRs across programs, tools and platforms	Evaluate opportunities to extend disease specific EMRs to other programs, and assess unique patient identification framework and linkage with National ID
Interoperability	Prioritize automating exchange of data between tools for community care, labs, pharmacy, EMRs, and HMIS	Assess current national HIE and ability of source systems to exchange patient-level data and suggest way forward
Decision Support	Define stakeholders' expectations of decision support, at the point-of-care and at each level of health management, from EMR-derived health information	Identify and categorize high value decisions and common workflow patterns that can be used to target functional improvements in EMRSs
Clear Ownership and Sustainability	Establish central authority to provide EMR standards, guidelines and direction on ownership of EMRs and related data and increase visibility into total cost of ownership for solutions	Evaluate costs and human resources required for Government ownership of EMRs and what resource gaps exist

eHealth Strategy Recommendations

Range of short to long-term recommendations that will strengthen the technical and operational environment for EMRs and improve Government ownership and sustainably in the longer term

Encourage Data Use and Simplified Collection	► Experiment with new approaches to data collection (e.g., minimizing data points to be collected, different timings or roles for data entry) and data use cultural change (e.g., different incentives for workers, different performance indicators) in select locations to identify what works best
Understand the Environment and Define Appropriate Solutions	► Develop a maturity model for facility- and community-based deployment that defines the optimal technology packages that best fit Malawi's variable environment. Work with EMR providers to offer variable packages, including expansion of appropriate infrastructure
Focus on the Patient	► Design a standardized patient-centric model for data collection across all programs, including methods to uniquely identify patients and improve patient record linkage across disparate systems
Support Interoperability	► Assess HIE readiness of point-of-care systems and recommend context-appropriate modifications to enable standards-compliant sharing of data across disparate systems for patient-level and aggregate-level data
Build Internal IT Capacity	► Develop and cost human resource strategies to centralize IT support skills and knowledge within the Government or designated providers, including capacity for ad hoc report generation
Strengthen Ownership and Governance Models	► Define ownership and governance model for all patient-centric systems across multiple health programs. Evaluate resourcing needs to enable the Ministry of Health to own the evolution and scale of EMR systems

Estimated time till recommendation is fully recognized: Short-term (6 months – 1 year); Medium-term 1 – 2 years; Long-term (2-3 years)

Implications for Phase 2

Further Areas of Investigation

Phase 2 should focus on the following key areas to vet findings and identify appropriate solutions to address barriers to scale:

- Cost of deployment and sustainability of current solutions
- State and quality of hardware, as well as suitability and maintenance
- Performance of EMRs across sites including processing time, response time, system effectiveness during system outages and power variations
- Data quality of EMR and paper records
- Ownership of data and systems
- Human capacity available to support scale
- Interoperability among modules within the existing EMRs and with other national systems
- Security, privacy and confidentiality of EMR data

Illustrative Questions for Phase 2

- Are the software solutions technically capable of meeting demands for functionality at the planned scale?
- What is the extent of interoperability between EMRs and other health information systems? What would an ideal architecture look like?
- How well are EMRs functioning in the current sites? What are the challenges and what is the quality of the data?
- What are the costs associated with deploying, running, and maintaining the systems?
- What are the performance issues? What is the state of the supporting infrastructure in facilities?
- What is the quality and longevity of the existing software and what lift is needed to improve software platforms (if necessary)
- What are the current technical skills and capabilities within the Government to support use and oversight of EMRs?
- How can we move towards interoperability between EMRs and other existing national systems? What does an architecture look like?

