Standards in PhD Education in Biomedicine and Health Sciences in Europe

Michael Mulvany

Vice-president

Organization for PhD education in biomedicine and health sciences in the European system

Department of Biomedicine
Aarhus University
Head of Graduate Studies, 2002-2011
mm@farm.au.dk
Standards in PhD Education in Biomedicine and Health Sciences in Europe

1. PhD students now do large amount of the research … need for effective PhD programmes

2. We need good PhD programmes to attract good students
Standards in PhD Education in Biomedicine and Health Sciences in Europe

- Development of PhD education in Europe
- Standards for PhD education: the ORPHEUS project
- Outcomes of PhD training – where are we going?
The PhD

1800s Germany, Humboldt: *dr. phil.* to younger students who had completed a prescribed course of graduate study and successfully defended a thesis/dissertation containing original research in science or in the humanities (*Wikipedia*)

1861 USA, Yale

1917 UK, Oxford

…. return to Europe

…. extension to rest of World
The traditional PhD culture

- PhD traditionally seen as being the necessary training before being allowed to contribute to scientific knowledge.

- Emphasis on individual scientific excellence.
  - Methodology, documentation, analysis, interpretation,
  - Own work,
  - Monograph,
  - Closed viva examination.

- Less emphasis on dissemination… thus, articles and presentations after qualifying.
Traditional apprenticeship model for PhD doctoral candidates
Traditional apprenticeship model for PhD doctoral candidates
Actual career paths for PhD candidates

non-academic positions

PhD

Postdoc

Academic position
Actual career paths for PhD candidates

non-academic positions

PhD → Postdoc → Academic position

Academic position

Postdoc
Career paths for PhD graduates

Careers outside science: 80%
Early career researcher: 47%
Academic research staff: 27%
Non-university research (industry, government etc.): 17%
Professor: 3.5%
0.45%

Report of the Royal Society, UK, 2010
Most doctoral programmes conform to a model defined in the middle ages.

Reform the PhD system or close it down

There are too many doctoral programmes, producing too many PhDs for the job market. Shut some and change the rest, says Mark C. Taylor.
PhD students are

• a mainstay of current scientific research (30-50% of research done by doctoral candidates),

• the source of our future scientists, and

• a basis for providing persons with the skills needed to build knowledge societies.

PhD training must also prepare for non-academic jobs
Developing a new culture
"Ministers consider it necessary to … include the doctoral level as the third cycle in the Bologna Process."

Ministers emphasised: "the importance of research and research training … in enhancing the competitiveness of European higher education".

… development of the "knowledge society"
Development of the “Salzburg culture”

*European Universities Association:* “The core component of the third cycle is … *original research.* This makes the third cycle unique and different from the first and second cycles”…

1. The core component of doctoral training is the advancement of knowledge through original research
2. Embedding in institutional strategies and policies
3. The importance of diversity
4. Doctoral candidates as early stage researchers
5. The crucial role of supervision and assessment
6. Achieving critical mass
7. Duration
8. The promotion of innovative structures
9. Increasing mobility
10. Ensuring appropriate funding
1. The core component of doctoral training is the advancement of knowledge through original research.

2. Embedding in institutional strategies and policies.

3. The importance of diversity.

4. Setting up structures means taking institutional responsibility for training through research ...

5. Achieving critical mass.

6. [and] … to provide support structures for professional development. Offering training in transferable skills, … is central.

7. The promotion of innovative structures.

8. Increasing mobility.

9. Ensuring appropriate funding.
The two cultures

The traditional culture

• emphasis on individual scientific excellence
• the thesis (monograph) is the end product

The Salzburg culture

• emphasis both on scientific excellence and development of generic skills
• emphasis on dissemination (publications)
• emphasis on project management
• the thesis and the competences developed are the end product
Standards in PhD Education in Biomedicine and Health Sciences in Europe

- Development of PhD education in Europe

- Standards for PhD education: the ORPHEUS project

- Outcomes of PhD training – where are we going?
Why standards?

