Defense Health Information Management System
Deployment Operations, Sustainment Branch

MHS Interim Inpatient Documentation System

Essentris Product Overview

29 May 20009

Version 1.0

Documentation provided by:
CliniComp International
for
DHIMS Deployment Operations

Preface: In March 2009, CliniComp International (CCI) was awarded a contract with the Defense Health Information Management System (DHIMS) to purchase their inpatient electronic charting system, Essentris, and associated implementation and sustainment services for hospitals within the Military Healthcare System (MHS). Essentris is the MHS Interim Inpatient Documentation System. Essentris, also commonly referred to as "CIS" or "CliniComp," is currently in use at over 20 medical treatment facilities (MTFs) within the MHS to include Walter Reed Army Medical Center, Naval Hospital San Diego – Balboa, and Wright-Patterson AFB. In May 2009, DHIMS Deployment Operations requested of CCI to provide a document that provides an overview of the Essentris system for the hospitals as they prepare for Essentris implementation. The forthcoming documentation provides an introduction to the Vendor and their past experience with the Department of Defense - Health Affairs and their product Essentris.

DHIMS Deployment Operation encourages wide distribution of this document. DHIMS Deployment Operations also encourages MTFs scheduled to receive Essentris in the near term to establish a local Essentris intranet website and upload this document.

Respectfully,

Mr. Kevin O. Abraham
Product Line Implementation & Training Manger,
Contract support to DHIMS Deployment Operations

Essentris

Overview

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REVISION HISTORY

LEVEL	DATE	REVISION DESCRIPTION	ORIGINATOR	REVISION
1.0	29-May-09	Initial Version	K. Friedrichs	Original

REVIEW HISTORY

WHO	DATE
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INTRODUCTION

Since its founding in 1983, CliniComp, Intl. has been dedicated to the clinical information system business, with particular emphasis on innovative software and hardware technological designs for the unique and demanding hospital environment, with an emphasis on the intensive data management requirements of critical care hospital environment. The company's founding principles were and remain to provide and maintain a robust, efficient and always available system to support healthcare providers and to provide an accurate and readily accessible Electronic Medical Record (EMR). The guiding mission for both system design and maintenance support is to maintain foundations permitting systems to function through single point failures without the loss of data, functionality or system availability. These principles and the company's expertise have produced the exceptionally reliable (i.e., 99.99% availability) Essentris Systems being deployed today.

CliniComp began its partnering with the DOD in 1988, when Naval Medical Center (NMC) San Diego made its pioneering decision within the military to implement an inpatient clinical documentation and selected CliniComp, who previously had been exclusively involved in the commercial marketplace, and its Commercial Off the Shelf (COTS) Clinical Information System (CIS) to support its vision. Madigan Army Medical Center (Tacoma, Seattle) soon followed using CliniComp's CIS to implement what was then the world's largest CIS installation.

In 1996, CliniComp had its first experience with centrally managed DOD processes when, after conducting and extensive national competition, the DOD's selected CliniComp as the single approved provider of inpatient clinical information systems, initially for two evaluation deployments in the highly visible National Capital Region. Over the years since, CliniComp's CIS, now Essentris, has been successfully deployed at important critical care military treatment facilities (MTFs), which now total the 21 existing sites. During this period, CliniComp has endeavored to faithfully work in concert with the individual MTFs, the respective service Surgeons General, and agencies such as USAMITC, CITPO, and DHIMS.

After twenty years of partnership with MHS and the DOD, thousands of critical care clinicians - providers, nurses, therapists, chaplains, and others - at MTFs worldwide have been trained on and rely on Essentris to document the care they deliver to this nation's Wounded Warriors. CliniComp has gained invaluable knowledge and experience in the highly clinical workflow processes of the demanding Military healthcare environment. At the same time, CliniComp has consistently used it best efforts to learn and adapt to evolving important DOD administrative processes and procedures, including compliance with the critical security requirements arising under DIACAP (formerly DITSCAP).

The CliniComp Essentris solution is an intelligent clinical solution designed to make a difference at the point of care, providing practitioners with a new generation of clinical tools for increasing productivity, ensuring patient safety, and improving overall quality of care.

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ESSENTRIS OVERVIEW

Essentris supports patient care throughout the military treatment facility in the critical care, acute care, labor and delivery, postpartum, nursery, medical, surgical, and emergency departments and a host of other locations. Essentris employs a client-server open architecture design and supports integration and use of industry standard hardware components.

ELEMENTS OF THE SYSTEM

The major elements of the typical Essentris system are the Data Acquisition System (DAS), the redundant Essentris central servers, and the Global Data Repository (GDR) with local storage. Essentris runs on two or more *redundant* central computer systems. The Essentris redundant central computer server architecture is designed so that no single point of failure will prevent its operation or prevent access to patient data. This strategy also supports planned updates, upgrades, and maintenance without planned downtime.

The Essentris database is an object-based database management system that runs on all servers redundantly. The GDR runs on a separate server using the Oracle 10g database software and supports native, object-oriented queries and Open Database Connectivity (ODBC) interfaces to standard commercial-off-the-shelf (COTS) relational database platforms.

System end users access Essentris via a graphical user interface (GUI).

System access devices, including bedside/nursing point of care workstations and personal computers, consist of both fixed and portable workstations designed to support different physical plants and work designs. Essentris uses existing MTF local area networks (LANs) supported by the host installation to provide connectivity between the workstations and servers. The DAS devices run on a proprietary platform manufactured by CliniComp to provide an interface to the bedside instruments, such as physiologic monitors. Essentris captures data from supported bedside devices.

Redundancy/High Availability

A fundamental design goal of the Essentris system is its high availability. Essentris is designed to eliminate any single point of failure. This is accomplished using data replication, hardware redundancy, automatic failover, and a sophisticated set of remote monitoring and remote support tools to empower the system support function.

Through contracted maintenance services, Essentris is automatically monitored 24 hours a day. This remote monitoring enables early detection of faults, potential faults, and abnormal conditions. This ensures that should a failure occur, it will be detected and addressed promptly to restore the system to its fully redundant mode.

