"CONSULTING AND IMPLEMENTING ONCOLOGY EMR"

A dissertation submitted in partial fulfillment of the requirements
For the award of

Post-Graduate Diploma in Health and Hospital Management

by

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April, 2013

ACKNOWLEDGEMENT

I wish to express my sincere thanks and gratitude to Prof. Indrajit Bhattacharya my mentor under whom, I had the privilege to work. His valuable advice and expert supervision were available at every stage of this work. His active interest in my work and helpful attitude encouraged me tremendously during the period of research.

I am indebted to the Mr. Vivek Vig ,Senior Manager – Dell International Services Application Support for his support and understanding because of which I am able to complete this project to the best of my ability I am also thankful to my mentors – Mr. Bhushan Prasad P Voovayya and Mr. Sreerama K Sharma for their continuous support, guidance and perseverance during the course of my project.

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To whomsoever it may concern

This is to certify that Ms. **Sneha Bhardwaj** of **International Institute of Health Management Research (IIHMR), New Delhi** campus has been working with Dell Services for her dissertation project.

Project Details:

Project Name: **Consulting and Implementing Oncology EMR**
Duration: **12 Weeks**
Location: **Bangalore**
Guide Name: **Bhushan Prasad P Voovayya**
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She has successfully completed her project and her performance during the tenure of the internship has been found to be satisfactory.

Her findings in course of the project has been found to be practical and relevant and some the recommendations will be incorporated on the floor on approval from the business.

We wish him/her good luck for her future assignments.

Thanking You,

Regards,

Adarsh Naik

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April 14, 2013

This is to certify that **Ms. Sneha Bhardwaj** has successfully completed her 3 months internship in our organization from **January 14 2013 to 14 April 2013**. During this tenure, the intern has worked on **"Consulting and Implementing Oncology EMR"** under the guidance of me and my team at **DELL International Services, Bangalore.**

We wish her good luck for her future assignments.

Regards,

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CERTIFICATE OF APPROVAL

The following dissertation titled **"Consulting and Implementing Oncology EMR "** is hereby approved as a certified study in management carried out and presented in a manner satisfactory to warrant its acceptance as a prerequisite for the award of **Post- Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

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CERTIFICATE FROM DISSERTATION ADVISORY COMMITTEE

This is to certify that **Ms.Sneha Bhardwaj**, a graduate student of the **Post- Graduate Diploma in Health and Hospital Management**, has worked under our guidance and supervision. She is submitting this dissertation titled **"Consulting and Implementing Oncology EMR"** in partial fulfillment of the requirements for the award of the **Post- Graduate Diploma in Health and Hospital Management**.

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

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LIST OF ABBREVIATION

DTC Dell Tech Concierge

EMR Electronic Medical Record

ERP Enterprise Resource Planning

GUI Graphical User Interface

MGCI Mahatma Gandhi Cancer Institute

ICU Intensive Care Unit

IT Information Technology

PACS Picture Archival and Communication System

CPOE Computerized Physician Order Entry

CDSS Clinical Decision Support System

HIPPA Health Insurance Portability and Accountability Act

PET Positron Emission Tomography

CT Computed Tomography

PAR-I

INTERNSHIP REPORT

1.1 Organizational Profile

Dell Inc. (Dell) is a global information technology company that offers its customers a range of solutions and services delivered directly by Dell and through other distribution channels. Dell is a holding company that conducts its business worldwide through its subsidiaries.(1) Dell Inc. was founded in 1984 and is headquartered in Round Rock, Texas. Dell traces its origins to 1984; when Michael Dell created PCs Limited while a student at the University of Texas at Austin. The dorm-room headquartered company sold IBM PC-compatible computers (2) built from stock components. Dell dropped out of school in order to focus full-time on his fledgling business, after getting about $300,000 in expansion-capital from his family.

In 1985, the company produced the first computer of its own design, the "Turbo PC", which sold for US$795. PCs Limited advertised its systems in national computer magazines for sale directly to consumers and custom assembled each ordered unit according to a selection of options. The company grossed more than $73 million in its first year of operation.

The company changed its name to "Dell Computer Corporation" in 1988 and began expanding globally. In June 1988, Dell's market capitalization grew by $30 million to $80 million from its June 22 initial public offering of 3.5 million shares at $8.50 a share. In 1992, Fortune magazine included Dell Computer Corporation in its list of the world's 500 largest companies, making Michael Dell the youngest CEO of a Fortune 500 company ever.(3)

Dell has grown by both increasing its customer base and through acquisitions since its inception; notable mergers and acquisitions including Alienware(2006) and Perot Systems (2009). As of 2009, the company sold personal computers, servers, data storage devices, network switches, software, and computer peripherals. Dell also sells HDTVs, cameras, printers, MP3 players and other electronics built by other manufacturers. The company is well known for its innovations in supply chain management and electronic commerce. (3)

Perot Systems was an information technology services provider founded in 1988 by a group of investors led by Ross Perot and based in Plano, Texas, United States. A Fortune 1000 corporation with offices in more than 25 countries, Perot Systems employed more than 23,000

people and had an annual revenue of $2.8 billion before its acquisition in 2009 by Dell, Inc. for $3.9 Billion.(4)

Perot Systems provided information technology services in the industries of health care, government, manufacturing, banking, insurance and others. Perot Systems was especially strong in health care industries with services such as digitizing and automating medical records.(4)

The integration of Perot Systems has strengthened Dell Services, expanded its portfolio of capabilities, and established a strong foundation for future growth. The combined Dell Services business unit represents almost $8 billion in annual revenue. With more than 43,000 team members working in 90 countries, Dell Services operates 60 technology support centers around the world, 36 customer data centers and provides technical support for 14 million client systems and 10,000 Software-as-a-Service (SaaS) customers. Over the past year, the Services team met or exceeded all of its integration milestones, achieving more than $100 million in cost savings in fiscal year 2011 and capturing revenue synergies of more than $150 million, both surpassing original estimates.(5)

