ORganisation of PhD Education in Biomedicine and Health Sciences in the EUropean System

Towards Standards for PhD Education in Biomedicine and Health Sciences

A position paper from ORPHEUS

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Foreword

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ORPHEUS (Organisation for PhD Education in Biomedicine and Health Sciences in the European System) was created in response to the growing emphasis throughout Europe on PhD education as the "third cycle" in the Bologna process. For health sciences this provides new opportunities for the advancement of clinical research as well as for strengthening basic research in the field. This is, however, dependent on the content and quality of the PhD degree, as discussed at the previous ORPHEUS conferences held in 2004, 2005 and 2007.

The present position paper builds on the consensus documents from the previous ORPHEUS conferences, and seeks to provide a framework for the further development of standards for PhD education in biomedicine and health sciences.

The position paper is primarily addressed to faculties and heads of graduate schools, but may also be of interest for legislators.

The position paper is the result of extensive discussions before and during ORPHEUS2009, Fourth European Conference, held at Aarhus University, Denmark 23-25 April 2009. The conference welcomed 165 participants representing 72 health schools/universities from 33 European countries who participated in the discussion. Drafting was undertaken by a Task Force, the members of which are listed at the end of this document.

Further details about ORPHEUS may be found on http://www.orpheus-med.org, where the previous consensus documents also may be found.

On behalf of the ORPHEUS Executive Committee

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Michael Mulvany
ORPHEUS2009 conference chairman

12 May 2009

Towards standards for PhD Education in Biomedicine and Health Sciences: a position paper from ORPHEUS

The purpose of the position paper is to summarize the consensus documents from the previous ORPHEUS conferences, to provide a status report concerning European PhD education in biomedicine and health sciences, and to make a number of recommendations regarding steps to be taken for developing standards for PhD education. The paper refers to the standards for which we aim, and not standardization of PhD programmes.

1. Background

The modern concept of the PhD degree, research training under supervision, was developed in the nineteenth century and has since spread to most of the World (Nerad and Heggelund, 2008). The overall aim is to produce a qualified researcher, evaluated by the PhD thesis and an oral defence of the scientific results.

The "Bologna Process" was initiated in 1999 with the intention of harmonizing European higher education. The process was extended at a meeting of ministers in Berlin in 2003 to include all three "cycles": Bachelor, Master and PhD and attention is now shifting towards the PhD level.

The vast number of new PhD programmes in Biomedicine appearing throughout Europe requires that standards are defined for the quality for PhD programmes in general. It has to be stressed, however, that the autonomy of the institutions must be respected and the existing diversity amongst the programmes protected.

At the ORPHEUS conference in 2007, "clinical PhDs" were discussed. "Clinical PhDs" are PhD programmes in parallel with clinical training, and therefore extend over longer periods. It was agreed that a clinical PhD should meet the same standards as other PhDs as regards the level of the PhD thesis. In this respect, the PhD differs significantly from the "professional doctorates" awarded in some countries, and which are often based on shorter research training periods.

The consensus documents from the three previous ORPHEUS conferences are in full agreement with those of the European Universities Association (TRENDS V, 2007, page 25).

> "The core component of the third cycle is the advancement of knowledge through original research, and this makes the third cycle unique and different from the first and second cycles. The doctoral training phase constitutes the main link between the European Higher Education and Research Areas, and high quality doctoral programmes are therefore crucial in achieving Europe's research goals."

The present position paper seeks to clarify standards expected and, on the basis of the previous ORPHEUS consensus papers and other relevant documents, to suggest a structure for European PhD programmes in biomedicine and health sciences.

2. Admission criteria

a) *Qualifications*

In regard to the Bologna process (with the Berlin addendum), admission should be based on a Master's degree, but this is not always the case. In some countries, admission to PhD programmes can be made concurrently with a Master's programme, but the PhD can only be awarded after obtaining a Master's degree. In other countries, PhD

degrees are awarded alone on the basis of assessment of the PhD thesis without regard to previous degrees.

The admission criteria are usually the responsibility of the university and the academic unit concerned. Criteria for admission normally require that the candidate's qualifications are such that the candidate may be expected to complete a PhD programme successfully. Criteria can include proven research competence through for example predoctoral research programmes and published papers, high marks in bachelor and masters exams, and - for medical candidates - clinical experience.

