

MetSys®

(Metabolic Systems Analysis)

Biochemical Analysis in Nutritional Practice

Because Every Patient Is Unique

Project Name: MetSys®

Project Value: A conservative 10% improvement in health of Americans would reduce estimated annual disease costs by \$45 Billion

Public Need Fact: Six of the top ten causes of death are the direct result of mal- or dysnutrition and lifestyle decisions. Public health and sanitation measures are causing Americans to live longer and create more time for chronic degenerative disease to develop thus increasing lifespan without increasing healthspan.

Magnitude of Problem: 58% of Americans (170 million) consistently fall short of the established RDI for essential nutrients

Drug Problem Fact: Current drug therapy prescribed properly by the medical community ranks as the 3th leading cause of death in America and Canada accounting for 132,000 and 18,000 deaths respectively in 2010. Finding a scientifically directed nutritional

alternative to drugs would save lives and health care costs. (*JAMA* - 7/28/2000)

Potential Application Fact: Currently, 45% of Americans take some form of vitamin or mineral product regularly with only 5% directed by a doctor/clinician trained in nutrition. This is a potential \$90 billion annual sale for ethical nutritional Supplementation

Number of Cases in Project: 22,000

Duration of Project: ongoing since 1979

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Overview

The MetSys project has addressed clinical, technical and methodological questions in the design and implementation of aids for conservative health care providers making nutritional decisions and patient management more comprehensive. Technically, the project has focused on the use of logical programming and knowledge-based methods for constructing an ongoing patient record creating a unique patient model implementing a single subject research design. MetSys has succeeded in integrating its generic decision support technology and electronic health care record with ongoing clinical information provided by subjective patient derived data and objective measurements from symptomatic, amphotometric and laboratory testing.

Objectives

The MetSys project has developed feedback systems to support ongoing health decision making and patient management. The main aim of the project was to establish diet, lifestyle and specific nutrient requirements for advanced clinical decision support systems; to develop tools, methodologies and architectures to construct such systems; and to develop protocol-based applications in four main clinical settings:

1. Primary care - to identify lifestyle factors including stress, diet and habits which contribute to ongoing wellness as well as potential risks in the seemingly healthy individual
2. Sports medicine – to model the physically elite individual for optimum performance making critical suggestions toward illness prevention
3. Functional medicine – use the patient as their own control in establishing diminishing symptomatology as laboratory values approach a unique attractor (optimum range)
4. Interdisciplinary nutritional practice – using diet, exercise, stress recognition and control, relaxation, herbs, vitamins, minerals, enzymes, biological flora, nutraceuticals and graphical feedback cues to educate, motivate and measure patient qualitative improvement from an unbroken serial record of cause and effect logic.

Results & Demonstration

The following scenario illustrates the types of recommendations developed by MetSys to support clinical users. It has been taken from one of the main clinical areas covered by the project: Interdisciplinary nutritional practice. Comparable recommendations were also developed in the other three fields.

A clinician/doctor sees a patient with a specific set of non-pathomagnomic symptoms, unremarkable physical findings and usual ranged blood and urine tests. The patient describes a recent physical exam where through their HMO "... nothing was out of normal but a few tests were borderline." The patient was given no care and sent home to manage their own symptoms with some suggested OTC medications, rest, and general dietary guidelines. The patient also adds some vitamins, minerals and herbs. To the patients dismay, the symptomatic picture remains after a reasonable time without resolution. Knowing that there are many sub-clinical conditions and many therapies for their restoration, the clinician/doctor proceeds by processing the same data through the MetSys series of programs and generates 1) a narrative report of findings for the patient measuring health at 10 body system levels 2) summary of lab data, symptoms and clinical considerations which are ICDA coded, and 3) recommended foods, individual nutrients and sympathetic/parasympathetic inclinations. The system supplies the clinician with details to match the patient's specific needs which is one of the most important, though complex and challenging, aspects of a nutritional practice. After 3 months the of following the recommendations of the doctor/clinician a follow-up MetSys shows improvement in 5 of the 10 systems which correlates with the patient's symptomology. Ninety day follow-up MetSys analysis are continued until satisfactory resolution of lab and symptoms is achieved.

Impact

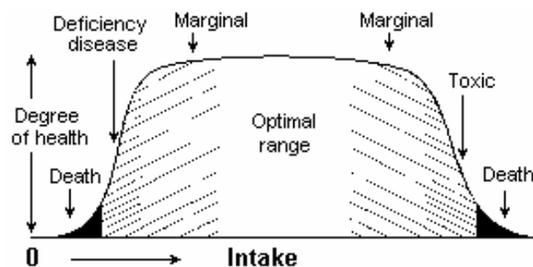
Problems involved with information dissemination and patient compliance with the best standards of care, soundly based on scientific evidence, arise increasingly common throughout health care. A substantial portion of future drugless health care will depend greatly on improved collaboration between the care giver and care receiver. The creation and dissemination of clinical guidelines is finding increasing favor with clinicians as well as patients where doctors try to keep pace with the implosion of nutritional discoveries. Use of clinical guidelines in everyday healthcare has been shown to result in significant improvements in the care process and outcomes as well as in containing unnecessary costs. The MetSys Project has demonstrated that an educated patient is a motivated patient and doctor/clinician's time constrains can be effectively managed to both the satisfaction of the patient and the efficiency of the doctor/clinician.