On February 3, 2012, it held a worldwide portfolio of 3,449 patents and had an additional 1,660 patent applications pending. The Company also holds licenses to use numerous third-party patents. The Company designs, develops, manufactures, markets, sells, and supports a range of products, solutions, and services. It also provides various customer financial services to its Commercial and Consumer customers. During fiscal year ended February 3, 2012 (fiscal 2012), Dell acquired Compellent Technologies, Inc. (Compellent), SecureWorks Inc. (SecureWorks), Dell Financial Services Canada Limited and Force10 Networks, Inc. (Force10). In February 2012, the Company acquired AppAssure. In April 2012, the Company acquired Clerity Solutions.(6)

Services provided by Dell International Services

- **Healthcare & Lifesciences**
- **Dell Global Analytics** - Dell Global Analytics (DGA) is a captive analytics division supporting multiple functions such as Pricing, Web Analytics, Supply Chain, Marketing, Quality, Services, Financial Services and Contact Center Analytics. It is a single, centralized entity with a global view of Dell’s business activities spanning Dell's business units of Consumer, Large Enterprise, Public and Small & Medium Business. DGA

supports all the three geographies: Americas, EMEA (Europe, Middle East, Africa) and APJ (Asia Pacific), supporting over 500 internal customers.

- **Customer Care**
- **Hardware Warranty Support** for Consumers (USA, UK and Ireland), XPS (UK, Ireland and South Africa), SMB, ANZ, Enterprise Server and client desktops and portables support for UK and Ireland
- **Dell Financial Services**
- **Small and Medium Business Chat Support**
- **Email Support**
- **Spanish-speaking Support'**
- **Dell on Call'** *(Now Known as Solution Station)*
- **Solution Station (Now known as Dell Tech Concierge - DTC)**

1.2 Key Learning

The area of engagement in the organization was in EMR support team of DELL. Initially I was engaged in training of Meditech and McKesson EMR for 2 weeks and then got training on Cerner core application for next 3 weeks.
The summary of learning at Dell is mentioned in the form of points:-

- Functional Overview of Cerner Millennium
- Knowledge of the hospital workflow and its integration
- Backend Configuration
- Overview of the security access rights of Cerner Millennium users
- Working knowledge of various Cerner Millennium modules
- Testing & Validation

Apart from the working knowledge of Cerner Millennium, why it is the most used EMR in the world as compared to other EMR's like EPIC, McKesson is because

- Robust
- Can be integrated easily with any other EMR and can be used as a standalone over the counter healthcare ERP
- Minimum Clicks
- User Friendly & good GUI

PART- II

DISSERTATION REPORT

1.0 ABSTRACT

Electronic medical records (EMRs) are the newest form of documenting a patient's medical record. An EMR is a system that contains a patient's personal medical history, test results, dictations, and other medical and financial information. EMRs will improve healthcare by enhancing patient care, preventative health, and provider convenience and is an extreme improvement to an already highly technological healthcare corporation.

The role of EMR in a oncology setting is of great importance as clinical oncology involves many complex patient care processes unique to medicine such as documentation of cancer stages and chemotherapy treatments, creating multidisciplinary workflows, oncology-specific flow-sheets, integrating laboratory and imaging reports, providing medication-related safety checks, generating standardized treatment plans and summaries and its implementation is a complex orchestration of information technology and business process "system builds." Successful implementation requires that end users understand each workflow, that all technology components work properly with the corresponding workflow and that each end user knows how to use relevant software components. However, the implementation timeline and focus are invariably technology-driven with go-live as the culminating event in which all EHR components are turned on, used simultaneously and expected to work properly.

This document will describe the role of a healthcare IT consulting firm in helping a new cancer institute(hypothetical case) to select and implement oncology specific electronic medical record to ensure user buy-in through alignment of institute's vision, project governance, operational requirements, application set-up, testing, training, and go-live and post go-live support. Also, the consulting firm would suggest the hospital latest state of art medical equipments and hardware available that would integrate well with the EMR and would assist the organization in achieving is goal of excellence in patient care delivery.

2.0 INTRODUCTION

Mahatma Gandhi Cancer Institute's (MGCI) is a visionary project of Oncology Cancer society and Research Foundation, which aims at providing the best of Oncological Care to patients. The institute is 100 bedded state-of-the art not for profit facility which provides affordable quality patient care. The philosophy of MGCI is to constantly strive towards excellence in patient care through combination of latest technology, competent personnel and a humane touch. As a part of its effort to provide the best available patient care, the institute will be equipped with latest state of the art medical facilities.

The institute seeks to provide specialty services such as Medical, Surgical, Radiation oncology, Palliative care, Pediatric Cancer care and Support services under one roof. State of the art ancillary services like Laboratory, Radiology and pharmacy will form an integral part of the institute. The institute would have separate geriatric, male, female and pediatric wards. The institute is expected to serve 7500 out-patients and 2500 in-patients annually.

As clinical oncology involves many complex patient care processes unique to medicine such as documentation of cancer stages and chemotherapy treatments, creating multidisciplinary workflows, oncology-specific flow-sheets, integrating laboratory and imaging reports, providing medication-related safety checks, generating standardized treatment plans and summaries. MGCI has planned to implement oncology EMR to improve the safety, quality and efficiency of patient care.

Healthcare Consulting team would be working hand in hand with MGCI to successfully implement an integrated Electronic Medical Record (EMR) by addressing its operational and clinical needs. It includes IT strategy and management to systems implementation, optimization, by adoption of its proven ADOPTS (Assess, Design, Optimize, Prepare, Transform, Sustain) methodology to identify and design a solution around the unique practices and needs of the institute to help the institute to achieve its goals. Also, Healthcare Consulting team would provide a comprehensive end to end hardware solution according to the need of the institute. Healthcare Consulting team will help to setup Service Helpdesk which will provide 24/7/365 clinical and technical support to the users.

3.0 PURPOSE

Healthcare Consulting team would seek to provide complete solutions to MGCI which include Consultation on Medical devices, Hardware Services, Software Services, Cloud based Service, Network Services, Installation, Implementation, Training and Support Service.