The Essentris architecture employs a symmetric cluster of active servers. This provides the most cost effective performance and response time, since each server is operating in parallel with the others, processing transactions from the workstations connected to it.
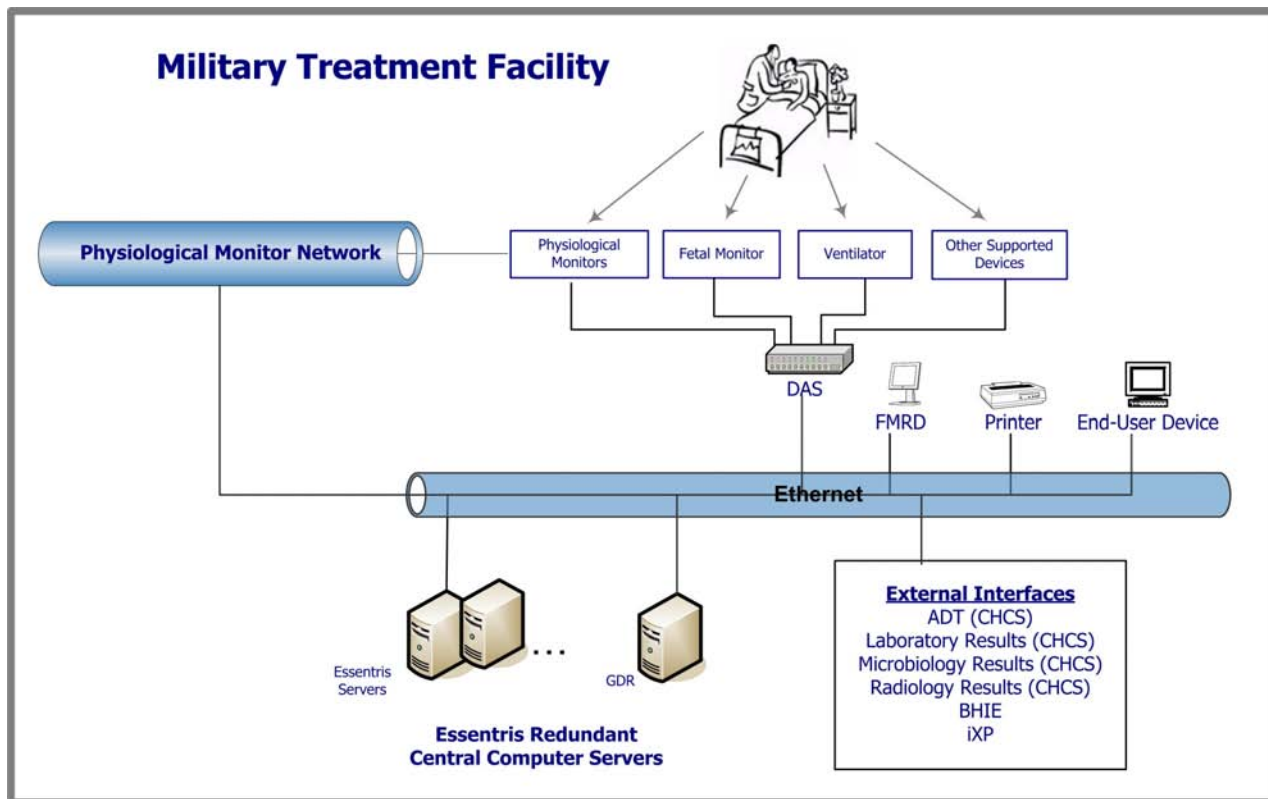
SYSTEM ARCHITECTURE DESCRIPTION

CliniComp has supplied an integrated industry standard hardware and software system solution with a view to achieving four (4) fundamental goals: reliability, performance, efficiency of system service/ maintenance and economic expandability. In addition, it communicates data from hospital information systems. CliniComp has pursued these goals through sophisticated engineering techniques while at the same time emphasizing an open architecture design environment. The Essentris system also provides additional research capabilities through downloading to standard relational database packages.

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Cost Effective Solution

The CliniComp system is architecturally designed to be the most cost-effective option for patient care automation. The approach of having fully redundant servers supporting client computers at the point of care allows customers to expand the system throughout the hospital in an incremental manner. The system creates a seamless chart that travels throughout the hospital with the patient.

The following figure describes the Essentris system architecture. Refer to the following sections for a description of the components herein.

Figure 0-1: Essentris System Architecture

Environment Description

Essentris is a COTS system that employs a client-server open architecture design and supports integration and use of various standard hardware components. Essentris provides additional research capabilities through downloading of clinical data to standard relational database packages. Essentris interfaces at each site with the Composite Health Care System (CHCS) and CliniComp using standard communication protocols. Essentris also interfaces to bedside instruments, such as physiologic monitors, fetal monitors, and ventilators. Data captured through these interfaces include monitored parameters and continuous waveforms.

Essentris runs on redundant central computer systems. This strategy supports upgrade and maintenance with no scheduled downtime.

The Essentris GDR is a system that runs on a separate server and uses Oracle 10g. The Essentris GDR provides a relational software layer that supports Structured Query Language (SQL) queries and is Microsoft™ ODBC compliant. The Essentris relational software layer provides access to the object-based

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database through SQL and open database-compliant interfaces to standard COTS relational database platforms.

Application users access Essentris via an enhanced GUI. Application access devices consist of both fixed and portable workstations (provided by the MTF) designed to support different physical plants and work designs. Essentris uses LANs provided and maintained by the MTF to provide connectivity between the workstations and servers.

Major Essentris components, located at the sites, include redundant central servers; multiple bedside/nursing display station assemblies (provided by the MTF); postscript laser printers (provided by the MTF); and DAS external interface devices. CliniComp also maintains a high-speed IPSec virtual private network (VPN) tunnel between CliniComp corporate headquarters and each operational Essentris location. A standard Essentris architecture is connected to an MTF LAN as represented in Figure 1-1.

Virtual Private Network

CliniComp's ability to provide timely and efficient Essentris support is based on the availability of VPN connectivity between the Essentris system at each MTF and CliniComp's San Diego, California, support center. VPN connectivity is established through a dedicated, encrypted (IPSec) VPN tunnel that allows CliniComp's support team to directly access the servers on a 24/7 basis. This promotes timely and efficient response times as expected by the physicians and clinicians using an online charting system managing live patient data on a real-time basis in critical care medical environments. The VPN is also critical to support software upgrades, configuration maintenance, and patching without planned downtime.

