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Assessment of health management information system (HMIS) data quality and information use: The case of Yekatit 12 Hospital, Addis Ababa

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Dedication

This project work was dedicated to my mother w/r BACU ABELTI and my father Ato BAYISA OBSE; who have always provided me their un-reserved financial and psychological support in my career, including this project work.

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Abbreviations

BPR: Business process reengineering

CHAI: Clinton Health Access Initiative

CSA: Central Statistics Agency

DPs: Development partners

DQA: Data Quality Audit

EPI: Expanded Program on Immunization

ESHE: Essential Service for Health in Ethiopia

FMOH: Federal Ministry of Health

GTP: Growth and Transformation Plan

HMIS: Health management information system

HMN: Health Metrics Network

HSDP: Health Sector Development Program

LQAS: Lot Quality Assessment Sampling

MDGs: Millennium Development Goals

MAT: Management Assessment tool

OBAT: Organizational and Behavioral Assessment Tool

PASDEP: Plan for Accelerated Development to End Poverty

PHCU: Primary health care unit

PRISM: Performance of Routine Information System Management

RHIS: Routine health information system

SMT: Senior management Team

WHO: World Health Organization

Abstract

Background: Good quality data delivered on time to users (as information) is an important aspect of healthcare planning, management and decision making. Data must be collected, processed and transformed, communicated, and used to help decision makers on resource allocations, policy formulation, staffing, service delivery, cost-recovery, supportive supervision, and other elements required in the effort of ensuring quality health service provision. HMIS is a core health system building block designed to provide important data for continuous quality improvement at all level of decentralized health care administration. For consistent data use to occur, data need to be of high quality so that data users are confident that the data they are consulting are accurate, complete, and timely. Without quality data, demand for data drops, data-informed decision making does not occur, and program efficiency and effectiveness will suffer.

Objective: To assess Health Management Information System (HMIS) data quality and information use in Yekatit 12 Hospital, Addis Ababa, Ethiopia.

Methodology: Descriptive cross sectional case study design in the form of both quantitative and qualitative study methods were used to identify the HMIS interventional areas in the hospital. Customized questionnaire and observation guide from PRISM tool was used to collect both descriptive and analytical data. Following the selected tools guideline most of the HMIS performance determinants were measured through continuous or Likert scale of 1-7 (one- very weak to seven- very strong) indicators. The organizational and behavioral part has involved 187 respondents selected from each department staff. Mix of data collection technique used was: interview of key informants, self-administered questionnaire, record review and observation.

Discussion of results: This assessment revealed high report completeness (100%) and data accuracy (90%); however, it also demonstrated limited generated information use at senior management level and totally non-existence of information use practice at departments and case team levels. Both organizational and behavioral determinants were found to be major rate limiting factor for low level information use observed. Overall, information culture promotion was found to be only 51.0 (47.2, 54.7); meaning the hospital management was weak in creating good work environment for HMIS related activities, use of collected data for evidence based decision making, empowering and creating responsibility among employees. This assessment also revealed low level staff motivation 45.2 (41.5, 49.0) and comparatively higher staff confidence in performing HMIS related activities. Respondents were more confident in interpreting results and their implication 67.0 (63.5, 70.6) than routinely collecting information which they rated as most boring activity 40.4 (36.7, 44.1).

Conclusion and recommendation: This assessment confirmed high report completeness, data accuracy and report generation in Yekatit 12 Hospital; with limited information use practice which was not because of data quality rather because of low information culture promotion and low level of staff motivation on HMIS related activities. This also indicated that data was primarily collected for reporting not for use. Therefore, in order to ensure the continuity of present data quality and to improve the observed poor information use; the hospital shall:

- Adopt and implement context-appropriate incentive systems for accurate and complete data collection, analysis and use at individual, case team or department levels with timely report submission to HMIS unit and evidence-based plans and performance achievements.
- The hospital should functionalize the hospital performance monitoring team established to oversee the HMIS data collection, analysis and utilization performance in hospital.
- Quarterly performance review meeting should be fully implemented as per EHRIG standard both at department and hospital levels especially using objective performance measurement based on selected respective indicators.

Key words: Data quality, Information use and Performance determinants.

1. Introduction

1.1 Background

Data that are accurate, complete and delivered on time to users (as information) is an important aspect in healthcare planning, management and decision making (1, 2). However, different studies done in developing countries show poor quality data generation and utilization. Data must be collected, processed and transformed, communicated, and used to inform decision makers on resource allocations, policy formulation, staffing, service delivery, cost-recovery and other elements contributing toward improved health outcomes (3).

In Ethiopia, the overall decentralized health provision activities are based on a long term plan called 'Health Sector Development Program (HSDP)'. All health facilities annual, quarterly and monthly plans are taken from this HSDP targets and key activities; it is also revisable every five years and well aligned with other national and international set targets like Plan for Accelerated Development to End Poverty (PASDEP) and Growth and Transformation Plan (GTP), Millennium Development Goals (MDGs) and others (4). At the time of this study, HSDP IV 2010/11-2014/15) is toward the end of its implementation period so the Ministry of Health is simultaneously developing the fifth HSDP to guide future health sector activities.

The recently implemented business process reengineering (BPR) of the health sector has introduced a three-tier health care delivery system. The first level also called primary health care unit (PHCU) comprising a primary hospital serving population coverage of 60,000-100,000 people, health centers 1/15,000-25,000 population and their satellite health posts 1/3,000 -5,000 population that are connected to each other by a referral system. The second level in the tier has a general hospital serving a population coverage of 1-1.5 million people and the third level encompasses specialized hospital that serves a population of 3.5-5 million range (5).

To improve quality of curative and rehabilitative health service provision of FMOH has developed Ethiopian Hospitals Reform Implementation Guideline (EHRIG) in collaboration with Clinton Health Access Initiative (CHAI). Like the previous HSDP, this guideline is also fully aligned with initiatives like Business Process Re-engineering (BPR), Balanced Score Card (BSC) and other health sector long term plans which have direct or indirect effect on hospital performance. Each of thirteen chapters included in the guideline has its own operational standards, implementation guidance and performance measurement indicators and checklists (6). In general, the guideline is very comprehensive addressing all technical and non-technical activities performed in the hospital to save client life or to promote quality of life. All regions and city administrations including Addis Ababa Health Bureau has cascaded this guideline implementation to improve their hospitals quality of health service provision capability through provision of onsite training and material support.

To monitor implementation of aforementioned guidelines and achievements of set targets and

planned key activities the Ministry of Health in collaboration with other partners has standardized and launched a principle of one plan, one report and one budget system. To facilitate the standardization and reporting system the Ministry also developed different guidelines like indicator definition, disease classification, data recording manuals and guideline for generated information use by health care providers at all levels(7-10).

Accordingly, while patient cards and different registers were designed to capture routine patient related data, reports are based on the 108 sector wide indicators that have been jointly agreed and endorsed by Federal Ministry of Health (FMOH) and other development partners (DPs) legally registered and allowed to operate in the country (7-10). The necessary resources like: human resources, tools, equipment and other materials needed for the proper documentation, compilation, analysis, use and timely dissemination of routine facility data as per the health management information system (HMIS) standard and requirement is being allocated by respective decentralized administrative levels (4, 11). Since no other parallel program specific reporting system is allowable all DPs are expected to support this system technically and financially to get quality HMIS generated indicators which they are obliged to depend on for their own program monitoring activities.

Although performance varies from facility to facility the routinely collected data from each health delivery outlets is first aggregated, analyzed and used at facility level to monitor health service provision activities of the facility itself and to facilitate improvement interventions. The frontier health delivery facilities are also tasked to regularly send collected data to the relevant higher administrative levels as per the HMIS reporting calendar (9). Stakeholders operating with any of decentralized governmental health institutions are allowed to get access to collected data and indicators they want from respective institutions they are working with. Validation of the data is done through performance monitoring, integrated supportive supervision, surveys and regular inspections (4).

1.2 Statement of the Problem

Accurate and timely accessed health data and information is very necessary to routinely monitor health service provision practice and to evaluate short term or long term strategic plans and also useful for improvement of healthcare services delivery and programs. As countries monitor their progress towards achieving the United Nations MDGs, HSDPs or other regional and facility level targets; the need for high quality data and information use is indisputably important (2,3,10). Likewise, governmental budget allocation to health sector and non-governmental organizations funding and supporting of planned health activities is highly affected by quality of data and information coming from service provision areas. Nevertheless, assuring quality of this important health data & proper use of generated information by all concerned bodies remains a challenge.

In Ethiopia, routine data collection and aggregation process occurs at all levels of health system administration hierarchies. After collection and aggregation summary statistics is expected to be produced and used for performance monitoring, planning and decision making (11). However,

according to assessment results done by FMOH and World Health Organization (WHO) in collaboration with Central Statistics Agency (CSA) and HMN, among the six assessed key components of HMIS functionality measurement parameters (Resource, indicators, data source, data management, information products and dissemination and use) three were reported as "*not adequate*"; Numerically data management was reported as 33%, dissemination and use reported as (36%) while resources availability was reported as (39%). Similarly, other HMIS parameters were also not up to the standard (12). From this study one can clearly understand that, if data management is as low as 33% and resource allocation for data management activities is also as low as 39%, the quality of data collected from such working environment is too low and use of information generated from such poor data quality is also not free of error.

Likewise, a study done in HMIS implementing regions of Ethiopia by WHO in collaboration with FMOH has indicated that feedback provision practice on HMIS data submitted to higher administrative level from frontier health facilities was reported to be only 35.3% while discussion and decisions made based on HMIS data collected happened in only 37% of assessed health facilities. Additionally, this study also revealed limited culture of information use and weak informed decision making practice; just only 37% of health facilities had exercised discussion and made decisions using findings from routine health information system (13).

Another study conducted in Amhara Region by Essential Service for Health in Ethiopia (ESHE) reported that, utilization of health information both at district and health facilities levels was "*partial and not uniform*" (14). Assuring low level of HMIS generated information usage practice in the region both at facility and district level.

