

Make Workflow Visible - Medical care is delivered in organizations according to standardized workflows. The patient care system should provide a current accounting of the steps in the process, not just the order result. For example, an order for a laboratory test initiates workflow steps such as ordering the blood draw, drawing the blood, check-in of the specimen to the lab, processing the specimen, and reporting of results. The time that each of these steps are completed can be recorded to fully disclose the status of the order at any point in time. Workflow knowledge needs to be shared to promote coordination and improvement.

Monitor Processes Concurrently - Workflows need to be not only made visible to the organization; they need to be communicated concurrent with the event. For example, for a patient having an x-ray the status of each step should be posted, i.e., scheduled time, x-ray taken, film developed, film read, report available. The system should post the predicted time that the step will occur along with the actual time that the step occurs.

Principle #7: Data Administration - Recognize data as an organizational asset and establish responsibilities and accountabilities accordingly.

Treat Processes as Assets - At the core of healthcare are the processes that bring together the people, resources, and information needed to provide, manage and improve medical care. Treat these processes for what they are, a principle asset. Have information systems in place to manage and preserve the healthcare processes.

Negotiate from Knowledge - Enter managed care contract negotiations fully informed. Quantify and understand costs of care as they relate to the various guidelines, protocols and pathways in use.

Understand Patient Population Served - Each patient population has distinct demographics, disease incidence rates, and treatment preferences. Have information available to plan services, develop budgets, provide preventive health services, and deliver care.

Monitor Contract Performance - Care delivered must be compared to the care planned and the care that was negotiated. Be aware of increases in cost, in care provided, or outcomes not being achieved.

Understand Productivity of the Healthcare Team - A key to cost performance is making the best use of employee time. Productivity does not really measure how hard an individual works, but rather the efficiency of the systems in place to help the employee do their job. Understand productivity as a basis for tuning and improving systems and processes.

Assure Accuracy - Data are the basis of medical decision-making. Make sure that the processes used for placing data into the healthcare information system are correct so that analysis and conclusions are correct.

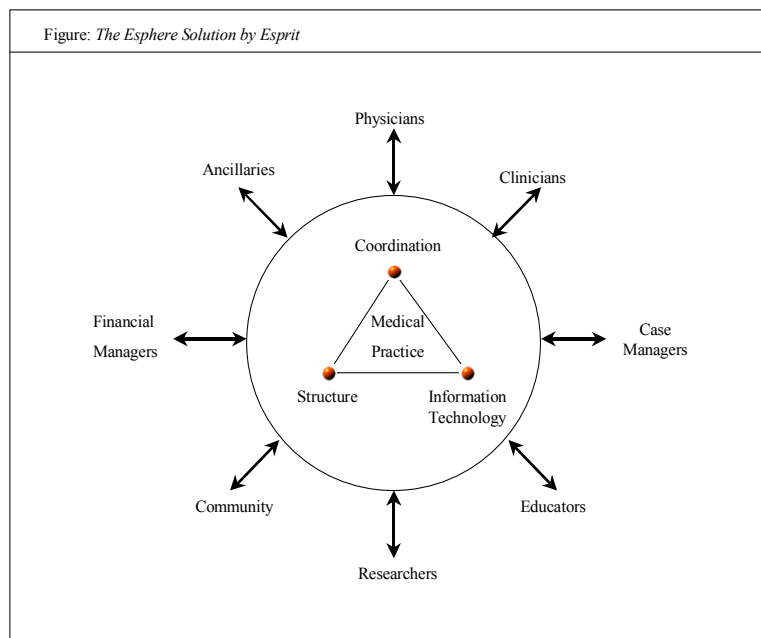
Assure Security, Confidentiality, and Patient Rights - Patient confidential data must be secured and made available only to care givers with legitimate needs. Aggregate data must be treated as protected competitive information, yet still be available for operational and scientific investigation.

Assure Version Control - Experience is used to improve the definition of tasks, and the make-up of pathways. These are data that need sound version control management to assure that clinicians are utilizing the most up-to-date standards when planning and providing care.

