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Problems and Opportunities in the Application of Efficacy Research

The evaluation of the use of skull radiography in head trauma has become the cornerstone for the resurgence of efficacy research in radiology. Ever since the landmark publication by Bell and Loop [1] on the utility and futility of skull radiology, a significant and increasing component of radiologic research has been devoted to evaluating the implications of diagnostic procedures in patient care. Considerable effort has been devoted to discovering and assessing the benefit of alternative diagnostic procedures in terms that may be meaningful to physicians in diagnostic decision strategies. Underlying many previous efforts [2] is an a priori assumption that research activities that define the merit of a diagnostic procedure naturally lead to a more rational choice of procedures by both physicians and patients.

Further research, particularly in the area of skull radiography, has shown that this assumption is not necessarily valid. The behavior of physicians in requesting diagnostic procedures and of patients in assuming that they should have diagnostic procedures have not uniformly responded to empirical data. Other forces obviously play a significant part in physician and patient behavior. Many of these forces may be logical in their own right and thereby represent a classic example of bounded rationalities [3]. Obviously, if the results of efficacy research are ever to be implemented in the practice of medicine, it is important to better understand the bridge between experimental observations and their ultimate clinical application.

Cummins (this issue, pp 339–342) has provided us with an insightful commentary on the behavior of a select group of physicians in requesting a skull film for the management of head trauma. He identifies several probable explanations for "overuse" of skull films, many of which were not in the literature. While they are intuitively reasonable and indeed appreciated in practice, their relation to the application of efficacy research results is increasingly important as further expansion of this research proceeds. The particular con-

cerns with patient demand, time exigencies, fear of uncertainty, compliance, etc. point to potentially rewarding areas for well designed experiments that might yield a more quantitative assessment of the significance of these demand components in clinical strategies.

Unfortunately, while time exigencies, patient demands, and "routine" radiographs are logical motives in a context of bounded rationality, and understandable in the light of human nature, they are certainly not rational with respect to the clinical decision-making paradigm that has as its goal efficacious patient care. Hopefully, additional research into physician behavior and market demand in diagnostic procedures will yield more meaningful insight into the implications of these various motivating factors.

In the context of the demand component, Cummins reviews the relevant decision-making approaches (i.e., pattern recognition, method of exhaustion, and hypothesis testing). Significantly, although these strategies have been identified before, the residents in this study, who were interviewed by the author, used different strategies for different patients, and elements of all approaches entered into their treatment of any specific patient. This observation, while enhancing the complexity of analyzing the decision strategies, may be useful in planning future investigations either by simulation or clinical observation. It will be necessary to ascertain the attributes of the decision-making process that produced tendencies toward a specific strategy.

Obviously, the results of this investigation and those of others [4] clearly point to a need for improved physician education in the principles of decision-making and in the factors that affect human behavior in the patient care process. The rather remarkable capacity of the residents to wholeheartedly disagree with prior established high-yield indications that they found too lenient (i.e., prone to false-negative findings) is not atypical for young physicians. Unfortunately, the type II error (increase in false-positives) does not seem to be as widely recognized by physicians as

is concern for missing something. Here again, one could point to a need for broader physician understanding of the implications of current research in diagnostic decision analysis and clinical behavior.

A major contribution of Cummins' article relates to the observation that "the context in which decisions are made plays a cardinal role in request for skull films," an observation that not surprisingly has been neglected as an important value in prior radiologic research. The mere capacity to invent new diagnostic tests or improve on the fidelity of prior technologies without an appreciation of the context in which they are to be used limits this potential contribution of radiology to patient care. Obviously, radiologic research must extend beyond the confines of image production and evaluation as it becomes increasingly important to understand the totality of diagnostic resource application in patient management. The development of technologies has proceeded more rapidly than the evaluation of their respective effects on the total diagnostic picture. This important consideration should thus provoke further research into a clearer understanding of physician behavior and diagnostic decision analysis. More efficacy research, extending beyond the simple identification of the merits of alternative

diagnostic tests on an empiric scientific basis, must be undertaken. This research area must include and consider factors that affect physician behavior as well as the contextual basis in which medical decisions are made.

While Cummins fully recognizes the limitations of the methodology he used in interviewing residents, it is apparent that the phenomena he describes may represent a significant advance in our understanding of the need for further research into this important issue.

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