HMIS implementation assessment done in Addis Ababa health institutions has reported that although there is staff commitment on data registration and reporting at the health facility level, comparison of reports sent to regional office and data analysis reports at facility level revealed significant discrepancy (15); reassuring existence of poor data quality in Addis Ababa health information system operation.

So, assessing level of data quality and information use status and exploring their determinants in Addis Ababa health facility can demonstrate level of data quality and degree of information generation and utilization practice with currently available resource. It also reveals fundamental problems that should be emphasized during continuous quality interventions development.

Therefore, this assessment evaluated the level of HMIS data quality and information use practice in Yekatit 12 Hospital using standardized PRISM framework. It also explored key determinants of data quality and information use practice by categorizing as technical, behavioral and organizational determinants which facilitates continuous quality improvement effort by revealing priority problem for intervention planning.

1.3 Objectives

1.3.1 General objective

To assess Health Management Information System (HMIS) data quality and information use in Yekatit 12 Hospital, Addis Ababa, Ethiopia

1.3.2 Specific objectives

- To assess the degree of data quality in terms of its accuracy and completeness in Yekatit 12 Hospital
- To examine the degree of generated information use in the hospital
- To assess technical, organizational and behavioral determinants affecting data quality and information use.
- To examines the overall health information system functionality and availability of resources.

1.4 Significance of the study

This project work can serve as baseline information towards quality improvement intervention effort of hospital management. Furthermore, it also helps hospital management and other partners to develop structured interventions based on the identified and prioritized problems and guide implementation of interventions which result in positively affecting data quality and information use practice in the hospital and finally improve client treatment outcome.

The findings could also provide information to improve the quality of health care delivery in general and Yakatit 12 Hospital in particular. The main beneficiaries of the result will be hospital clients; as high quality data and proper use of information directly affect the treatment outcome of clients. Other beneficiaries include: hospital management, department heads, hospital staff, Addis Ababa Regional Health Bureau, FMOH and other nongovernmental organizations. Finally, this study could be used as baseline for interested individuals who want to continue the implementation phase of this project work.

1.5 Scope and Limitations

The assessment of HMIS data quality and information use was carried out only in Yekatit 12 Hospital, Addis Ababa. Other health facilities and data out of selected Hospital was not included because of time and resource constraints.

The project assessed the overall HMIS functionality and resource availability emphasizing data quality and information use practice. It also explored HMIS related technical determinants particularly it explored data collection instruments, registers, forms and reporting systems and communication channel between HMIS unit and frontier data recorders and between hospital management and HMIS unit. Besides, as HMIS data were collected, compiled, analyzed and used

by health professionals; this work also explored behavioral and organizational factors affecting the practice of information use and quality data generation.

Due to time and financial problem the last two project phase (implementation and post implementation assessment) is not included. Therefore, comparison of this finding and the post implementation evaluation result is not possible. Provided that the intervention planning time is much far from this baseline study anyone can use this baseline findings for intervention planning and intervention after intervention the same assessment criteria used here can be used to evaluate post intervention outcome.

Data collection questionnaire for organizational and behavioral factors were prepared in English assuming that the study participants had higher education and can understand the language.

2. Literature Review

2.1 Basics of PRISM framework

Different efforts have been made to improve the quality and management of health information systems in developing countries. Two prominent examples are the Health Metrics Network (HMN), an international network that seeks to improve the quality of health information from various sources, and Performance of Routine Information System Management (PRISM) framework, which was developed as a method for assessing strengths and weaknesses of routine health information systems. Other initiatives, such as the Data Quality Audit (DQA), have been used by the GAVI Alliance to improve the monitoring of immunization coverage and in addition to other quality dimensions FMOH is also using Lot Quality Assessment Sampling (LQAS) method to check data accuracy at health facility level (13, 16).

Routine health information system (RHIS) improvement effort requires continuous problem identification that addresses a wide range of possible performance determinants. Prioritization and development of proper interventional strategies and implementation of those strategies were also very important to ensure data quality and information use improvement. PRISM analytical framework enables exploration of health information system determinants by systematically categorizing them as environmental, behavioral and technical determinants (17, 18).

Environmental determinants address both external and internal health organization determinants affecting smooth functioning of health information system. Factors external to health organization includes transportation infrastructure, electricity, telecommunication and availability of trained human resource which can present tangible obstacle to data quality and information use practice. Since health organization might not have full control over these environmental determinants they were not emphasized in PRISM framework rather health organizations internal determinants like: clear roles and responsibilities division, level of management support to create good culture of information use, evidence based decision-making practice and introduction of policies, standards and norms were given more attention (16, 17).

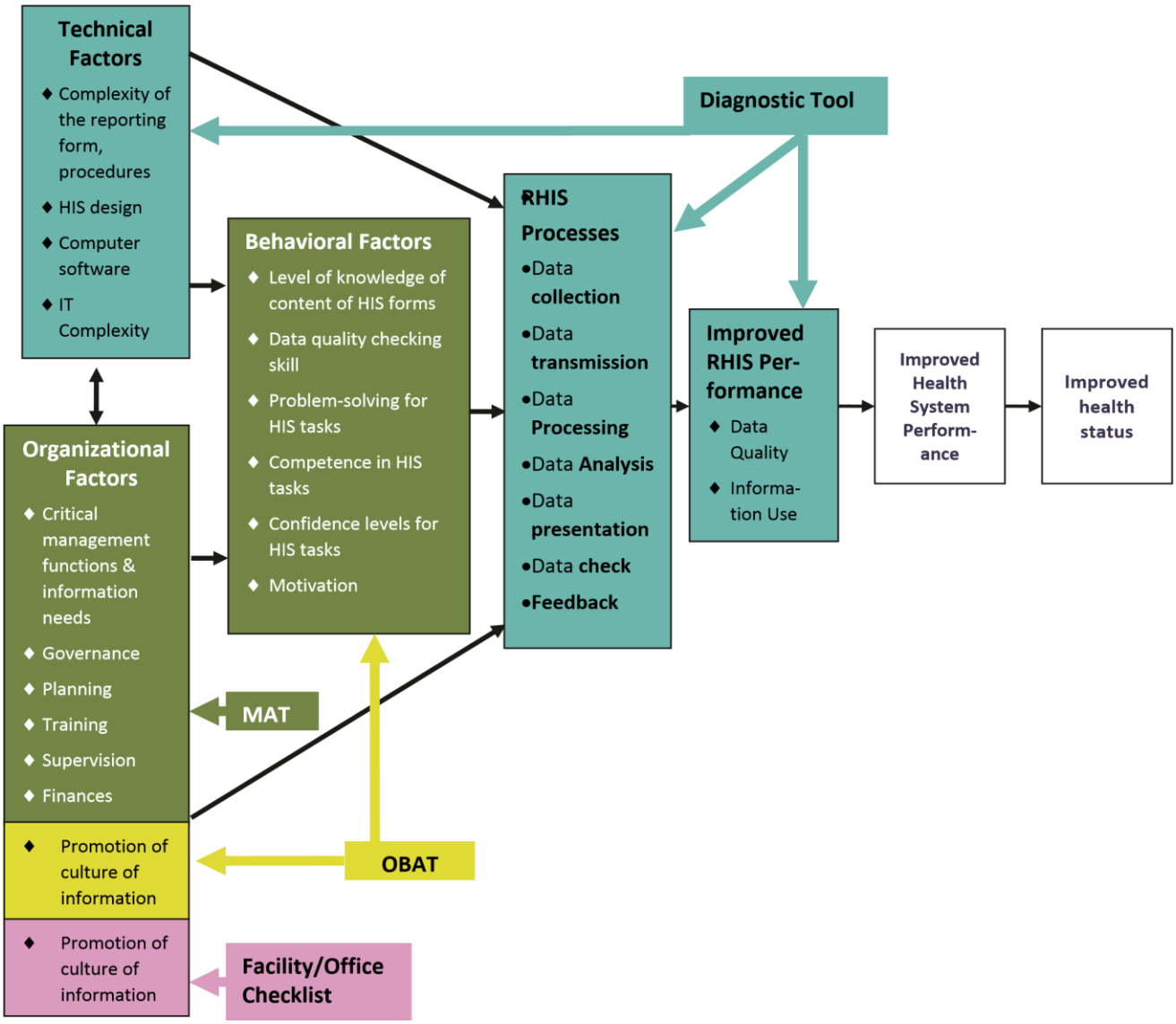
Health data were collected and used by people who play professional and personal roles in health system operation, so scanning of human behavioral determinants in RHIS process is mandatory. Accordingly, examination of behavioral determinant includes assessment of intangible factors like employee motivation, attitudes, knowledge and skills for data processing, analysis, interpretation and use of information (16, 17).

PRISM framework also assesses technical determinants that are related to information technology. RHIS determinants belonging to this category includes software development, indicator selection, data collection forms, and procedural manuals related factors that affect overall data quality and information use practice (17, 18).

The aforementioned determinants were captured through different PRISM tools (Figure 1) specifically designed for this purpose. Diagnostic tool assesses factors related to RHIS processes,

performance, supervision and other technical determinants while office/facility checklist explores availabilities of resources like: forms, registers, staff, etc. Management assessment tool (MAT) evaluates health management functions (planning, organizing, evaluating and monitoring) related factors. Lastly, organizational and behavioral assessment tool (OBAT) assesses promotion of a culture of information and key behavioral factors that influence RHIS process and performance (16, 18).

Figure 1: RHIS determinants and data collection tools



Source: PRISM analytical framework, MEASURE Evaluation/JSI Publication. User guide, June 30, 2009, page 13

2.2 General Literature

HMIS is an organized system of recording, processing, storage, reporting, and use of routinely generated health data or information to continuously monitor and make necessary interventions during health care delivery practice (19). It has both paper-based and computer-based application for all decentralized health administrative levels. Low and middle income countries mostly use paper-based data collection processes at primary health care level and paper and computer-based health information systems at district levels (20).

