



## The Legacies of Rudolf Virchow: Cellular Medicine in the 20th Century and Social Medicine in the 21st Century

Darren A. DeWalt MD and Theodore Pincus MD

<sup>1</sup>Robert Wood Johnson Clinical Scholars Program, University of North Carolina at Chapel Hill, NC, USA

<sup>2</sup>Division of Rheumatology and Immunology, Department of Medicine, Vanderbilt University School of Medicine, Nashville, TN, USA

**Key words:** cellular medicine, social medicine, biopsychosocial model, Virchow

IMAJ 2003;5:395–397

Most advances in twentieth century medicine may be viewed as based on a paradigm of “cellular medicine,” which may also be termed a “biomedical model” [1]. This approach is based on a “reductionist” perspective to identify a single cause and “cure” for each disease, with preeminence of high technology, “objective” laboratory and imaging data in diagnosis, prognosis, and monitoring of patient status [1]. A person’s health is viewed as largely the responsibility of healthcare professionals and the public health system, with little contribution from the individual patient. Outcomes are determined by access to health professionals and medical care, and depend on the actions of these professionals without any influence on the part of the patient, as the mind and body are regarded as independent [2].

The cellular biomedical model approach appears most effective in acute diseases, and in acute events within chronic diseases – the primary health problems at the beginning of the 20th century. The preeminence of cellular biomedicine is most apparent in the acute inpatient hospital, the traditional primary arena of medical care, education and training. Almost all actions are based on “orders” of health professionals, with limited contribution of the patient to the outcome.

A major contributor to the development of the cellular biomedicine paradigm was Rudolf Virchow, the great 19th century German pathologist. Virchow recognized that “*omnis cellula ex cellula*,” i.e., cells are derived from cells, rather than from humoral principles, as was thought in the mid-19th century [3]. The principles of “cellular medicine” led Virchow to many celebrated contributions concerning the pathophysiology of leukocytosis, leukemia, thrombosis, pulmonary embolism, mycoses, amyloid, trichinosis, and other diseases [3]. Virchow’s description of cellular medicine, together with the germ theory of Pasteur and Koch, provide much of the foundation for the spectacular advances of 20th century medicine.

The cellular medicine paradigm has been less successful in chronic diseases, the primary health problem at the end of the 20th century and the principal basis for disability and medical expenditures in the United States [4]. Chronic diseases are characterized by complex pathogenetic mechanisms involving

interactions of the host and environment, efforts to “control” disease with multiple approaches rather than with a silver bullet “cure,” and “mind-body” interactions [2]. In chronic diseases, much clinically relevant data in diagnosis, prognosis and monitoring of patient status are derived from patients, as a patient history or from self-report questionnaires, rather than high technology sources [5]. In chronic diseases the patient is in control 99% of the time, so that outcomes are dependent as much or more on self-management and behaviors as on actions of professionals [2].

### Limitations of cellular medicine – evidence in health disparities according to socioeconomic status

Perhaps the most prominent evidence of limitations of cellular medicine may be seen in persistent and growing disparities in health according to socioeconomic status. Such disparities have been recognized in all countries in which they have been examined, including Australia, Belgium, Denmark, Finland, Italy, Israel, Japan, the Netherlands, New Zealand, Norway, Russia, Spain, Sweden, Britain and the U.S [2,6,7]. These disparities are generally regarded as largely “explained” by limited access to medical care and/or by risk factors identified by laboratory medicine, e.g., high cholesterol. However, considerable evidence suggests that limited access to care and recognized risk factors explain only a small component of the disparities, while differences in self-management, behaviors and patient actions are considerably more explanatory of the data [2,8]. A few examples of the evidence for this conclusion are summarized briefly below.

In the U.S. population under age 65, most cardiovascular, pulmonary, musculoskeletal, renal, gastrointestinal and psychiatric diseases occur at least twofold more commonly in individuals who have not completed high school than in those who have, and are not explained by age, gender, race and smoking [2]. Non-completion of high school identifies a considerably higher likelihood of *developing* many chronic diseases, as well as having poor outcomes, than all recognized biomedical risk factors other than a single gene.

In the Whitehall study of 17,530 London civil servants, death from cardiovascular disease over 7–10 years occurred in more than 4% of unskilled workers, compared to 3% of clerical workers, 2% of professional/executive workers, and fewer than 1% of administrators [7]. Less than one-third of these differences were explained by cholesterol, blood pressure and smoking. All these individuals were working at the onset of the observation period and had access to medical care through the National Health Service.