Thank You

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List of Interviewees for Phase 1

Name	Role	Organization
Martha Kwataine	Executive Director	Baobab Health Trust
Phidelis Suwedi	Product Manager	Baobab Health Trust
Soyapi Mumba	Director of Public Health	Baobab Health Trust
Dave Gampahini Phiri	Health Management Information Specialist	CDC
Dr. Andrew F. Auld	Country Director	CDC
Nellie Wadonda-Kabondo	Chief, Epidemiology and Strategic Information	CDC
Isaac Dambula	Deputy Director	CMED
Jacob Kawonga	Technical Advisor	CMED
Efrida Kutengule	Technical Advisor	CMED
Maganizo Monawe	Technical Advisor	CMED and Kuunika, MoH
Dr. Doreen Ali	Deputy Director Preventive Health	Department Community Health Services, MoH
Sam Gama	M&E Officer	Department Community Health Services, MoH
Chimwemwe Mkandawire	Technical Advisor	Department of HIV/AIDS, MoH
Dr. Andreas Jahn	Chief Epidemiologist	Department of HIV/AIDS, MoH
Dr. Rose Nyirenda	Director	Department of HIV/AIDS, MoH
Riyla Nkhata	Programmer	Department of HIV/AIDS, MoH
Gibson Kapokosa	Deputy Director ICT	Department of ICT, MoH
Grace Banda	Systems analyst/ICT Officer	Department of ICT, MoH

List of Interviewees for Phase 1

Name	Role	Organization
Dr. Fanny Kachale	Director	Department of Reproductive Health, MoH
Dr. Owen Chikhwaza	Deputy Director Reproductive Health	Department of Reproductive Health, MoH
Annie Dambe	Deputy Coordinator Mtengowanthenga	DREAM
Phillip Mphande	IT Support person	DREAM
Stefano Orlando	Coordinator	DREAM
Chris Kulanga	Country Director	D-Tree
Maganiza Chipula	Director	eGov
Simon Ndira	HIS/EMR Specialist	GIZ
Dr. Chris Moyo	Country Director	HISP
Isaiah Makwakwa	IT Specialist	HISP
Dr. Richard Msonda	Director	Integrated Management of Childhood Illness (IMCI)
Christopher Kathungo Kapachika	Product Owner	The Kuunika Project
Kondwani Kuthyola	Product Manager	The Kuunika Project
Ted Banda	Support Officer	The Kuunika Project
Hsin-yi Lee	LIN-Country Representative	Luke International
Rebecca Mtegha	Project Coordinator	Luke International
Austin Gumbo	M&E Manager	Malaria Control Program
Dr. Eric Schouten	Regional Technical Advisor	Management Sciences for Health

List of Interviewees for Phase 1 (Cont'd)

Name	Role	Organization
Kari Edvardsdal Hansen	Secondary Secretary	NORAD
Amos Misomali	M-Health Specialist	ONSE
Dr. Rudi Thetard	Chief of Party	ONSE
Precious Bondwe	M-Health Specialist	ONSE
Dr. Emily Wroe	Chief Medical Officer	Partners in Health
Dr. Luckson Dullie	Country Director	Partners in Health
Sundeep Gupta	Country Director	Partners in Hope
Collins Kwizombe	M&E Specialist	President's Malaria Initiative (PMI) / USAID
Dr. James Mpunga	Program Manager	TB Control Program
Francis Muwalo	IT Specialist	TB Control Program
Rachel Goldstein	Health Officer	USAID

Site visits to:

- **KCH,**
- **Mtengowatenga DREAM facility,**
- **Dowa District Hospital,**
- **Queen Elizabeth Hospital,**
- **Area 18 Health Facility**

Spoke with 17 clinicians, health workers and data clerks using EMR systems

WHO Digital Health Intervention Classification

Identify specific areas of need for EMRs across Health Programs

- **Classification of Digital Health Interventions** developed by the **WHO** categorizes the different ways in which digital and mobile technologies are being used to support health system needs
- This assessment utilizes and adapts this classification to identify areas of need for health programs in Malawi

Targeted client communication

- Transmit health event alerts to specific population group(s)
- Transmit targeted health information to client(s) based on health status or demographics
- Transmit targeted alerts and reminders to client(s)
- Transmit diagnostics result, or availability of result, to client(s)

Client identification and registration

- Verify client unique identity
- Enroll client for health services/clinical care plan