In Ethiopia, HMIS is designed to capture and provide essential data for performance monitoring, planning and decision making effort of healthcare providers and mangers at all levels of decentralized administrative bodies. Before fully scaling up the piloted HMIS implementation, FMOH also adopted a *"One plan, one budget and one report*" policy making HMIS a core information generating system for all service providers, managers, policy makers or DPs eliminating previously existing duplicate and program based data collection and reporting practices of healthcare system(10,11). The primary purpose of HMIS is not only data collection and reporting but also aimed to improve generated information use for decision making by healthcare providers, managers and policy makers.

Although HMIS data quality and information usage issue is a global problem (20), different studies done on quality of health information systems in developing countries frequently documented problems with data quality and information usage; such as incomplete records, untimely reporting and poor information usage for decision making (21-23). Yet, this information systems were the only data sources available for routine program monitoring and continuous intervention planning at different health service provision areas of those countries.

Assessment conducted in Malawi on quality of health information system revealed that the systems used to gather data for management of health services were too many and uncoordinated. In addition, collected data had poor quality and rarely used for planning and other health service related interventions. Similarly, the study also reported that quality of health care provision depends on quality of routinely collected HMIS data; which intern depends on a number of factors such as health workers attitudes, organizational factors, availability of skilled man power and others resources (21). In general factors influencing each health facilities continuous quality improvement effort can be grouped as cultural, technical, strategic and structural attributes.

A country wide study conducted in Tanzania on HMIS have shown that HMIS has been successfully implemented throughout the entire country. However, generated data and information from this newly implemented HMIS was insufficient to allow managers and policy makers to make informed decisions at all levels. Some of contributing factors mentioned in the study were incompleteness of reporting, data inaccuracy, lack of timeliness and insufficient analysis (22).

A program specific study done on challenges of routine health system data management on prevention of mother to child transmission of HIV/AIDS in South Africa revealed another major defects on completeness and accuracy of collected health data. The investigators analyzed six data

elements for one year retrospectively from 316 sites which showed that the data were complete only half of the time (50.3%) with high data inaccuracy; data elements classified as *'accurate'* was only 5.3% to 19.8% (23).

Study done in Kenya on HMIS information use and its determinants revealed limited information use practice; only 34% of health managers exercised evidenced based decision making in their institutions; which means strategies and interventions were taken arbitrarily and not based on data for the other 66% of assessed institutions. A number of stated factors contributing for the problem were: lack of capacity and skills, unavailability of guiding documents, lack of trained man power, use of untrained support staff and manual data collection system also affected the quality of information generation which intern affects data utilization (24).

Assessment of SINAIS (national health information system, by its Spanish acronym) in Guanajuato reported that data accuracy and completeness for selected indicators was 95% and 100% respectively while poor information use was reported both for health facilities and district health offices. The examination of technical determinants also reported that more than 85% of respondents felt that manuals, registries and software were user-friendly while promotion of organizational culture was also reported to be very good (73% & more) which means health department promotes good work environment on data quality and information use. Finally, staff behavioral factors like motivation and self-confidence to perform health information related activities was reported to be 69% and 74% respectively (25).

HMIS study done in India reported that information use in meetings was 35% while the overall respondents confidence in performing HMIS related tasks was 69.4% with perceived promotion of a culture of information being 70% (26).

A national HMIS assessment done in Ethiopia by FMOH in collaboration with WHO, CSA and HMN reported that among the six major components of Health information system parameters (resource, indicator, data source, management, products and dissemination and use) the core three components found very weak; these were resources, data management, and dissemination and use while the other three components are more or less categorized as good. The study also listed the weakness observed during the assessment which were inequitable resource distribution between urban and rural areas, lack of trained man power and attrition of human resources (12).

Another review conducted in Ethiopia on HMIS data quality and information use by FMOH and WHO revealed that the content completeness and reporting timeliness remained far below the national 85% target for the selected six indicators. Accuracy of reported data was also reported to be insufficient. Over reporting tendency was a common finding in almost all of the assessed reporting levels. Culture of information use for decision making observed at all level was almost null; they simply collect data from lower level and transfer it to the higher level. Factors identified were: inadequate provision of the required resources or inputs, including lack of trained focal persons, inadequate start-up costs that including basic infrastructure, such as the availability of card rooms, standard MBI boxes and shelves(13).

Study conducted on HMIS generated information use in Amhara Regional state by Essential Service for Health in Ethiopia (ESHE) reported that, utilization of information at District and health facilities levels was partial and uneven (14); another Study done on HMIS data quality and information use in SNNPR by MEASURE Evaluation in collaboration with regional health bureau showed very low level of data accuracy in health facilities except for hospitals; but the data completeness of facility reports was found good. The other deficiency reported was less attention to individual performance appraisal and reward or recognition. Similarly, use of generated information at facility level was found very limited; few contributing factors reported: wrong perception that data is collected primarily for reporting, lack of trained man power and poorly designed database. Assessment of determinants contributing to this practice was revealed that promotion of information culture was 85% & more while staff self-confidence and motivation were reported to be 70% and 65% respectively (27).

Health information utilization assessment done in Jima zone Oromia region reported that the utilization of health information was 119 (32.9%) in all the study units/departments (3). Similarly, Study done in Amhara region on implementation status of HMIS in public health facilities and institutions reported the existence of unnecessarily high data burden, with duplicative and poor quality data which clearly affects use of information (14).

HMIS design and implementation assessment done by Messay in Addis Ababa health facilities reported average data quality as 70% indicating the quality is higher for hospitals 87.7% compared to health centers which was 52.3%. The study also reported the monthly quality check by HMIS focal using nationally adopted LQAS tool was 100% (28). Contrary to this finding, another assessment done by Alganesh on HMIS in the same city revealed that even though there was commitment on data registration and reporting; there still exists discrepancy of reports sent to regional office and data analysis reports produced at the regional HMIS unit indicating poor quality data (15).

2.3 Related Works

If fully implemented, this project has three phases, so project works having three phases: baseline assessment, intervention and post intervention assessments were listed below as related works.

Data quality interventional study conducted in KwaZulu-Natal, South Africa showed that overall data completeness improved from 26% to 64% when carefully assessed before and after implementation of intervention with the same tool. Similarly the data accuracy also improved from 37% to 65% before and after the intervention (29). However, another interventional study conducted in Italy teaching hospitals of medical and surgical ward patient records showed a low quality improvement both in completeness and clarity of hand writing which cannot be considered as satisfactory. The reason for unsatisfactory result was attributed to professional's attitude and weakness of the designed data collection methodology (30).

Facility based assessment of health management information system implementation in Ayder referral Hospital, Ethiopia has reported 63.3% of report accuracy and 95% patient card completeness. The study also revealed that no sign of generated information use practice in the hospital (31).

3. Methodology

3.1 Study setting

The assessment was accomplished in Yekatet 12 Hospital, one of the hospitals under Addis Ababa Health Bureau jurisdiction. At the time of its establishment in 1923 the hospital started service delivery to clients by one physician (Swedish), 2 nurses and 3 health assistants but currently the hospital is serving the community by a total of 520 staff of which 305 technical, 203 administrative and 12 academic employees. In 2009 the hospital was selected for electronic health record pilot implementation by Ministry of Health but the pilot implementation was interrupted since 2012 due to renovation and upgrading work undergoing in the hospital.

In addition to different reforms introduced by government the hospital is also implementing the EHRIG guideline which is designed specifically to guide the overall hospital day-to-day activity. Accordingly, the hospital had senior management team (SMT) chaired by Chief executive officer who is trained in MHA (management of hospital and healthcare administration) and responsible for overall hospital performance management; under SMT top management structure, the hospital had inpatient, outpatient and emergency directorates which in-tern had different case teams and employees directly serving the hospital clients in unison.

In principle, the case teams daily serve the clients come to their unit and collect data on their daily activities. Coordinators of each case team were responsible for HMIS and key performance indicators (KPI) data elements related to their unit; which they were expected to collect, analyze and use it for their task monitoring purpose and present report monthly to their respective directorates and HMIS unit. The HMIS unit is supposed to compile the hospital level data collected from case teams and report to senior management committee for hospital level consumption and transfer it to regional health bureau on monthly basis.

3.2 Study design

Descriptive cross sectional case study in the form of both quantitative and qualitative methods was used to identify the HMIS interventional areas in the hospital. Questionnaire and observation checklist was customized from standardized PRISM framework (19-18, 32). The rationale for using the PRISM framework was that the framework not only defines and measures data quality and information use but also permit exploration of related performance determinants. Thus, use of this framework enabled the investigator to identify routine HMIS performance related strengths and weaknesses with their determinants. Such comprehensive problem identification with corresponding determinant facilitates continuous quality improvement effort on hospital HMIS data quality and information use.

Customized framework had four sub components addressing all health information system data generation and information use related issues with their determinants. Brief description of each components:

1. Diagnostic tool: This tool determines performance of HMIS, in-terms of data quality and information use, processes and user friendliness of data collection forms. It uses document review and observation of resources and displays of HMIS related data method
2. Facility checklist: Examines the existing overall health information system and its functionality and availability of resources through interview and observation.
3. MAT: This tool assesses the management support services; including governance, planning, training, internal supervision, performance monitoring and follow up.
4. OBAT: This is a self-administered questionnaire completed by technical health workers and HMIS staff to identify behavioral and organizational factors affecting routine HMIS performance. Organizational factors include level of promotion of a culture of information within the hospital and use of routinely generated information. While, behavioral factors include HMIS related problem solving knowledge, staff confidence or self-efficacy and motivation.

The routine HMIS related performance of Yekatit 12 Hospital was assessed using the aforementioned tools. The hospitals SMT, medical service departments (Emergency, Outpatient & Inpatient) and HMIS unit performances were assessed by interviewing key informants (all HMIS staff, Medical service department heads and SMT representative), review of documents and observation of resources or displays while organizational and behavioral determinants were examined by self-administered questionnaire from technical employees randomly participated in the study. In all cases, key informant interview, retrospective record review and observation of displays, minutes, records, tallies and registries were done for a record of six month data (October 2013 to march 2014).

