


**THE INTEGRATED PATIENT RECORD**  
 A KNOWLEDGE BRIEF  
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## 1 SITUATION

Today, the field of healthcare stands at a crossroads. The rapid advancement in medical knowledge and applied technology has resulted in an unprecedented capability to effectively diagnose and treat patients. This advance has brought with it a new set of problems. For example, during the course of the average patient admission an avalanche of information both textual and visual is generated and stored in a patient record. In turn, this information is used for many purposes, in particular, to apply medical knowledge to manage patient care delivery. The complexity of the information and the impact it has on the quality of care has increased dramatically. In fact, the volume and complexity now threaten to overwhelm healthcare providers. In addition, the growth of regulatory mandates and complexity of billing has added additional legal and financial strains to the system. Unfortunately, the present structure of the patient record has been greatly influenced by how healthcare was delivered in the past. This, in turn, has greatly circumscribed how we deliver healthcare today even when the data is committed to computerized database systems. Given the increased complexity of healthcare delivery, weight of regulatory requirements, rising patient expectations, and falling reimbursements the patient record as it now stands hinders the delivery of patient care not to mention the capacity to further scientific advances by through data mining for epidemiology and clinical trials.

## 2 PROBLEM

How can we manage large volumes of patient information and medical knowledge to best effect to achieve:

- RISK:** Maximum patient safety.  
**QUALITY:** Maximum reduction of patient pain, suffering, and inconvenience.  
**UTILITY:** Maximum efficiency and efficacy in use of limited resources.

## 3 SOLUTION

More effective healthcare delivery can be achieved through the redesign of the patient record that,

**AT MINIMUM:**

- Enforces standardized terminology to support effective communications and data mining.
- Effectively integrates all patient data in a structure that is easily queried, mined, and analyzed.
- Provides a means of flexible customization of data categorization and ordering of records.
- Allows the application of The Scientific Method to drive the diagnostic and therapeutic efforts.
- Provides a means of applying differential diagnosis and therapeutic engines – artificial intelligence.
- Allows for the customization of data viewing and manipulation by individual healthcare providers.
- Provides a means of instituting alerts and feedback loops to assure timely assessment and action.
- Provides a more efficient and effective means of managing risk, quality, and utilization.

This technical brief presents a concise overview of how an integrated approach to the design of the patient record will solve the above stated problems based on The Scientific Method through implementation of associative database technology.

## 4 ASSOCIATIVE DATABASE MODEL FOR THE INTEGRATED PATIENT RECORD [IPR] – IN BRIEF

### THE ASSOCIATIVE STRUCTURE PROVIDES VIRTUALLY INFINITE FLEXIBILITY IN DESIGN AND USE:

The associative data model creates a set of intermediate data tables that allows for linking of any two or more records or fields across any and all tables in a relational database without:

- Adding new fields to the patient database tables
- Redefining the metadata
- Risking damage to relational integrity
- Preventing data corruption by the act of creating or deleting an associative relationship.

Freedom from the underlying relational model allows any individual to either:

- Manually create links between existing data and/or
- Define links to occur automatically when future data is entered

### SOPHISTICATED LINKING TO CREATE INTELLIGENT SYSTEMS:

In addition, linking can be defined as:

- Absolute – always active in every query that accesses that link
- Conditional – dependent on values in fields in the underlying database or the intermediate linking table

In addition, programmatic code can be used to manage the links for more sophisticated modeling.

### WE IMPOSE OUR WORK PROCESS ON THE DATA AND NOT VIS VERSA:

Since all linking can be defined outside the native database tables, this allows for the storage of all data in a clean linear structure that can then be bent and shaped as needed to present and future imperatives that arise through advancements in medical knowledge, technology, and healthcare regulations. As a result, complex systems can be created that are one or more of the following:

- Relational / Nonrelational
- Linear / Nonlinear / Circular
- Open Ended Systems / Closed Systems
- Unidirectional / Bidirectional
- Clustered / Unclustered

### MULTIPLE PRACTICE SYSTEMS CAN BE RUN SIMULTANEOUSLY OVER THE SAME DATA:

Since all associative linking resides outside the native database:

- An unlimited number of associative modes can be run against the same database simultaneously.
- Separate associative models can be merged together to form ever more capable systems.
- Large complex systems can be separated into smaller, less complex systems.

