Clinical physiology: a successful academic and clinical discipline is threatened in Sweden

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Arheden H. Clinical physiology: a successful academic and clinical discipline is threatened in Sweden. Adv Physiol Educ 33: 265–267, 2009; doi:10.1152/advan.00072.2009.—Clinical physiologists in Sweden are physicians (the majority with a PhD degree) with thorough training in system physiology and pathophysiology. They investigate patients in a functional approach and are engaged in basic and applied physiology teaching and research. In 1954, clinical physiology was founded as an independent academic and clinical discipline by the Swedish government to ensure “contact between routine clinical work and the scientific progression.” Up until 2008, clinical physiology was an independent clinical discipline but was then made a subdiscipline to radiology, a fundamentally different discipline. Individuals wishing to become clinical physiologists are required to be trained and certified as European radiologists, after which training and certification as clinical physiologists may be pursued. This means that radiologists without training in clinical physiology have become gatekeepers for future clinical physiologists. Unfortunately, this development takes place at a time when research and education in preclinical integrative physiology have diminished in favor of other organizational levels, such as cellular and molecular biology. The responsibilities for education and research in integrative human physiology have therefore mainly been transferred to clinical physiologists. Clinical physiology has been a successful independent clinical discipline in Sweden for the past 55 years and could serve as a model for other countries. Unless clinical physiologists regain control over their own discipline, systems physiology as a knowledge base and resource for patient care, education, and research will be severely impaired.

education; medical; graduate; undergraduate

THE FIRST DEPARTMENT OF CLINICAL PHYSIOLOGY was created at Karolinska Institute in 1947 by Torgny Sjöstrand. Partly inspired by this department, an evaluation of the medical school curriculum in 1953 (SOU 1953:7) found that the curriculum should be modernized due to the rapid developments within physiology and biochemistry. It reads as follows:

The new institutions, such as that of clinical physiology, should ensure “contact between routine clinical work and the scientific progression.” The committee suggested that clinical physiology should be an independent part of the medical school curriculum. In 1954 (Government Bill 1954:212), clinical physiology therefore became an independent academic and clinical discipline in Sweden. This required the fast establishment of clinical physiology in all Swedish universities.

The first Departments of Clinical Physiology in Denmark and Finland started in 1963 and 1971, respectively, and are today represented academically by professors at the universities and clinics of most of the larger hospitals (2). In Denmark, clinical physiology and nuclear medicine merged in 1982 and became a single discipline.

In Sweden, clinical physiology was an offspring of scientifically strong preclinical Departments of Physiology. Clinical physiology was meant to be a bridge between preclinical and applied clinical physiology. The name “Department of Physiology” disappeared in several Swedish universities a few years ago, and most preclinical scientists have limited or no patient contact but focus successfully on cellular and molecular biology. As a consequence of that development, there has been an increasing demand for clinical physiologists to participate in teaching human integrative physiology and pathophysiology in the medical curriculum.

Some of the founding professors of clinical physiology have concluded the following (2):

The most important task for clinical physiologists is to transfer knowledge and methods that are developed in physiology to clinical practice in healthcare, research and teaching. This requires solid knowledge in physiology and pathophysiology that enables correct conclusions to be drawn out of the enormous flow of information that modern investigational methods provide—to understand what actually happens in what seems to happen. In that way optimal requirements are shaped to develop and use those methods in the best interest of the patients.
Clinical Physiology Today

Clinical physiology is a dynamic discipline that has been under constant development since its foundation. Methods have been developed or adopted rapidly according to the needs of the healthcare system. Examples of methodology and fields of activity today are noninvasive measurements of electrical activity, pressure, flow, resistance, gas exchange, exercise testing, ultrasound, nuclear medicine, single photon emission computed tomography (SPECT), positron emission tomography (PET), and MRI. This is applied in testing for arrhythmias, regional and global cardiac function, cardiac valve function, stress-induced myocardial ischemia, obstruction to cerebral or extracranial blood flow, abnormalities of lung function and pulmonary circulation, detection of peripheral vascular disease, obstruction or functional disturbances of urogenital system, etc. Measurements are made not only at rest but also during exercise and under daily living conditions.

Patients are referred to clinical physiology from other disciplines, most commonly from e.g., cardiology, emergency medicine, family medicine, pulmonary medicine, and internal medicine. This system, to have functional testing organized within an independent department, prevents self-referral, which may induce unnecessary investigations and costs. Clinical physiology also often has the role of a “final investigational station” when other investigations have not been fruitful.