Equally important, this VPN connectivity permits the proactive monitoring of the major elements of the Essentris system performance 24 hours a day, seven days a week in order to permit the early detection of Essentris system malfunctions to minimize downtime. The service communication link includes automatic self-paging to CliniComp service representatives 24 hours a day, seven days a week. Special proprietary diagnostic software programs installed on Essentris automatically send alert warnings of major Essentris malfunctions. The Essentris software performs continuous self-diagnostics while the Essentris systems are running, including verifying correct operation of key data acquisition and assessing that known software checkpoints are being met. Important discrepancies found result in the automatic notification to CliniComp support personnel.

Security Aspects of Essentris

To comply with Department of Defense (DoD) Information Assurance Certification and Accreditation Process (DIACAP) requirements, including protection of the integrity and security of the VPN connectivity, CliniComp has implemented both physical means of protection and strict personnel policies and practices.

Physical means of protection include CliniComp's implementation and maintenance of a separate DoD support LAN that is physically separated from all other CliniComp networks ("air-gapped") and provides approved security for both corporate location and remote VPN support access to MTF CliniComp hosts. Only dedicated DoD support servers and related equipment are connected to this internal LAN, isolated from all other corporate networks. The Essentris product is also firewall protected from the external devices and networks. A second firewall protection exists between the product and the support network and systems located at the development/maintenance facility in the CliniComp San Diego facility.

Access to the San Diego support systems is strictly limited to specifically identified individuals compliant with at least Information Technology (IT) Level II clearance requirements. CliniComp support personnel establish a connection between CliniComp headquarters and a customer site using an RSA SecurID Token with an individual user ID and encrypted password to log on to a DoD workstation to provide after hours servicing. CliniComp maintains a continuous log file of all who access the customer sites. This log file records the employee's name and time of access.

CliniComp also has implemented personnel policies and practices supporting security protection. These include the following:

- Limiting access and monitoring access to the development facility.
- Restricting physical access to the CliniComp building via access code–controlled entry. Facility audit logs are regularly reviewed to identify any indications of inappropriate or unusual activity.
- Requiring that all individuals, other than those being escorted, must have obtained or have applied for and received temporary authorization for at least an IT Level II position sensitivity designation of access to the DoD support environment and have completed required training prior to receiving authorization to obtain a CliniComp-DoD network password.
- Requiring that each individual must have a unique complex password meeting DoD regulations and personnel are not permitted to share passwords.
- Placing all support workstations in locked and protected areas to prohibit access or observance by unauthorized individuals, password protecting screen savers, using terminal lock functions, and employing complex password protection.

SYSTEM INTERFACES

The system interfaces to bedside instruments such as physiologic monitors, ventilators, IV pumps, etc. Not only monitored parameters are read, but also available waveforms from bedside instruments, such as physiologic monitors and ventilators (EKGs, fetal strips, etc.). The Essentris system has the capability of acquiring, processing, and archiving this data for more than 24 hours, assuming adequate hardware facilities. Interfacing with bedside instruments is performed by remote data acquisition units (DAS boxes), which implement each instrument's individual protocol and perform local processing storage.

The Essentris system includes one of the following interface connections per MTF system:

- HL7 Admission, Discharge, Transfer (ADT) Inbound Interface – CHCS transmits patient admissions and updates to this interface.
- HL7 Laboratory Interface Inbound Results – CHCS transmits laboratory results to this interface.
- HL7 Radiology Interface Inbound Results – CHCS transmits radiology text interpretations to this interface.
- HL7 Microbiology Interface Inbound Results – CHCS transmits Microbiology results to this interface.
- Essentris Information Exchange Platform (iXP) interface – This interface is used by Essentris to send iXP-supported orders from the Essentris Computerized Provider Order Entry (CPOE) module to the Government-furnished iXP system.
- Bi-Directional Health Information Exchange (BHIE) Interface – This interface is used to make available certain notes from discharged patient encounters to remote DoD and Veterans Affairs (VA) sites through the Government-furnished DoD Secure Healthcare Alliance Record Exchange (SHARE) application and VA Federal Health Information Exchange (FHIE) framework.

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SPECIFIC INPATIENT SYSTEM CAPABILITIES

CliniComp's Essentris system is a comprehensive, point-of-care solution for use in acute care hospitals. The system software allows for individualization for each hospital, each unit within the health care system and for each patient. Individualized applications are available through a configuration process that does not require system programming. For example each health care facility can modify the system database, drug lists, data entry, retrieval screen formats, and printed report contents.

The online and archive capability of the system provides accessibility to patient information from any patient care environment. CliniComp's Essentris provides a clinical database throughout the continuum of care. The system is capable of instant data retrieval on any patient in any hospital environment. Patients can be transferred with the system with no loss of data.

A broad spectrum of patient care applications replaces the paper medical record with Essentris. In addition, data may be retrieved in various formats determined by the users for reporting or administrative functions.

Essentris is comprised of the following key components:

- **OneChart:** Patient chart that includes flowsheets, treatment notes, patient control, a medication administration record (MAR), care plans, and integrated order entry. The chart is configurable to meet the military customers' evolving needs and business objectives.
- **Device Connect:** CliniComp, Intl. pioneered the automated collection and charting of physiologic data from monitors. Today, Essentris has more interfaces to a wider variety of patient monitoring devices than any other health information company.
- **Global Data Repository:** A real-time reporting and analytics platform for charted and captured clinical data.
- **On-Watch:** a real-time clinical surveillance and alerting solution that can be configured as clinical dashboards or individual clinician prompts

USER INTERFACE & REVIEW CAPABILITIES

A series of user interface features are available for each data entry and retrieval screen. These include:

- Tabular data with time on the vertical axis
- Customized choice list windows
- Summary windows
- Special data entry and retrieval formats
- Edit History
- Combinations of the above.