3.1 PROJECT SCOPE

- The scope of EMR implementation project is to assist MGCI to select and implement an oncology EMR solution fulfilling their requirements and expectations.
- To provide consultation on hardware and software requirements.

4.0 BUSINESS PERFORMANCE OBJECTIVES

- Streamline the daily activities of patient care & improve the quality of services.
- Improve productivity and help in increasing the efficiency of the care-providers.
- Improve the cost control and budgeting to improve the overall performance.
- Generate accurate and comprehensive statistical information.
- Facilitating more efficient utilization of doctor's time by enabling pre/post handling of patient queries by support teams.
- Enabling easy & flexible access to research and latest medical information to doctors from their workstations or hand-held devices.
- Enable lower per-patient costs and thereby increase patient-handling capabilities with lower incremental costs.
- Generate comprehensive analytical queries and reports to help the management in better decision making.
- Maintain medical and administrative information related to patient visits both as outpatients and inpatients.
- Improve the accuracy, speed, flexibility, and convenience of patient scheduling and recall, patient registration, on-site and off-site clinical, inpatient, patient account management and billing.
- Achieve an integrated information system providing improved system performance, data capacity, and potential for significant future growth in the number of system users, sites supported, programs managed, and patient accounts.

5.0 HOSPITAL'S PROPOSED LANDSCAPE

The hospital will be an exclusive Cancer care mid-sized Super-Specialty hospital located in Bangalore. It will provide comprehensive services to cover all the healthcare needs of the Cancer patients. The facility includes treatments such as yoga, music therapy.

The hospital is estimated to have a built up area of about 40,000 square feet on 5 acres of land. The hospital has a three story building with a basement and is divided into different levels.

Level (-1/Lower Basement)- This is the basement level, where Radiation oncology department, Nuclear Medicine department and other support service departments like central inventory, central pharmacy, laundry, dietary, engineering and maintenance, IT department will be situated.

Level (zero) - This is the entrance level, where patient Registration/Admission department, Billing department, Emergency department, OPD, diagnostic services (Laboratory and Radiology) and cafeteria will be located.

Level (1) – On this level medical oncology department is situated along with daycare center with 10 beds for chemotherapy sessions. Also, MRI and CT department are situated in the north and south wing on this floor.

Level (2) – Surgical oncology department is located on this floor with Pre-operative unit, 5 operation theaters and ICU unit.

Level-(3) – In-patient department is situated on this floor with female ward, male ward, pediatric ward, geriatric ward and isolation rooms

HOSPITAL'S GENERAL INFORMATION	
Location of the Hospital	Bangalore
Type of hospital	Super Specialty
No: of Beds	100
No: of ICU Beds	10
No of Emergency Beds	5
No Of Isolation Beds	3
No of Counseling rooms	2
No of daycare beds	10
No of OPD clinics	8
No of Operation Theatre	5
No of Conference Rooms	2
Patient Nurse Ratio	5:1
Patient Doctor Ratio	10:1
No: of Footfalls(annually)	7500
Projection of Bed Occupancy (annually)	2500
No: of Doctors	40
No: of Nurses	120

Table-1

5.1 MEDICAL SPECIALTIES & SERVICES

The Cancer & Palliative care hospital will provide facilities as detailed below:

- Radiology & Imaging services – Linear Accelerator, Brachytherapy, Digital X- ray, Mammogram, Ultrasound, CT-Scan, MRI.
- State-of-the-art Lab for Bio-chemistry, Microbiology, Pathology & Hematology.
- Blood bank for collection and storage of blood & blood components.
- Pediatric Cancer Care
- Emergency Care
- ICU
- Operation Theaters
- Consultation Rooms
- Medical Records
- Pharmacy (OP & IP)
- Counseling Room
- Physiotherapy
- Central Sterile Supply Department
- Engineering & Maintenance
- Cafeteria
- Front Office (Admissions & Reception)
- House Keeping
- IT
- Finance and HR
- Materials
- Security

6.0 ROLES & RESPONSIBILITY OF STAKEHOLDERS

TITLE	ROLE
Top Management	
Board	Ultimate responsibility
Project Steering Committee	Overall guidance & management oversight, compliment strategic vision
Chief Medical Officer	Overall accountability for project
Implementation Team	
Project Manager	Manages overall implementation
Application Specialist	Provides content knowledge about use, design, and configuration
Clinical Workflow Specialist	Understands healthcare processes
EMR Vendor	Develop resources if needed, best practices, fix software issues
Consultant	Experts in specific areas if needed
IT Team	
IT Manger	Overall responsibility from an IT perspective
Integration Architect	Overall IT architecture, development, production, testing, & integration
Database Administrator	Tune and manage database
System Administrator	Manage live system, file growth

TABLE-2

7.0 GENERAL SYSTEMS REQUIREMENTS

- Security of data and confidentiality of information should be of paramount importance across the entire application. The system should provide for definition of various authorized users at multiple levels corresponding to the roles and functions of operations across the hospital. The system should log details of every user such as ID, date and time of entry in addition to logging the details of users who make the modifications. Also, system should provide access control features for control accessing details such as confidential/high-risk information about a patient.

- A patient's encounter with the hospital could be either as an inpatient or an outpatient sub-classified as a normal outpatient or a referred patient. Each encounter should be identifiable by a unique reference number where it occurred. The services provided to the patient, whether clinical care (like laboratory tests, X-ray investigations, pharmacy prescriptions) or supportive in nature (like allocation or transfer of bed, type of meal), should all be associated with unique reference number.

- EMR should integrate clinical, financial and administrative applications and the authorized personnel should be able to retrieve necessary information from anywhere and at any time.

- The solution should also be able to integrate seamlessly with the hospital's PACS system and provide support based on standards (such as DICOM) to interface with the specialized equipment installed at the hospital.

- Hospital services being essential, EMR has to be operational round the clock on all days of the year and be able to handle a reliability requirement of 99% uptime overall.

- It is expected that the EMR and the hospital data would be adequately supported with proper back-up as per prevailing industry standards.