Sweden, with a total population of 9 million, has 27 Departments of Clinical Physiology with 196 MD specialists (most of them with a PhD degree as well), 49 residents, and 600 technicians, engineers, and physicists. They perform more than half a million patient examinations annually and teach basic and applied physiology to medical students, nurses, physical therapists, and engineers. Specialists from other disciplines, such as cardiology, internal medicine, emergency medicine, family medicine, pulmonary medicine, renal medicine, and anesthesiology, receive part of their specialist training (3–6 mo) in clinical physiology. Clinical physiology is also one of the most research intensive disciplines in Sweden and serves as an important research resource for other disciplines.

Current Threat to Integrative Physiology

In 2001–2002, a government-initiated survey and analysis were performed (4) with the main purpose to improve the quality of resident training and to adjust the structure of the clinical disciplines. It was finalized in 2004 (5).

It was stated that “physiology is of fundamental and undisputed importance for the basic education of physicians” and that “clinical physiology could successively take over the physiological education as the pre-clinical physiology diminishes.” This should be read with the understanding that the American undergraduate and medical curriculum also has faced difficulties with the fragmentation of physiology (6, 8, 9). However, the decision was made to terminate radiology and clinical physiology as disciplines and institute a new discipline called “image and functional medicine” where radiology and clinical physiology would merge.

In Denmark, a similar analysis was made in 2000 to see if radiology should merge with clinical physiology and nuclear medicine (7). The conclusion of the Danish Ministry of Health and the Board of Health in Denmark was the opposite to that in Sweden: there should be no merger.

What happened in Sweden was that radiology was terminated and that image and functional medicine was created with clinical physiology as a subdiscipline. Image and functional medicine, however, is in reality a change of name for radiology, which has been explicitly explained by the National Board of Health and Welfare. The translation of the new discipline in official documents in English is “radiology.”

The new federal regulations, which took effect on September 1, 2008, created a situation where radiology, a clinical discipline that is fundamentally different from clinical physiology, was given the authority to control the appointment, education, training, and certification approval that educational and training goals are met during a 5-yr residency period. After that, two additional radiologists at the National Board of Health and Welfare have to certify that the future clinical physiologist has reached the status of European Radiologist. This situation will impoverish both academic and clinical physiology as resources of knowledge for healthcare, teaching, and research in the future. The concept of systemic or integrative physiology will eventually die.

Cooperation by several clinical and diagnostic disciplines around major equipment, such as SPECT, PET, and MRI, is probably cost effective and promotes cooperation and prevents “turf battles.” The bases of knowledge in radiology and clinical physiology are, however, completely different, even if they to some extent use the same equipment in clinical practice, research, and teaching. The fundamental idea is to bring disciplines with different knowledge together to work for the best interests of the patient. This does not, however, mean that different disciplines should have the same education and training background. That would oppose the basic idea.

In 2008, in a member poll, 79% of the members of the Swedish Society for Clinical Physiology voted that clinical physiology education and training are best conducted as an independent discipline or in conjunction with nuclear medicine. Only 15% of the members voted that the education and training are best achieved as a subdiscipline to image and functional medicine (= radiology).

The Danish and Finnish Societies for Clinical Physiology and the Finnish Society for Nuclear Medicine have officially expressed serious concerns over the situation in Sweden (3). Thirty-five young people under training for clinical physiology in Sweden have expressed their concerns in an open letter to the Swedish National Board of Health and Welfare (1).

Consequences for Clinical and Integrative Physiology

The future of integrative physiology in patient care, education, and research is already compromised due to the new regulations. The recruitment of future clinical physiologists has decreased by >50% since the institution of the new regulations.

This development unfortunately takes place at a time when research and education in preclinical integrative physiology have diminished in favor of other organizational levels, such as cellular and molecular biology. These theoretical approaches have impaired the recruitment of medical staff to preclinical institutions, and the departments are now mainly manned by people with biomedical training and limited clinical competence and experience. The lack of knowledge in integrative physiology has therefore transferred the responsibility to clinical physiologists for teaching and research in human integra-
The present situation, when clinical physiology is controlled by radiology, will lead to a depletion of knowledge in system physiology, which is detrimental to patient care, education, and research. No new generation of integrative physiologists will be trained. Systems physiology will be taught by individuals who lack training and expertise in systems physiology—or not taught at all.

Conclusions

The reinstatement of clinical physiology as an independent academic and clinical discipline would assure the presence and survival of knowledge in human integrative systems physiology in Sweden. The discipline could even serve as a model for other countries. Unless clinical physiologists regain control over their own discipline, as has been the case for the past 55 years, systems physiology as a resource for patient care, education, and research will be severely impaired.

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