Following the PRISM guideline most of the HMIS behavioral and organizational performance determinants were measured through continuous or Likert scale of 1-7 (one- very weak to seven- very strong) indicators. Each of the continuous indicators ranked by study participants were aggregated to form ‘composite indicator’. The composite indicators further aggregated to form grand composite indexes which was used as key behavioral and organizational determinant describing indicator. During both aggregation ‘mean percentile’ was the main measurement used which was calculated by first finding the mean of each indicator rated from one to seven and then changed to percentile.

Although data quality has eight dimensions, which include: accuracy, reliability, completeness, legibility, timeliness, accessibility, usefulness and confidentiality or security; this study has used only accuracy and completeness dimensions to measure data quality (2). Data accuracy was calculated by comparing value of selected data elements in the reports with that of registries or tally sheets while completeness was measured by comparing monthly reported data elements to health bureaus against monthly reportable data elements. Similarly, the use of information was assessed through a review of report production, minutes of meetings, feedbacks, decisions, updated displays, evidence of follow up actions and other documents that verifies whether and how HMIS data were used in decision-making processes.

3.3 Source and study population

The study population was Yekatit 12 Hospital technical staff and key informants. The discussants of qualitative data collection were purposively selected individuals including chief executive officer (1), Department heads (3) and all HMIS staff (7). Respondents of the quantitative data collection were randomly selected from the remaining technical staff; the following assumptions were made to determine the sample size using single population proportion formula: P= 50%, d= 5% allowed margin of error, 95% Confidence level, and α= 5% and total study population 300 which is <10,000:

$$\frac{(Z\alpha_{/2})^2\, P(1-P)}{d^2} = 384$$

Adjusting for sampling from smaller study population: $\mathbf{n} = \frac{384}{(1+\left(\frac{384}{300}\right)} = 168$

Adding 5 % non-response rate and 11 key informants; total sample size used was **187** technical and key informant staff of different departments (33).

Half year (October 2013 to march 2014) documents: registries, tally sheets, patient cards, graphs, meeting minutes and other documents were tracked retrospectively to examine the hospitals routine performance monitoring practice. For record review part among monthly reportable data elements: Deliveries attended by skilled birth attendant, Number of newborns weighed, low birth weight, DPT3 and measles were selected and used as proxy indicator to measure data quality in terms of report completeness and data accuracy dimensions.

3.4 Data collection (tools, variables),

The study used self-administered questionnaire for behavioral and organizational quantitative data collection while semi structured interview, observation and review of documents were also used to gather important data for other parameters.

Study variables used:

1. Dependent variable
    - HMIS data quality and use
2. Independent variables
    - Organizational factors i.e. information culture, resource, management functions
    - Behavioral factors i.e. Motivation, confidence and problem solving knowledge
    - Technical factors i.e. data collection and reporting forms and data analysis tools

3.5 Data management and analysis

Collected quantitative data was cleaned and analyzed using EPI info 7 downloaded from CDC website and Microsoft excel 2013 while qualitative data was collected and analyzed manually. Descriptive analyses, means, mean percentiles and frequencies were used in interpreting findings.

HMIS performance determinants were first categorized as organizational, behavioral and technical based on PRISM framework. Organizational determinants intern classified as culture of information promotion, management function and resource availability while behavioral determinants were sub-classified as staff motivation, confidence level and problem solving perception composite indicators. Each of composite indicators also had different sub indicators.

During analysis each indicator was first aggregated separately based on its mean and frequency using aforementioned EPI info the result was exported to Microsoft Excel; after which the indicators were grouped by their category to form composite and grand composite indices based on their mean percentiles which was finally presented by tables and charts.

Different data quality assurance techniques were used to ensure the quality of collected data. To mention few, half day orientation was given for all data collectors, approved PRISM framework was used both for quantitative and qualitative data collection, data collectors were supervised during their operation, the principal investigator himself participated in key informant interview and observation and finally, each of collected data was cleaned for completeness, consistency and missing values.

3.6 Method of dissemination of results

Quality and timely health information is needed at different levels of health sector for effective intervention development either by organizational representatives or individuals. This assessment result would be available in Addis Ababa University, School of Information Science library, so that any interested student can refer it or complete the project implementation cycle starting from this assessment finding provided that the time is not too far.

The assessment finding will also be shared for Yekatit 12 Hospital SMT members, so that they use it for internal quality improvement effort. Addis Ababa Health Bureau and Federal Ministry of Health will also be copied for follow up of the result consumption primarily by hospital departments and SMT members and if implementation was resulted in positive impact then future scale up to other hospitals can be considered by any interested organization or individual.

3.7 Operational definitions

Technical determinants: refers to all those factors that are related to technology and specialized know-how on development, management and improvement of HMIS processes and performance. These factors refer to development of indicators; designing data collection forms and preparing procedural manuals; types of information technology; and software development for data processing and analysis (16-18).

Organizational determinants: refers to all those factors that are related to organizational structure, resources, procedures, support services, and culture to develop, manage and improve HMIS processes and performance (16-18).

Behavioral determinants: HMIS users' demand, confidence, motivation and competence to perform HMIS tasks affect HMIS processes and performance directly. How an individual feels about the utility or outcomes of a task or his confidence in performing that task, as well as the complexity of the task itself, all affect the likelihood of that task being performed. Limited knowledge of the usefulness of HMIS data is found to be a major factor in low data quality and information use (16-18).

Mean percentile: Each indicator rated from one to seven first added then divided for total respondents (mean rating) and finally, the mean rating was changed to percent.

Composite mean percentile: Each indicator rated from one to seven and belongs to one category was aggregated to form composite indicator in terms of its mean then the mean was converted to percent.

Grand composite indicator: each composite indicator farther aggregated to get grand composite indicator.

Data: It is the raw material in the form of numbers or characters and it is without context.

Data element: A data element refers to the name of a particular event or factor that must be counted or measured." In context of HMIS, a data element is a record of health event or health related event. E.g. Number of skilled birth attendant, number of newborns weighed and etc

Indicator: An indicator is derived from data elements so that it becomes information that can be used for programme monitoring, management, and action. E.g. Proportion of low birth weight, skilled birth attendants etc.

Data quality: represent what was intended or defined by their official source, are objective, unbiased and comply with known standards and it includes: accuracy, validity, reliability, completeness, relevance, timeliness, accessibility and usefulness

Information: It is a meaningful collection of facts/data with reference to a context.

HMIS: is an organized system of recording, record keeping, processing, reporting and use of generated information in hospitals or higher levels it is also designed to serve different level of customers (clients, service providers, managers, planners and policy makers) with timely and relevant information.

3.8 Ethical Clearance

The project work was carried out after getting ethical clearance permission from the ethical clearance committee of Addis Ababa University, through School of Public Health. Both Addis Ababa Health Bureau and Yekatit 12 Hospital management representatives were also consulted about the planned assessment on HMIS data quality and information use in their hospital and they gave green light for the study and also promised to take over project implementation phase to improve their hospital data quality and information use based on the finding.

Before start of data collection each of the study participants were explained about the project objectives and how their privacy issue is going to be ensured and lastly, each participant's oral consent form was taken before any questionnaire administration or interview.

4. Discussion of Results

The findings of this assessment study was presented in three different parts: Overview describes the various existing information systems and their relationship with each other. The second part explores hospital routine data quality and information use practice followed by brief description of the finding. Lastly, routine data quality and information use performance determinants were described separately as organizational, behavioral and technical factors with their sub-categorical determinants.

4.1 Overview

Interview with key informants and observation of overall hospital information system revealed that the hospital use HMIS with its electronic database and KPI again with its electronic database both monthly reportable to Addis Ababa regional health bureau. All frontline client servers use registries to collect information from patients except the card room which uses both computer based and manual information capturing mechanism. Although, all units are primarily expected to collect and use data for their department performance monitoring and report to HMIS unit regularly; in practice no department was practicing this apart from manually registering client related information while serving them. Because of this, when report is required HMIS staffs collect data elements by physically rounding all service provision areas, compile it and send to regional health bureau.

Both HMIS and KPI data elements were collected from registries, tally sheets, medical record, bin cards and other documents. However, they use separate data analysis tools leading to duplicate effort of data entry on professionals. Content wise, the KPI data elements are almost included in the HMIS database but sometimes with different indicator definition (e.g. tracer drug calculation). The management also assigned separate team to handle this hospital based information systems separately showing the commitment they had in fulfilling report demanded of regional health bureau than bothering the use of collected data at hospital level.

4.2. Data quality

In every hospital health data are maintained for the present and future care of the visiting client regardless of the level of hospital at which the service is provided. The quality of that data is crucial, not only for use in patient care, but also for monitoring of overall healthcare provision performance. Therefore, all collected and presented data at hospital level must be accurate, complete, reliable, legible, useful and accessible to authorized users on time.

In this assessment, data quality was approximated by level of its completeness and accuracy dimensions which intern measured by selected data elements from HMIS monthly reportable ones. Data completeness was assessed by examining the number of cells left black excluding cells with absolute zero value, cells having non monthly reportable data elements and cells corresponding to

service that are not given by the hospital. Accordingly, both Tehesas and Megabit month report either for HMIS or KPI report didn't have any black reportable cell showing 100% completeness for both system reports. This result is above the national HSDP IV target which is 90% and has to be maintained (4). However, during data audit many pitfalls were found in registries, tally sheets and client's medical record completeness; indicating the level of commitment observed in report production didn't cascaded to data collector's level showing possible area for quality improvement intervention. This study result was comparable with PRISM based assessment result found in SNNPR hospitals which also revealed that report completeness was 100% for hospitals but much less for other health facilities (27). This achievement was probably because of regional health bureaus and FMOH direct follow up of hospital performance and supporting them with different initiatives like Ethiopian Hospitals Alliance for Quality, separate performance monitoring indicators, deployment of especially trained professionals in hospital administration and health care financing.

Data accuracy can be checked in two ways; by comparing whether data registered in registries accurately represent the actual number of clients provided service or by comparing whether reported data element in the monthly report was consistent with collected data from registries. For this study purpose, the second definition was used which means data accuracy was checked by cross checking data in the report with that of registries. The randomly selected monthly reportable data elements were: a) Delivery attended by skilled birth attendant, b) Number of newborns weighed, c) Low birth weight, d) Pentavalent DPT3 immunization for infants < 1year of age and e) Measles immunization for infants < 1 year of age.