- EMR Solution should be designed such that it is scalable seamlessly to take care of all future needs of hospital.

- The short-listed Vendors should be able to demonstrate as per MGCI requirements.

- The proposed solution should meet the performance criteria specified by MGCI. At the minimum, the application response time for any non-image based query should not exceed 3 seconds under normal operations with around 200 concurrent users.
- The Vendor should be in a position to demonstrate the performance capabilities of the solution at different user loads The Vendor should submit standard performance benchmarking results and actual performance standards being met, wherever available.

7.1 ONCOLOGY EMR -FUNCTIONAL REQUIREMENT

- Cancer Treatment Plan
- Cancer Treatment Summary
- Chemotherapy automation with alerts and correct dosing
- Oncology specific EMR templates
- Automated cancer registry reporting
- Laboratory result interface
- Automated lab result tracking
- Medication inventory tracking
- Automation of charging and billing
- Document scanning
- Patient accessibility

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8.0 RISK MANAGEMENT

Threat	Problem	Impact	Plan to address threat
Implementation			
H/W delivery delays or problem	Low	Medium	• Have backup vendors
SW delivery delays or problem	Medium	Medium	• Establish Pilot alpha, beta cycles to minimize overall deployment risk
User do not like final workflow	Low	High	• All departments performs beta testing
Natural Disasters	Low	High	• Have plan to delay go-live, protect H/W • Disaster recovery plan restores data to recovery point. • Fire suppression system in data center to prevent fire damage
Internal sabotage	Low	High	• Back up S/W every night. • Security systems should monitor all the areas. • Cameras should be there in data center.
Key Resource Turnover	Medium	Medium	Keep back up personnel briefed on project on regular basis.
Go-Live			
User Training Issues	High	Medium	Mandatory Training Super users available in each department.
Role and Privilege	Low	Medium	Test during beta testing.

problem			System Admin available during all hours. Supervisors approves all roles and privileges for EMR departments
Poor Organization attitude	Low	High	Up front communication to benefit deployment
Operational			
Poor adoption rate	Medium	Medium	One on one training by training team. Include any "problem" on beta testing team.
Unknown security issue arises	High	Medium	Conduct complete security audit
Offsite un authorized access to data	Low	High	Clearance procedures need to insure proper HER rights are provided Develop roles /privileges for all access needs. Develop process to immediately address ant security issues. Audit reports to help identify device or user account used
Virus	Medium	Medium	Install personal firewall. Restrict access to high risk internet sites. No unauthorized software to be installed on in-house computers. Only IT system team can install hardware or software.
System goes down	Low	High	Prepare back up plan based on paper processes. Backup process for main server.

			Perform post analysis of problem
Data Corruption	Low	Medium	Daily incremental back up Weekly full backups. Use more secure networks
Person illegally enters area	Medium	Medium	Cameras to monitor all the areas. Security cards used to enter all secure areas and are controlled by access privileges. Back up media kept in secure area. Visitor sign in procedures.
Workstation is Stolen	Low	Medium	Ensure data is on servers and not on workstations. Keep emergency backup workstation.
Employee Leave	Medium	Medium	HR/IT process includes the elimination of all access privileges to all systems immediately.

Table-3

9.0 ONCOLOGY EMR VENDOR SELECTION

After a workable listing of facility background data and vendor requirements is completed, the next step is narrowing the vendor pool. Selecting the right EMR vendor is critical to the overall success of EMR implementation and achieving our goals for improving quality of care. In researching vendors, factors other than software functionality must be considered.

Key considerations include:

- Financial stability, reputation, and history (e.g., longevity)
- Ability to provide a list of current customers and references
- Percentage of research and development reinvested into the company
- Life cycle state or maturity of EMR system products (i.e., the occurrence of software obsolescence)
- Frequency of software product updates
- Customer support availability
- Certification status

9.1 ONCOLOGY EMR VENDORS

Company	Product	Features in brief	Origin
JVS Group	Oncosoft	• Scheduling and Resource Management • Patient Treatment Pathways • OncoSoft Decision Support • Electronic Medical Records - Patient Medical& Surgical EMRtory, Medical Management, Action Plan, Cancer Staging • Pathology & Radiology Management • Archival Support	India
NewCreationIT	NewCreationIT oncology software	• Practice management, • Patient registration, scheduling, • Medical billing, • Medical records • Treatment Management - Chemotherapy, Medical and Radiation Oncology • Oncology Specific Templates • Automated Clinical Decision Support System (CDSS) • Archival support	India
IntrinsiQ	IntelliDose	• Computerized Physician Order Entry (CPOE) • IntelliScribe™ : Medical oncology e-prescribing integrating chemotherapy and support drug prescribing into patient treatment management • IntelliCharge™ :Patient chemotherapy encounter details with CPT, J-codes, and wastage information in a detailed nursing charge summary. • Practice Performance Reports: Data from your practice side-by-side with national benchmarks helps you analyze and compare treatment regimens, drug usage, and adherence to established treatment guidelines.	US

Elekta	MOSAIQ® Oncology Information System	• Diagnosis/Pathology • Treatment - Chemotherapy, Medical and Radiation Oncology • Clinical Lab • Cancer registry • Practice Management- scheduling, charge capture, billing, authorizations and electronic reimbursement	US
	MOSAIQ® Data Director	• Seamlessly integrated to the MOSAIQ EMR, MOSAIQ Oncology PACS enables users to archive, retrieve and manage images and information needed to support image-intensive methods such as IGRT, independent of planning or treatment delivery system.	
	MOSAIQ® Image Management:	• Enables archiving, retrieval and management of data to support advanced IGRT techniques.	

