

R. H. Adler

Medical Division Lory, Inselspital,  
University of Berne

## Hard and soft data: a semiotic point of view

### Only hard data are useful

Attitude and bias towards hard and soft data, although often concealed, play a role in clinical medicine, teaching and research. In the literature, the problem of hard and soft data has only occasionally been discussed [1, 2]. It is found in the area of qualitative and quantitative research [3, 4], of test-sensitivity and specificity, and of clinical biostatistics [5]. However, the terms qualitative, quantitative, sensitive, specific are free of value judgement and the pejorative connotation which is attached to the hard-soft differentiation. As Feinstein wrote: "... hard data have been excessively venerated to an extent far exceeding their inherent im-

portance or actual reliability; and soft data have been not merely de-emphasized, but deliberately excluded or eliminated from consideration. For the clinico-statistical worshipper ... soft data are not just 'dirty' and sinful; they are scabrous horrors, to be expunged from civilized numeracy." [5] Perhaps the subject matter is of no importance; anyone dedicated to a serious scientific approach – and who is not – swears by hard data. The questions are seldom posed as to what distinguishes hard data, do they exist at all, how do they differ from soft data, or is there room for soft data in "serious" medicine.

### Characteristics of hard and soft data

Instinctively, I would consider the value of serum creatinin to be hard data. It gives me information about renal clearance; the patient's age and weight are determining factors. Semiotically expressed hard data are index signs representing a limited number of factors. The serum troponin level represents another example of hard data. It reflects necrosis of myocardial tissue. In patients who have suffered myocardial infarction the severity of depressive feelings is as significant as the decrease of the ejection fraction with respect to potential acute cardiac arrest [6]. Depressive feelings as an index sign are probably determined by a greater number of factors than is serum creatinin, and are considered to be soft data. The increased risk of cardiac events after myocardial infar-

tion in socially isolated individuals is another example of the significance of soft data [7]. One distinguishing feature between hard and soft data could be the greater or lesser number of factors which are referred to by the sign. A second feature could be the mainly explanatory aspects of hard data and the additional managerial features of soft data [2].

In the first two examples, which I would say belong to the category of hard data, factors independent of the patient and physician as persons play a role. They are called "objective". In the third and fourth examples the factors have to do with the persons of the patient and physician. These are called "subjective". A further distinguishing feature could be the association of the sign with either the objective or

---

Correspondence:

Prof. Dr. med. Rolf H. Adler

Medical Division Lory

University of Berne

Inselspital

CH-3010 Berne

e-mail: irene.baechler@insel.ch

subjective world. Feinstein's characterization of hard and soft data corresponds with the features outlined above: "hard" is usually applied to information that is unequivocal, derived from specimens that are preservable (blood, cells, ...), with observations that are made ob-

jectively (preferably with a machine), and expressed in quantitative dimensional terms. ... Soft information is intrinsic to human life and to the judgements made in clinical practice ... pain, discomfort, distress, insomnia, ...

## Theoretical models of medicine

This directs our attention towards the development of the terms "subjective" and "objective" in the history of science. The splitting of subject and object was suggested by R. Descartes. He called the discerning id "res cogitans" and discernible nature "res extensa". "Res cogitans" corresponds to the subject and "res extensa" to the object or nature itself. The human element is, thus, removed from nature and the living organism receives the attributes of an engine functioning by physical and chemical laws and assessable by count and measure. Feinstein deplored this development [2]: The activities of ordinary clinical care are placed outside the domain of scientific methodology. Despite these technological advances, however, few dramatic improvements have occurred in the basic science of managerial decisions ... we rely too much on technological data and not enough on human perceptions. ... this has led to the omission of an enormous amount of crucial clinical data from the scientific analysis ... The inference seems logical that hard data refer to the engineering [8] model of medicine,

whereas soft data refer to a somato-psycho-social model including psychological and social elements. It is not surprising that medicine has been emphasizing the engineering model for over two hundred years. Controlling nature through mechanistic intervention has led to enormous technical progress in medicine, and there is more to follow. It seems advantageous to work with hard data. In addition, it is simple and seems time-saving. However, it is erroneous to assume that it is impossible to measure and do research with soft data. Corresponding scales (ordinal and nominal) exist, and in the case of skewed distribution data there are non-parametric statistical procedures. Furthermore, the scales can be examined for their internal consistency (i.e. correlation of individual test-items with the sum test score); they can be validated with other tests; the reliability of ratings can be tested over time, and the reliability of the rating of the same data by different raters can be assessed (i.e. interrater reliability).

## A clinical example of soft data

A male patient in his late seventies is hospitalized because of right-sided chest pain in connection with respiration and is anticoagulated because of suspected pulmonary embolism. A chest X-ray reveals an infiltrate in the area of the pain, in the phrenicocostal angle and right lower lobe. As tutor of a student group, I learn during the interview that the patient's wife was admitted to the same hospital two weeks previously with chest pain; there she died of pulmonary embolism. The man's behavior, the social background elicited and lack of physical signs of pulmonary embolism (sputum, ECG, etc.) suggest a conversion symptom connected with grieving, i.e. the bodily expression of an unconscious wish and of the psychic tendencies which attempt to suppress the wish. We

searched for and found old chest X-rays which showed exactly the same opacity. The pain could not be explained by hard data. It was necessary to find an interpretation that would include the relationship between the patient and his environment (soft data). It is remarkable how consideration of the relationship and a change from an engineering to a somatopsychosocial approach can change a diagnosis. Thus the question arises as to the value of hard and soft data.