Figure 1, shows that overall hospital level data accuracy was 90% with 48% to 100% data accuracy range for the selected data elements; high data accuracy was observed in expanded program on immunization (EPI) unit which may be because of partners support in the area while low accuracy was observed in child health unit. Reason for discrepancies were missing report and data transfer error because of illegibility of registries, presence of black cells and burden of data collection on HMIS staff as they were the only employee tasked to collect information from each unit. Front health care providers don't report data to HMIS unit few interviewed staff members even questioned whether it was their responsibility.

This level of data accuracy is equivalent with HSDP IV target which is also 90 % (4). This result may increase if program data elements were used and may decrease if health service indicators were used as the former have good partner support including onsite professional support and it's also government priority area while the latter do not have such opportunity. HMIS Assessment study done by Messay in Addis Ababa health facilities reported 87.9% data accuracy for hospitals showing comparability to this result. Another study done in SNNPR also reported high level of data accuracy in hospitals (67%); even though it was far below than this finding. (28, 27)

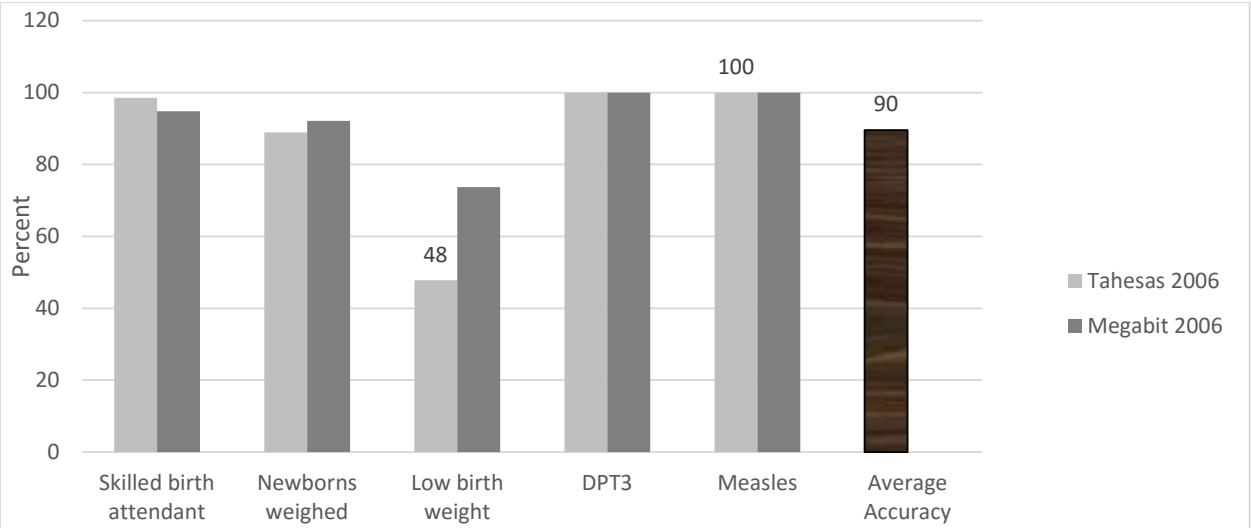


Figure 2: Data accuracy of selected data elements, Yekatit 12 Hospital, April 2014

4.3. Information use

Use of information was assessed using three criteria; first, the availability of monthly reports and feedback and reviewing them for any indications of information use. Second, the availability of up-to-date performance monitoring displays in each department and also at hospital management level. Third, observation of performance review meetings, discussions, decisions and other documented record. Nonexistence of records and documents was taken as un-utilization of generated information.

Monthly reportable data items were regularly compiled and sent to regional health bureau; copies of reports sent to regional health bureau were separately available in their respective HMIS and KPI unit. Additionally the data analysis tool itself keeps the soft copy of generated reports; as computers may crash or corrupt destroying the files stored in it both units regularly take back up of their important files onto separate hard disk. As a rule, hospitals are expected to collect, analyze and use data primarily to improve individual client treatment outcome; departments and senior management members of the hospital were also expected to use it for overall performance monitoring against set targets, develop interventions and continuously improve their health service provisions; finally the collected data should be transferred to higher administrative level for farther consumption at regional and national levels.

Although good report production and filing was observed both in HMIS and KPI units; other examined departments (outpatient, inpatient and emergency) were unable to show evidence of data collection and filing on data elements pertaining to their department. Apart from giving care to clients and registering their profile on registries and patient cards which they saw as tedious work; all department head interviewees didn't believe that report production and filing was their responsibility. Despite regular report submission to hospital SMT or regional health bureau no

written feedback criticizing or recognizing the work was observed; either from hospital management to HMIS unit or from regional health bureau to hospital. During interview the HMIS unit head explained that she always got oral feedback from regional health bureau HMIS officers but while asked about SMT's oral feedback on her job she doubts whether they were observing what was inside the report apart from signing and transferring it to region. Although both HMIS and KPI unit interviewees claimed that each department heads were assigned as data owners of their respective data elements and they were also responsible for collection, analysis and use of this data; No department was using performance indicators to monitor their department or individual level achievements and challenges. All department heads and SMT members were observed when running here and there to tackle already happened problem rather than strategically monitoring their performance against their plan and anticipating potential problem which would arise and developing intervention ahead of time.

Display of performance indicators either in numeric or chart format was one of information use measurement parameter used. All assessed departments didn't have any performance indicating displays. However, in HMIS and SMT unit display of un-up-to-dated graphs showing: top ten causes of morbidity, mortality and other service utilization indicators were observed.

Review of documents and meeting minutes revealed that the hospital had a bottom-up regular quarterly performance monitoring plan for hospital, departments and individual performance evaluation. When this plan was compared against their accomplishment, two hospital level review meeting was carried out during the past three quarter; however at department and case team levels totally no performance evaluation was observed. Review of meeting minutes of SMT and proceedings of the hospital level quarterly performance review records revealed that no topic related to data quality and information use was discussed or not documented. Both performance evaluation meetings were not geared with HMIS indicators and root cause analysis but only on prevailing problems.

Although the hospital was good in collecting and filing copies of reports sent to regional health bureau no written feedback or up-to-date display of performance indicators were observed in all departments. The review of meeting minutes and other documents also revealed that no discussions was made on data quality and information use during the past six month. Since there was no discussions on data quality and information use one shouldn't expect decisions and interventions related to this topic during this time. Meaning indicators were collected only for the sake of reporting not for internal consumption. Despite good data completeness and accuracy generated poor or un-utilization of information for performance monitoring and quality improvement interventions was observed in all departments and at SMT level.

This finding was comparable with results of studies done in Ethiopia and other developing countries (2,7,9,16) which also reported that information use at facilities and health offices were limited or far below the national expectation.

4.4. Determinants

HMIS data quality and information use is a function of organizational (promotion of culture of information, better management functions, availability of resources etc.), behavioral factors (increased staff motivation, self-efficacy or confidence and perception of HMIS related problem solving knowledge) and technical factors (user friendliness of registries, reporting forms and data analyzing software). Self-administered questionnaire were used to assess behavioral and some of organizational factors while the technical and few of other organizational factors were assessed by interview and observation. To do so, one hundred eighty-seven questionnaires were distributed to staff and collected after completion. The collected questionnaires were cleaned; eleven were excluded from analysis because of incompleteness and inconsistence. This gave 94% response rate for the self-administered study participant.

Respondent's distribution of work was 153 (86.93%) technical staff, 16 (9.09%) Case team coordinators and 7 (3.98%) HMIS staff; similarly, their sex distribution was 99 (56.25%) female and 77 (43.75%) male. The mean age of the respondents was 36.6 years with median of 8 years work experience in the health sector not specifically in the study area.

Although review of hospital documents and SMT interview showed recent HMIS training was given for selected hospital staff in collaboration with Tulane University and regional health bureau 119 (67.61%) respondents replied that they didn't get training during the past six month. Sporadic training interventions were reported but it lacks in-depth problem area analysis and need continuity.

Table 1: Socio-demographic characteristics of the study respondents, Yekatit 12 Hospital, April 2014 (N= 176)

Variable	**Mean/Frequency**
Mean of age	36.6 Years
Median of work experience	8 Years
Respondents work category	No (%)
Case team coordinator	16 (9.09)
HMIS staff	7 (3.98)
Technical Staff	153 (86.93)
Sex	
Female	99 (56.25)
Male	77 (43.75)
Training on HMIS	
No	119 (67.61)
Yes	57 (32.39)

4.4.1 Organizational determinants

Key areas assessed under this topic includes: promotion of information culture, better management functions and availability of resources. Promotion of a culture of information was assessed by four dimensions: hospital SMT's extent of management support for HMIS related tasks, evidence based decision making practice, strengthen sense of responsibility among staff and extent of accountability or empowerment.

Overall respondent's degree of agreement on existence of information culture promotion practice was found to be 51.0 (47.2, 54.7). Almost half of the respondents strongly disagree on the creation of good work environment for data collection, analysis, storage and use at all levels. The following Table 2 shows the extent of respondent's degree of agreement on promotion of information culture in the hospital setting categorized into different composite indicators which was in tern aggregated from their own sub variables. Accordingly, staff's sense of responsibility to accomplish their HMIS related activities was the highest value recorded 56.5% (95%CI 52.8, 60.3) while extent of management support to create good work environment for those activities was found to be the lowest 45.6% (95%CI 41.8, 49.3).

Observation of each composite indicators sub-variable (Table 3) showed where the strength and weakness lies; enabling problem oriented intervention plan development and implementation. For example, the lowest composite indicator (extent of management support) was lower than the rest as a result of weak internal feedback provision to staff 42.5 (38.7, 46.2) and also weak feedback collection from staff and public 43.3 (39.6, 47.1); similarly, the regular data quality check and conflict resolution was also weak indicating priority area for improvement. Nonexistence of

performance based reward system was reported by discussants which also affected extent of management support.

