REDUCING DIAGNOSTIC ERROR IN MEDICINE

THROUGH THE INTEGRATION OF SYSTEMS AND COGNITIVE PROCESSES – A PROPOSED SCHEMA

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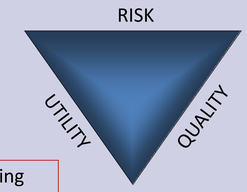
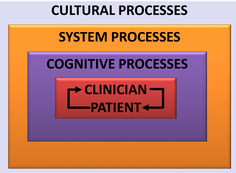


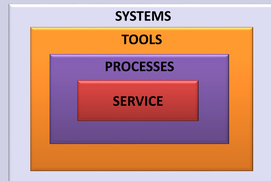
1. Describe how advances in our capacity to diagnose, when combined with more effective therapy has led to greater frequency and significance of diagnostic error. **2.** Explain how introducing Failure Mode and Effect Analysis as an organizing imperative allows for integrating systems and cognitive level processes. **3.** Discuss how the resulting schema can be used to generate a comprehensive taxonomy for Diagnostic Errors in Medicine.

SYSCOG



PROPOSED CYBERNETIC SCHEMA INTEGRATING SYSTEMS AND COGNITION SHOWING HOW IT CAN BE FURTHER ORGANIZED BY MODIFIED FMEA HEADINGS

Based on an initial review of the literature combined with personal experience as a physician and pathologist, I have begun to develop a generalized schema that provides a dynamic means of organizing potential **causes** and **frequency** of as well as **severity** of diagnostic error into a useful taxonomy. Clearly, more work is necessary to attain a level of generalization that is useful. However, I believe that the schema illustrated below is a worthwhile beginning from which discussion and debate can be initiated to reach our goal.



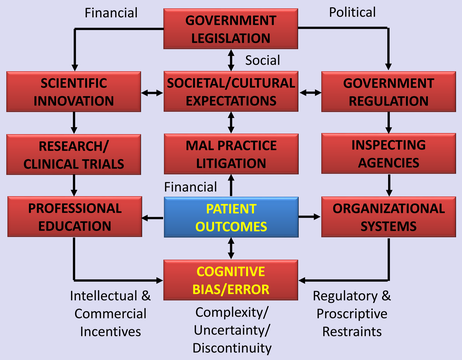
mFMEA

CULTURE OF COMPLEXITY [CULTCOMP]

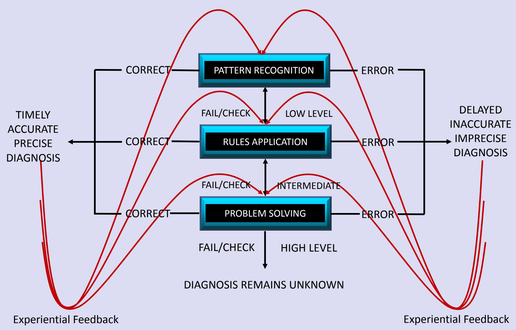
Societal and cultural forces create complexity adversely affecting health care systems and diagnostic cognition. Advances in knowledge and technology arising from these forces have lead to the capacity to detect disease earlier. This paradoxically increases uncertainty since early disease often does not fully meet established diagnostic criteria. Add the attendant complexity on the therapeutic side and you've got real problems.

A simplified schema of how this works is shown below.

SIMPLIFIED SCHEMA OF CULTCOMP CONTEXT



DIAGNOSTIC COGNITIVE CASCADE IN BRIEF



FMEA/SYSCOG COMPONENTS

TOOLS
SERVICE

SYSTEMS
TOOLS
PROCEDURAL
SERVICE

SYSTEMS
TOOLS
PROCEDURAL
SERVICE

ERROR MODE
FAILURE MODE
HARMS DONE

SIGNALS — **Characteristics**: Type/Density/Complexity/Clarity [Signal/Noise]/Amplitude/Duration/Order

MODULATION — **Raw and Modified** via Tools [Radiologic/Microscopic/Laboratory Instruments/etc.]

RECEPTION — **Neurologic**: Eyes: Light/Ears: Sound/Fingers: Pressure

PERCEPTION — **Neurologic** : Low Level Neuronal Processing – Perceived/Not Perceived/Misperceived

Intrinsic | Form

FILTERING — **Neurologic**: Low Level Neuronal Limits to Signal Acquisition – Monitor/Attention/Focus/Alertness

Slips
Lapses

TRANSLATION — **PRIMING –** Observation of signals such as heart sounds/EKG's/glass slides/radiographs/etc.
Signal Processing: Signals ➡ Symbols ➡ *Pattern Recognition/Discrimination* – Simple/Fast

ASSESSMENT — **TRAINING –** Carrying out tasks in the process such as history/physical/test ordering ➡ **Proficiency**
Symbol Processing: Symbol ➡ Information ➡ *Applying Rules/Heuristics* – Moderate/Intermediate

Mistakes
Violations

Extrinsic | Meaning

CONCEPTUALIZATION — **EDUCATION –** Learning concepts of disease pathophysiology and clinical presentation ➡ **Reasoning**
Information Processing: Information ➡ Knowledge ➡ *Associations/Problem Solving* – Complex/Slow

DECISION[S] — **EXPERIENCE –** Bias/Commission/Omission/Timeliness vs. Accuracy ➡ **Competency**
Judgment: Assign Diagnosis or Seek More Information/Knowledge *in the form of additional Testing/Reading/Consultation*

Episodic

ACTION | INACTION — **Judgment**: Treat/No Treat or Seek More Information/Knowledge *in the form of additional Testing/Reading/Consultation*

NEED TO KNOW
CULTURAL IMPERATIVE
NEED TO ACT

EFFECT

ERROR/FAILURE CASCADE TO PATIENT HARM

EXPECTED | UNEXPECTED — REACTION — **Clinician Response**: Cognitive, Emotional, Organizational, and Social Goals and Values ➡ Motivation and ***Perceived Acceptable Risk****/Justification/Hindsight - Foresight*

WANTED | UNWANTED

NO FAILURE | FAILURE

OUTCOME/SEVERITY

NO HARM PERCEIVED | HARM PERCEIVED — **Patient Response**: to Interaction/Diagnostic Processes/Diagnoses/Therapy/Management Actions
Produces New Signals as Feedback – ***Consequences of Decisions and Actions***