Table-4

9.2 VENDOR EVALUATION

Features	Description	NewCreationIT	OncoSoft
Patient Registration		YES	YES
Scheduling		YES	YES
Medical Billing		YES	YES
Medical record	• Date of diagnosis • Initial Staging • Current stage • Physical findings • Relevant procedures notes • Admit note • Operative notes • Procedure notes, Chemotherapy record • Discharge notes • Pain assessment • Graphic, photos and sketch handling, • Radiation reports • Pathology reports • Consents • End of life documentation	YES	YES
Reports from multiple diagnostic methods		YES	NO
Empirical therapy	• Empirical therapy may be given in situations without an exact diagnosis, based on the available evidence	YES	NO
Treatment Management	• Radiation Therapy Treatment • Chemotherapy/Biotherapy Treatment • Surgery • Follow-up Care • Palliative Care of patients with terminal malignancies	YES	NO

Oncology Specific Templates		YES	NO
CDSS	• Staging guidelines • CTCAE toxicity guidelines • NCCN guidelines • Regimens & compendium • Chemotherapy/biotherapy drug guidelines for individual drugs • ASCO guidelines and tools • Pain management – scales, guidelines, resources • Anti-emetic guidelines • Ability to incorporate institutional specific SOP's/guidelines/workflow • Template based tools for encounters and visits	YES	YES
Flow sheets		YES	YES
Standard			
HIPPA		YES	NOT KNOWN
HL7		YES	NOT KNOWN
CPT		YES	NOT KNOWN
ANSI X12		YES	NOT KNOWN

Table-5

10.0 HARDWARE

Equipment	Description	Units
Workstations	DELL® OptiPlex XE (small form factor)	138
Printers	Zebra Printhead For LP2824 Printers	71
Barcode Printer	Zebra S4M 300 DPI Thermal Barcode Printer	71
Barcode Scanner	Metrologic MS9540 USB Voyager Scanner for use with Patient Check-in	138
Scanners	Fujitsu FI-6110 Sheet-Fed Desktop Scanner	27
Cloud Server	Dell™ PowerEdge™ servers	
Cabling	CAT-6	
Network	Dell' power connect	
Storage	Dell's PowerVault TM NX3300 Network attached storage	
	Dell's PowerVault TM TL 4000 rack mount tape library with 2x LTO 5 FC Drive	
PACS workstation	Dell's Precision workstation	5
PACS Storage server	Dell DX Object Storage-16TB	
Image Storage Capacity (compressed)	2,353,519 Images	
(Non-compressed)	784,506 Images	

Table-6

10.1 MEDICAL DEVICES

EQUIPMENT			VENDOR
Radiation Oncology	Linear Accelerator	Intensity Modulated Radiotherapy (IMRT)	Varian
		Image Guided Radiotherapy (IGRT)	Varian
	Radio-surgery	TrueBeam™ STx	Varian
	Brachytherapy	Image Guided Brachytherapy (IGBT).	Varian
		HDR Brachytherapy	Varian
Nuclear Medicine		Gamma Camera	GE
		PET-CT	GE
Radiology		Digital X-ray	GE
		Mammography unit	GE
		Ultrasound Unit	GE
		MRI	GE
		CT	GE
		Electrocardiogram (ECG)	GE

Table-7

11.0 CONFIGURATION AND CUSTOMIZATION

Documentation details provided will include:

- Description of the system functionality
- For each input process that is to be customized / developed
- Method of invocation
- Major data items
- Coding scheme and structure
- Control numbering mod
- Frequency of data input
- Interface with any data capture devices
- Authorization/control requirement
- Security and access requirement
- Error control procedure
- Expected processing time
- For each report / query that is to be customized/developed
- Invocation Criteria
- Frequency of generation
- Content of report
    - Format
    - Preprinting requirement
    - Data items with mode of printing (Bar-code)
    - Sort order
    - Total/control information
- Number of copies
- Routing of reports and its usage at every point
- Sensitivity, security and access requirement
- Control and audit requirement
- Expected processing time for generation

12.0 SOFTWARE INSTALLATION

The modified Application Software will be delivered and installed along with the User and operations manuals for each module. Some modules have only a user manual.

- NewcreationIT Oncology EMR software
- Lab information system (LIS)
- Radiology Information System (RIS)
- Pharmacy Information System (PIS)

13.0 TESTING

Each of the Application Modules will be tested by the nominated Application Testing Team. The team should comprise of designated staff from the Hospital. EMR Consultant will act as advisor to the testing team.

Before performing the acceptance test, the testing team must review the customization specification and create a comprehensive set of test cases for the acceptance test. It will not only test the system's functions and features but also the correctness of the procedure and operations manuals.

All the test cases must be clearly documented to include the following:

Function or feature to be tested

- Test version number, the date, the tester
- Testing environment, the test data base version
- Input and anticipated output
- Remarks of the test results
- Failure situation

14.0 TRAINING

Training is conducted for the following groups of users:

- Training for the hospital's EMR department staff
- Hospital staff

  -Top Hospital Management

  -Department head

  -Department supervisors

  -End users.

After software installation, 3 months approximately of on-job training covering the technical and application relation aspects will be provided to the hospital's staff

LEVELS OF TRAINING

At the application level, the project team will prepare a training schedule on three levels:

I - **General System Overview**: TEAM will be aimed at the

- Hospital Administrators
- Departments Heads
- Senior Consultants / Doctors

It will take the form of seminar and demonstration sessions on Oncology EMR software.

II - **Departmental Heads/Supervisory Training**

Team will be aimed at

- Groups of Departmental Heads
- Senior Consultants/Doctors in particular application areas.

It will take two forms:

- General review of specific application areas in the form of a seminar and demonstration sessions in which system features, implications and benefits will be considered and any changes in documents and procedures discussed.

- Individual's hands-on training in usage of the systems, given in a series of sessions.

III – **End User Training**

EMR training should be given to the system end users like physician, nurses, technicians, pharmacists etc whose jobs, and daily operation needs will be done using particular system functions. System operations will be the responsibility of end users.

The training will comprise of a general introduction to their system plus specific hands-on sessions in specific application areas. These hands-on sessions would normally be in a pre-specified number of Training Sessions on consecutive days.

15.0 POST IMPLEMENTATION SUPPORT

The objectives of post-implementation support are:

- Monitor the effectiveness of operational and system support and improve on it.
- Monitor and review the department operation under live operations of oncology EMR and make changes to improve workflow if needed.
- Monitor system performance.
- Setup training guidelines / orientation methodology for all fresh employees joining the department.