### SECURITY:

Associative linking via intermediate tables adds an additional layer of security onto the system and allows for the customization with permissions to access a health record and even define this to vary by individual patient.

## 5 AN OVERVIEW OF WHAT THE PATIENT RECORD REPRESENTS

At first glance the patient record appears to be a simple set of chronologic entries documenting what is done to a patient while under the care of healthcare workers. In reality, the patient record is the center piece of healthcare delivery activity and represents the means to either obfuscate or clarify what is going on with the patient. From a structural point of view the average patient record for a hospital stay includes but is not limited to the following types of information:

- PATIENT IDENTIFICATION
- INSURANCE INFORMATION
- PATIENT HISTORY AND PHYSICAL EXAMINATION
- VITAL SIGNS
- PHYSICIAN ORDERS FOR DIAGNOSTIC LABORATORY AND RADIOLOGY TESTING
- PHYSICIAN ORDERS FOR THERAPEUTIC PHARMACEUTICALS, AND SURGICAL PROCEDURES
- DIETARY EVALUATION
- SOCIAL EVALUATION
- DIAGNOSTIC, STAGING, AND THERAPEUTIC RESULTS
- PHYSICIAN AND NURSING PROGRESS NOTES
- DISCHARGE NOTE AND DISPOSITION PLAN

From a process point of view the patient record directs or influences the following management activities:

### PROCESS AND FINANCIAL MANAGEMENT

- PROJECT MANAGEMENT AND **SCHEDULING** - [PERSONNEL, RESOURCES, SPACE]
- **COMMUNICATIONS** LINK BETWEEN HEALTH-CARE GIVERS
- **FINANCIAL** DOCUMENT FOR **BILLING**, **INVENTORY** CONTROL, AND **BUDGETARY** COST PROJECTIONS

### HEALTH CARE PRACTICE MANAGEMENT

- **EDUCATIONAL** DOCUMENT FOR MEDICAL STUDENTS, DOCTORS, AND NURSES
- **RESEARCH** DOCUMENT FOR SCIENTIFIC INVESTIGATION - CLINICAL TRIALS
- SOURCE OF DATA FOR **EPIDEMIOLOGIC** STUDIES - PREVENTATIVE MEDICINE
- SOURCE OF DATA FOR THE DEVELOPMENT OF **PRACTICE GUIDELINES** & MONITORS
- SOURCE OF DATA FOR THE DEVELOPMENT OF **DIFFERENTIAL DIAGNOSIS** ENGINES