Client health records

- Longitudinal tracking of client's health status and services
- Manage client's structured clinical records
- Manage client's unstructured clinical records
- Routine health indicator data collection and management

Healthcare provider decision support

- Provide prompts and alerts based according to protocol
- Provide checklist according to protocol
- Screen clients by risk or other health status

Health worker activity planning and scheduling

- Identify client(s) in need of service
- Schedule healthcare provider's activities

Prescription and medication management

- Transmit or track prescription orders
- Track client's medication consumption
- Report adverse drug events

Laboratory and Diagnostics Imaging Manangement

- Transmit diagnostic result to healthcare provider
- Transmit and track diagnostic orders
- Capture diagnostic results from digital devices
- Track biological specimens

Supply chain management

- Manage inventory and distribution of health commodities
- Notify stock levels of health commodities
- Monitor cold-chain sentitive commodities
- Register licensed drugs and health commodities
- Manage procurement of commodities
- Report counterfit or substandard drugs by clients

Civil Registration and Vital Statistic

- Notify birth event
- Register birth event
- Certify birth event
- Notify death event
- Register death event
- Certify death event

Data collection, management, and use

- Non-routine data collection and management
- Data storage and aggregation
- Data synthesis and visualization
- Automated analysis of data to generate new information or predictions on future events

Data coding

- Parse unstructured data into structured data
- Merge, de-duplicate, and curate coded datasets or terminologies
- Classify disease codes or cause of mortality

Data exchange and interoperability

- Data exchange across systems

For full list of Digital Health Intervention see:
https://www.who.int/reproductivehealth/publications/mhealth/classification-digital-health-interventions/en/

Health Program Overview: HIV/AIDS

Significant investment has been made resulting in a varied and well-developed, HIV/AIDS-specific EMR landscape but program staff reported challenges with data quality and reporting

Program Overview:

- 1.1 million HIV positive people in Malawi. Prevalence among population aged 15-49 is ~8.8%
- Around 820,000 people have been initiated on ART and about 80% of HIV-infected TB patients are also receiving ART
- Malawi aims to achieve the 90-90-90 targets where 90% of PLHIV know their status, 90% of those will be on ART, and 90% of those have their viral load suppressed

Current EMR Status:

- Multiple, significant investments have resulted in EMRs that are designed specifically for HIV/AIDS developed by Baobab Health Trust, DREAM, and Partners in Health (OpenMRS)
- The BHT EMR system is deployed in all 122 high-burden, Government-supported HIV clinics across Malawi. Over 60% of HIV patients are managed through the BHT EMR system. It is now being scaled up to an additional 141 HIV clinics
- The DREAM EMR system is deployed in HIV clinics across 13 CHAM facilities
- The PIH OpenMRS EMR system is deployed in all HIV clinics across Neno district

Data-related Challenges:

- Data quality varies significantly by facility type (e.g., CHAM vs. non-CHAM) with reports from some EMR sites often delayed, according to DHA staff, however the situation is reportedly improving
- PEPFAR data and reporting requirements are cumbersome, especially for high-burden facilities that manage over 2,000 patients, creating a clear need for tools that collect and manage patient, disaggregated data, reduce health worker data management and reporting burden
- Running EMR reports is time consuming and requires significant resources on a quarterly basis. Customized (non-PEPFAR) reports need to be requested of EMR provider and can be delayed
- Connectivity and power issues result in erroneously high defaulter rates due to lack of back-data entry when power is down by health workers, creating incomplete and inaccurate records

Quotes from HIV/AIDS Health Program

"It's been a necessity. It is doing its job. What we can do with paper is limited"

"As MoH, EMR is our priority, but we don't have the people with that capacity to support it"

"In Malawi we have very rural facilities and we want it to be easy to maintain EMRs there"

"We had a problem with inadequate data coming from the EMR. We could not create quarterly reports. From the EMR it was all over the place. It was inaccurate"