The *eSphere* Solution

eSphere has two major elements. First *eSphere* is a methodology for modeling medical process workflow. Second, *eSphere* is a software platform that enables the creation of protocols by non-programmers that can be combined to deliver solutions to meet the needs of the organization. Charges and financial information are captured with *eSphere* as a byproduct of the performance of clinical work.

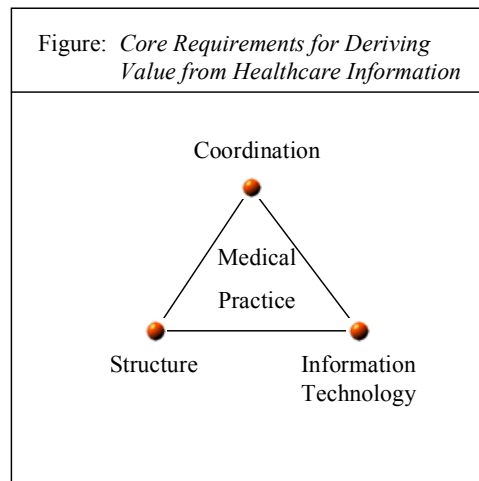
Esprit recognizes the application of medical science and medical technology to specific patient problems as central in health care. This means providing caring and fiscally responsible prevention and intervention medical services today, while at the same time evolving prevention and intervention processes to incorporate tomorrow's advances in medical science and technology. As such, *eSphere* sits at the core of the infrastructure that enables an organization to effectively and efficiently support the practice of medicine (see figure below).



eSphere is an information technology solution for coordinating the health care team around standards-driven medical practice. *eSphere* supports the application of protocols and pathways for medical prevention, intervention, and management. *eSphere* makes available experience data linking intervention and outcome to provide an analytical basis for the development of ever-improving protocols and pathways. *eSphere* is used by physicians, clinicians, case managers, educators, researchers, financial managers, and the community being served to plan appropriate care, provide care within a disciplined process, and evaluate the effectiveness of that care to improve intervention and prevention services.

Core Requirements for *New Patient care Information Systems*

Based on these identified problems, there are four core requirements (see figure below).



- Core Requirement #1* *The workflow methodologies of **Medical Practice** must become the central organizing principle of healthcare information systems, for this is the core competency of a healthcare organization and its sole reason for existence.*
- Core Requirement #2* *Healthcare information systems must incorporate the latest advances in **Information Technology**.*
- Core Requirement #3* *Healthcare information systems must provide a **Structure** that mirrors the disciplined approach used by members of the healthcare team.*
- Core Requirement #4* *Healthcare information systems must help in the **Coordination** of the healthcare team around the care of patients, patient conditions and populations; and the management team around the contracting for business and planning for the future.*

#1 - Medical Practice as the Central Organizing Principle

Medical knowledge is obtained through scientific investigation at research centers, at teaching centers, and in clinical application throughout the health care system. The scientific approach is not only used in obtaining new knowledge, it is the pillar on which daily medical practice is based. Physicians, nurses and the allied health professions all practice through assessment, decision making, and subsequent actions. The medical practice sequence of assessment-decision-action is not a one-time event, but is repeated in a continuing cycle.

The place of medical science at the core of medical practice has several implications.

- Medical practice involves an application of professional knowledge. Professional knowledge is learned in schools, gleaned from journals, passed on at professional

conferences, and shared among colleagues. Professional knowledge is incorporated into medical practice at each local practice site.

- Medical practice uses data learned from experience. Professional medical knowledge informs about cause and effect relationships, while data local to the practice site is needed to apply professional knowledge to specific cases.
- Assessment and reassessment lead to new knowledge. New knowledge comes from observing individual patient's response to treatment. The knowledge gained in reassessment is used to both modify the course of care for individual patients, and to perhaps modify the process of care as it will apply to other patients.
- Physicians are scientists who are expected to utilize knowledge gained in medical practice to improve practice and advance medical knowledge. As scientists, there is a particular interest in identifying cause and effect relationships. Data needs to be accumulated that links together the cause (e.g., assessment and intervention for a specific group of patients) and effect, or outcome, of the intervention.

eSphere places the workflow of medical practice at the information system center. With *eSphere*, the science-based approach of assessment-decision-action-reassessment is electronically modeled to define the flow of actions and resources for delivering and monitoring health care services. Data are arrayed in support of medical care decision processes, intervention processes, and evaluation processes. *eSphere* represents an integrated, real-time approach for coordinating medical practice, resulting in both the accuracy and completeness of *eSphere* data.