Operational support services

As part of post implementation services consulting team will be offering facilities such as the setting up departmental Operations and Procedure to effectively controlling the workflow involved in a hospital information management system

Functions to be performed under operational support:

- Data Management
- Backup control and monitoring
- File growth monitoring and reorganizations
- File integrity checking.

Security Management: Implement security control at:

- System level
- Database level
- Monitor user ID allocations and password changes
- Analyze system security printouts for authority violations.
- Computer room security.
- User Management
- Implement user security groups
- Analyses system data log for violations

- Monitor user handling (tampering) of the hardware
- User support in routing system problem
- System Performance Tuning
- Monitor system performance with various tools and identify bottlenecks and solve them
- Monitor system response time.

Software Management

- Keep track of system software / versions/updates
- Maintain system manuals
- Coordinate and control the installation of new versions of the software
- Control software development from the point of view of compute resource usage and standards.

User Support

- Post implementation operational support
- Attend peripheral operational problems - printers, Scanner, workstations, bar code readers, etc.
- Timely replacement of consumable (labels, stationary, etc.,)

16.0 SUPPORT AND MAINTENANCE

Services supported by IT would include, but are not limited to:

IT Support Center

IT Support Center is the first point of contact for technology-related problems or requests, such as hardware or software assistance; new computer, voice services, or network connection service requests; and password assistance.

Workstation Support

The minimum PC and laptop standards are based on the requirements necessary to adequately run current Administrative, Financial, and Clinical services.

Workstation support includes

- Printer/Scanner Support
- New Computer Ordering and Deployment and Computer Replacement
- Handheld Device Support
- Software

Identity and Access Management

Identity and Access Management team provisions application and system access, including authentication and authorization to internal users based on their roles

- Authentication
- Roles Based Access Control
- Termination of Access

Server Support

- Purchases/Upgrade and configures all server hardware
- Installs, configures, supports, and maintains the server Operating System, database software, and the following enterprise management software and services:
    - Anti-virus
    - Inventory and Security Patching/Auditing
    - Monitoring
    - Backup/Recovery

- IT Data Center Operations
- Cloud Support services
- Data Restores: Data stored on servers located in a Data Center facility is included in the IT Enterprise Disaster Recovery Plan.

17.0 CONCLUSION

It is time to realize the promise of EMRs to improve health care for cancer patients and their care providers. By pursuing a collaborative process that brings together clinical, technical, and research knowledge and by merging of technology and operational processes EMR assist in achieving value and intelligence for better clinical care delivery It also helps in bringing about organization transformation by provider engagement in the development, adaptation, acceptance and accountability for care delivery processes.

EMR implementation brings about standardization, efficiency and utilization optimization in care delivery and administrative process.

ANNEXURE

PRE IMPLEMENTATION ASSESSMENT

Department's hardware Requirement

Basement

Radiation Oncology Department							
Rooms	**No.**	**No of Workstation**	**Printer**	**Scanner**	**Port for EMR**	**Voice port**	**Cable**
Reception		1	1		2	1	CAT-6
Screening /Exam room	1	1	1	1	1	1	CAT-6
Radiation oncologists room	1	1	1	1	1	1	CAT-6
Dosimetry	1	1	1		1	1	CAT-6
Cinical Trilogy (Linear Accelerator (IMRT/IGRT)	1						CAT-6
Cinical Trilogy Console	1	2	1	1	2	1	CAT-6
Brachytherapy Room	1						CAT-6
Barachytherapy console	1	2	1	1	2	1	CAT-6
Changing room	1						CAT-6
Patient Waiting Area	1						

Nuclear Medicine Department							
Rooms	**No.**	**Workstation**	**Printer**	**Scanner**	**Port for EMR**	**Voice Port**	
Reception							CAT-6
Physician room	1	1	1	1	1	1	CAT-6
Patient Change room	1						CAT-6
Injection room/ Hot Lab PET	1	1			1		CAT-6
Post injection waiting room	1						CAT-6
Technologist's room	1	1	1		2	1	CAT-6
Gamma camera room	1						CAT-6
PET-CT Room	1						CAT-6
Post injection waiting room-gamma camera	1						CAT-6
stress lab	1						CAT-6
Radioactive iodine therapy	1						CAT-6

Other

Central Inventory		5			6	2	CAT-6
Central Pharmacy		3	1	1	4	1	CAT-6
Dietary Department		1			2	1	CAT-6
Laundry		1			2	1	CAT-6
Engineering and maintenance	1						CAT-6
IT Department	1	2			4	2	CAT-6

Ground Floor

Rooms	No. of Rooms	Workstations	Printer	Barcoded Printers	Scanner	EMR Ports	Voice Ports	Cable
Registration Desk/ Admission /Billing		6	3	1	1	12	3	CAT-6
TPA desk		1	1		1	2	1	CAT-6
OPD chambers	8	8	1		1	16	16	CAT-6
Preventive oncology clinic	1	1	1			2	2	CAT-6
Counseling Room	1	1				2	2	CAT-6
Dietician Clinic	1	1	1			2	2	CAT-6
Accession area	1	1	1	1		2	2	CAT-6
Clinical Biochemistry Lab	1	2	1			4	2	CAT-6
Microbiology Lab	1	2	1			4	2	CAT-6
Hematology Lab	1	2	1			4	2	CAT-6
Cytology Lab	1	2	1			4	2	CAT-6
Histopathology Lab	1	2	1			4	2	CAT-6
Immunochemistry	1	2	1			4	2	CAT-6
Tumor markers	1	2	1			4	2	CAT-6
Report Writing area	1	2	1			4	2	CAT-6
Storage room	1	1	1			2	2	CAT-6
HOD/ chief pathologist Room	1	1	1			2	2	CAT-6
Medical examination room	1	1	1			2	2	CAT-6
Blood Collection	1	1	2	1		2	2	CAT-6
Storage for preservation	1	1				2	2	CAT-6
Serology Lab	1	1	1	1		2	2	CAT-6
Refreshments room	1							CAT-6
Medical Social Worker	1	1	1			2	2	CAT-6