ORPHEUS recommends that admission should normally be on the basis of a previously obtained Master's degree or equivalent, or the expectation of obtaining this during the PhD programme. There should, however, be flexibility. Studies or work experiences which bring a candidate to Master's level may also be accepted.

b) ***Requirements for enrolment***

Before enrolling the PhD student, the institution concerned should approve the following points.

- The scientific quality of the project. This can for example be done by written external assessment of the project description or else by presentation of the project to a panel of assessors. It is important that the PhD student is given a project which has good chances of success.

- The quality of the supervisors. See section 4.

- The resources needed to complete the project. These resources include infrastructure for the project, the running costs, the costs of supervision, and the stipend for the PhD student. The stipend level varies between countries depending on tradition and finances available. In some countries, stipends will be sufficient to meet costs of living, in other countries stipends are at a level of junior academics. PhD students with medical degrees are often salaried at a level which may be compatible with clinical salaries. In some institutions bench fees are required.

c) A*ccess to PhD programmes*

To ensure quality of PhD programmes, it is advantageous that PhD students are selected on the basis of a competitive and internationally open process. On the other hand, in many institutions entrance to a PhD programme is seen as the continuation of a Master's program. Furthermore, there is now strong evidence that a successful PhD programme is dependent on good personal interaction between student and supervisor, indicating that such interaction is needed before admission. Access to PhD programmes should take account of these differing requirements.

3. Requirements of the PhD programme

a) Length of programme

PhD programmes normally have a duration equivalent to 3-4 years full time commitment (Salzburg Bologna Seminar, 2005). It is important for the international compatibility of a PhD degree that the programme has a clear time limit. This serves several purposes. Firstly, the time frame guarantees that there is an upper limit to the amount of scientific work, which can be expected to be included in a PhD thesis. This is an effective way to avoid the requirements for a PhD degree escalating over time. Secondly, it encourages the PhD student to devote concentrated time to the scientific problem, and to ensure that the programme is based on original research. Finally, it allows graduate schools to develop

structures for handling a steady stream of PhD students.

b) ***Structure of programme***

The PhD programme aims to provide students with competences that enable them to become a qualified researcher; that is a scientist able to conduct independent research. Some may be expected to continue in research, in either public or private institutions, while others are expected to use the competences obtained in other occupations. To meet these needs, PhD programmes should include the following.

- Original research and scientific training where the PhD student performs hands-on research, including experience in methodology, experimental design, analysis and data presentation.

- Formalized PhD courses. It is recommended that the course programme is formalized and limited to about 6 months (~30 ECTS-points) of the total PhD programme (ORPHEUS 2005). The courses would normally include general courses that provide the student with an insight to relevant sub-disciplines of medical science, and offer specialized, up-to-date elective courses to support the students in their scientific training.

- Training in transferable skills. This could include training PhD students in presentation of their research (oral /poster), in university teaching, in linguistic skills, in project management, in critical evaluation of scientific literature, in supervision of technicians and/or undergraduate students, and in establishing national and international contacts. Training in transferable skills should be a substantial part of the formalized PhD courses.

c) ***Securing quality***

A formal framework for quality assurance of the PhD programmes should be developed, as well as for the progress of the individual student. It is recommended that the PhD programmes should be evaluated regularly both internally and externally. Quality of the PhD programme may be secured by (a) regular evaluation of progress and future plans of the PhD student (reports, meetings of the thesis committee or a follow-up group), (b) evaluations of the quality of the PhD courses by feedback from qualified researchers in the field, the teachers and the participants to ensure continuous assessment and improvement of the training programme.

4. Requirements for the supervisor

Qualified supervision is an essential component of a successful PhD. The supervision should be tailored to meet the requirements of the individual PhD student and his or her development throughout the programme. In selecting supervisors the following elements may be considered.

- Academic requirements. The supervisor should be scientifically qualified in the field concerned, implying that he or she is an active scholar with a steady scientific production that contributes to the peer reviewed literature. The supervisor should have a PhD or an equivalent degree. The supervisor should have a broad scientific local and international network to be able to introduce the PhD student into the scientific community. Increasingly, it is expected that the supervisor has some formal training as a supervisor.

- Responsibilities. The supervisor should be available on a regular basis throughout the PhD programme. The support should include general scientific advice, help on project management, help to identify and

initiate follow-up projects, assistance during publication, and career development. The number of PhD students per supervisor should be compatible with his or her workload.

- Supervisor-student relationship. This relationship is the key to a successful PhD programme, and requires mutual respect, planned and agreed shared responsibility, and a contribution from both.