#2 –Advanced Information Technology

eSphere implements the latest three-tier architecture using Object Oriented Technology to flexibly distribute the *eSphere* capabilities across the healthcare team, putting information to do their work into the hands of the right people at the right time. Technology is embodied in *eSphere* to provide customization and to empower the user. Data dictionaries, data views, and report writing depend on a data model of the healthcare network's distributed operations.

eSphere real-time operation is supported by a client-server configuration, with both fat-client and thin-client options, depending on the workload of the particular workstation. This means that the data from *Esphere* can be accessed remotely from "thin" PCs with standard browsers. *eSphere* supports web-publishing that makes the remote access feasible.

eSphere technology ensures accuracy by providing customized views of the data, while at the same time implementing structured graphical data capture. At a glance, the appropriateness and completeness of data inputs are controlled. A key to *eSphere* customizability is the use of templates that allow the views that are specific to individual users and disciplines. Users are empowered because the technology allows the user views to be re-modeled as needed, and for the user to re-customize the reports they receive.

eSphere incorporates a multi-tier database structure, with separate structures used for real-time care, data warehousing, registration, and pathway modeling. Databases can be custom tailored

and distributed according to organizational unit or mission, constrained only by the data administration policies of the client organization.

#3 - Structure

eSphere takes advantage of the recent advances in modeling healthcare practices that have been variously known as guidelines, protocols, pathways, etc. These models all have as a goal the application of scientific principles to the practice of medicine. With these models, there is a basis for bringing the state-of-the-art practice approach to the patient. However, these models are not "cookbook medicine," for they demand that the practitioner make the appropriate adjustments for each patient based on professional judgement of patient complexities and comorbidities. The use of models in *eSphere* offers a structure for supporting a disciplined approach to planning, providing, and improving intervention and prevention healthcare services by providing the ability to automate the organization's approach for service delivery. *eSphere's* pathway models capture the step-by-step tasks that constitute the medical care process workflow.

eSphere does more than let you transfer paper-based pathways to the computer, it encourages you to *re-model* your healthcare approach based on a critical examination of what, and how you do it.

The *eSphere* structural approach includes a methodical process for implementing the model of care. The *eSphere* steps in the medical care process are planning, scheduling, ordering, verifying, documenting, and monitoring:

Planning - The appropriate approaches for the patient are selected during the planning step. For example, the patient might be experiencing heart failure, renal failure, diabetes, and fighting pneumonia. The multiple models specific to this patient's condition can be applied to the patient. The modeled approach can be modified where appropriate to fit the specific patient needs.

Scheduling - Once the model is selected, it is scheduled to identify who needs to do what, and when, for the patient. *eSphere* is capable of merging the individually indicated approaches into a single plan of care. Merge conflicts are identified and resolved to eliminate duplicate or contradicting tasks.

Ordering - The planning and scheduling of the elements in the health care process launches the patient on a trajectory. However, the patient's care is continually monitored and refined based on the reactions and condition of the patient. Thus, there are periodic interventions that modify the patient's course. These interventions take the form of orders that provide additional tests or treatments, or discontinue tests or treatments that are already scheduled. For example, the physician may perform daily rounds for the patient, and order additional laboratory tests based on a patient's slow response to treatment. Or, for example, a member being monitored for diabetes by a health care plan may report a lab result that indicates the need for a visit to the physician.

Verifying - There are several circumstances that require verification of an order. Orders often require verification to assure that the clinically appropriate treatment is properly selected from

available choices, e.g., verification of medication orders by the pharmacists. Orders may need to be verified to confirm the order, as when a physician verifies their verbal order that they gave to a nurse over the telephone. Another cause of order verification is to assure that orders are being written within the privileges of the person doing the ordering, e.g., to assure that an Aide is not initiating an order for a narcotic.