Office								
Medical Officers Office	1	1	1			2	2	CAT-6
Dirty utility room	1							CAT-6
X-ray room	1	1	1			2	2	CAT-6
Dark Room	1	1						CAT-6
Mammography	1	1	1			4	2	CAT-6
Ultrasound	1	1	1			4	2	CAT-6
Radiographer's rest room	1							CAT-6
Radiologist's office	1	1	1			2	2	CAT-6
Change room	1							CAT-6
Patient waiting area	1							CAT-6
OPD Pharmacy	1	2	1	1		4	2	CAT-6
Administrative department	1	4	1			8		CAT-6
MRD	1	2	1	1	1	4	2	CAT-6
Physiotherapy	1	2	1		1	4	2	CAT-6
Cafeteria	1	1						CAT-6
Board room	1	1	1			4	2	CAT-6
Security	1	1				2	2	CAT-6
Registration desk (ED)	1	1	1	1		2	2	CAT-6
Nursing station (ED)	1	1	1			2	2	CAT-6
Doctor's duty room	1	1	1			2	2	CAT-6
Triage area	1	1				2		CAT-6
Minor OT	1							CAT-6
Observation beds	5	5						CAT-6
Telemedicine room	1	2	1			6	2	CAT-6
Yoga and Recreation Centre								CAT-6

First Floor

Medical Oncology department (East Wing)								
Rooms	**No of Rooms**	**Beds**	**No of Workstation**	**Printer**	**Scanner**	**EMR Port**	**Voice Port**	**Cable**
Registration/Billing area			1	1	1	1	1	CAT-6
Screening room/ Exam room	1		1			1	1	CAT-6
Medical Oncologist room	1		1	1	1	1	1	CAT-6
Infusion room			1					CAT-6
Daycare center	2	10						CAT-6
Nursing station			1	1	1	3	1	CAT-6
MRI department and CT scan (West Wing)								
MRI Registration/ Billing			2	1	1	3	2	CAT-6
Radiologist's Room	1		1	1				CAT-6
MRI room	1							CAT-6
Console room	1		2	1	1	4	1	CAT-6
Change room	1							CAT-6
CT room	1							CAT-6
Console room	1		2	1	1	4	1	CAT-6
Patient Waiting Room	1							CAT-6
Report preparation area	1		1	1	1	2	1	CAT-6
Electrical room								CAT-6
House- Keeping								CAT-6

Second Floor

Surgical Oncology Department								
	Rooms	**Beds**	**Workstations**	**Printer**	**Scanner**	**EMR Port**	**Voice Port**	**Cable**
Pre Operative/ Hold area		5						CAT-6
Nursing Station			2	1	1	4	2	CAT-6
Operation theater		5				6		CAT-6
Intensive Care Unit(5 beds)	2	10				6	1	CAT-6
Waiting Area	1							CAT-6
Control Station	1		2	1	1	6	1	CAT-6
Staff changing room	2							CAT-6
Anesthesia room	1		1			2	1	CAT-6
Sterile storage room	1		1	1		2		CAT-6
Central equipment storage room	1		1	1		2		CAT-6
Lounge area	1							CAT-6
Conference room	1		2			4		CAT-6
CSSD manager room			1	1	1	2		CAT-6
CSSD issue area			1	1	1	2		CAT-6
CSSD receive area			1	1	1	2		CAT-6
House keeping	1							CAT-6
Department of Anesthesia	1		1	1		2	2	CAT-6

Third Floor

	No of Rooms	Beds	Workstation	Printer	Scanner	EMR Port	Voice Port	Kiosk	Cable
Reception			2	1	1				CAT-6
General ward Female (5 beds)	2	10	1						CAT-6
General Ward Male(5 beds)	2	10	1						CAT-6
Geriatric Ward	1	5	1						CAT-6
Duty Doctor	1								CAT-6
Single Rooms	10	10	1						CAT-6
Semi Private	10	20	2						CAT-6
VIP Suite	2	2	2	1	1				CAT-6
Paediatric ward	2	10						2	CAT-6
Nursing Station			7	7		14	14		CAT-6
Isolation room	2	3							CAT-6
Clean utility room	1								CAT-6
Dirty utility room	1								CAT-6
Children play area	1								CAT-6
Change room	1								CAT-6
Housekeeping room	1								CAT-6

EMR Vendor Selection Matrix

SCREENING MATRIX FOR EMRVENDOR SELECTION	Weightage	NewCreationIT	JVS Group
Functionality	0.2		
Integration with PACS	0.1		
Industry Standards	0.1		
Price	0.1		
Usability	0.05		
Reporting	0.05		
Stability and financial health	0.075		
Customer Support	0.075		
Commitment to the Industry	0.075		
Installed Base	0.075		
Weighted Score			
Comments			

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CASE STUDY

On

Cerner

CERNER

CERNER is the leading U.S. supplier of healthcare information technology (HIT) solutions that optimizes clinical and financial outcomes.

Mission

To connect the appropriate person(s), knowledge and resources at the appropriate time and location to achieve the optimal health outcome.

CERNER MILLENNIUM

The Product Cerner Millennium is a person-centric solution framework continues to advance the digitization of individual electronic medical records to meet the needs of care providers, support professionals and healthcare consumers.