The Beta-Blocker Heart Attack Clinical Trial (BHAT) indicated significant differences in 3 year mortality according to formal education level, which were considerably greater than differences according to whether an individual took a drug or a placebo [9]. These differences were not explained by an extensive array of high technology data at baseline, including laboratory tests, electrocardiograms and other specialized tests, but were explained by two psychosocial variables – life stress and/or social isolation [9]. Patients have optimal access to health professionals during a clinical trial, since those who do not keep scheduled appointments are contacted for follow-up visits.

The degree of socioeconomic inequality within a society is correlated with life expectancy, independent of the average income of that society [10]. Mortality rates in individual states within the USA are correlated positively with the degree of inequality within each state [11]. The effects of different social circumstances on stress, self-esteem and social relations may influence health more than do biological risk factors [10]. Health disparities according to socioeconomic status appear to be widening in the UK [12] where a National Health Service has been available for more than 40 years, as well as in the Netherlands and the USA [13].

### Virchow's writings on social medicine

The above observations suggest that new approaches to chronic diseases beyond cellular medicine are needed in the 21st century to replicate the great success of cellular medicine in acute diseases in the 20th century. One source of such new approaches is found in the writings of Virchow, who was not only an architect of cellular medicine, for which he remains prominently recognized, but also of "social medicine." These writings remain largely unknown today despite several excellent reviews [3], and are summarized here for a medical audience.

Virchow was a member of the German legislature for a time, and wrote that "*medicine is a social science, and politics nothing but medicine on a grand scale*" [3]. He stated that "We have often referred to 'the scientific method', we now find that through applying it, we have moved from medicine into the social field, and in so doing, we have had to consider some of the fundamental issues of our time" [3].

After serving on a commission in Upper Silesia to investigate an epidemic of relapsing fever, Virchow wrote, "the answer to the question of how to prevent outbreaks in Upper Silesia is quite simple: education, together with its daughters, freedom and welfare" [3]. He further suggested, "the improvement of medicine would eventually prolong human life, but improvement of social conditions could achieve this result now more rapidly and more successfully" [3]. Virchow founded a short-lived journal on medical reform, in which he suggested: "the only goal of our efforts [is] to

endeavor to build society on reasonable foundations, or, in other words, to create institutions that guarantee the liquidation of pauperism" [3]. He proposed that "physicians are the natural attorneys of the poor, and the social problems should largely be solved by them" [3].

Virchow's writings concerning "medicine as a social science" appear prophetic with respect to persistent and increased socioeconomic disparities in health over the last few decades [12,13]. In emphasis on "cellular medicine," health professionals have generally regarded socioeconomic considerations as "demographic" rather than "medical" variables, peripheral to medical care, research and reform. This view suggests that amelioration and ultimate correction of these disparities will be effected primarily through provision of more "cellular medicine" services to disadvantaged individuals. However, widening health disparities according to socioeconomic status despite continual expansion of cellular medicine over the 20th century are explained only in small part by limited access to cellular medicine. Therefore, it appears unlikely that the eradication of health disparities according to socioeconomic status will result simply from provision of more medical services.

Virchow suggested that "the improvement of medicine would eventually prolong human life, but improvement of social conditions could achieve this result now more rapidly and more successfully" [3]. We interpret this statement to suggest a need for medicine to incorporate a perspective of social medicine, or a biopsychosocial model as proposed by Engel [1], in addition to cellular medicine or a biomedical model.

### Some proposals for physician actions concerning social medicine

We would raise for consideration that investigation of psycho-socio-economic variables in disease should be regarded as within the domain of physicians and health professionals, in addition to social scientists. We believe that Virchow would favor universal access to medical care (as we do), although hopefully to more psychosocially oriented medical care. Neither Virchow nor ourselves propose to "blame the victim," the individual of lower socioeconomic status who is statistically vulnerable to disease and poor outcomes. On the contrary, if disparities in health according to socioeconomic status are to be corrected, they must be better recognized, characterized, understood, and addressed with effective interventions – beyond increased access to cellular medicine "solutions."

We propose that physicians might be leaders in social medicine and in recognizing limitations of an exclusively cellular medicine approach. We also propose a return to Virchow's view that "physicians are the natural attorneys of the poor, and the social problems should largely be solved by them" [3]. Ironically, the term "social medicine" emerged only in the 20th century [14], to emphasize other components of medical care beyond the pre-eminence of "cellular medicine." However, social medicine may be viewed as the oldest tradition in medicine, derived from principles of social justice espoused by biblical prophets, through physicians such as Hippocrates, Maimonides, and Virchow. The agenda of social medicine may be summarized to recognize and understand

how psycho-socio-economic variables affect health and disease as a direct "medical" concern of individual physicians and health professionals, not merely as a "demographic" concern of social scientists and public health officials [14]. A few suggestions might include:

- In clinical care, the "social history" might be collected rigorously by health professionals, to include education, occupation, work status, and social support, thereby providing an infrastructure for clinical and research studies to improve health outcomes. Furthermore, the "psychosocial" history might be expanded to include completion of patient self-report questionnaires to address psychosocial constructs such as optimism, helplessness, sense of coherence [15], and self-efficacy, which have been shown to predict disease outcomes as effectively or more effectively than many routinely used laboratory tests and other high technology procedures [2].
- In clinical research, renewed emphasis might be directed to the social context of disease and the importance of socioeconomic variables in disease.
- Non-completion of high school is as high a risk factor for the development, prevalence, morbidity and mortality of most diseases as any recognized biomedical risk factor derived from cellular medicine, other than a single gene [2]. This phenomenon is generally regarded as "explained" by biomedical risk factors or limited access to medical care which, as noted above, is an invalid conclusion and requires considerably more research.

In medical political action, physicians and their professional organizations must propose solutions that extend beyond mere access to more medical services to improve health and longevity of the population [2,10]. Further, physicians might become advocates of socioeconomic equality within the society, including consideration that more education might improve health as much or more than new medical facilities and increased services. If physicians do not emphasize this point, politicians and the public cannot be expected to grasp its implications.

In conclusion, Virchow's observations suggest a new emphasis on "medicine as a social science" to complement medicine as a "cellular science" in medical thinking and curricula. Renewed interest in medicine as a social science may provide opportunities for physicians and professional societies to seize initiatives toward effective healthcare reform for the 21st century. Physician leadership toward optimal treatment and prevention of disease requires

reform based on medicine as both a social and cellular science, as recognized by Virchow.

**Acknowledgments.** Supported in part by the Jack C. Massey Foundation.

## Reference

1. Engel GL. The need for a new medical model: a challenge for biomedicine. *Science* 1977;196:129-36.
2. Pincus T, Esther R, DeWalt DA, Callahan LF. Social conditions and self-management are more powerful determinants of health than access to care. *Ann Intern Med* 1998;129:406-11.
3. Ackerknecht EA. Rudolph Virchow: Doctor, Statesman, Anthropologist. 1st edn. Madison: Univeristy of Wisconsin Press, 1953.
4. Rice DP, Feldman JJ. Living longer in the United States: demographic changes and health needs of the elderly. *Health Soc* 1983;61:362-96.
5. Pincus T, Brooks RH, Callahan LF. Prediction of long-term mortality in patients with rheumatoid arthritis according to simple questionnaire and joint count measures. *Ann Intern Med* 1994;120:26-34.
6. Antonovsky A. Social class and the major cardiovascular diseases. *J Chronic Dis* 1968;21:65-106.
7. Marmot MG, Kogevinas M, Elston MA. Social/economic status and disease. *Annu Rev Public Health* 1987;8:111-35.
8. Ben-Shlomo Y, White IR, Marmot M. Does the variation in the socioeconomic characteristics of an area affect mortality? *Br Med J* 1996;312:1013-14.
9. Ruberman W, Weinblatt E, Goldberg JD, Chaudhary BS. Psychosocial influences on mortality after myocardial infarction. *N Engl J Med* 1984;311:552-9.
10. Wilkinson RG. Income distribution and life expectancy. *Br Med J* 1992;304:165-8.
11. Kaplan GA, Pamuk ER, Lynch JW, Cohen RD, Balfour JL. Inequality in income and mortality in the United States: analysis of mortality and potential pathways. *Br Med J* 1996;312:999-1003.
12. Marmot MG, McDowall ME. Mortality decline and widening social inequalities. *Lancet* 1986;ii:274-6.
13. Pappas G, Queen S, Hadden W, Fisher G. The increasing disparity in mortality between socioeconomic groups in the United States, 1960 and 1986. *N Engl J Med* 1993;329:103-9.
14. Rosen G. What is social medicine? *Bull Hist Med* 1947;21:674-733.
15. Antonovsky A. The sense of coherence as a determinant of health. In: Matarazzao JD, Weiss SM, Herd JA, Miller NE, eds. Behavioral Health: A Handbook of Health Enhancement and Disease Prevention. New York: John Wiley & Sons, 1984:114-29.

**Correspondence:** Dr. T. Pincus, Division of Rheumatology and Immunology, Vanderbilt University School of Medicine, 203 Oxford House, Box 5, Nashville, TN 37232-4500, USA.

Phone: (1-615) 936-2152

Fax: (1-615) 936-2159

email: t.pincus@vanderbilt.edu