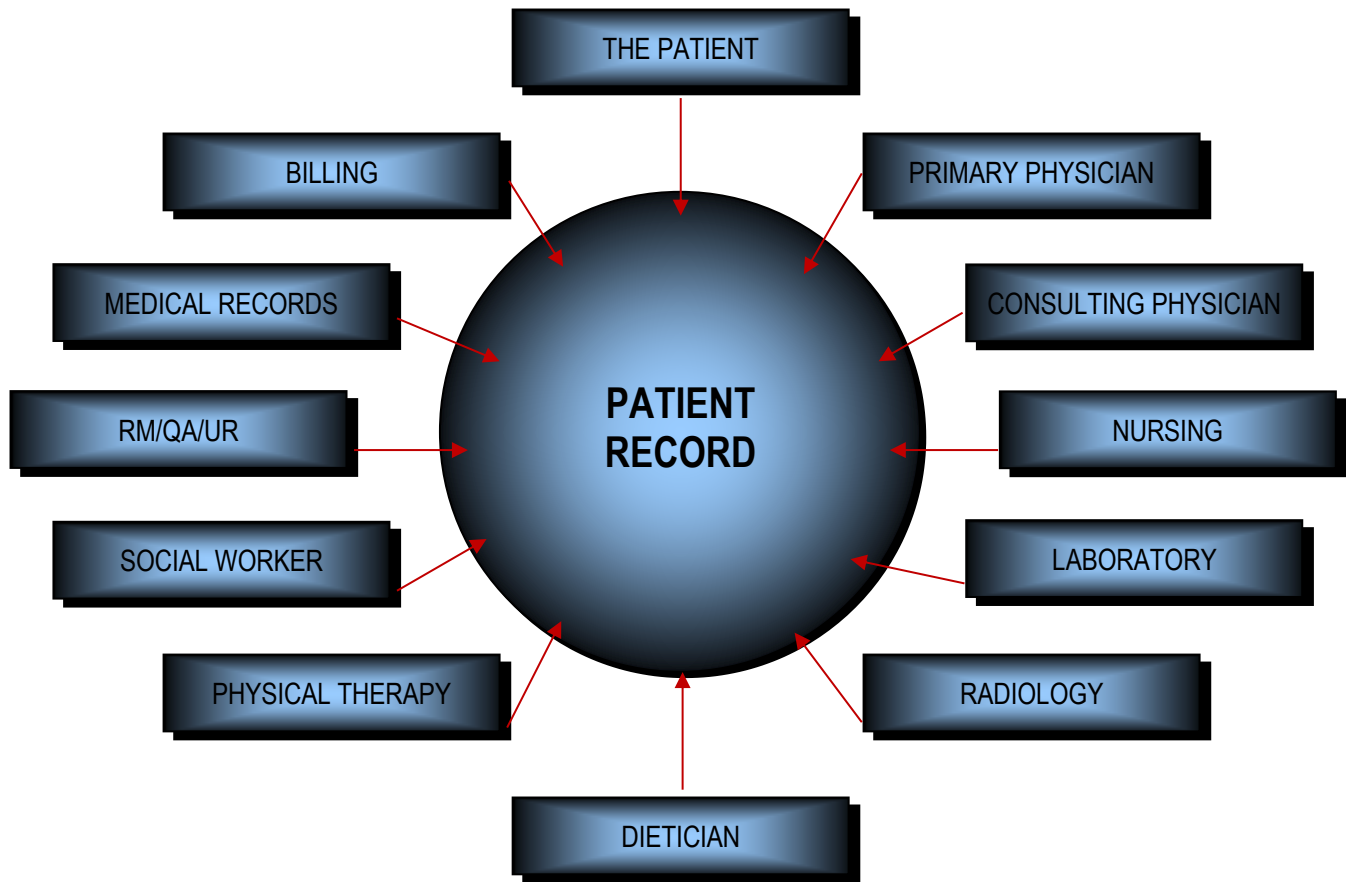
### INTEGRATED SYSTEMS MANAGEMENT

- LEGAL DOCUMENT MEASURING **RISK** FOR TORT ACTIONS AGAINST THE HOSPITAL
- PRIMARY DETERMINER OF HOW **QUALITY** HEALTH-CARE IS DELIVERED
- RESOURCE MANAGEMENT TOOL TO MONITOR **UTILIZATION** PATTERNS

The individuals who utilize and add to the patient record are shown schematically below. The large number requires careful document control mechanisms be put into place to avoid significant errors and to allow the freeform linking of information to meet the needs of each patient problem and each healthcare worker.

**THE ASSOCIATIVE MODEL PROVIDES THE FLEXIBILITY TO DO THIS**

THE PATIENT RECORD AS AN INTEGRATING SYSTEM FOR HEALTH CARE ACTIVITIES



**IT SHOULD BE EMPHASIZED THAT:**

**THE RELATIONAL MODEL:**

- Is too rigid and restrictive to handle this group of complex activities
- Imposes a very high administrative overhead at the point of use for very little gain
- Requires a very large backend expenditure to redesign as new requirements arise over time

**THE ASSOCIATIVE MODEL:**

- Is very flexible and open ended so can handle this type of system with multiple simultaneous solutions
- Reduces administrative overhead at the point of use for very great gain
- Requires no backend expenditure to redesign as new requirements arise over time