"Facilities should be able to use the data, they should own it! So far they have just recruited data clerks through the Global Fund which are being trained by CMED"

Demand: HIV/AIDS

As a chronic disease HIV requires significant longitudinal data for tracking patients to support continuity of care and meet highly demanding program reporting requirements

HIV/AIDS Program Needs (using WHO DHI Classification)	Details about Specific Needs Expressed by Program
Client identification and registration	▸ Verify a patient's unique identity ▸ Enroll a client for an ART care plan
Client health records	▸ Longitudinal data for tracking patients including being able to pull up records in and across facilities
Healthcare provider decision support	▸ Provide decision support to clinicians (e.g., type of treatment to provide)
Health worker activity planning and scheduling	▸ Schedule appointments for ART clinics
Prescription and medication management	▸ Able to pull up patient treatment history ▸ Report and capture any adverse events
Laboratory and diagnostics imaging management	▸ Collect and update patient lab results (e.g., viral loads)
Supply chain management	▸ Track supply of drugs distributed to patients to monitor stock levels
Data collection, management, and use	▸ Collect and manage disaggregated patient data ▸ Conduct quarterly cohort reporting across health facilities
Data coding	▸ Deduplicate data for cohort reporting
Data exchange and interoperability	▸ Reporting into DHIS2 and DHAMIS

Overall Demand: HIGH

Demand for scalable and reliable EMR that can be used in high and medium burden sites to support the collection of disaggregated data and that can be run and managed by Government staff in the long-term.

Health Program Overview: Reproductive, Maternal, Neonatal and Child Health

Roll-out of BHT ANC EMR to track program specific data under way, with additional modules and program-specific implementations planned

Program Overview:

- Adolescent pregnancies account for 25% of all pregnancies, and 20% of maternal deaths annually resulting in significant health burden
- Nearly 70% of health facilities offer basic child health interventions using the IMCI approach and similar services are offered at community level in village clinics across the country

Current EMR Use:

- ANC module being tested and deployed by Baobab across 51 in facilities (with more planned). Maternity and Family Planning modules also planned for development and deployment once ANC module has been successfully tested. Paper registers will be maintained alongside the EMR until it is countrywide and data quality is validated
- GIZ also planning to test an OpenSRP EMR in 4 districts for their own program

Data-related Challenges:

- Electronic data capture limited to HIV-related indicators that are of interest to the DHA, limiting the availability of data for the Reproductive Health program
- District reports are frequently delayed for the Integrated Management of Childhood Illnesses (IMCI) Programme due to the need to transport paper documents from facilities and the magnitude of paper records that need to be manually entered into DHIS2
- Multiple paper registers exist making it hard to track data and trends, an EMR will help to improve visibility into these
- Patient can lose paper health passports which hold their medical histories, making it difficult for clinicians to provide continuity of care

Quotes from TB Health Program

"Now there are issues with lost health passports which is hard for continuity of care. The EMR will help to avoid duplication so that next time the next time the mother visits can have her medical history available."

"Currently they are too many registers to follow. We hope that the EMR will let us collect all the different information from the separate registers."

Demand: Reproductive, Maternal, Neonatal and Child Health

Ability to track mother and children over time is important to being able to provide continuity of care to patients

MNCH Needs (using WHO DHI Classification)	Details about Needs Expressed by Programs
Client identification and registration	Register and collect details on new mothers including number of children
Client health records	Track patients and their histories across facilities for continuity of care and better decision making
Healthcare provider decision support	Decision support for health workers
Health worker activity planning and scheduling	Scheduling of ANC appointments to support facility staff workloads
Civil registration and vital statistics	Collect data on births and deaths
Data collection, management, and use	Capture of additional data needed by Reproductive Health Department (e.g., Syphilis testing data which impacts prevalence of still births) Use the data for planning and reporting Track patients, collect data on maternity, delivery, births, and deaths Track number of women who request different family planning methods
Data exchange and interoperability	Seamless reporting into DHIS2

Overall Demand: HIGH

Demand for an EMR that supports continuity of care, tracks key MNCH-indicators, and gives greater visibility into data currently collected across multiple paper registers.