This low level of information culture promotion result 51.0 (47.2, 54.7) was comparable with previously observed low level information use reported. However, when compared with study result of Guanajuato health department information culture promotion practice which was reported as 73% & more (25), this finding was far below. Variation was observed may be because of the respondents level of awareness on data quality and information use as the study areas were different; one developed country while the other was in developing country.

Table 2: Overall and composite indices mean percentile score of information culture promotion determinants, Yekatit 12 Hospital, April 2014 (N= 176)

Composite indicator	**Point Estimate (95%CI)**
Extent of management support	45.6 (41.8, 49.3)
Evidence based decision making	49.8 (46.0, 53.5)
Sense of responsibility	56.5 (52.8, 60.3)
Empowerment or accountability	52.0 (48.2, 55.8)
Overall promotion of information culture	**51.0 (47.2, 54.7)**

Table 3: Each variable's mean percentile score of information culture promotion determinants, Yekatit 12 Hospital, April 2014 (N=176)

Information culture promoting variables	Point estimate (95%CI)
Evidence based decision making	
Personal preference/favoritism	50.4 (46.6, 54.2)
Superior's directives	49.4 (45.6, 53.1)
Evidence/facts	49.3 (45.5, 53.0)
Political interference	49.5 (45.7, 53.3)
Comparing data with set health objectives	48.3 (44.5, 52.1)
Actual Health needs	51.4 (47.6, 55.1)
Considering costs	50.2 (46.4, 53.9)
Extent of management support	
Seek feedback from concerned/affected staff	43.3 (39.6, 47.1)
Discuss conflicts openly to resolve them	45.8 (42.0, 49.5)
Seek feedback from concerned community	47.5 (43.7, 51.2)
Emphasize data quality in monthly reports	47.5 (43.7, 51.2)
Use HMIS/KPI data for setting targets & monitoring	46.9 (43.2, 50.7)
Check data quality (validation) regularly	45.5 (41.7, 49.2)
Provide feedback to staff regular	42.5 (38.7, 46.2)
Sense of responsibility	
Are Punctual	56.6 (52.8, 60.3)
Document their activities and keep records	58.0 (54.3, 61.8)
Feel committed to discharge their responsibility	58.8 (55.1, 62.6)
Set appropriate and realistic goals for them selves	58.0 (54.2, 61.7)
Feel guilty for not accomplishing set goals	57.7 (54.0, 61.4)
Get rewarded for good work	50.2 (46.4, 53.9)
Empowerment or accountability	
Are empowered to make decisions	51.4 (47.6, 55.1)
Can able to say freely 'NO' to superiors for decisions not supported by evidence	51.2 (47.4, 55.0)
Are made accountable for poor performance	52.9 (49.2, 56.7)
Admit mistakes for taking corrective actions?	52.5 (48.8, 56.3)

Management functions

Managing a health information system is about managing resources and functions of hospital in general and HMIS unit in particular to provide quality health service. This assessment looked at the presence of Hospital strategic and annual plan cascaded to case teams and individual levels, routine performance monitoring practice either by meeting or internal supervision, evidence of interventions or further investigation done after performance review; like training, coaching and situational analysis activities.

The management assessment revealed existence of hospital level annual plan in SMT office although adherence of hospital activities to the plan was questionable. In outpatient, inpatient and emergency departments no cascaded plan was found either at department or individual level. But, the hospital had clear organizational chart, mission and visions posted in its compound.

In the past two quarters, hospital level performance review meeting was carried out two times showing 100% achievement in this area. Nevertheless, examination of meeting minutes, proceedings and other documents revealed that neither agendas nor discussions related to data quality and information use were addressed during those meetings. None of the department heads tried to evaluate their performance against plan. Internal supportive supervision checklist, report and feedback was not found both in SMT and departments offices; ensuring nonexistence of internal performance monitoring practice either from SMT to departments or from departments to case teams and individuals. Compared to SMT, departments were very weak in performance reviewing and activity monitoring.

Planning was major weakness area identified especially at department, case teams and individual levels needing immediate intervention; as performance monitoring and other activities should depend on what was planned. Other improvement area identified was documentation problem, although interviewees claimed that many activities were performed; verifying those activities was impossible because no written document supporting their claim was found and considered as not done. The start of performance evaluation was good but need to be geared by HMIS indicators and should be cascaded to departments and case teams.

HMIS resource

Availability of resource required to perform HMIS related tasks were crucial for HMIS data quality generation and information use. Assessed resources were: guidelines, Standard operating procedure, Registries, reporting forms, infrastructure and financial resources required to guarantee a wholly functioning health information system.

Observation of different service delivery units and key informant interview revealed existence of enough registries even for next one year consumption, desktop computers donated from Tulane University (more than 64 computers were available at service delivery outlets only), human resource and guidelines like ERHIG, KPI manual, HMIS indicator definition, HMIS disease classification and HMIS information use guide. Health care financing has resolved their financial related issues; as it guaranteed them to retain and utilize their own finance within permitted cost sharing margin for improvement of curative and rehabilitative health service quality. This was stated as good opportunity although they complained about un-availability of supplies needed for service provision from market. Electric and water supply interruption were common phenomenon affecting quality of service delivery; although this problem were above their control they didn’t have good back up for both utilities. As the hospital was under great renovation; infrastructure will not be problem in near future.

Availability of resource required for smooth HMIS related task functioning was good and need to be maintained. Guidelines were not properly used by department heads or service providers rather they were found shelved or forgotten on some tables. Distributed desktop computers need to be functionalized for its primary purpose.

4.4.2 Behavioral determinants

Behavioral determinants were assessed by level of staff motivation, self-efficacy or confidence and perception of HMIS related problem solving knowledge; meaning high self-efficacy or confidence levels to complete a task ensures that the task will be done, and done correctly. Similarly, if one feels that performing a task will bring about a positive outcome on his career, he/she is more likely to perform that task voluntarily (increased motivation). There is also empirical evidence that people perform more those behaviors which are meaningful and have value for them.

This assessment revealed that overall respondent's degree of positive perception on HMIS related task accomplishment was 53.8 (50.1, 57.6) (Table 4). Maximum mean percentile was scored on staff's confidence to perform HMIS related task 64.1 (60.4, 67.7) while minimum value was recorded on extent of staff motivation 45.2 (41.5, 49.0) to perform those activities; employees were more confident in performing their HMIS related task although they were less motivated to do so. Respondent's perception of problem solving knowledge falls in-between the two composite indices.

Description of each composite indices sub variable (Table 5) revealed that where behavioral related strength and weakness lies; facilitating improvement plan development. Respondents were more confident in interpreting results and their implication 67.0 (63.5, 70.6) than routinely collecting information which they rated as most boring activity 40.4 (36.7, 44.1). Similarly, Respondents were more confident in using data for decision making than collecting information which they consider as something forced on them.

This low level of staff motivation 45.2 (41.5, 49.0) was analogous with poor information use practice observed both at hospital and department levels. This result was also comparable with low level management support finding; which also goes in line with low level information culture promotion practice found. PRISM based study done in SNNPR (27) reported staff self-confidence as 70% and motivation as 65% which was comparable to this finding. Another study done in Guanajuato health institutions (25) reported a bit higher value for both determinants.

Table 4: Overall and composite indices mean percentile score of behavioral determinants, Yekatit 12 Hospital, April 2014 (N= 176)

Composite indicator	Point estimate (95%CI)
Extent of staff motivation	45.2 (41.5, 49.0)
Self efficacy or confidence level	64.1 (60.4, 67.7)
Perception of problem solving knowledge	52.2 (48.4, 55.9)
Overall	**53.8 (50.1, 57.6)**

Table 5: Each variable's mean percentile score of behavioral determinants, Yekatit 12 Hospital, April 2014 (N=176)

Behavioral Variables	Point estimate (95%CI)
Extent of staff motivation	
Collecting information which is not used for decision making discourages me	44.2 (40.5, 48.0)
Collecting information bores me	40.4 (36.7, 44.1)
Collecting information is meaningful to me	50.7 (47.0, 54.5)
While recording data am contributing to the monitoring of heath service delivery performance	53.7 (50.0, 57.5)
Collecting information is forced on me.	40.2 (36.5, 43.9)
Data collection is a burden! am busy with my job	42.1 (38.4, 45.8)
Self efficacy or confidence level	
I can check data accuracy	62.6 (58.9, 66.2)
I can calculate percentages/rates correctly	62.9 (59.3, 66.5)
I can plot data by months or year	63.6 (59.9, 67.2)
I can compute trends from bar charts	63.2 (59.6, 66.9)
I can explain findings & their implications	67.0 (63.5, 70.6)
I can use data for identifying gaps and setting targets	64.1 (60.5, 67.7)
I can use data for making various types of decisions and providing feedback	64.9 (61.3, 68.5)
Perception of problem solving knowledge	
Use generated data for day–to-day activities	51.9 (48.2, 55.7)
Monitor their performance against set target?	53.4 (49.6, 57.2)
Gather data to find the root cause(s) of problems	52.8 (49.0, 56.5)
Develop interventions for a given problem	54.0 (50.2, 57.7)
Develop outcomes for a particular intervention	51.8 (48.0, 55.6)
Evaluate whether the set outcomes have been achieved	49.2 (45.4, 53.0)

4.4.3 Technical determinants

Technical determinants were assessed by key informant interview on the user-friendliness of HMIS manuals, registries, reporting forms, software interface, HMIS comprehensiveness and use of information technology to collect, analyze, use and transfer it to hospital managers, regional health bureau and DPs as needed. The finding showed that, all interviewees agreed on the user friendliness and comprehensiveness of the tools even though they also hinted interruption of computerized data collection system has created a serious problem on quality of data collection and desktop computer use at service provision areas; especially in the outpatient, inpatient and emergency departments. Here the interruption of computerized data collection was not related to technical factors rather it was because of management issue which they intern claim hospital renovation as a reason for interruption.