CLIENT

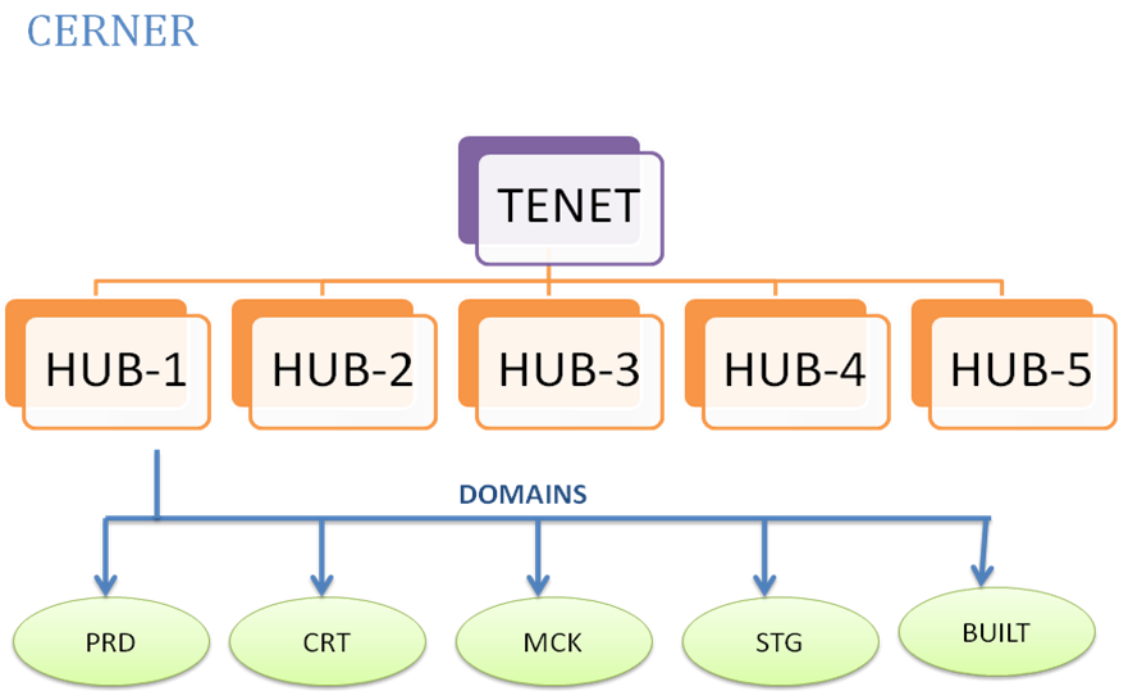
Tenet Healthcare Corporations is one of the largest investor owned healthcare delivery systems in USA. It runs

- 49 hospitals
- 124 outpatient centers
- 14 Conifer Service Centers

Dell International Services (Healthcare and life-sciences vertical) is in contractual obligation with Tenet Healthcare Corporations to provide functional support for Electronic Medical Record, ERP used by Tenet's Hospitals. The functional support is in the form of 24X7 model where both the onsite as well as the offshore team sitting in Dell, Bangalore handle the work. Right now Dell is providing support only for the hospitals that have been divided in the form of hubs.

In order to provide support in an efficient way the list of 49 hospitals is divided geographically which are called as hubs. There are five hubs in which the hospitals have been divided. These hubs are then further classified into various environments or servers, where each environment has its specific use.

Name of the Environment/Domain	Use
Production	Live Server
Certification	For testing purpose
Mock	For training purpose
Stage	For testing purpose
Build	For Configuration



TECHNICAL OVERVIEW – ARCHITECTURE

Three-tiered distributed, Client Server Model

- Tier 1 – Client (where the GUI resides)
- Tier 2 – Middleware (programs running on backend AIX servers)
- Tier 3 – Database (Oracle)

MODULES

- PharmNet Module
- PowerChart Module
- Clindoc Module
- eMAR Module
- Bedrock Module
- Core Module
- SurgiNet Module
- Scheduling Module
- Charting Module
- PathNet Module
- RadNet Module
- FirstNet Modul

CORE TASK

1. User Creation
2. Configuration and Customization
3. Test Patient Creation
4. Physician Provider group Assignment
5. Health Plan Addition

- Testing & Validation

At Dell, each month, service packages (SP) are installed by the onsite Cerner Team. Followed by the installation, the offshore team at Dell Bangalore needs to validate the service package installation by testing the various modules of Cerner Millennium by testing and validation. Following are some of the modules that are tested after SP installation.

Name of the Module	Functionality
FirstNet	Emergency Department Module
SurgiNet	Surgical Module
RadNet	Radiology Module
PathNet	Pathology Module

Powerchart	EMR
PharmNet	Pharmacy Module
eMAR	Medication Administration Module
Scheduling	Scheduling Module
Charting	Clinical Reporting tool
Core	User Creation Module
iNet Clindoc	Clinical Documents

A certain downtime is provided to the offshore team at Dell Bangalore in which the testing and validation needs to be done. The test scenarios used for testing remains nearly constant but are changed as and when required. Any abnormal behavior observed, while performing the testing task is recorded and reported to the Cerner onsite team in the form of quality control documents. Share-point is the common platform that is used for reporting of these quality control documents with the onsite team. The abnormalities are then rectified by the software engineers and then tested again.

- User Creation

For the purpose of testing, each month new users are needed to be created so that using these users, the test scenarios can be conducted and the proper functioning of the modules can be validated. These users that are created are called as Generic Users. The password for such users is kept constant throughout the list so that it becomes easy for the testers to use them for testing the modules. The generic accounts are created for each hub (i.e hub1, 2, 3, 4 & 5) as well as each facility/hospital and for each department (eg. Radiology, pharmacy, pathology, physician, nurse, front desk executive etc.)

- Audits

There are two types of audits that are conducted on quarterly basis

I. Multi- Organization Audit

In multi-org audit, a check for the association of the Cerner Millennium users is done with the organization/hospital, they are working with. It may happen that a physician associated with an organization, may have left it and joined some other organization. In such a case this physician still having access in the old organization would mean violation of the HIPPA act. Therefore in order to prevent such an activity, every quarter this audits is conducted

II. Generic Account Audit

In generic account audit, the accounts created as discussed earlier as a part of user creation activity are inactivated so that the same accounts are not used for testing again

- Configuration

In configuration task, functional changes in the modules are processed. The request for the changes in the module, are processed by the hospital and is sent initially to the onsite team. The onsite team forwards the configuration request in the form of a ticket to the offshore team sitting back in India. As soon as the configuration ticket is received the changes are made

- Cerner Command Language (CCL)

CCL is similar to SQL. CCL is used to write codes that help in automating the above mentioned jobs. CCL automation codes are normally written onsite