Health Program Overview: TB

TB-specific system designed to meet the needs of the TB health program highlights greater demand for integration across programs

Program Overview:

- There is a high TB burden in Malawi with an estimated prevalence of 451/100,000 among the adult population
- The number of notified TB cases is just below 18,000 cases a year with the death rate associated with TB being around 8%

Current EMR Use:

- TB Program investing in their own TB-specific system called TB for Community Intervention (TBCI), using the provider IMOSYS. TBCI is currently in 5 districts and planned to scale to another 4 in January 2019 with funding from World Bank.TBCI has reduced turnaround time for test results from 3-4 weeks to 1 week and automatically notifies patients when their TB test results are ready
- BHT HIV-TB EMR system has been piloted with the Lighthouse Trust in Lilongwe
- DREAM is investing in additional functionality to support TB screening

Data-related Challenges:

- Previous lack of TB-specific solutions (e.g., Baobab system was used to track co-infection of HIV/AIDS patients) did not meet overall need of TB program promoted investment in program-specific solution
- Inability to get comprehensive patient view across programs and access information that would improve the quality of care for TB patients (e.g., to understand if patient is on other medication that may impact what antibiotics to prescribe for TB)
- Time consuming DHIS2 reporting due to manual data aggregation has prompted the health program to want to integrate with DHIS2 for aggregate-level data and indicator reporting

Quotes from Health Program Staff

"We would like to be able to track the patient across levels, across time, and across programs"

"The TBCI has reduced time waste and costs, like transportation. If we want to cut 'catastrophic cost of healthcare' need to also factor in transport costs for those living far away from a facility"

"We need to allow beneficiaries to talk to us! We need a system where patients can participate"

Demand: TB

Program wants to be able to track patient data, integrate with lab systems, and notify patients when results are ready

TB Program Needs (using WHO DHI Classification)	Details about Specific Needs Expressed by Program
Targeted client communication	▸ Communicate with patient when test results are ready ▸ Track and follow up with patients who have not come to collect their tests or medication
Client identification and registration	▸ Register and verify a patient's unique identity
Client health records	▸ Track treatment adherence and patient progress ▸ Track and follow up with patients who have not come to collect their tests or medication ▸ Determine recurrence of TB among patients
Healthcare provider decision support	▸ Alert health workers when patients have not returned to facility to collect results ▸ Appointment reminders ▸ Recommend antibiotics based on lab results
Prescription and medication management	▸ Report and capture any adverse events ▸ Track and follow up with patients who have not come to collect their test results or medication
Laboratory and diagnostics imaging management	▸ Track if lab results have arrived or are delayed ▸ Link test results from lab to a particular patient ▸ Identify individualize diagnosis to determine specific TB strand for prescribing treatment
Data collection, management, and use	▸ Tracking of specific TB indicators
Data exchange and interoperability	▸ Linkage with other health programs (e.g., HIV/AIDS) to allow for a more comprehensive view of the patient (e.g., for ART and other antibiotics being prescribed) ▸ Interoperability with DHIS2 for seamless reporting

Overall Demand: HIGH

Demand for an EMR that captures TB specific information that support continuity of care, can be deployed in communities and in health facilities, and interacts with patients.

Health Program Overview: Malaria

Significant challenge with tracking malaria commodities and ensuring that malaria patients are diagnosed and treated; no cur

Program Overview:

- Malaria is highly endemic throughout Malawi with 95% of the population at risk
- There are an estimated six million cases occurring annually and the disease accounts for over 30% of all outpatient visits.
- It is a leading cause of morbidity and mortality in children under five years and pregnant women and mortality due to malaria is estimated to be 24%.

