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In reply

We are grateful that Dr Ferguson points out the utility of the GAPS approach in the prevention of unwanted pregnancy, an area of great interest to family physicians. Following a cycle of goal setting, assessment, planning, and start-up, this approach applies to a broad range of clinical areas. The GAPS approach might also apply to improving the care of patients with chronic and acute conditions.

We encourage others to explore the impact of GAPS on such clinical areas as the care of asthmatic and diabetic patients, personally and through clinical trials.

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Chaotic Family Dynamics

I enjoyed the article by Smith¹ in the March 1994 issue of the ARCHIVES a great deal. It is a pleasure to see such information presented in medical literature, especially family medicine, since it may mean that the Glass and Mackey² comment "that detailed mathematical and theoretical analyses are not appropriate in biology . . . [and] the mathematical training of most biologists and physicians is minimal" is not as true today. As a closet numbers dabbler, I am intrigued by the chaos theory; however, I am not sure why.

One of the points Smith makes is that the concept of homeostasis is "profoundly comforting . . . that the human body will put itself back to normal after it has been disturbed . . ." but this appears to *not* be the way that life, or at least health, may work. I found it interesting that

he would then characterize a chaotic or strange attractor (his Figure 5) as showing a "system that was momentarily perturbed . . . and then regained its composure."¹ Again, this suggests the comforting thought of a composure to be regained; however, I think healthy chaos means that there are literally an infinite variety of states to be obtained and that no single state is preferred. The implications of this sensitivity to initial conditions is just as devastating to medicine as it is to Lorenz's meteorology—the butterfly strikes again!

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In reply

Mathematics is important in family medicine. Calculus and differential equations are especially important because they allow us to conceptualize how systems evolve. Those who look at medical problems from a primary care perspective may be in the best position to apply mathematical concepts because our natural preoccupation is with the macroscopic behavior of organs and people, rather than with microscopic details.

Romanic's struggle to reconcile the implications of chaos theory is typical of the mental journey that we all have to take to comprehend strange attractors. I recall spending several months testing refinements of the double-scroll computer program, hoping to plot the ultimately correct trajectory that the system traced in its strange attractor. With every increase in the precision of the calculations, the trajectory would shift, sometimes a little and sometimes a lot. Where was the truth? What was the answer? At last, I accepted the proposition that the general geometry of the strange attractor was comprehensible, but the exact systemic behavior was not.

Healthy chaos does mean "that there are literally an infinite variety of states to be obtained." But those states are confined within the volume of a strange attractor. Even if we knew exactly where the system is right now within the strange attractor, we could not say exactly where it will be tomorrow.

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