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ADMINISTRATIVE FUNCTIONS

- **Admission, Discharge, Transfer:** The system manages the admission, discharge, and transfer of patients through the ADT interface. This capability is available at point-of-care and may be accessed automatically from a remote system.
- **Archive:** A copy of all patient data is maintained online for a time period specified by the health care facility. At which point, patient data automatically archives. Archived patient data are interactively retrievable by staff with appropriate permissions from any computer.
- **Reports:** Printed graphic and tabular reports from the patient record are automatically produced at scheduled user defined times or when manually requested.
- **Queries:** The patient database can be searched and queried via the Global Data Repository (GDR). Ad hoc queries can be created with this tool. Queries also can be exported to a standard relational database for further analysis and report writing.
- **Reference:** Essentris offers a unit specific online reference library for technical information of the hospital's choice. The library can be accessed from any location, in any environment, to provide user defined reference material. The Reference library may be used to reference industry standards or facility specific information such as, policies and procedures, education updates, help function, etc.

IN-PATIENT CARE ENVIRONMENT

Essentris can be configured to support patient care and manage clinical data within any in-patient environment. The system currently accommodates:

- Critical Care Units (SICU, MICU, CCU, NICU, etc.)
- Med/Surg Units
- Labor & Delivery Units
- Mother/Baby Units
- Pediatric Units
- Psychiatric Units
- Rehabilitation Units
- Subacute Care Units
- Special Procedure Units
- Emergency Department.

The following patient care applications provide a fully automated medication record and clinical repository. They also provide clinically integrated data to support decision making.

In-Patient Care Applications

FLOWSHEET APPLICATIONS
Vital Signs
Intake and Output
Medications
Respiratory/Ventilator
Treatments
Assessments

NOTES APPLICATIONS
Admission Data
Assessment
Progress Notes
Patient Education
Care Plans
Transfer Notes
Procedure Notes
OR Reports
Discharge Summary
History and Physical

APPLICATIONS
Waveforms
Fetal Plot Screens
Fetal Monitor Remote Display
Clinical Summary Screens
Laboratory Results
Status Boards
Plot Screen
Growth Charts
Order Entry
Medication Reconciliation

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FUNCTIONALITY OVERVIEW

This section provides an overview of the following key Essentris functionality:

- Flowsheet Applications: Vital Signs, Fluid Balance, and Medication Administration
- Notes Application
- Waveforms
- Fetal Plot Screen
- Fetal Monitor Remote Display (FMRD)
- Other Functionality:
  - Patient Tracking
  - Discharge Instructions
  - Care Plan
  - Kardex
  - Patient Data Summary and Review Screens
  - Reference Capabilities
- Order Entry
- Global Data Repository (GDR).

Flowsheet Applications

System flowsheets are characterized by rows of items and time columns for real time charting. Flowsheet rows and choice lists are configurable by the health care facility. They can be modified to meet the needs of particular units in the hospital. Flowsheets also can be customized by the bedside clinician to meet specific patient needs. For example, flowsheet rows can be added by the clinician for a patient via an "Add Row" feature, such as when a patient has a Swan Ganz Catheter inserted and a PA Catheter row can be added on the vital signs flowsheet for data entry. Rows can be stopped or started as needed. In other words, the amount of data presented on the screen can be configured to match the specific patient's needs of the unit.

Additionally, annotations can be entered directly on flowsheets via a single keystroke. The annotation can be read from the data cell where the note was entered and can be configured to appear in a separate section on the flowsheet. Typically, health care facilities use the flowsheet application when configuring screens to chart patient physiologic data, fluid balance, medication administration, invasive device monitoring, treatments, and results reporting. The system supports up to 24 different flowsheets per unit.

In some cases, sections are added when orders are added to flowsheets from Standard Order sets and individual orders, which are configured by the health care facility. Orders automatically populate flowsheets when acknowledged or entered by nurses. Depending on the system configuration, when a clerk or physician enters orders, a "Pending Orders" message may appear alerting the clinician to check and acknowledge new orders.

Schedule markers can be configured to appear indicating the time the order should be administered. The clinician can manually adjust the ordered frequency schedule markers as needed.

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Fluid Balance Flowsheet

The Intake and Output (I&O) Flowsheet is configured with multiple intake and output sections. The Intake fluid section will display the type of fluid, volume hung, infusion rate and site and the volume delivered. The output section will display the type of fluid output device and volume drained. Hourly and shift totals of each intake and output fluid are automatically calculated and presented along with the total fluid balance by hour, shift and day. IV infusions are displayed on the screen when ordered.

The clinician can discontinue an item on the I&O flowsheet with a single keystroke. All site and rate changes are displayed. IV bag numbers, whether TPN or blood products, can be entered on the I&O flowsheet. Patient height and BSA are displayed in the upper left corner of the flowsheet for reference. Patients pre-dialysis and post-dialysis weights can be added with the "Add Row" feature as needed per patient. The patient's weight history can be quickly reviewed via a pop up window. Additional sections to meet a unit's specialized needs may be configured (e.g., breastfeeding, infant measurements, dialysis).

Warnings can be configured to alert clinicians that attempt to enter an intake volume that exceeds the amount ordered and force the user to then provide affirmation or a negative response to whether the volume entered is correct.

Depending on the system configuration, when an IV drip is ordered the infusion automatically flows to the Vital Signs Flowsheet for calculating dosages such at U/hr or mcg/kg/min. and to the Intake and Output flowsheet for measuring the volume infused. Additionally, standard IV drip concentrations are configured into Essentris enabling users to quickly choose the IV drip from a choice list and enter the default concentration or modify the drip to conform with the specific order.

Vital Signs Flowsheet

The Vital Signs Flowsheet is typically configured with special flowsheet sections for plotting physiologic parameters and calculating IV drip dosages. The patient's physiologic variables are entered with a single keystroke from bedside monitors or manually entered by the clinician. Vital signs can be entered as frequently as every minute.

Acceptable ranges can be configured into the system to decrease typographical errors. Other items, such as mean BP, SVR and LVSWI, are automatically calculated and displayed as soon as sufficient data are entered.