MetSys has built on conventional primary (objective laboratory findings) and secondary (patient provided subjective data) informatics systems by providing clinicians with protocol-based nutritional decision support (Weed, 1983). The project has applied decision support telematics in three countries where there is significant concern for the quality and efficiency of nutritional healthcare provision throughout Canada, New Zealand and the United States. MetSys technology has aimed to extend the capabilities of existing conventional clinical nutrition information systems by adding value in such areas as patient time-based data comparisons, graphic representation of ten body system functions, diagnosis of developing metabolic disorders, nutritional prescribing and reasonable expectations of follow-up.

Technology and Demonstrator Applications

The development of clinical nutrition applications in MetSys was underpinned by a methodology for establishing clinical and functional optimum ranges for age and sex specific measurements (Cheraskin, 1977). It also implemented a generic business model which formalizes protocol-based follow-up care.

Technically, the project focused on knowledge-based methods and the use of logic programming for constructing a generic technology to support clinical nutrition decision making. The decision technology supported the scheduling and execution of nutritional related tasks in protocol-based patient care. The decision functions have been used in diagnosis, investigation and therapy selection applications, and in a primary care nutritional prescribing advice system. The MetSys decision model and associated technology



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were successfully demonstrated in some 22,000 patients under the direction of twelve doctors/clinicians in 3 countries.

MetSys technology included:

- ❑ An electronic patient record, developed to accommodate protocol-based care plans
- ❑ A protocol-oriented system for supporting clinical decision making and the nutritional management of care plans
- ❑ Specific clinical applications 1) Primary Care 2) Sports Medicine 3) Functional Medicine and 4) Interdisciplinary Nutritional Practice shared care. These applications were linked to the decision and protocol support functions which access patient data stored in the electronic patient record.

Protocol-based nutritional decision support, a major concern of the project, has been critically lacking but has become widely recognized as important to the future of conservative health care and is likely to develop into a major commercial opportunity for doctors/clinicians using MetSys technology. One area of great assistance to the doctor/clinician is in predicting patient response to nutritional therapy. Tabulating Sympathetic/Parasympathetic contributions to daily activity and body system symptoms provides a useful measure of delayed response vs. hypersensitivity to metabolic shifts due to nutritional therapy.

Dissemination And Exploitation

The primary results of the project were software products to support quality and consistency of nutritional care in the majority of case presentations regardless of diagnosis or stage of pathology. The achieved objective of improved patient compliance and motivation to make lifestyle changes in a timely fashion was a surprising success. By achieving more effective application of state-of-art therapeutic knowledge in clinical nutritional care, savings in clinician time and patient cost became apparent.

The MetSys protocol model and technology have attracted particular interest from nutritional user organizations. With 96% of vitamin and mineral type of products directed and sold by health food stores or network marketing organizations, MetSys became a standardized way of providing nearly self-directed preventive nutritional care by the doctor/clinician. Links have been established between members of the MetSys doctors and direct marketing nutritional companies to host health fair or health workshops providing the doctor with marketing opportunities and patients with customized vitamin counseling.

- 1) Industrial Impact – There is likely to be a substantial market among healthcare suppliers for efficient and cost-effective telematics products which can extend the scope of primary and shared care and enable these sectors to co-operate more extensively with the nutritional product industry. Commercialization of the electronic patient record, is being carried out by a number of start-up companies in the United States as well as Canada and New Zealand. The existence of a market for a clinical trials management system for the nutraceuticals sector, based on MetSys technologies has also been established and is providing the basis of a clinical trials product,
- 2) Health/Social Impact – Doctors/clinicians in many nutritional oriented healthcare sectors experience difficulty in applying the best current scientific nutritional knowledge in everyday decision-making. Clinical decision support systems could improve both quality of care and efficiency of resource use. The aging population, growing pressures on health service resources, and public concern for the quality of nutritional care and patient life span are leading to growing roles for primary nutritional care and shared care delivered in a community setting. These changes are creating new demands for the distribution and availability of expert knowledge of best clinical nutritional practice.
- 3) Obstacles and Difficulties – Certain aims proved to be more difficult to fulfill than had been originally envisioned. Identifying healthy optimum laboratory values should have been readily available. Smith-Kline Laboratories provided randomized as well as standardized data on age and sex distribution from the multi-channel serum chemistry, CBC and urinalysis. Curve fitting of the data produced rather skewed representation of the supposed healthy population. Nine identifiable age groups for each sex were chosen and used in MetSys logic systems until 1996 when individual year breaks were recognized from the MetSys patient data-base.

Ten Reasons Why MetSys Will Make A Positive Impact On the Future Of Nutritional Practice

- 1 Nutritional science is accelerating faster than any other health field
- 2 Simplifying many complex logic processes is a cost effective endeavor

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- 3 Correlating objective and subjective data by a professional is a time consuming effort
- 4 Using a single subject design customizes a nutritional program to fit the individual nutrient needs
- 5 A recursive view of emerging data forms a seamless record of patient health status at any one time
- 6 System deviations from optimum can be quickly identified and modifications in lifestyle factors made easily
- 7 A practical approach to preventing illness emerges naturally
- 8 The Patient's time and effort is valuable
- 9 The Doctor/Clinician's time is valuable
- 10 Fast turnaround means better patient compliance

List of Doctor/Clinician Participants in MetSys Project

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