



# **REPORT**

**of a**

**Consultants' Meeting on**

**“Distant Learning in Radiopharmacy”**

**International Atomic Energy Agency  
Vienna, Austria  
14 to 16 June 1999**

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## **The Current Status**

Education in radiopharmacy is currently organised in a somewhat fragmented manner, with, at least until recently, little co-ordination or co-operation between different regions or organisations. The delivery of education in such a specialised field suffers from a number of intrinsic problems: only small numbers of students are normally present in any one region and are often widely dispersed geographically. There are a limited number of expert teachers available, and limited funds available to organise courses. Both students and teachers are only able to devote a limited amount of time to such education since, except for a few exceptions, there is currently no formal requirement for continuing professional development and therefore no allocation of funds or time for such activities.

The resources available and the experience in Radiopharmacy education vary from one region to another. Most have some degree of availability. For example; in the US there are a small number of distance learning and Master degree courses; in Europe a series of short courses leading to a postgraduate specialisation in Radiopharmacy has recently been organised; in Malaysia a series of radiopharmacy courses have been organised at MINT; in Latin America several courses have been conducted in the past but the need for more central co-ordination has been identified. Similar situations apply in most parts of the world and the IAEA also run occasional specialised short radiopharmacy courses in many regions.

Radiopharmacy is a variable component of a number of courses other than for pharmacists and radiopharmaceutical chemists, including those for technologists and Medical Doctors and the IAEA is active in this field. For example the Agency, with the financial support of the Australian government is currently organising a distance learning course for technologists in SE Asia which includes a radiopharmacy module and a Web-based teaching programme in the clinical aspects of Nuclear Medicine is under development. Other locally organised courses for these professional groups are available in some parts of the world.

### **Is there a Need for More Educational Resources in Radiopharmacy?**

Current programmes are unable to cope with the demand even in the developed world. For example, in the US there are insufficient Nuclear Pharmacist available to fill the available posts and in Europe more courses are required to support the Postgraduate specialisation scheme. In the developing world the small number of existing courses are able to meet only a fraction of the need. A recent IAEA survey has shown that the number of gamma cameras installed in the developing world has doubled in the last five years. These facilities require associated radiopharmacy services and the personnel providing those services need to be trained.

Thus, availability of courses remains a major difficulty and most practitioners in the field do not have adequate access to courses of the appropriate level and intensity. Those educational programmes which do exist run only as a result of the

dedication and efforts of a small number of individuals and there exists an undoubted need for a central source of support for such endeavours.

Although (outside the US) there is at present only a limited legal requirement for a specialised radiopharmaceutical qualification or continuing education, this is at least in part because of the lack of suitable courses. It would be expected that the establishment of a widely available education system would lead to a formalisation of the need for specialist qualifications in this field. The need for education is not dependent upon the nature of Radiopharmacy practice and those working in hospitals, universities, nuclear centres and industry have need of such programmes. Although a trend towards centralised Radiopharmacy services in larger cities, particularly in Private hospitals, may be predicted, such enterprises will still have a need for suitably educated individuals. Thus there exists a clear need for a sufficient number of trained competent individuals able to deliver a timely, safe and efficient service in all areas of radiopharmacy practice.

Education programmes are needed at a number of different levels ranging from the generalist health-care professional, through the more specialised technologists and radiochemist/pharmacist and much of the knowledge base is shared between these groups. Thus a core of radiopharmacy knowledge could be identified which would be suitable for all of these groups and a system of prioritisation and specialisation could be conceived through which the student could progress. In addition to this core, different groups of students with different backgrounds will require specialised areas of teaching in, for example basic pharmacy or radiochemistry.

The development of a Radiopharmacy course requires:

1. definition of a syllabus
2. assembly of the teaching material
3. delivery of teaching material
4. organisation of the course including a means of supervision, assessment, etc.

*1. Definition of a syllabus.*

An outline syllabus which would be suitable for the content of a radiopharmacy course was published in the EJNM 1999 26 BP8-BP9 and this, together with a more detailed syllabus agreed by the Committee on Harmonisation of Nuclear Pharmacy education is attached as an appendix to this report. A list of 30 topics which could form the core of any Radiopharmacy course is also appended.

*2. Source of teaching material*

A considerable amount of teaching material is already in use in those radiopharmacy teaching programmes already in existence and it seems likely that much of that material which is not protected by copyright could be collated and, after suitable editorial refinement, be provided as a central resource in order to support educational programmes as well as providing a greater degree of uniformity between the content of the course provided around the world. It will, however be necessary to assemble this material in such a way as to ensure that it is comprehensive, easily

assimilated and at the level required for the different groups of students to whom it will be directed.

### 3. *Method of delivery*

A distance-learning approach has significant attractions for delivery of a specialised body of education to a widely dispersed audience and this provides a further opportunity for centralised support of Radiopharmacy education. Through such an approach, it would be possible to provide a body of teaching material which could be used for a variety of different courses operating on different levels and suitable for different groups of students. Although different formats are available for distance learning programmes, an Internet approach has a number of advantages, since although initial set-up costs may be relatively high, distribution and subsequent updating costs are low. The technology is attractive and still developing and allows the programme to be made interactive. The main drawback of such a system is the need for the availability of modern computer facilities including fast internet access. Although fast computers are generally available in most departments slow internet access remains a problem in many centres and therefore it would be necessary to use a large memory storage device (CD-Rom/Zip disc) as a backup.