The Vitals Plot section graphs pre-defined patient data items such as heart rates, arterial systolic and diastolic pressures to quickly evaluate trends. Significant events such as "Intubated" or "Dopamine started" can be entered on the Vitals Plot section. Events can be tailored for each environment and can be entered from a choice list or typed in as free text. The window left of the plot section, can be configured to display items such as height, weight, blood type, gravida, para, admission date, burn days etc. Daily weight and yesterday's and today's fluid balance summaries can be configured for display in the right corner window. Data in both windows are automatically transferred and updated from data entered on the admission record screen and the Intake and Output Flowsheet.

IV drip dosage calculations are performed automatically and displayed by Essentris on the Vital Sign Flowsheet (depends on the system configuration). The system accurately calculates the appropriate dosage such as mcg/kg/ min, u/min, or mg/min. For example, a rate of Dopamine entered in cc's per hour will be converted to the appropriate dosage in mcg/kg/min based on the patient's weight and the concentration of the Dopamine drip. IV drug infusion rates can be entered manually or automatically through an interface to an infusion pump.

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Medications Flowsheet

The Medication Flowsheet displays all ordered medications and acts as the Medications Administration Record (MAR). The hospital formulary can be loaded to Essentris which provides string searches for medications when entering new orders. Ordered medications will be displayed in the appropriate sections of the medication screen based on ordering frequency.

For example, a medication ordered "TID" displays in the "Scheduled Medications" section and a medication ordered "STAT" displays in the "STAT/ One Time Meds" section. The medication name, dose, frequency, route and any comments will be displayed. Each data cell provides spacing for the medication dose, whether it was given or held and staff initials. Like all the flowsheets, annotations can be entered. Additional time columns can be quickly added to chart multiple deliveries of the same medication within the same hour.

When delivery of a one time or stat medication is charted, the medication is automatically discontinued. A medication ordered STAT or "X1" can be charted as delivered with one keystroke when the clinician is entering the medication order.

An expiration bar will automatically display when a medication has been discontinued to alert clinicians the medication order is no longer active. A discontinued medication will automatically disappear from the MAR in a configurable length of time. The system provides a "Give Medication" and "Hold Medication" entry via a single keystroke. Medications scheduled in the future, are highlighted by schedule markers. These schedule markers can be automatically reset and /or manually changed per the actual medication administration. Schedule markers will continue to display indicating late or overdue medications. Sliding scale medications are entered per dose in the orders section. Drug tapering is also entered separately with a start time included so that both medications are not given at the same time. Doses are entered separately and are automatically discontinued if a DC time is entered in the order.

The Order Entry function incorporates a third-party package to alert users of allergic reactions, duplicate orders, duplicate therapies, and drug-to-drug interactions.

Notes Application

The Notes Application enables the facility to create on-line forms such as Shift Assessment, History & Physical and Multidisciplinary Note, for patient data entry. The application supports documentation from health care providers, including but not limited to, nurses, physicians, clergy, social workers, physical and occupational therapy, nutrition and pharmacy. There is no limit to the number of notes that can be created by the facility.

These patient data input forms travel seamlessly with the patient through different care environments without duplication. The patient data input forms are retrieved at any time on any patient from sites supported by Essentris on a real-time basis. The clinician selects the desired note from a listing of notes configured for that unit. Configured notes can be grouped into categories as defined by the facility. Patient data is entered into the note automatically by importing information from flowsheets and/or from other notes or manually via checkboxes, choice lists, default text, free text or a combination. Importing information between notes and from flowsheets greatly reduces redundant charting.

Notes can be entered at current time or retrospectively by choosing the "enter time" field. The note will display both the retroactive time and the time the note was stored. The practitioner's name and title appear on each note for easy identification. In addition, previous notes can be copied to the current time and edited to reflect patient status. Notes are displayed and printed in chronological order. For easy access, notes can be sorted by the time of the note, type of note, topic, user who stored, or status of note. All notes written can be viewed from the Notes screen. Data entered on a note by a clinician can be queried (if it is set up as a query or database item) for reporting purposes with the system's Global Data Repository query tool.

"Required Fields" can be built into the notes and will not allow the user to store/save the note until information is entered in those fields. Multiple notes can be brought up for viewing at a single session, with copy and paste capabilities. Choice lists may be enforced promoting standard nomenclature and allowing for ease of data queries. "Non-printing reminders" may be configured to alert the person documenting to perform a certain action. This text does not print with the chart. Notes can be configured to not print specified fields if vacant. In addition, fields can be configured so that additional choices can cascade. "More fields enable the user to create as many fields as needed (e.g., past illnesses, medication, or past surgeries). Created notes may contain charts/drawings/medical clip arts as well as digital images.

The System Administrator can create and modify notes using the Notes Configuration Tool. This powerful tool gives each facility the ability to design the most efficient and complete note templates to chart and track any set of data. The site can choose from available note templates to modify and implement or they can start from scratch to design a note template that models their current paper system (or some combination of the two methods). For each data element or field in the note, the customer can identify whether appropriate entries for that data element are free text, free text with optional choice list or mandatory choice list.

Discharge instructions can be incorporated into the discharge note, nursing care plan or care path. These instructions are created and maintained by the site. Discharge instructions can be individualized and printed in duplicate to provide a signed copy for the hospital record and a copy for the patient to take home. The standard discharge instructions are specific to specialty type and are easily retrievable during the next patient visit in order to review the course of care. Discharge instructions may be created by the facility in the system in other foreign languages.

Waveforms

Essentris can display multiple waveforms simultaneously by capturing the waveforms via the "read monitor" function. Notes can be entered on the waveforms by the clinician and are stored with the trace.