Documenting - With *eSphere*, documentation is performed real-time by exception against the plan of care, thereby logically relating the elements of care together and eliminating duplication. The time needed for documentation is reduced because the way the documentation is performed is fundamentally different than the old paradigm. Documentation is performed with customizable views that match the workflow of each health discipline. Graphical displays make it easy to complete the documentation with reduced effort as part of the natural workflow.

Monitoring - *eSphere* graphically indicates the status of completion for each step in the medical care process. The healthcare team can monitor the status of care real-time. Concurrent monitoring opens up the healthcare process and makes it visible to a wider circle within the organization. Because *eSphere* is a paperless patient record, any step in the care process can be monitored for any group of patients. *eSphere's* reporting database allows for retrospective studies that monitor outcomes and processes of care for any desired patient population.

eSphere enables healthcare processes to be linked together by identifying the relationships and dependencies between tasks, by triggering tasks based on the completion of a task, or the outcome of a task, and by communicating alerts. Here are some examples to further illustrate these points.

Single Thread Modeling - Provides the ability to describe the entire protocol, with conditional decision tree branches, the sequence and timing of events, and the relationship between the data elements and the protocol.

Dependencies - For example, if a patient is being transferred, say from a critical care unit to a step-down unit, the care in the step-down unit should not be initiated until the nursing orders on the critical care unit are discontinued. *eSphere* allows for the modeling of this dependency. *eSphere* allows for modeling at the item level, e.g., surgery can begin only after pre-op has been completed.

Triggers - For example, a patient may receive an order to be placed on a ventilator. The ordering of the ventilator could be used to trigger the periodic assessment of the ventilator care by nursing. Or, walking can begin after the patient is assessed to be able to bear weight. Or, the amount of KCL to be given to a patient is a result of the K+ value. Using triggers, all PRN orders could be modeled as a result of an assessment. Such a model eliminates PRN orders and replaces them with indications and orders.

Alerts - For example, a physician might wish to be notified if the temperature for a patient exceeds a certain threshold. *eSphere* lets you trigger a page (or other action) based on the recorded temperature (or other measure) for the patient.

Groups - It allows the grouping of items together, e.g., grouping of a colostomy with the education of the patient and family on the colostomy. If the colostomy is discontinued, then the colostomy education can be automatically discontinued as well.

#4 – Enables Healthcare Team Coordination

The information technology and structure incorporated into *eSphere* enable an organization to coordinate tasks across the healthcare team. The planning and scheduling steps (described above) are multi-disciplinary. *eSphere* encourages each health care discipline to contribute their perspective to the medical care process. The multi-disciplinary approaches are integrated within *eSphere* to guide the provision of care, and to identify and remove conflicts and bottlenecks.

There is one patient plan of care and its related documentation. This one care plan is multi-dimensional, meaning that the care plan is available at different levels of detail from the most summary level to the most detail level. Multi-dimensional allows each discipline to check the overall status of other disciplines (interdisciplinary), while reviewing their own care plan in actionable detail (intradisciplinary). Each discipline is made to feel that *eSphere* is dedicated to their particular needs. For example, a surgeon with patients on a post-surgical care unit will see the clinical data specific to their requirements. The nurses on the same unit will see the data displayed specific to the nursing tasks that they are responsible for performing. Both the physician and the nurse are seeing data from the same database, only in user-specific views.

eSphere provides distributed access to patient information so that all members of the healthcare team can expedite the patient's medical care process. *eSphere* provides web-publishing that allows viewing of patient data from remote sites with a standard web browser. *eSphere* is designed with the recognition that healthcare is team-based, and that all members of the healthcare team need the right information at the right time to make their contribution optimal.

eSphere coordinates the medical care process among distributed care settings in the healthcare network. Where legacy systems interface data between systems in use in different care sites, *eSphere* integrates the longitudinal medical care process. From any point in the health care network, *eSphere* allows users to see the medical care process from the perspective of a delivery site on the network, or from the integrated network perspective.

eSphere is designed to meet the individual needs of each member of the healthcare team. *eSphere* is a disciplined approach that spans and links the entire healthcare process while at the same time is customizable to the individual person or team. Here is an overview of how *eSphere* appears from the perspective of various potential users of the system.

