Wisława Szymczyk

A Medical Physics Course in Manchester in 1957

Polskie Towarzystwo Fizyki Medycznej, Oddział w Krakowie

Fifty years have elapsed this year since I attended a radiation physics course held at Christie Hospital and Holt Radium Institute (Christie) in Manchester, Great Britain. The good fortune which enabled me to go this course was due to Professor Hanna Kołodziejska, director of the Institute of Oncology in Kraków, and her personal friendly relations with Professor Ralston Paterson, founder of the Manchester School of Radiotherapy and director of Manchester Christie who was a leading authority in the world at that time in the treatment of cancer by radiation.

Professor Kołodziejska was appointed Director of the Institute in Krakow in 1954 and since then this institution has seen a steady development. She was a most versatile and highly talented person, most fascinating and totally dedicated to the cause of combating cancer. Undoubtedly, her way of life had been determined by the community awareness in her family tradition and the tragic developments in the II world war, in which both her parents and her husband perished.

Professor Paterson not only admired Professor Kołodziejska talents and untiring perseverance but he also helped her by providing her with funds and grants which enabled to offer the possibility to some young and promising employees to attend specialized courses of medical physics and radiotherapy in England.

During the II world war and soon afterwards professor Kołodziejska worked at the Radium Institute in Warsaw, which was built in the 30s and provided with radium sources by Maria Skłodowska-Curie. The Radium Institute, due to the patronage of Mme Curie, closely cooperated with the corresponding Institute in Paris and applied the

so-called Parisian System of Radiotherapy. Professor Kołodziejska, when she became head of the Institute in Krakow reversed this orientation and applied a more rational and objective Manchester System based on team work of physicians and physicists.

The Manchester School of Radiotherapy was developed by the above mentioned Professor Paterson, himself a radiotherapist, and physicists such as HM Parker, WJ Meredith and others. Professor Paterson's textbook on radiotherapy became a Bible for radiotherapists for a long time.

What should be remembered is that at that time radiotherapy, along with surgery, used to be the most important method of treating cancer diseases, whereas radium and radon were nearly the only radiation sources used in brachytherapy. Chemotherapy was considered as a "puny child".

The main principle represented by the Manchester School was the requirement of the highest possible accuracy in carrying out radiotherapy which was based on objective and precise mathematical and physical methods. This newly adopted conception of radiotherapy would demand a lot contribution on the part of the physicists. The required degree of accuracy involved all the stages of radiotherapy: planning, implementation and consistent dosimetry so "that the amount of radiation called 1000R is the same actual quantity whether in London, Scotland, the USA ... over the years".

To reach high accuracy in determining dose distribution at the stage of treatment planning Manchester School developed a comprehensive Dosage System (primarily concerning Radium brachytherapy in gynecology, interstitial and mould technique). It consists of a set easily specified rules, and assumption that the dose to the target volume should be distributed as uniformly as possible. For brachytherapy these were: tabular data outlining mg hr/1000R and radium distribution rules, for teletherapy – a "balance method" in calculation beam "weights", using depth dose data prepared and updated by physicists.

Accuracy and reproducibility in dose delivery was secured by technical service: specialist workshop and Mould Room providing individual applicators, immobilizing shells, centrators, boluses and other auxiliary devices.

The main task that the physicists were confronted with has always been the monitoring and control of radiation sources, based on standardized procedures and calibrated dosimeters according to increasingly more detailed protocols.

The Manchester System required also consistent treatment schedules of each site and disease type. This was to reduce variations due to the doctors individual intuition

and clinical experience and would result in an easier approach to radiotherapy practice, whereas accumulation of a large and homogenous clinical material made it possible to get more reliable information on treatment results, essential in the attempt to improve clinical outcomes.

Manchester hospitals: Christie and Holt Radium Institute have long been at the forefront of cancer research and therapy. At early 30s they became combined and reorganized by Professor Paterson into world famous model cancer and research center.

As early as the 1950s, Christie was already equipped with megavoltage machines, such as a 4 MeV linear accelerator, a cobalt unit a cyclotron with an extracted neutron beam, as well as a large number of conventional X-ray apparatus among others a rotating unit, a multitude of radium tubes and needles, backed by a manufacturing facility – Mould Room, Radiation Physics Department including sections of Clinical Dosimetry, Nuclear Medicine, Health Physics, (providing services to smaller hospitals) and a research unit. There was also a Radiobiology Department with experimental animals (primates).