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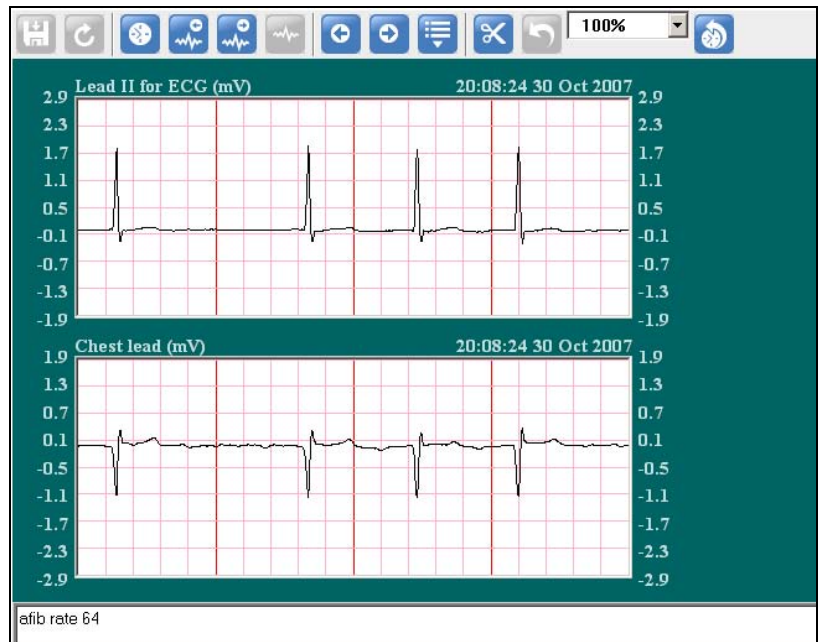
Fetal Plot Screen

Once the fetal monitor is connected to the patient, the trace produced is continuously read into the CliniComp's Essentris. This electronic record can be stored indefinitely or as regulatory agencies require. Fetal strip storage provides for retrospective review of the record. The fetal strip is displayed as follows:

- A current 12-minute FHR trace displays on the upper half of the screen and the full size current 12-minute uterine activity displays below it.
- A second trace is displayed on the same graph for twins. The second trace displays in a thicker line.

Time markers with corresponding annotations can be entered in free text or from a choice list on the fetal plot record and stored as part of the patient record. Events entered on the mother's vital plot section on the vital signs screen can be configured to import to the fetal strip.
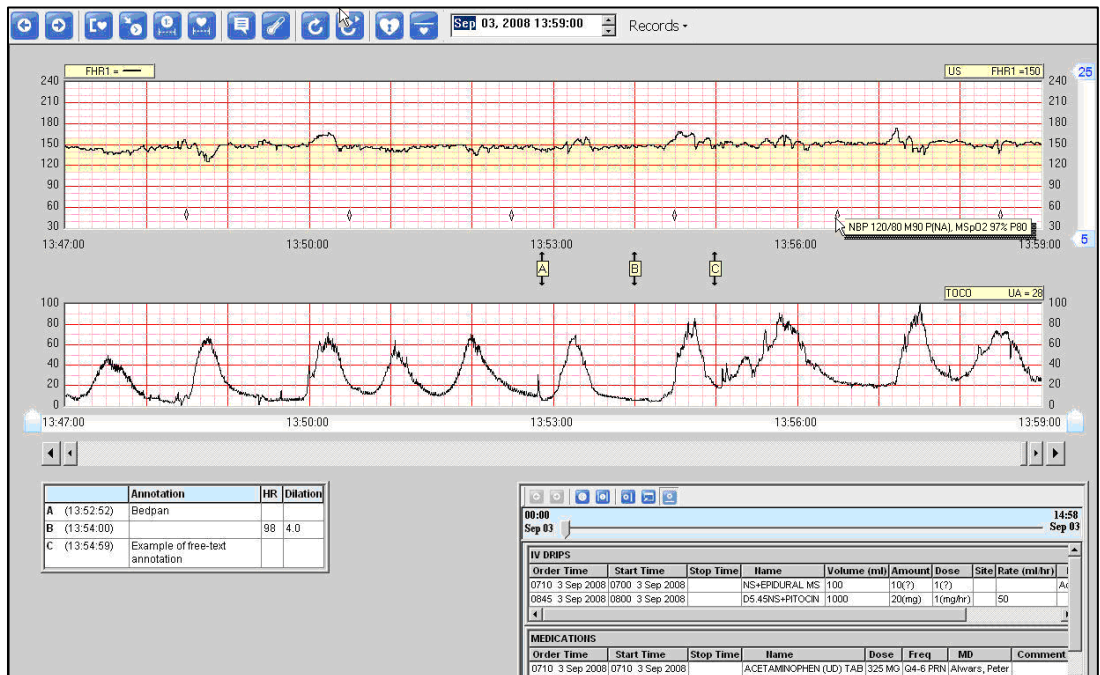
The time interval of the fetal trace can be changed from a 12-minute strip to a one-hour strip. The one- hour strip can also be viewed to determine the number of contractions within an hour.

Fetal Monitor Remote Display (FMRD)

CliniComp's full featured Fetal Heart Rate and Uterine Activity (FHR/UA) acquisition, display and archival system supports up to twelve strips simultaneously per display. The Fetal Monitor Remote Display (FMRD) captures beat to beat information from the bedside fetal monitors and displays that information on one or more FMRD central stations. The user may select the desired strip to be viewed in the top "Zoom" window. Time scale markers appear on the FMRD every one minute with lighter grid lines every 10 seconds.