The clinical example shows that soft data can be generated in a tertiary medical center just as well as in a primary practice. Their careful consideration is of vital importance to the diagnosis which should not be based on hard data alone.

## Data value

Data value does not depend on whether “hard” or “soft”, but rather on the question asked. Hard data belong to the realm of physical and chemical interventions in medicine. The interpretation of soft data allows the physician to comprehend the subjective individual reality [9] in which the patient lives with his or her disease. Each question is related to a theory and leads to answers on that level. Each question utilizes the language of its own level. Questions of a molecular nature find answers in the language of molecular biology; sociologic questions use sociologic terms. The prob-

lem of how different levels in the hierarchy of living organisms are linked is of utmost importance in medicine, but will not be pursued here [10]. Hard data, or speaking semiotically, signs representing only one or few factors are therefore only helpful when being used in the engineering model.

At this point, it must be said that the existence of hard data is an illusion. The selection of what is perceived depends to a large part on unconscious decisions of the observer, and on his conscious prejudice, which lead to a selective perception of his environment.

## A suggestion for a substitute of the terms “hard” and “soft”

In clinical medicine each sign is a potential carrier of harder and softer characteristics. This was illustrated by Wolf and Wolff's observations on Tom, their laboratory assistant, who had a fistula in his abdominal wall into which gastric mucosa had grown [11]. The two scientists introduced prostigmin through this hole into the stomach. Tom's reaction to this was cramps and diarrhea. They then administered a placebo. Tom's reaction was the same. Even after the application of atropin, Tom reacted with cramps and diarrhea. From experience, he attributed a meaning to the vehicle “pill”. The consequences of an experience became important and were propped onto the linear cause and effect causality. This suggests that it would be advantageous not to distinguish data as “hard” or “soft”. Instead, we should always examine signs for their cause and effect causality, and their meaning for the subject, and comprehend the context in which they are embedded. The linear cause-effect concept can be em-

ployed in the engineering clinical field provided we are dealing with somatic processes which are being elicited; the user, as a matter of principle, should always consider the meaning of the sign for the subject by analyzing its position in the individual's life context.

The scientific approach does not depend on the specific field of research [12]. Rather, it depends on the scientist's method. The outstanding importance of methodology in dealing with soft data, and the emphasis of explanation when working with hard data has been put forward by Feinstein [2]. I would suggest referring to the science of medicine as the “science of man's nature”, implying, of course, not a somatic but a somato-psycho-social nature. How data are used to answer questions determines their value, not whether they belong to the somatic, psychological or social level.

I would like to thank Thure von Uexküll and Michael Schüpbach for their critical suggestions.

## References

- Zeller C, Scherrer M. Harte und weiche Daten in der Medizin; ihre Verarbeitung durch den Arzt und durch den Computer. *Schweiz Med Wochenschr* 1979;109:773–80.
- Feinstein AR. An additional basic science for clinical medicine: I. The constraining fundamental paradigms. *Ann Intern Med* 1983;99:393–7.
- Sells SP, Smith TE, Sprenkle DH. Integrating qualitative and quantitative research methods: a research model. *Fam Proc* 1995;34:199–218.
- Baum F. Researching public health: behind the qualitative-quantitative methodological debate. *Soc Sci Med* 1995;40:459–68.
- Feinstein AR. Clinical biostatistics. XLI. Hard science, soft data, and the challenges of choosing clinical variables in research. *Clin Pharmacol Ther* 1977;22:485–98.
- Frasure-Smith N, Lespérance F, Talajic M. Depression following myocardial infarction. *JAMA* 1993;270:1819–25.
- Case RB, Moss AJ, Case N, McDermott M, Eberly S. Prognostic importance of social and economic resources among medically treated patients with angiographically documented coronary artery disease. *JAMA* 1992;267:515–9.
- Foss L, Rothenberg K. The second medical revolution. From biomedicine to infomedicine. Shambala, Boston, London: New Science Library; 1987.
- Uexküll TH, Wesiack W. Wissenschaftstheorie: ein bio-psycho-soziales Modell. In: Adler RH, et al. Hrsg. *Psychosomatische Medizin*, 5. Aufl., 1996, Kap. 1.
- Adler RH, Uexküll TH. Die individuelle Physiologie als Zukunftsaufgabe der Medizin. *Schweiz Rundsch Med Prax* 1987;76:1275–80.
- Wolf S, Wolff HG. Human gastric function. An experimental study of a man and his stomach. 2nd ed. London, New York, Toronto: Oxford University Press; 1947.
- Odegaard CE. Dear Doctor. A personal letter to a physician. Menlo Park, CA: Henry J. Kaiser Family Foundation; 1986.