Current EMR Use:

- There are currently no malaria-specific EMRs deployed in Malawi
- BHT has developed an add-on to its OPD EMR system that is used to report malaria diagnoses and to follow the malaria protocol
- The malaria add-on for the BHT OPD EMR system was piloted in 3 facilities but it is currently not being supported but is partially being used to support the clinical workflow in the AETC at QECH

Data-related Challenges:

- Commodity accountability is one of the biggest challenges. Concerns about misappropriation of malaria drugs with facilities dispensing more drugs than the cases observed. Lack of proper records makes this difficult to track
- Unexpected stock outs due to a lack of documentation and proper tracking until it is too late
- Unreliable diagnosis and treatment adherence due to health workers not always following correct malaria protocol
- Inability to capture all suspected cases due to multiple paper registers
- Erroneous DHIS2 reporting due to manual data aggregation
- Multiple paper registers currently used for data collection and sent to the NMCP

Quotes from Health Program Staff

"Clinicians complained that it was more work for them because of maintaining both EMR and health passport records"

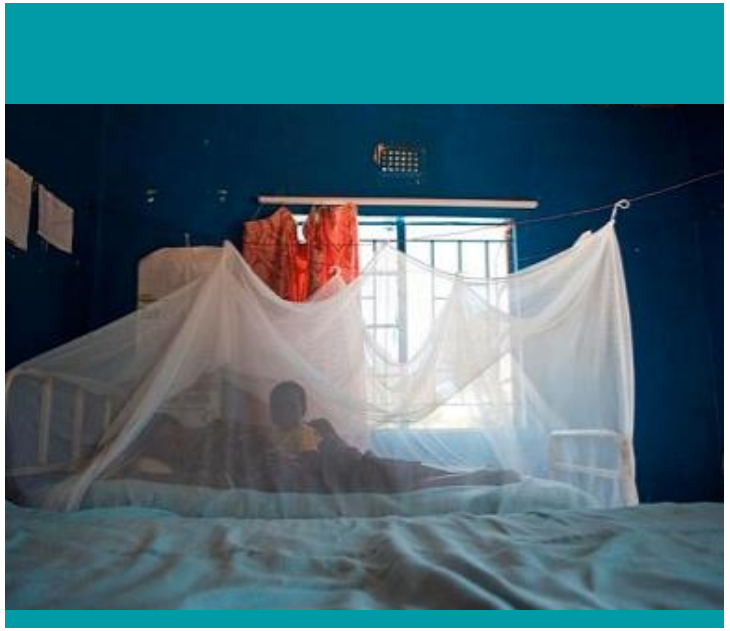
"It is a good system which we need to have, though we still need to build support capacity in the districts so that issues can be resolved quickly. We would have loved if there was a way to build capacity in the district to troubleshoot"

"Some of the clinicians were not making eye contact with the patient whilst using the EMR system"

Health Program Demand: Malaria

Need for tool to support proper diagnosis, adherence to treatment, and tracking of medications dispensed against malaria cases seen and treated

Malaria Needs (using WHO DHI Classification)	Details about Specific Needs Expressed by Programs
Client health records	▸ Ability to identify recurrence of malaria in patients
Healthcare provider decision support	▸ Support health workers to go through the malaria protocol to ensure all risk factor questions are asked ▸ Support to triage malaria cases based on severity of case
Prescription and medication management	▸ Monitor confirmed malaria cases that received first-line malaria treatment and breakdown by doses and treatment type
Laboratory and diagnostics imaging management	▸ Diagnosis made based on results from the lab
Supply chain management	▸ Monitor discrepancies between quantity of malaria diagnoses and treatments dispensed
Data collection, management, and use	▸ Report malaria incidence through DHIS2 and IDRS Monthly Reporting ▸ Use data for supervision and mentorship of facility staff
Data exchange and interoperability	▸ Capture malaria incidence data in other modules like ANC, in-patient systems, and maternity



Overall Demand: HIGH

Demand for an EMR that supports health workers to adhere to malaria protocol for diagnosis and treatment of malaria incidence and for drug commodity tracking.