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## THE DANGER OF CONFUSING “NORMAL” AND “HEALTHY”

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Patients, as well as doctors, often consider normality to be the desired goal. Intellectually and emotionally most of us like the idea of “normal” and are uncomfortable or even threatened by the idea of “abnormal”. We are all more comfortable with what is average and familiar. The normal is something standard. In medical practice the normal has become *the* standard. I will suggest, here, that our goal should be health, not normality.

It is worth considering the reasoning process involved in establishing what we consider normal. (1,2) *Inductive* reasoning, that is, generalizing from the particular, is one methodology of defining the average or the normal; it is the one largely utilized in medical practice. The method is as follows: many individuals are studied, the numbers tallied, and the average calculated; the distribution of the individuals around that average, or normal value, then is used as a way of estimating the degree of abnormality. Because abnormal values are characteristically associated with a lack of health and normal values typically associated with the lack of illness, it is generally believed that normal findings are an indication that illness is not present. A specific example of reasoning would be as follows: The average intraocular pressure is 15 mm Hg.; most people with IOP of 15 mm Hg do not have glaucoma; therefore, (reasoning inductively) a person who has a pressure of 15 mm Hg does not have glaucoma. However, as is always the case with inductive reasoning, certainty is never possible.

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*Deductive* reasoning is the method in which one goes from a definite truth to a particular, rather than the other way around. For example:

All people die.  
Martha is a person.  
Therefore, Martha will die.

The conclusion in this case with this type of reasoning will always be true, as long as the premise is true. Deductive reasoning is notably absent from the way physicians think and reason. This absence has serious consequences for patients.

Let us define health as that situation in which a person feels well and functions well. That statement, then, would serve as the universal, generalizable truth. Then consider the following:

Health is a situation in which a person feels and functions well.  
Martha feels and functions well.  
Therefore, Martha is healthy.

Because the initial premise is true, the conclusion must be true.

Let us make this more complex now:  
Health is a situation in which a person feels and functions well.  
Martha feels and functions well.  
Martha has an intraocular pressure of 30 mm Hg  
(or Martha likes to cook artichokes.)  
Therefore, Martha is healthy.

This reasoning is not so clean, and in fact, whether Martha’s pressure is 15 mm Hg or whether she likes to cook artichokes is unrelated to whether or not she is healthy. But, since she feels well, she *is* healthy.

If we physicians want to be successful in helping patients achieve an outcome of health, then that outcome has to be the “truth” that we take as our gold standard. We need, then, to assess the person’s health as directly as possible. The most important method of assessing that is the history. Additionally, tests of clinical performance are increasingly emerging in the field of medicine, and allow accurately quantifying how well individuals can perform the activities of daily living. (3-7) We physicians need to be alert to the development of these tests and start employing them in our practices as they become clinically useful. We also need to be cautious about continuing to reason inductively, as we almost always do, from the individual to the universal. That method forms the basis of almost all medical teaching, the so-called case system. While the method is useful, its limitations are usually ignored.

There has long been a tension between the “clinician” and the “academician”. Clinicians are primarily concerned with the specific individuals under their care, and try to apply universally-true principles to those individuals. In contrast, academicians tend to think of individual patients as examples of a population, the nature of that population being established by the characteristics of the individuals within the population. Probability and certainty are different things. Adding up bits of information to come to a conclusion, the inductive method of reasoning, is a dangerous way of thinking, even though it is the standard method that physicians are advised to employ. In the field of function, for example, there is now indisputable support for what every thoughtful observant ophthalmologist has known for many years, specifically that some individuals with normal visual acuity and normal visual field do not perform well with regards to those activities of daily living that require vision, whereas some individuals with marked loss of visual acuity and marked loss of visual field do perform well. Adding up bits of information to come to a conclusion is a dangerous way of thinking, even though it is the standard, current method that physicians employ.

The critically important words that need to be added to the way most physicians reason are “all”, or “always”. Consider the following:

Premise

All persons with an IOP of X have glaucoma.

Mark has an IOP of X.

Therefore, Mark has glaucoma.

This conclusion is always correct. What, then, is the value of X? It certainly is not the average, that is 15 mm Hg; nor is it a standard deviation of the average, 21 mm Hg; nor is it even five standard deviations above the average, 30 mm Hg. Not all individuals with IOP of 30 have or will get glaucoma. Physicians need to consider carefully the huge implications of the fact that a measurement of the most important risk factors or disease can be more than five standard deviations greater than the normal and still not be associated with the disease for which it is a risk factor. That fact should make us reconsider the entire way we consider data, including risk factors.

## CONCLUSION

If we physicians are serious that our stated purpose is to try to restore, maintain or enhance the health of patients, then we need to consider as directly as possible the health of our patients, and not be satisfied with indirect surrogates which are frequently invalid measures of health. We need to pay far more attention to what is *always* associated with health (or disease) and far less attention to what is only sometimes associated with health (or disease). Concepts of normal or abnormal are not interchangeable with concepts of health.

## REFERENCES

- (1) Inductive reasoning: Experimental, developmental and computational apparatus. Aidan Feeney and Evan Heit (Eds.) Cambridge University Press, Cambridge, 2007 ISBN 978-0-521-85648-5.
- (2) Logic: Deductive and Inductive. Thomas Fowler, Elibron Classics, Adamant Media Corporation, 2007.
- (3) ALTANGEREL U., SPAETH G.L., STEINMANN W.C. – Assessment of function related to vision (AFREV). Ophthalmic Epidemiol 2006; 13(1):67-80.
- (4) WARRIAN K.J., ALTANGEREL U., SPAETH G.L. – Performance-based measures of visual func-

- tion. *Surv Ophthalmol*. 2010 Mar 4; 55(2):146-161. Epub 2010 Jan 13.
- (5) MILANESCHI Y., BANDINELLI , CORSI A.M., VAZZANA R., PATEL K.V., FERRUCCI L., GURALNIK J.M. – Personal mastery and lower body mobility in community-dwelling older persons: the invecchiare in chianti study. *J Am Geriatr Soc*; 58(1):98-103.
- (6) VOLPATO S., CAVALIERI M., GUERRA G., SIOULIS F., RANZINI M., MARALFDI C., FELLIN R., GURALNIK J.M. – Performance-based functional assessment in older hospitalized patients: feasibility and clinical correlates. *J Gerontol A Biol Sci Med Sci* 2008; 63(12):1393-8.
- (7) McDERMOTT M.M., TIAN L., LIU K., GURALNIK J.M., FERRUCCI L., TAN J., PEARCE W.H., SCHNEIDER J.R., CRIQUI M.H. – Prognostic value of functional performance for mortality in patients with peripheral artery disease. *J Am Coll Cardiol* 2008; 51(15):1482-9.
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