Visual and audible alarms for user defined Tachycardia and Bradycardia limits may be set on a per strip basis or as default parameters. In addition, a triggered alarm will stop when the FHR returns to the normal range and can be silenced at the FRMD (configurable). A rectangular box in the upper right corner of the screen will flash to show that the display station is working properly. Any software inconsistencies will alarm and be prominently displayed on the screen.
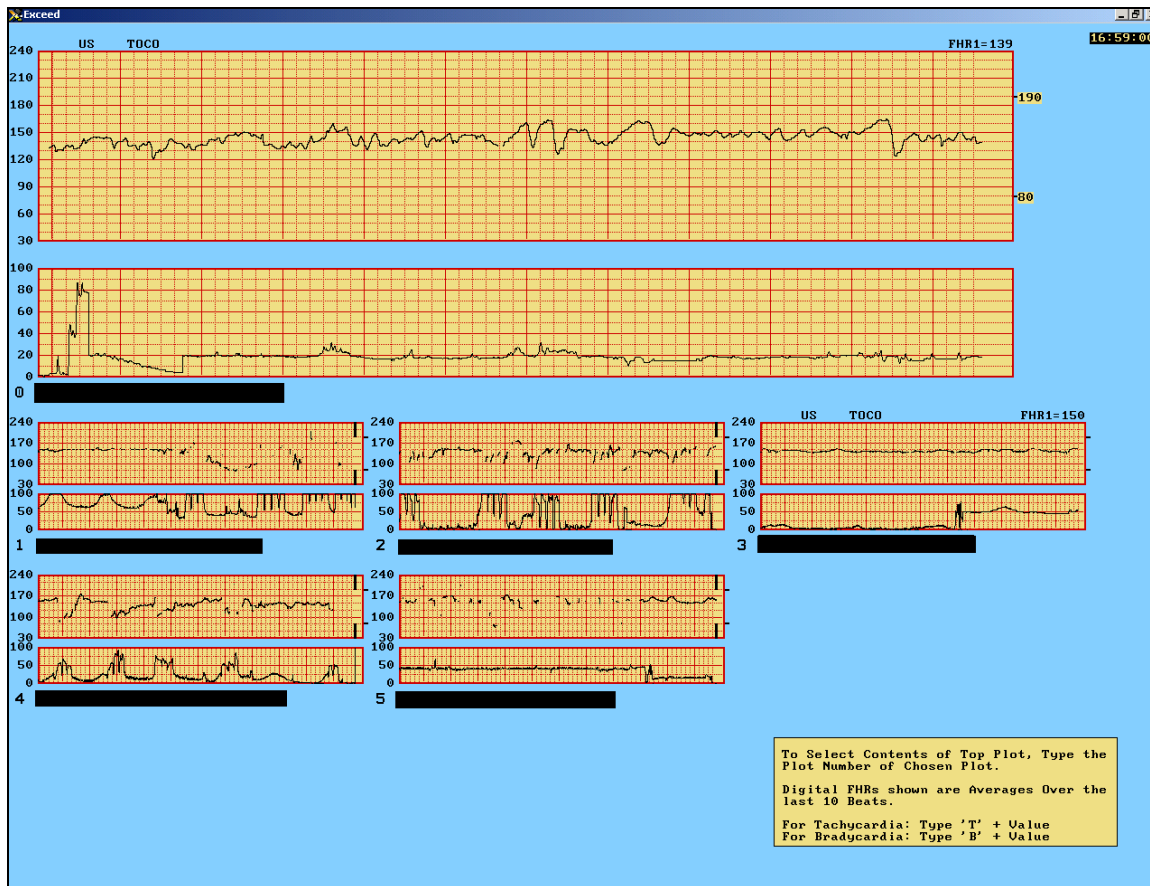
OTHER FUNCTIONALITY

Patient Tracking

The Status Board screen is a real time display of unit census as well as patient and clinical information. The hospital staff configures each unit's Status Board fields to meet their needs. These fields automatically update in real time when information on an individual patient record is charted. Configuration features of the status board include: documentation on configured items; imported labs from the lab system via HL7 link can be displayed in color for low and high values; visual flag for new/ pending order(s); and comment fields for entering messages or communications. Any central computer or workstation other than one dedicated to Fetal Monitoring can display the status board at any time.

Discharge Instructions

Discharge instructions can be incorporated into the discharge note, nursing care plan or care path individualized and printed for the patient and family. Discharge instructions are created and maintained in the CliniComp System by the site. These can be retrieved, individualized and printed real time and in duplicate for the patient to sign and take home as they leave the office, emergency department or hospital. The standard discharge instructions are specific to type of outpatient specialty and are easily retrievable during the next patient visit in order to review the course of care. These instructions may be created in the system in the foreign language of your choice.

Discharge instructions can be configured to print in duplicate, one copy for a patient to sign and is included with the chart, and one copy for a patient to take home.

Care Plan

CliniComp International offers a traditional care planning function that can be tailored specifically for a professional discipline. All care plans can be individualized to the specific patient's needs. The care plan interacts with the note function so that evaluation of expected outcomes can be tracked in the notes. The care planning methodology can be configured based on facility specific practice patterns.

The Care Plans Application allow an unlimited number of items in care plans per patient, modifications per patient, printing at user intervals or updated on demand, can update on-line. The system will capture, store and allow retrieval of the time of day for each item added to the care plan. Nursing interventions are generated from the patient problem identification list.

Care Plan templates can be put into the system and then individualized per patient. A record of when the problem was identified and modified is displayed above the notes menu.

The Care Plan application may be added to the Notes application, which allows the entry and revision of unique nursing care plans on a per patient basis. The structure of the Care Plan may be configured to include diagnoses, expected outcomes and intervention. Each Care plan is assigned from a default problem list and tracked by care plan topic, assignment in time and resolution time. All active problems will be displayed and include the time stamp.

Kardex

A system wide Kardex can be designed on-line to display individual orders as well as demographic information, data from admission notes and/or flowsheets. The population of the screen is automatic and is view only.

Individual orders are entered via the flow sheet or the Order Entry Screen. The order completions charted on the flowsheets will automatically update the Kardex.

Patient Data Summary And Review Screens

System functionality includes the ability to display results and documentation throughout the patient record on a single screen. The Summary Screen integrates and displays information on the patient's status from a variety of sources. These screens can pull in data from the patient record that is relevant to specialty personnel. Screens such as a Diabetic, Dietary, or Cardiology Information Presentation Screens, can be created for specific parameters. The data can be presented in a variety of display formats including tables, line graphs, time, XY plots, plateau plots, and bar graphs.

The blood gases, temperature and vitals can be displayed in time plots that graphically summarize all stored vital signs data in the appropriate scale. All flowsheet data can flow to the summary screens, including laboratory values, nutrition status, VS, weights, medications, invasive pressures, fluid balance etc. For precision, a moveable cursor allows the user to pinpoint any measurement time on a plot and present all associated values in the corresponding tables. Display options such as changing the display interval or end time can be manually adjusted with a single keystroke as needed. In addition, the desired screen can be printed to any designated printer.

Reference Capabilities

Essentris offers an on-line reference library for reference information of the hospital's choice. The library can be accessed from any computer, in any environment, to provide user-defined reference material for clinical practitioners as they provide patient care. Facility specific and/or industry standard information is organized in several different directories or "environments" from which the user may select. This can include, but is not limited to, protocols, standards of care, policies and procedures, algorithms, formulas, graphics, phone numbers and flow charts. Data can be entered in the reference library by the hospital System Administrator or by submitting an electronic file to CliniComp. All data can be modified or deleted by the System Administrator. A "search" function in the Reference Library assists users in finding "help."