A three-month course in radiation physics, in which I was joined by a physicist from the Institute of Oncology in Gliwice (Silesia), was international in character. The participants came from several countries, also out of Europe. Similar training courses attended in the following years several Polish physicists and clinicians specializing in radiotherapy .

The syllabus covered the following topics: lectures in radiation physics, practical work in X-Rays Therapy Department, Mould Room, Radium Handling Laboratory (mostly serviced by elderly gentlemen), Radiation Protection Section as well as regular face-to-face encounters.

The subject matter of the lectures focused on “Physics in Radiology”, that is it included production and properties of X- and gamma rays, interaction with matter, radiation measurements, nuclear medicine, radiation safety, involving the latest information from specialized literature. A large amount of work was devoted to clinical dosimetry such as, energy absorption in various body tissues (Spier’s work), rad-rentgen relationship, measurements and calculations of doses in therapy beams including those of irregular shape and in rotation therapy. These works were often based on the own research of the lecturers. A lot attention was also paid to measuring devices such as the chambers developed by Farmer, Sievert, substandard dosimeter of the Baldwin-Farmer

type, calibration of therapy beams and “acceptance tests”, which were later extended into large national and international calibration and QA protocols.

The lectures, always carefully prepared and kept up-to date, were given by well-known medical physicists, authors of fundamental works, and textbook such as WJ Meredith, JB Massey, FW Tranter, RF Farr, SK Stephenson and others. They delivered their lectures in a way that was easily understandable to everyone.

The course ended by visiting three medical physics Laboratories in three leading London hospitals.

By the way, I have to confess that when I started my work at the Institute of Oncology in Krakow, I had a feeling that the professional qualifications of the staff on all levels exceeded the requirements posed by the Institute. In Manchester, it was quite different. I had also the impression that all the research here there seemed to lie in a well-defined direction, without wasting any time or effort.

The daily routine at Christie’s was also different from ours. The day work was between 9 a.m. and 5 p.m. with one-hour lunch break. Before noon the work was concentrated on current affairs, services, lectures or demonstrations for visitors, in the afternoons there was time for research: developing new problems and methods. The atmosphere pervading the work was that of concentration and dedication, one could almost feel the British “doing my best”. The daily routine also included meetings in a large library at coffee time together with visitors from almost all continents, sometimes very exotic. The atmosphere was that of the imperial past of the United Kingdom.

Our obvious aim was to assimilate and to adopt the knowledge of all the procedures and methods that could find application on our return home. This was fully appreciated by the Manchester hosts, who provided us with the possibility of spending evenings to copy all the necessary data: isodose charts, tables, etc. in the absence of Xerox copying machines and scanners. We also met with great friendliness, kindness, helpfulness and hospitality on the part of British physicists and their families This friendship had crossed over the borders even after we have returned home.

In 1957, the Institute of Oncology in Kraków had very modest facilities for radiotherapy. There were four X-ray machines, 1800 mg of radium and one dosimeter (partly gifts from UNRRA). We used a very archaic system of radiotherapy: in brachytherapy the dose unit was a stray mcd, in teletherapy Minimal Erythema Dose was employed. In the treatment of skin cancer, heated radium sources used to be embedded directly into the dental mass, which was very risky both for the personnel and the radium

source. As a result, the doses to the patient were very poorly determined, whereas those to personnel often exceeded the permissible level.

The medical physics training course, and soon a course in radiotherapy for the physicians helped to initiate intensive team work and released a lot of energy. Professor Kołodziejska, on her part, did everything to arouse and amplify this enthusiasm by making us aware of the chance of a life time: to improve the fate of cancer patients and to make up for the backwardness in Polish radiotherapy.

To summarize, the training we had in Manchester was the first important stage in implementing the Manchester System and updating radiotherapy at the Institute of Oncology in Kraków.

The first task was to set up a Physics Laboratory and Mould Room as well as training of physicians, nurses and technicians. What was very urgent was to improve radiation safety by replacing old and adding new shielding equipment in radium handling and application laboratory.