- It is recommended that each PhD student should have at least one co-supervisor in addition to the main supervisor to cover all aspects of the programme. However, the responsibility of each supervisor should be explicit.

5. Requirements of the PhD thesis

The PhD thesis is the primary basis for evaluating if the PhD student has acquired the skills to carry out independent, original and scientifically significant research and to critically evaluate work done by others.

Consistent with the 'Zagreb declaration' (ORPHEUS 2004), it is recommended that the benchmark for the PhD thesis in biomedicine and health sciences should be the equivalent of at least three *in extenso* peer-reviewed papers published in internationally recognized journals. In addition to the papers presented, the PhD student should provide a full review of the literature relevant to the themes in the papers, and a full account of the research aims, methods, results, discussion and conclusion. Where the PhD research is presented in other formats, such as the single monograph, the assessment committee should ensure that the contribution is at least equivalent to this benchmark

The independent contribution of the PhD student should be clearly demonstrated by delineating the contribution made by the student and acknowledging work done by others. In cases where the articles or manuscripts are joint publications, there should be co-author statements showing that the PhD student has made a substantial and independent contribution. Some universities require that at least one paper is published in a SCI-listed paper (sometimes with the additional requirement of impact factors above a certain level). Some universities require that the student is the first author of at least one published paper

To encourage internationalisation it is recommended that the thesis is written, and optimally also defended, in English. This is not, however, always possible or desirable, especially where projects are primarily concerned with national questions. There should be a summary of the thesis in the local language. If possible, to allow comparison of PhD programmes, PhD theses should be published on the graduate school's home-page, preferably *in extenso*. Where patent, copyright legislation or other reasons prevent this, at least abstracts of the theses should be publicly accessible.

6. Evaluation of PhD theses

Assessment committees are normally appointed by the university or institution at which the PhD has been performed. The PhD thesis is the primary basis for the award of the PhD degree. To maintain quality at international level the thesis should be evaluated by independent persons external to and without connection to the milieu where the PhD was performed, and without any conflict of interest. Internationalization of the PhD degree will be enhanced if the assessment committee includes at least one member from another country. All committee members should be senior and active scientists. The supervisor should not be a member of the committee.

It is important that the institution has clear criteria for the assessment of a PhD thesis, in

particular as regards the number and standard of articles, which are expected, whether these should be published or in manuscript form, as well as the content and length of the accompanying review.

PhD students often enter a period of unemployment following submission of their thesis. Therefore efforts should be made to ensure that PhD theses are assessed within three months, consistent with rigorous assessment.

Negative assessments. As regards a negative assessment of the PhD thesis, in most cases, the PhD student is given the opportunity to rewrite the thesis. Where there is a negative assessment of the final public defence or viva, it is recommended that the student is allowed an additional defence. If there is still a problem after the second defence, the thesis is normally declined**.**

7. Conclusion

This position paper has sought to define the main elements of a European PhD in biomedicine and health sciences, and point to factors which can enhance the quality of a PhD degree. The content and requirements for a PhD degree will inevitably vary between countries, universities and faculties. However, if the value of the PhD degree is to be maintained and increased, some harmonization of current standards and goals is needed. It is intended that this position paper will be of assistance in this direction.

Addendum on Nomenclature

PhD student, PhD candidate. These terms are synonymous and indicate a person who is enrolled in a PhD programme. The term "PhD candidate" is preferred by several organisations, including EURODOC. The term "PhD student" is still the most common, and the one used in this paper.

Master's degree in medicine and other health sciences. The degree obtained by medical and other health science students following a professional training of 5-6 years is usually considered to be equivalent to a Master's degree, and thus normally considered fully sufficient to enter the third cycle of the Bologna Process.

Supervisor, Mentor, Advisor. A supervisor is a person who has responsibility for providing the framework for the PhD student's programme, giving advice as needed, and ensuring that the student has the opportunity to complete the programme satisfactorily. In addition, some programmes have mentors and advisors, who provide broad counselling to assist both the supervisor and the PhD student.

Professional doctorate. A professional doctorate is in some countries given for a relatively short research programme, normally part of a longer taught programme, in extension of a bachelor+masters programme which gives professional competence, e.g. a medical degree. This should not be confused with a PhD.

Higher doctoral degrees. Many countries award doctoral degrees or qualifications for achievements beyond the PhD. Such degrees or qualifications include the widespread "habilitation" and the Scandinavian dr. med. Such degrees or qualifications are generally given in recognition that the holder is an established scientist.

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