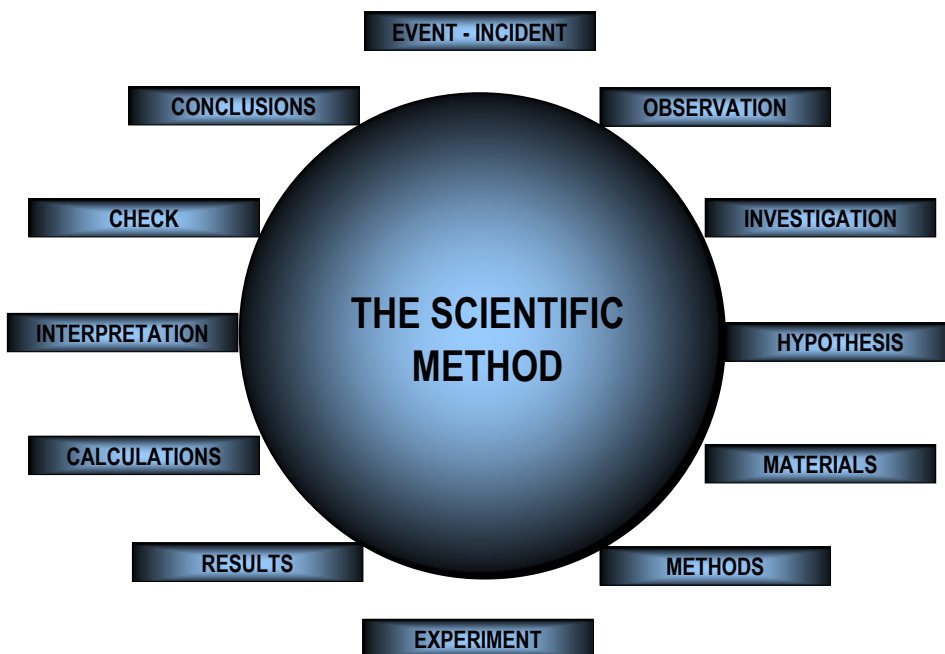
**6 THE CORRESPONDENCE BETWEEN THE SCIENTIFIC METHOD AND PATIENT MANAGEMENT ACTIVITIES**

The Scientific Method is the best approach to the objective evaluation of a patient. You can find an identity with all aspects of the diagnostic workup and therapy and so, if properly implemented will drive the process:

#	STEP IN THE SCIENTIFIC METHOD	STEP IN PATIENT MANAGEMENT
1	Event – Incident	Chief Complain/Presenting Sign or Symptom
2	Observation	History, Physical, Vital Signs, Progress Notes
3	Research – Investigation	Medical Knowledge/Practice Guidelines/Consultation
4	Hypothesis	Initial Assessment – Differential Diagnosis/Problem List
5	Materials	Diagnostic Work up – Resource Allocation & Scheduling
6	Methods	Diagnostic Work up – Departmental, Procedures
7	Experiment	Diagnostic Work up – Scheduling and Executing
8	Results	Results – Local/Departmental
9	Calculations	Calculations – Local/Departmental
10	Interpretation	Interim Assessment – Working Diagnosis
11	Check	Therapy and Outcome
12	Conclusion	Final Diagnosis/Follow up Management/Problem List