An online help is available as part of the system. Another feature of the system is "Per item" reference. Reference data is added by the System Administrator and is available on individual flowsheet rows. The reference information is easily accessed by the end user via the Describe Item function. Per item reference can contain any reference material or standards of care information.

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ORDER ENTRY

The Order Entry (OE) Module is a specialized software application that communicates orders within Essentris and electronically sends orders (including requests for services) outbound from CliniComp's Essentris or inbound to the CliniComp data repository. The OE module is designed to be used with other CliniComp modules.

Order Entry features include:

- Intuitive Graphical User Interface
- Order Entry Process
- Filtering and Sorting
- Order Checking
- Audit Trail
- Workflow Permissions
- Order Communication
- Decision Support.

The Orders Display Screen is the hub of the Order Entry system. It displays the order information in colors (for certain order types) and the font size is configurable by the user. This is the screen where orders are entered, approved and reviewed. The information displayed on the Order Display screen is determined by the hospital and can include: Order Category, Order Subcategory, Order Name, Order Priority, Order Frequency, Ordering Physician, Result Status, Order Comments, Order Start Time, Order Stop Time, and multiple approval levels.

The hospital determines the configuration of which section columns appear for each order and their placement on the display.

Order Entry Process

New Order is used for the initial creation of an order. If Order Entry is configured for flowsheet access, **New Order** can also be invoked from the Flowsheet Actions menu.

The Category pop-up appears when **New Order** is selected. Select a category from the list that appears by clicking on it and then clicking **OK**, by double-clicking the selection, or by typing the first letter of the category name and pressing **Enter**

Once the Category and Subcategory are chosen, the **Order Editor** form appears preloaded with the Order and Start Times preset to the current time. The Stop Time and all other fields are blank, except for medications with expiration times.

The New, Copy, and Edit Order content actions each make use of the pop-up Order Editor form, which contains its own icons and actions. Customized templates can be added for categories and subcategories. For example, under Input Orders type, Fluids can use a different Order Editor screen than Blood Products. Contact CliniComp Client Services to configure the Order Editor fields.

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Two optional processes are available for caregivers to review and/or rewrite individual stored, active orders for patients who are being transferred to a different level of care. All review activity is logged and added to the patient's record. Rewriting is similar to copying an order in that a new order is created.

The **Review** function adds a timestamp to the patient's record to note when the order was reviewed. The **Review** function has no effect on new orders when they are created.

Order Communication

The OE Module integrates an interface engine, which allows for all orders to be sent out of the OE Module using standard HL-7 compliant messages to a hospital interface engine, a hospital information system, or a departmental information system. For hospital systems not capable of receiving HL-7 messages or in hospital departments not having a system, orders entered in the OE Module can be automatically printed using postscript protocol.

Filtering and Sorting

A customized view screen of orders in different states can be accessed through the "Create View" soft key. The users can easily toggle between screen sorts of their choice. Sort options include: active orders, discontinued orders, all orders, orders requiring physician signature or co-signature, and orders by category or subcategory.

Order Checking

To ensure complete and accurate information is being entered by personnel with the appropriate authorization, every order entered is subject to basic checks (as determined by your facility). These checks include:

- Mandatory field completion
- Length of order compliance
- Priority

The system displays a warning message if an entry is invalid and asks the user to modify the order.

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Standard Order Sets

A highly developed capability of the OE Module is the ability to manage standard order sets. Order sets are designed by the user to reflect group- ordering patterns for different care environments. They can be created by diagnosis, individual practitioner name, unit standard or procedure title.

When ordering from Standard Order Sets, the user can select all or choose a subset, which automatically deletes the remainder, edit segments, or fill in blanks within the order set. When the store function is selected, the orders are sent outbound from the OE Module.

Workflow and Permissions

In order to facilitate the workflow of the ordering process, each individual user receives security access depending on their provider group (e.g., physician, resident physician, registered nurse, clinician, pharmacist, system administrator, etc.). The groups are determined by the facility. Permissions can then be further adapted to an individual user; however, changing permissions results in changing user passwords (depending on the system configuration).

The facility may create multi-level security for the restriction of data entry and review capability, as well as restrict display station access to other departments or units.

In addition, permissions can be assigned to edit orders entered by other health care providers. For example, a clinician may edit an order entered by a ward clerk. A ward clerk cannot edit an order entered by a licensed provider. Most of the permission rules associated with the entering of orders and the sending of orders are configurable to support the work flow patterns of the facility.

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Decision Support

The OE Module includes the capability of accessing an industry standard, medication decision support database. This ensures that all medication orders have passed a drug/drug, drug/ allergy, adverse reaction and duplicate therapy screening prior to being sent outbound from the OE Module. The drug therapy monitoring system provides access to concise warning summaries briefly describing potential interactions, or, if additional information is desired, full-text, references can be viewed. Duplicate therapy screening supports prospective, concurrent and retrospective review when prescribing medications, while the patient is taking the medication and when retrieving historical medication information.

A decision can be made by an appropriate user to override the warning and proceed with the order process.

Audit Trail

The Order Entry system maintains a continuous log of all actions taken on an order. This includes:

- Names, titles, permissions and data fields
- Time intervals within the order entry process

This audit trail is available at any time from the order display screen. It can be viewed online through the Describe Order function from any order display or entry screen.

Global Data Repository (GDR)

The Essentris GDR subsystem is included in the proposed system. This system is built on top of Oracle relational database technology and uses Government-provided Oracle licenses. The Essentris GDR provides a relational software layer that supports SQL queries and is Microsoft ODBC-compliant. The Essentris relational software layer provides access to the Essentris object-based database through SQL and open database-compliant interfaces to standard COTS relational database platforms. This allows both canned and ad hoc reports to be written against both online (active between 100,000 and 400,000 patient days depending on the size of the MTF configuration) and archived Essentris patient encounters. The Government-provided software reporting environment can be used to run reports one time or to schedule them as well as to display or save the data to a Government-provided server. A convenient tool, Essentris GDR lets you save queries for easier report comparison and accommodates batch report requests. The system allows archiving and re-loading of data as appropriate for your query.

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