- Development in numbers … how to sustain quality in face of increased quantity.
- What is the “international standard”?
- Safeguarding the PhD as a research degree while ensuring employability of PhD graduates.
- Basis for quality assurance
Principles for Innovative Doctoral Training

- Research Excellence
- Attractive Institutional Environment
- Interdisciplinary Research Options
- Exposure to industry and other relevant employment sectors
- International networking
- Transferable skills training
- Quality Assurance
ORPHEUS is committed to safeguarding the reputation of the PhD as a research degree and strengthening career opportunities for PhD graduates.
The **ORPHEUS** project: setting standards for PhD training

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The project: setting standards for PhD training

Standards task force (ORPHEUS/AMSE/WFME)

- Prof. Jürgen Deckert, Germany
- Prof. David Gordon, Denmark, AMSE
- Prof. Hans Karle, Denmark, WFME
- Prof. Zdravko Lackovic, Croatia
- Prof. Stefan Lindgren, Sweden, WFME
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Aarhus University Press, 2012
Contents

- Research environment
- Outcomes
- Admission policy and criteria
- PhD training programme
- Supervisors
- PhD thesis
- Assessment
- Structure

General format

Basic standard (34):
- items that must be fulfilled

Quality development (31):
- best practice items

Annotations:
- explanations, recommendations and flexibility
Contents

- Research environment
- Outcomes
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General format

Basic standard (34):
- items that must be fulfilled

Quality development (31):
- best practice items

Annotations:
- explanations, recommendations and flexibility
4. PhD TRAINING PROGRAMME

Basic standard:
- PhD training programmes must be based on original research, courses and other activities which include analytical and critical thinking.
- PhD programmes must be performed under supervision.
- PhD programmes must ensure that students have substantial training in the rules concerning ethics and responsible conduct in research.
- PhD programmes must be structured with a clear time limit, a length equivalent to 3-4 years full time. Extension of the time frame should be possible, but limited and exceptional. Time frame must be extended in connection with parental leave and sick leave.
- The programme must include formalised courses totalling about 6 months (~30ECTS points) parallel with the PhD project. A substantial part of the course programme must be concerned with training in transferable skills.
- There must be arrangements to allow PhD students, if relevant, to perform part of their PhD programme at another institution, including those in other countries.
- PhD programmes that are performed in parallel with clinical or other professional training must have the same time for research and course work as any other PhD.
- There must be continuous assessment of the progress of PhD students throughout their PhD programme.

Quality development
- Merit should be given for relevant courses taken elsewhere or other relevant experience.
- For PhDs performed by clinicians, leave-of-absence from clinical duties should be provided for the PhD part of such programmes unless these are coincident.
- Confidential student counselling concerning the PhD programme, supervision, etc., as well as personal matters should be offered by the graduate school.
- Graduate schools should consider having a thesis committee for each PhD student that monitors the progress of the PhD student through meetings with the PhD student and the supervisors.
- Representatives of the PhD students should interact with the leadership of the graduate school regarding the design, management and evaluation of PhD programmes. Student involvement and student organisations working to enhance PhD programmes at the institution should be encouraged and facilitated.
- There should be an appeal mechanism allowing students to dispute decisions concerning their programmes and assessment of their theses.

Annotations:
- A 3-4 year full time limit has several purposes:
  - it guarantees that there is an upper limit to the amount of scientific work, which can be expected to be included in a PhD thesis, and is an effective way to avoid the requirements for a PhD degree escalating over time;
  - it encourages the PhD student to devote concentrated time to the scientific problem, and to ensure that the programme is based on original research;
  - it allows graduate schools to develop structures for handling a steady stream of PhD students.
- The formalised courses would include courses in ethics, health and safety, animal experimentation (if applicable), research methodology and statistics and elective discipline-specific components to support students in their scientific research.
- Courses in transferable skills could include training of PhD students in presentation of their research (oral/poster/papers) to academic and non-academic audiences, in university teaching, in linguistic skills, in project management, in grant application, in critical evaluation of scientific literature, in supervision of technicians and research students, and in career development and networking.
- Courses in transferable skills are important both for those who may be expected to continue in research, in either public or private institutions, and for those who continue towards careers in other fields.
- Studies for a medical qualification may be combined with a PhD programme to form a structured MPhil/PhD or MD/PhD programme. The exact nomenclature will depend on national traditions.
Basic standard:

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- PhD training programmes must be based on
to enhance PhD programmes at the institution
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6. PhD THESIS

Basic standard:

- The PhD thesis must be the 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.
- The benchmark for the PhD thesis must be the outcome to be expected from 3-4 years’ research at international level. In biomedicine and health sciences this benchmark is the equivalent of at least three in extenso papers published in internationally recognized, peer-reviewed journals.
- In addition to the papers presented, the PhD thesis must include a full review of the literature relevant to the themes in the papers, and a full account of the research aims, methodological considerations, results, discussion, conclusions and further perspectives of the PhD project.
- Where the PhD thesis is presented in other formats, such as a single monograph, the assessment committee must ensure that the contribution is at least original to the body of results from PhD studies should be clearly stated. This usually will preclude the same publication being used in more than one thesis.
- PhD theses should be published on the graduate school's home page, preferably in extenso. If patent or copyright legislation or other reasons prevent this, at least abstracts of the theses should be publicly accessible.
- There should be a lay summary of the thesis in the local language.

Annotations:

- By internationally recognized journals is meant good quality journals in the field concerned that are included in PubMed, Science Citation Index, or similar biomedical and health science literature databases. The quality of the PhD thesis will often be judged by the impact factor of the journals.
- It is generally understood that the PhD student has made a major contribution to each of the individual studies in the thesis and is the first author of at least some of these contributions.
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- By *equivalent of at least three in extenso papers* is meant that some of the papers may be manuscripts having the same level as a published paper.

- Some institutions allow that if papers are published in particularly high-ranking journals, then fewer than three papers can be accepted.
5. SUPERVISION

Basic standard:
- Each PhD student must have a principal supervisor and when relevant at least one co-supervisor to cover all aspects of the programme.
- The number of PhD students per supervisor must be compatible with the supervisor’s workload.
- Supervisors must be scientifically qualified and active scholars in the field concerned.
- Supervisors must have regular consultations with their students.
- The institution must ensure that training in supervision is available for all supervisors and potential supervisors.
- The supervisor-student relationship is the key to a successful PhD programme. There must be mutual respect, planned and agreed shared responsibility, and a contribution from both.

Quality development:
- Institutions should consider having contracts describing the supervision process to be signed by supervisor, PhD student and head of graduate school.
- The principal supervisor, at least, should have some formal training as a supervisor.
- Supervisors should where possible also act as co-supervisors for PhD students at other graduate schools within the country but also internationally.

Annotations
- For the supervisor to be scientifically qualified in the field implies that he or she will normally have a PhD or equivalent degree, and is an active scholar with a steady scientific production that contributes to the peer-reviewed literature.
- The term “regular consultations” will normally mean several times per month, but frequency will vary during the course of the programme according to the requirements of the individual PhD student.
5. SUPERVISION

- Principal supervisor and at least one co-supervisor.
- Establish expectations at the start.
- Limited number of PhD candidates per supervisor.
- Regular meetings (several per month).
- Courses in supervision – also for PhD students.
- The PhD student's relationship with his/her supervisor is the key to a successful research degree programme.
Student-supervisor relation

- supervisor must have time to supervise
- mutual respect and contribution from both
- expectations should be agreed
- a two-way process
Development of booklet on PhD supervision

Task force, Aarhus, 2009
- PhD students
- supervisors
- graduate school leadership
- department of medical education

Contents include
- finding the right person
- meeting activities
- research environment
- text production
Finding the right person

Points for consideration by the supervisor

• Have you assessed the candidate’s need for supervision? Can you and do you want to be contacted regularly, or are you very busy and do not have time for close collaboration?

• Does the candidate have the necessary initiative? Do you need to be involved in all decisions regarding the project, or do you prefer that the candidate decides when your help is needed?

• Do you expect to work with the candidate in a team, or are you looking for a candidate who is prepared to work independently?