**AS IMPORTANT IS THE FACT THAT THE SCIENTIFIC METHOD IS A CLOSED SYSTEM**

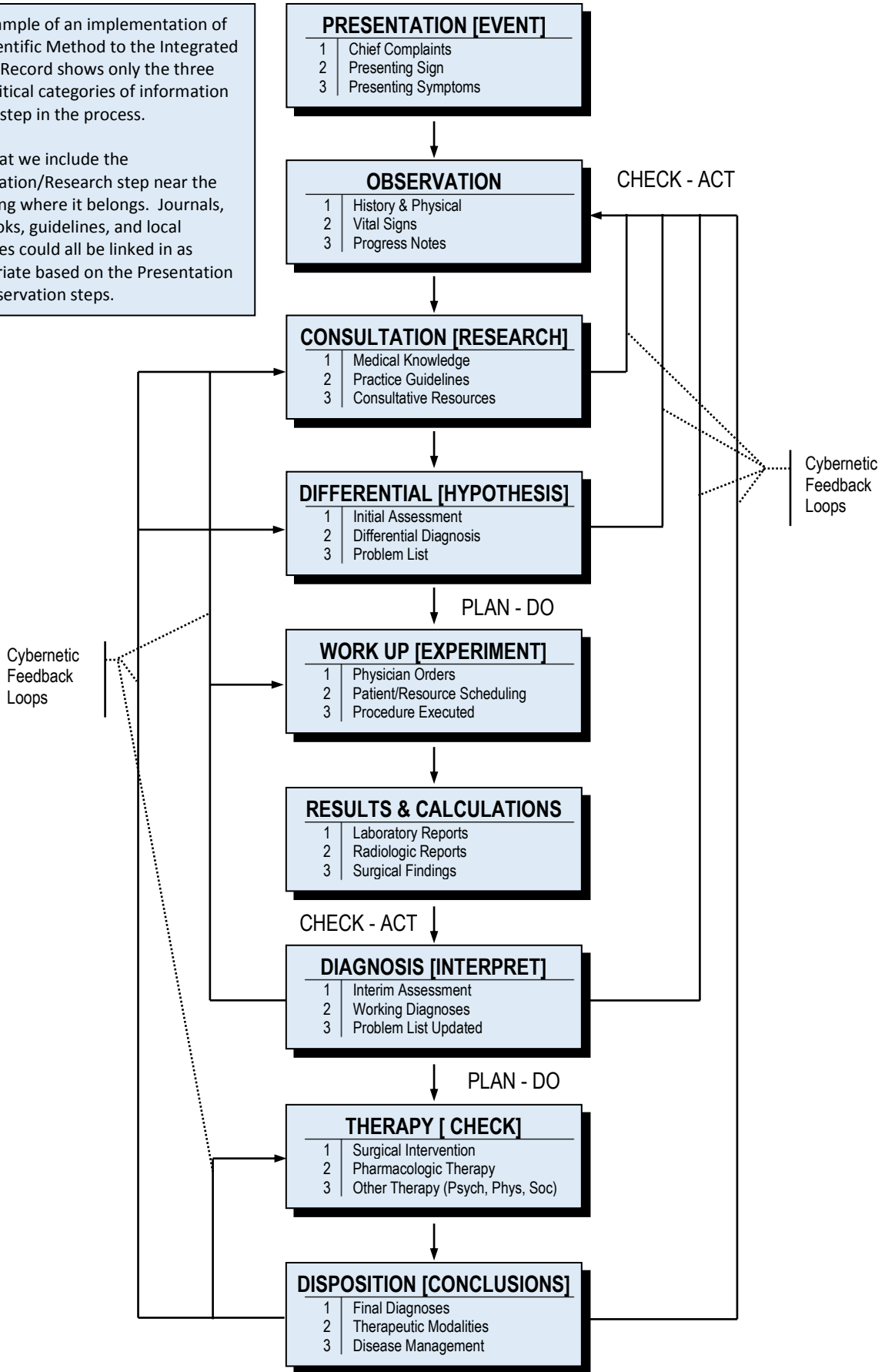
The Scientific Method provides a complete self-contained and self-correcting superset of Edward Deming’s Plan Do Check Act system and subsumes the Root Cause Analysis System making it the best approach to medical practice. It is well suited to being implemented using Associative Database Technology.



7 THE SCIENTIFIC PROCESS IN PATIENT MANAGEMENT – A SCHEMA FOR AN ASSOCIATIVE DATABASE STRUCTURE

This example of an implementation of The Scientific Method to the Integrated Patient Record shows only the three most critical categories of information in each step in the process.