In general, among assessed determinants only technical factors were not a problem of priority in Yekatit hospital while the organizational and behavioral factors were major problem area; affecting data quality and information use practice. The following (Figure 2) summarizes the behavioral and organizational determinants with highest value recorded in staff self confidence in performing HMIS related activities independently and correctly while lowest value was observed on extent of management support to foster good work environment for those activities by establishing reward system for best performers.

This study provides only descriptive comparison of the determinants, data quality and information use in Yekatit hospital.

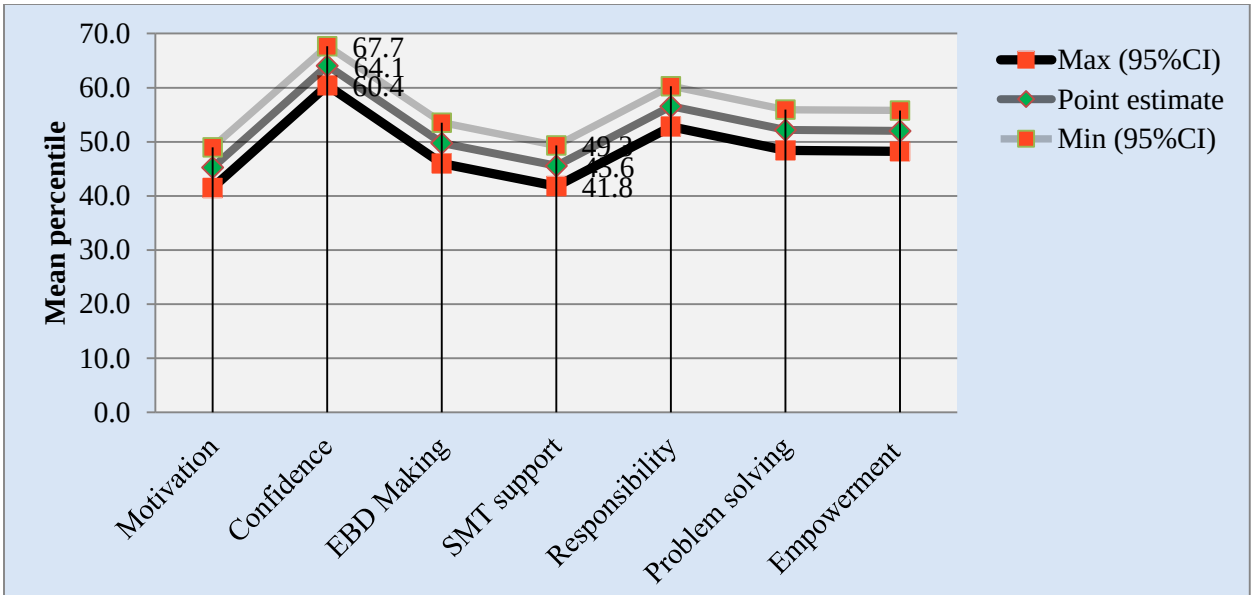


Figure 3: Summary of organizational and behavioral factors, Yekatit 12 Hospital, April 2014 (N=176)

5. Conclusions and Recommendations

5.1 Conclusions

This assessment revealed high report completeness (100%) and data accuracy (90%); however it also demonstrated limited utilization of generated information at hospital senior management level and totally non-existence of information use at departments and case teams; may be because of low level management support provision, weak feedback, low staff motivation and other factors but not due to data accuracy which was found to be higher and didn't guaranteed good information use.

Although good report production and filing was observed in HMIS and KPI units both in hard copy and soft copy; no written feedback criticizing or recognizing the work was observed; either from hospital management to HMIS unit or from regional health bureau to hospital. The review of meeting minutes and other documents also revealed that no discussions was made on data quality and information use during the past six month. Indicators were collected only for the sake of reporting not for internal consumption. At departments and case team levels both report production and utilization were non existing practice needing immediate intervention as they were the primary collectors of data.

Sporadic training interventions were reported but it lacks in-depth problem area analysis and need continuity.

Overall promotion of information use culture was found to be only 51.0 (47.2, 54.7); meaning the hospital management was weak in creating good work environment for HMIS related activities, inconsistent evidence based decision making practice, weak empowering and creating responsibility among employees. With feedback provision practice, creation of good work environment and recognition of best performing employees being the worst areas identified.

Although clear organizational chart, mission, vision and annual plan were observed there was no indication of routine performance monitoring practice against set vision and plan targets. The plan and performance evaluation practice was not cascaded to departments and case team levels. Documentation of activities done and internal monitoring practice was major problem area identified.

Availability of resource required for smooth HMIS related task functioning was good and need to be maintained. Guidelines were not properly used by department heads or service providers rather they were found shelved or forgotten on some tables. Distributed desktop computers need to be functionalized for its primary purpose.

This assessment also revealed low level staff motivation 45.2 (41.5, 49.0) and comparatively higher staff confidence in performing HMIS related activities. Respondents were more confident in interpreting results and their implication 67.0 (63.5, 70.6) than routinely collecting information

which they rated as most boring activity 40.4 (36.7, 44.1). This low level of staff motivation was analogous with poor information use observed both at hospital and department levels and also comparable with low level management support finding; which also goes in line with low level information culture promotion practice found

The technical determinate was not an area of priority for intervention in Yekatit 12 Hospital, as the finding shows that HMIS tools and contents were reported to be user friendly and comprehensive.

The study also revealed that two reporting systems were simultaneously in use and both were functioning separately with different man power and other resource which clearly shows data collection was merely for reporting not for use and duplicate effort was going on.

The assessment also revealed that HMIS unit staffs were responsible for collection of data from each service provision areas. Confirming that data were not used at case teams and department levels some interviewees even questioned whether HMIS related activities was part of their responsibility apart from treating patient and registering their profile.

5.2 Recommendations

In order to ensure the continuity of present data quality and to improve the observed poor information use; which directly affects the hospital's quality of health service provision effort. Either the hospital management or Addis Ababa Health Bureau should:

- The current level of data quality observed should be maintained and guidelines should be availed at each department either in hard copy or in soft copy to strengthen the frontier client data registration completeness on registries.
- As collection of quality data and information generation has no value if not used. This hospital also needs to improve the current poor information use practice by continuous performance monitoring against planned target based on respective performance indicators; departments should also follow the management footstep in planning and monitoring their activities.
- Display of performance or disease morbidity indicating charts and graphs shall be started as soon as possible; since it doesn't need much resource to implement.
- Management and department heads should give timely feedbacks to monthly reports and also should consult staff or public when giving decisions affecting them.
- Adopt and implement context-appropriate incentive systems for accurate and complete data collection, analysis and use at individual, case team or department level with timely report submission to HMIS unit and evidence-based plans and performance achievements.
- Quarterly performance review meeting should be started both at case team or department levels during which objective performance achievements shall be discussed based on selected indicators with its challenges.

- Clarify and communicate official expectations on performance of hospital staff as individual or as case team and department member with respect to data collection, analysis and information use; knowing what and why to do will definitely increase employee motivation to HMIS related activities.
- Training on HMIS data collection, analysis, use and other problem analysis methods shall be given to all staff working in data collection areas.
- The hospital should functionalize and merge the hospital performance monitoring team who can oversee the HMIS and KPI data collection, analysis and utilization at each departments and hospital level.
- Other PRISM based performance monitoring assessment and intervention should continue as needed or with set time period; since quality improvement is a continuous project.
- Strengthen interrupted e-HMIS

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Annexes:

Annex 1: Data quality and information use assessment questionnaire

Date of Assessment: _____ Name of Assessor:_____

Hospital Name:_____ Department:_____

Name and Title of person(s) Interview _____

I. Quality of Data (*This part doesn't include SMT, start from Roman number II)*

Data Recording

1. Does your Dep't/hospital keep separate record of HMIS and KPI related data? 1. Yes 0. No
2. Does your Dep't/Hospital keep soft or hard copy of HMIS and KPI monthly reports sent to higher level (HMIS unit or other higher level) 1.Yes 0. No
3. If 'Yes' to above, Count the number of HMIS and KPI monthly reports kept at the Dep't/Hospital for the past six month in 2006 (Tikemt – Megabit), HMIS _____ KPI _____
4. Does your Dep't have enough registers? 1. Yes 0. No
5. Does your Dep't/hospital keep used:
   - 5.1. Emergency registers? 1. Yes 0. No
   - 5.2. Outpatient registers? 1. Yes 0. No
   - 5.3. Inpatient registers? 1. Yes 0. No

Data Completeness

6. What is the number of data elements in the HMIS monthly report that has to be reported? _____ How about for KPI _____ *(NB: see copy of Tahesas HMIS 2006 and Megabit 2006 month report)*
7. Count the number of data items that are supposed to be filled by this Dep't/hospital but left blank without indicating "0" in the Tahesas 2006 and Megabit 2006 reports.
   - 7.1. Tahesas 2006, HMIS_____ KPI _____
   - 7.2. Megabit 2006, HMIS_____ KPI _____

Data Processes/Analysis (Only HMIS unit)

8. During the previous two quarter of EFY 2006 did you receive a directive from the Senior Management/ woreda health office to:
   - 8.1. Check the accuracy of data at least once? 1. Yes, observed 0. No
   - 8.2. Fill the monthly report form complete? 1. Yes, observed 0. No
   - 8.3. Submit the monthly report by the specified deadline? 1. Yes, observed 0. No
9. Does the facility produce the following:
   - 9.1. Calculate indicators for hospital catchment area (e.g. ANC)? 1. Yes, observed 0. No
   - 9.2. Comparisons, with Sub city/ health bureau targets? 1. Yes, observed 0. No
   - 9.3. Comparisons, among types of services coverage? 1. Yes, observed 0. No
   - 9.4. Comparisons of data over time (monitoring over time)? 1. Yes, observed 0. No

II. Use of Information

Guidelines

10. Does your Dep't/Hospital have the following manuals? (Hard or soft copy)
    - 10.1. ERHIG chapters 1. Yes, Observed 0. No
    - 10.2. KPI Manual 1. Yes, Observed 0. No
    - 10.3. HMIS Indicator definition 1. Yes, observed 0. No
    - 10.4. HMIS Disease classification 1. Yes, observed 0. No
    - 10.5. HMIS information use guide 1. Yes, observed 0. No

HMIS Report Production

11. Does your Dep't/hospital produce HIS related report? 1. Yes 0. No
12. Does your Dep't/hospital compile any other reports? 1. Yes 0. No
13. If "YES" to above question, please list reports and indicate frequency of reports (NB: don't forget to confirm the issuance of the report by observing it.)

