Emerging Research

Modeling physician practice change using the Integrated Systems Model

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rt has been estimated there is a 17-year lag time between medical discovery and when Americans benefit from resulting physician practice changes. In this article we use the Integrated Systems Model (ISM) to characterize the processes underlying physician practice change, and describe how we will validate it in ongoing research.

The Integrated Systems Model (ISM)
The ISM models physician practice as a complex adaptive system (CAS) with 3 major components: (1) Superstructure is the center: context, inputs, process, and products. (2) Change (top part of the inputs box) where alignment with the ongoing processes is designated by the angle theta (theta values <90 degrees are parasitic, drawing down system reserves, while values >90 degrees are symbiotic and contribute to increasing system reserves). This loop enabling the system to adapt to changing conditions. (3) Motivators, the bottom loop, which return resources that recharge the reserve and power the entire system. The metrics and incentives boxes assay the outputs of the system and direct where resources returning to the system are expended and can yield supplemental resources to the system. The arrows depict the manner in which the different parts functionally interact.

ISM models the practice as a system, with change being a loop outside the ongoing processes because change requires diversion of resources from the normal practice flow into the reserves that sit atop the inputs box. Failure to have sufficient reserves to power this loop puts the system in crisis and can lead to failure. The costs of change (in both time and money) depend on the scope of the change, but can be divided into 2 types: startup and recurring. Startup refers to 1-time costs to make the change. Recurring costs are those incurred for maintaining change.

The ISM defines each entity in the model as an agent or a microsystem in a larger system represented by the context. Individuals in the model operate from a set of simple rules (a feature of a CAS), but the exact nature of the rules differs with each microsystem. ISM proposes there is a subsystem for each individual in the system (health care professionals and patients). Financial solvency and quality care are critical aims of the physician practice microsystem. There are often multiple changes being considered at any given time, putting them in direct Darwinian competition. Generally, innovations producing a more positive theta value will win.

Although the model provides a

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framework for understanding how physician practices adopt change, it is not yet sufficiently developed to provide specific guidance about how to structure desired practice changes. We have generated guidelines for continuing medical education, but work still needs to be done to develop methods to measure and quantify theta and determine at what levels physician practice change begins to occur. We also need to develop the statistical models that will incorporate all components and yield quantifiable probabilities of making and sustaining change. The overall model is conceptualized as a form of CAS, however, this assumption needs to be tested and the components defined. Individuals in a CAS operate off of a limited set of simple rules. These rules need to be confirmed, and it needs to be determined to what degree they are system-specific or generalizable across physician practices. These and other issues pertaining to the ISM will be the focal point of our research in the coming years.

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References
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