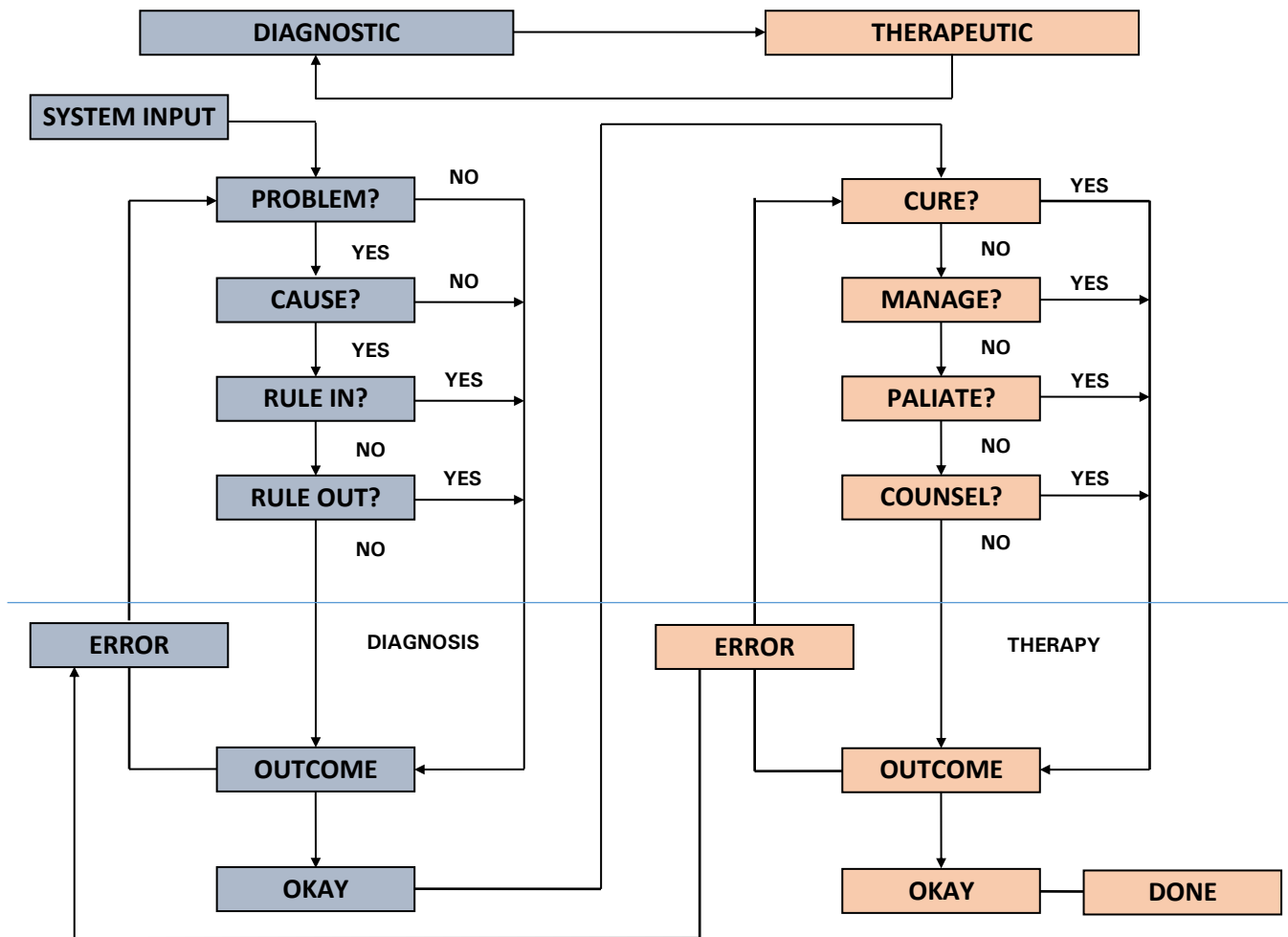
Note that we include the Consultation/Research step near the beginning where it belongs. Journals, text books, guidelines, and local resources could all be linked in as appropriate based on the Presentation and Observation steps.



**8 OBJECTIVES FOR HEALTH INFORMATION MANAGEMENT**

STRATEGIC OBJECTIVES ARE TO ASSURE
1. EVERY SIGNIFICANT <b>EVENT</b> IS <b>OBSERVED</b> . 2. EVERY SIGNIFICANT <b>TREND</b> IS <b>IDENTIFIED PROSPECTIVELY</b> . 3. EVERY SIGNIFICANT OBSERVATION AND TREND IS <b>DOCUMENTED</b> . 4. EVERY SIGNIFICANT OBSERVATION AND TREND IS <b>RESPONDED TO BY</b> : <ul style="list-style-type: none"> <li>a. ATTEMPTING TO <b>DIAGNOSE</b> EVERY PROBLEM AND ITS CAUSE.</li> <li>b. ATTEMPTING TO <b>TREAT</b> EVERY IDENTIFIED CAUSE</li> </ul>
OPERATIONAL OBJECTIVES
TO CREATE A COMPREHENSIVE CLOSED, CYBERNETIC FEEDBACK SYSTEM THAT DEFINES LOGIC WHICH ASSURES ALL CRITICAL RISK, QUALITY, AND UTILITY GUIDELINES AND MONITORS ARE MET

**EXAMPLE CYBERNETIC FEEDBACK SYSTEM FOR IMPLEMENTING ARTIFICIAL INTELLIGENCE**  
[Simplified]



**9 CONCLUSION**

If we as healthcare workers do not act to correct the growing chaos in the design and implementation of the so-called electronic patient record, we will be doing a great disservice to our patients, ourselves, and society as a whole. We have in our hands the knowledge and technology to tame this chaos and bring order and rational thought to the care of our patients.

Want to know more? Contact me at [mark@manxenterprises.com](mailto:mark@manxenterprises.com)

See our website: [www.manxenterprises.com](http://www.manxenterprises.com)