S.N	Title of the report	Frequency of reporting per six month	To whom the report is issued
1	KPI		
2	Malaria		
3	TB		
4	HIV/AIDS		
5	Logistics		
6	Others		
7			

14. Did the Dep't/hospital receive any feedback on the report they deliver to higher level (HMIS unit, Sub city/health bureau, FMOH) for the last half year? 1. Yes, observed 0. No
15. If 'YES' to the above question observe the report and write the summary concept. _____
    _____

Display of information

16. Does your Dep't/Hospital has performance monitoring display (graph, Table, Chart, Map, other)?
    1. Yes, observed 0. No
17. Please, write types of data displayed and whether the data are updated for EFY 2006, 2nd and 3rd quarters (Tikemt – Megabit)

	Type of data displayed	1.Type of display (Please circle)	2. Updated		Remark
1	Disease surveillance (e.g. Top ten diseases)	Table	1.Yes	0.No	
		Graph/Chart	1.Yes	0.No	
		Map/other	1.Yes	0.No	
2	Percent of EHRIG standard met	Table	1.Yes	0.No	
		Graph/Chart	1.Yes	0.No	
		Map/other	1.Yes	0.No	
3	Plan Vs Performance showing display	Table	1.Yes	0.No	
		Graph/Chart	1.Yes	0.No	
		Map/other	1.Yes	0.No	
4	Other service provision showing display (Write if any) _____	Table	1.Yes	0.No	
		Graph/Chart	1.Yes	0.No	
		Map/other	1.Yes	0.No	

Performance Review

18. Does your Dep't/hospital have performance review meetings? 1. Yes 0. No
19. How frequently are the performance review meetings supposed to take place?
    0. No schedule 1. Quarterly 2. Monthly 3. Every two weeks 4. Weekly
20. How many times did the performance review meetings take place during 2nd and 3nd quarter of EFY 2006? 4. More than six times 3. Six times 2. Two times 1. One times 0. None
21. Are minutes of performance review meetings maintained? 1. Yes, observed 0. No
22. If 'YES' to above question, observe the minutes from Tikemt – Megabit, 2006, and insure if there is:
    - 22.1. Discussions on data quality, reporting, timeliness or others? 1. Yes 0. No
    - 22.2. HIS related issues/problems referred to higher level for actions? 1. Yes 0. No
    - 22.3. Any decisions made based on the discussions of HIS related Issues? 1. Yes 0. No
    - 22.4. Follow-up actions taken on the decisions made? 1. Yes 0. No
    - 22.5. Discussions, on hospital performance (patient utilization, disease data, service coverage, or medicine stock out)? 1. Yes 0. No
    - 22.6. Any decisions made based on the discussion of hospital performance? 1. Yes 0. No

III. Facility/Office Checklist

IT related

23. Fill the following information technology related questions.

S.N	Items	Total	Remark (status)
1	Computer		
2	Data back-up unit (CD, data stick , etc)	1. Yes 0. No	
3	Internet or Modems (CDMA, EVDO)		
4	UPS		
5	Any Software supporting data collection or analysis (write if any)	_____	
6	(write) _____		
	(write) _____		

Utilities

24. Is there electricity supply? 1. Yes 0. No
25. How about generator? 1. Yes 0. No
26. Is there water supply interruption? 1. Yes 0. No
27. If 'Yes' to above questions how you insure service continuity?

_____
_____
_____

Availability of forms and other resource (HMIS unit only)

28. Do you have HMIS reporting forms? 2. Yes, we do 1. Yes, but not enough 0. No
29. Does the hospital have enough Registries and Tally sheets? 1. Yes 0. No
30. Do you have HMIS focal person? 1. Yes 0. No
31. How many other staffs are working in HIS unit? _____
32. Explain any other issues _____

IV. Management Assessment (SMT only)

33. Presence of health information system /HIS/ related long term plan in hospital strategic plan
    1. Yes 0. No
34. Presence of an updated organizational chart 1. Yes 0. No
35. Presence of catchment area map 1. Yes 0. No
36. Presence of HIS situation analysis report not too far 1. Yes 0. No
37. Presence of HIS plan with targets at hospital level 1. Yes 0. No
38. Presence of individual plan and performance appraisal 1. Yes 0. No
39. Presence of internal supervision schedule and checklist 1. Yes 0. No
40. Presence of internal supervisory reports and feedbacks 1. Yes 0. No

Annex 2: Observation guide and data audit tool

A. Observation guide

1. Is there a data office
2. Assess the overall data collection, processing and usage?
3. Assess the availability of data collecting tools
4. How and who compiles and records
5. Is there an operational HMIS computer
6. Presence of Guiding documents in the hospital
7. Are there records of meeting minutes? Does it include HMIS related activity
8. Is there performance review and planning exercise?

B. Data Accuracy Check (Data audit)

41. Find the following information for the two months in the register. Compare the figures with the health facility monthly reports. If there is no register put NA (not applicable).

S.N	**Data element**	**Tahesas 2006**		**Megabit 2006**	
		Register	Report	Register	Report
1	Delivery attended by Skilled attendant				
2	Number of newborns weighed				
3	Low birth weight				
4	DPT3				
5	Measles immunization				

42. What are the reasons for the discrepancy (if any) observed (please circle)?
    1. Data transfer error
    2. Arithmetic error in the register
    3. Missing reports
    4. Missing register
    5. Others (write)_____

Annex 3: Organizational and Behavioral Assessment questionnaire

Introduction

This survey is part of the data quality and information use assessment of Yekatit 12 Hospital. The objective of this survey is to assess the exact level of data quality and information use in your hospital with its determinants. **Please express your opinion honestly.** Your responses will remain confidential and will not be shared with anyone, except for presented graphs and table forms. We appreciate your assistance and co-operation in completing this study.

Thank you.

---

1. Name of your hospital _____
2. Title of the person filling the questionnaire: 1. Case team coordinator 2.HMIS/KPI staff 3.Technical staff
3. Your age, ____ Sex, _____ and Year of experience_____
4. Did you receive any training in HMIS related activities in last six months? 1. Yes 0. No

To what extent, do you agree with the following on a scale of 1-7?

Table 1: About yourself, (Please select one answer and encircle the corresponding number)

Questions	Strongly disagree	Disagree	Somewhat disagree	Neutral	Some what agree	Agree	Strongly agree
Personal: (motivation)							
Collecting information which is not used for decision making discourages me	1	2	3	4	5	6	7
Collecting information bores me	1	2	3	4	5	6	7
Collecting information is meaningful to me	1	2	3	4	5	6	7
While recording data am contributing to the monitoring of heath service delivery performance	1	2	3	4	5	6	7
Collecting information is forced on me.	1	2	3	4	5	6	7
Data collection is a burden! am busy with my job	1	2	3	4	5	6	7
Rate your confidence in accomplishing the following activities:							
I can check data accuracy	1	2	3	4	5	6	7
I can calculate percentages/rates correctly	1	2	3	4	5	6	7
I can plot data by months or year	1	2	3	4	5	6	7
I can compute trends from bar charts	1	2	3	4	5	6	7
I can explain findings & their implications	1	2	3	4	5	6	7

I can use data for identifying gaps and setting targets	1	2	3	4	5	6	7
I can use data for making various types of decisions and providing feedback	1	2	3	4	5	6	7

Table 2: About your hospital staff and management members,

Questions	Strongly disagree	Disagree	Somewhat disagree	Neutral	Some what agree	Agree	Strongly agree
In Yekatit 12, decisions are based on:							
Personal preference/favoritism	1	2	3	4	5	6	7
Superior's directives	1	2	3	4	5	6	7
Evidence/facts	1	2	3	4	5	6	7
Political interference	1	2	3	4	5	6	7
Comparing data with set health objectives	1	2	3	4	5	6	7
Actual Health needs	1	2	3	4	5	6	7
Considering costs	1	2	3	4	5	6	7
In Yekatit 12, management members:							
Seek feedback from concerned/affected staff	1	2	3	4	5	6	7
Emphasize data quality in monthly reports	1	2	3	4	5	6	7
Discuss conflicts openly to resolve them	1	2	3	4	5	6	7
Seek feedback from concerned community	1	2	3	4	5	6	7
Use HMIS/KPI data for setting targets & monitoring	1	2	3	4	5	6	7
Check data quality (validation) regularly	1	2	3	4	5	6	7
Provide feedback to staff regular	1	2	3	4	5	6	7
In Yekatit 12, the staffs:							
Are Punctual	1	2	3	4	5	6	7
Document their activities and keep records	1	2	3	4	5	6	7
Feel committed to discharge their responsibility	1	2	3	4	5	6	7
Set appropriate and realistic goals for them selves	1	2	3	4	5	6	7
Feel guilty for not accomplishing set goals	1	2	3	4	5	6	7
Get rewarded for good work	1	2	3	4	5	6	7
In Yekatit 12, the staffs:							
Use generated data for day–to-day activities	1	2	3	4	5	6	7
Monitor their performance against set target?	1	2	3	4	5	6	7
Gather data to find the root cause(s) of problems	1	2	3	4	5	6	7
Develop interventions for a given problem	1	2	3	4	5	6	7
Develop outcomes for a particular intervention	1	2	3	4	5	6	7
Evaluate whether the set outcomes have been achieved	1	2	3	4	5	6	7
Are empowered to make decisions	1	2	3	4	5	6	7
Can able to say freely 'NO' to superiors for decisions not supported by evidence	1	2	3	4	5	6	7
Are made accountable for poor performance	1	2	3	4	5	6	7
Admit mistakes for taking corrective actions?	1	2	3	4	5	6	7