In the first pioneering stage of development, we were greatly helped by some scientific institutions in Krakow. The necessary equipment for radium application laboratory was produced, according to our collective design, in the workshop of the Institute of Nuclear Research. The first dosimeter for determining personal doses was offered by the University of Science and Technology (AGH) -in the absence of the Central Laboratory for Radiological Protection (CLOR) to be founded much later. Beam directing devices for X-ray machines were produced in the workshops of the Jagiellonian University.

Professor Kołodziejska required that each stage of our work be completed by sending a respective report to the Polish *Nowotwory* (Cancer Diseases) Journal. Consequently, the first article: "The postoperative technique of irradiation of breast cancer" was soon published, aided by a whole set of Manchester devices increasing the accuracy of dose delivery such as boluses, centrators and isodose curves calculated according to the method developed by Meredith and Neary and published in 1956.

Manchester physicists always expressed their vivid interest in our work. They subscribed the Polish Journal *Nowotwory* (Not-to worry). They also published in English the report on our radium safe ("Radium safe from Poland"). We felt most happy when the physicists from the Democratic Republic of Germany (the so-called East Germany) while visiting our laboratory wanted to see the Farr's Machine (an analogue machine developed by Farr to calculate doses in rotational X-ray therapy). They were told that a

working Farr's Machine is to be seen in Krakow, as in Manchester it was not more used. Indeed, Farr's Machine was working successfully in our Department for many years.

All the forms of mutual interest were, of course, mainly on our side since we always wanted to follow the Manchester example and make up for our deficiencies. The British Journal of Radiology and some other British and American journals were our standard reading and application of available methods became our evident duty.

Unfortunately, direct contacts with Western countries were strictly limited in the People's Republic of Poland and invitations extended to specialists from abroad met with many obstacles. However, Director of the Physics Department of Christie Hospital, Mr. JB Massey visited Polish Institutes of Oncology four times, and each time brought with him specialist literature, books and valuable recommendations. Professor Paterson, known to be helpful in establishing first-class radiotherapy centers around the world, was to Poland twice and personally checked my ability to participate in the Manchester medical physics course.

The past 50 years of experience has taught me that although the present-day Polish material standards may not be so far distant from those in Great Britain there are, however, some things in Poland that have fallen short of our expectations, especially those of adopting, what Emmanuel Kant called the "social spirit". These are:

Omnipresent volunteer work (happily enough, already beginning to appear in this country): e.g. unemployed wives of physicians and physicists were always to be found in waiting rooms, offering help and words of consolation, as well as Sunday charity collection outside churches,

A large number of disabled persons fully employed, e.g. a physicist on a wheelchair who monitored therapy machines both in his own institution and in other places being brought by his wife, or a blind telephone exchange operator. Unforgettable also was the gallantry of a very ill little girl waiting for therapy in a room with beautiful aquarium. I tried to turn her attention on colorful fishes. She answered every my question by telling: "yes, thank you, fine, thank you"

Very careful selection of new employees by a competitive judging panel. At Christie, which I visited two times more, I found these people to become almost members of a large hospital "family",

Just as careful decision-making (with the participation of pensioned employees) in the distribution of medical equipment, always taking account of the needs by the whole macro region,

Very precise determination of duties and responsibilities,

Close cooperation between medical centers “vertically” and “horizontally” (Larger hospitals felt it was important to cooperate with neighboring smaller establishments in the supply of radioisotopes, dosimetric measurements, etc.). Close ties with the electro medical industry were also common.

Rigorous observance of predetermined rules, among other things, concerning retirement age of 65 years, which was also applied in the case of Professor Paterson, despite his perfect health condition and the great services he rendered. Professor Paterson, as a farewell gift, received his portrait by F.Topolski, a Polish artist who lived in London.

During my stay in Great Britain the notorious British conservatism and reserve did not prove to be true, on the contrary, the British turned out to be an open, friendly and solidary people, true to promises.

I came to understand the remark by Professor Kolodziejska that “she finds mental ease in G. Britain, because everything there is as it should be”.

Finally, I want to make a more personal remark. When I met with British culture in the late 1950s, it was a most impressive experience for me although very sad. It would not have, however, been so traumatic if I had expected that 50 years later the “iron” curtain would drop and Poland would join the European Union and my granddaughter would study at the Manchester University and visit my old friends.

I feel grateful to my friends: Professor Janina Kujawska and Dr Włodzimierz Łobodziec for their valuable suggestions while reading my recollections.

Translated from Polish by Oskar A. Chomicki