Physicians - Physicians define the *eSphere* screens to their own customized view so that they see what they want to see, and in the place they prefer to see it. Physicians use *eSphere* as part of their everyday work. *eSphere* is available in the clinic to provide the patients longitudinal history and physical, as well as reasons for referral. *eSphere* can then be used to communicate back to the referring physician. Medical ordering and documentation flow from the patient encounter. In the hospital, the physician uses *eSphere* to review patient status, write orders, document care, and write discharge notes. It is the only system in the hospital and clinic setting that the physician needs to learn. Templates are provided that are customizable to the individual physician. The physician can implement the treatment protocols that are specific to their practice.

Clinicians - Nurses and other clinical staff use *eSphere* to plan, schedule, and document the care that they provide. Because *eSphere* is documentation by exception, less time is spent documenting, and more clinical content is included in the documentation. *eSphere* communicates common standards of practice among the team, so that everyone is aware of the latest patient care requirements.

Ancillaries - Any ancillary area can use *eSphere* to receive orders, verify orders, define standardized workflow, schedule workflow, document, and to communicate results. *eSphere* communicates orders by posting a plan of care from the physician's orders and the clinician's schedule. The medical order can in turn be used to initiate workflow activities within the ancillary. Ancillary area workflows are integrated into the overall medical care process using *eSphere*.

- Pharmacy - Receive and verify orders. Develop manufacturing lists, and post the status of medication delivery. Track medication errors for constant improvement.
- Laboratories - Receive orders and initiate specimen collection and processing workflows. Report results.
- Radiology - Receive and verify orders. Drive workflow using schedules for patient delivery and testing. Communicate the status of work in progress.
- Physical Therapy/ Occupational Therapy - Receive orders. Manage and control workflow using schedules and concurrent communication.
- Cardiac Catheterization - Schedule procedures. Document procedures and report results.
- Food Service - Post a meal delivery schedule with diet orders and menu preferences. Document nutrition education.
- Respiratory Therapy - Receive orders. Schedule and document services.

Case Managers - Case managers use *eSphere* to help develop the plan of care, to monitor milestones of the plan of care, and to identify their particular contributions to the care. For example, the model for diabetes case management can include triggers to notify the case manager if a patient is in danger of falling off of their plan of care.

Financial Managers - Financial managers provide a common registration record, capture and transfer charges to the financial system, and monitor account financial status at points of encounter with patients. *eSphere* is used to cost out the plan of care, to evaluate the plan versus the actual cost, and to model care plans that fall within contract parameters.

Educators - Clinical educators use *eSphere* to train staff on the care model. Because *eSphere* is the core database for the automation of pathways, protocols, guidelines, etc., it serves as the knowledge base for teaching about care practices. Educational materials are integrated into *eSphere*, e.g., patient educational materials can be kept up-to-date and printed on demand directly from *eSphere*. Each healthcare team discipline can keep their policies up-to-date in *eSphere* and view them on demand.

Researchers - Researchers use *eSphere* to introduce research protocols into the clinical setting. The research protocol is merged into the plan of care so that it is followed by the clinical staff. The clinical staff document against the protocol to assure thoroughness of the research; and note observations and issues as the care progresses. *eSphere* provides a database that is not

limited to current patient encounters, so that research protocols can be followed across multiple sites of care, and across time (e.g., 20 year studies).

Community - People in the community can keep records of their own, and other members of their family, health history. *eSphere* provides a vehicle for recording well patient health history. It is a place to store information so that it is available both for wellness management by individuals, and in case the person needs to encounter an institutional health setting. This is a service that could be offered to members of the community, members of health plans, employees of corporations, etc., in advance of medical need. The health history is Web based so that it is easily accessible and available.

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Call us for more information about eSphere or other information technology solutions from Esprit Health, or visit us on the Internet.

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