The use of an HTML (World Wide Web) approach for supply of educational material has the additional advantage that it would be relatively easy to tier the level of difficulty of the course in order to tailor it to the individual requirements of the student. Thus it could be readily envisaged that the opening pages of a particular topic would provide a foundation level with subsequent pages becoming more and more advanced. The appropriate level for groups of professional could be identified, but the interested student could progress further if he or she desired.

Thus the provision of a body of Radiopharmacy teaching material in Internet/CD-Rom (HTML) format would greatly aid the establishment of Radiopharmacy courses throughout the world. Such a body of material could be made freely available within the public domain on a suitable Internet server such as that of IAEA.

Although an Internet-based programme is readily amenable to updating, a frequency and schedule for updating will need to be agreed and an institution or individual responsible for initiating this update will need to be identified.

### 4. *Course organisation*

While a centralised institution such as IAEA might usefully provide such a body of teaching material they may not be the appropriate body to organise the ultimate courses for which local educational institutions such as Universities, Health Authorities or Technical Colleges would be more appropriate. However, the IAEA can assist local organisations in course planning, particularly by running 'train the trainers' courses. There needs to be an ongoing programme of courses in all regions of the world and the Agency can play a role in stimulating and co-ordinating the establishment of such courses at the required frequency and location. With the benefit of such IAEA support, educational institutions will need to establish their own local system of student recruitment, course delivery, supervision and assessment.

Educational institutions may choose to collaborate between themselves and with others in professional bodies, scientific societies or charitable foundations in order to provide a comprehensive programme for a particular geographical region.

While the bulk of any course may be delivered through a distance learning scheme, consideration should also be given to bringing students together on-campus for a period of time in order to foster contacts between the students and with the teaching faculty. A mechanism must also be devised for teaching the laboratory component of the course, perhaps by collaboration with local hospitals, other universities or atomic energy centres, and the need for inclusion of some practical work experience must also be considered. A list of possible laboratory experiments and areas for practice experience is attached to this report as appendix II.

On completion of the course educational institutions will normally issue a diploma to students and may wish to involve the IAEA in this process. In addition, professional bodies or government authorities may wish to issue a certificate to the student to certify their competence to practice.

### Costs

As indicated above, although the running costs associated with such an undertaking are likely to be low, the set-up costs would be considerable. The magnitude of these costs also reinforces the need for central input by a well-funded authority into the programme. Until the full details of the programme are finalised it is not possible to define these costs with any degree of precision, but an approximate estimation can be made as follows.

ITEM	APPROXIMATE COST
Teaching material: Collation of teaching material and organisation into a form suitable for translation into a WWW(HTML) format	30 topics each requiring about 2 weeks work at a rate of \$2,000 per week =\$120,000
Central editorial input	\$10,000
Translation of teaching material into HTML	\$2,000 per topic = \$60,000
Updating teaching material	\$12-15,000 every 2 years
Additional costs include those of establishing and maintaining courses including 'training the trainers' workshops and the internal costs of the IAEA in managing the project.	

Thus the cost of creating the Distance Learning teaching resource would be approximately \$200,000. However, it should be appreciated that this is not costed at commercial rates. This estimation is based upon the expectation that a sufficient number of interested academic researchers would be prepared to donate their time to the project at the 'cut-price' rates indicated. The true cost at commercial rates would be at least 2-3 times this total.

## **Conclusions**

Although some educational programmes do exist at the present time, these are insufficient to cope with the existing need which is not expected to diminish in the foreseeable future. Because of the limited resources available locally to organise such courses central support and co-ordination of Radiopharmacy courses would be of great benefit.

In particular, the provision of a body teaching material, in a suitable distance learning format which could be utilised by educational bodies throughout the world would be of great benefit.

The cost of providing this teaching material, in an appropriate form would be approximately \$200,000.

Those educational institutions with limited experience in providing such courses would also require a programme of continued advice and support including a system for 'training the trainers'

Groups of professionals who would benefit from this course include: technologists, radiopharmaceutical chemists, radiopharmacists, Nuclear Medicine specialists, people working in the radiopharmaceutical industry

Groups who may benefit include: researchers, general health care professionals, regulatory officials.

## **Recommendations**

This consultants meeting recommends that the IAEA

- (a) consider the establishment of a central Radiopharmaceutical teaching resource which should be made freely available to Institutions providing education for Nuclear Medicine and related health-care professionals. This resource should be collated in an HTML format which could be distributed either through the internet or on CD-rom or other large memory storage device.
- (b) re-examine the course content and update the relevant sections every two years
- (c) liaise with local educational establishments in regions throughout the world to set-up educational courses for interested professional groups.

Appendices: (to be included)

1. EJNM course outline
2. Committee on Harmonisation syllabus
3. Suggested core topics (30)
4. Review of Latin American situation (A.Leon)
5. List of recommended Laboratory classes
6. List of suggested practical experience

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