• Does the project involve activities beyond normal working hours, and is the candidate able and interested in participating in these?

Points to be considered by the candidate

• How much guidance do you think you will need? Do you need a supervisor who is present a lot of the time? Have you considered whether the supervisor is sufficiently available?

Are there areas where you will need additional supervision because the area is new to you?

Will you need personal contact and informal exchange of ideas? Or do you prefer a little, but very specific advice? Will you need help with practical matters?

Are you good at working independently, or do you prefer teamwork?

Are you prepared to work overtime? Can you and are you interested in working nights and weekends? Are you worried about whether the project can be completed in the prescribed time?
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Development of booklet on PhD supervision

Chapter 5
Successful PhD Supervision: A Two-Way Process

Gitte Wichmann-Hansen, Lise Wogensen Bach, Berit Eika, and Michael J. Mulvany
Further points of ORPHEUS PhD standards document

- PhD programmes should be performed in, or in collaboration with, a **strong research environment**.
- Importance of collaboration for enhancing research strength (e.g. co-supervision, joint degrees)
- Admission to a PhD programme requires a level equivalent to a bachelor and **2-year research-based master’s or MD**.
- The PhD thesis assessment committee should consist of **active scientists**, who are **independent** of the student and the supervisor, and preferably **international**.
- The PhD defence should include a **public lecture and examination**.
- PhD students should be involved in the **management** of the graduate school.
Basis for document

- High degree of acceptance by academic community
  - 6 years of discussion at annual meetings
  - consultations with universities, scientific societies
  - >20 workshops
  - individual contributions
  - almost all European countries involved
  - a balance between specificity and flexibility
Practical uses

- Providing goals
- Internal evaluation
- External evaluation
  - Benchmarking
  - Funding agencies (basis for supporting PhD studentships)
  - Accreditation
- Labelling
Standards in PhD Education in Biomedicine and Health Sciences in Europe

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- Outcomes of PhD training – where are we going?
Outcomes

Scientific
• good research practice
• level that merits international refereed publications
• skills and methods of research

Generic
• communicate with peers, and with society
• relevant to specific employment opportunities
• other generic skills
Need for generic (transferable) skills
Transferable skills

- presentation of research (oral/poster/papers) to academic
- .... and non-academic audiences
- teaching
- linguistic skills
- project management
- ability to work in a team
- supervision of technicians and research students
- grant application
- career development
- networking
Portfolio (Diploma supplement)

- Presentation
  - Articles, reviews, abstracts
  - International conferences: participation, posters, lectures
  - Local meetings, department, national
  - Lay lectures
  - Patents
- Development of generic skills (including linguistic skills, project management and ability to teach)
- Team management
- Grants received
- Time in other laboratories, time abroad, time in industry or job placement
- Networks established
- Teaching
How would you advise a postdoc struggling with career options? It is hard to generalize; you need to take into account their dreams, their talents and the contributions that they can make in different settings. I worry that a number of them are receiving the message that if they don’t get a tenure-track position, they have failed. The good news is that nearly all postdocs are likely to be employed in interesting positions, but many will not travel a narrow academic path.

INTERVIEW BY GENE RUSSO
Some career opportunities for pharmacology PhD graduates

- academic research
- clinical research
- industrial research
- contract research organization
- research management

- clinical positions
- higher education teaching
- funding organizations
- scientific writing
- scientific consultant
- in vitro diagnostics, specialist laboratories
- evidence-based policy making
- own spin-off business

- marketing, sales,
- customer support, technical support,
- communications (internal, external), regulatory, QC&QA,
- patents
- investment banking
- human resources
- administration

ORPHEUS workshop, Cologne 2012
In conclusion

- Development of PhD education in Europe
- Standards for PhD education: the ORPHEUS project
- Outcomes of PhD training – where are we going?

Standards in PhD Education in Biomedicine and Health Sciences in Europe. Michael Mulvany. EPHAR lecture, 6 November 2013. Links


Basic Clin Pharmacol Toxicol 2013; 112: 289-295