Virtual Physiological Human Network of Excellence
Grant Agreement Number 223920

Work Package 4

Deliverable 4.4

Strategy for Industrial and Clinical Cooperation

Version 1.1

April 2009

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Document Information

IST Project Number	FP7 – IST - 223920	**Acronym**	VPH NoE
Full title	Virtual Physiological Human Network of Excellence		
Project URL	http://www.vph-noe.eu		
EU Project officer	Joël Bacquet		

Deliverable	**Number**	4.4	**Title**	Strategy for Industrial and Clinical Cooperation
Work package	**Number**	4	**Title**	Integration and Training Activities

Date of delivery	**Contractual**	30-Apr-09	**Actual**	30-Apr-09
Status	Version. 1.1		Final ☑	
Nature	Prototype ☐ Report ☑ Dissemination ☐ Other ☐			
Dissemination Level	Public ☐ Consortium ☑			

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Abstract (for dissemination)	*The report describes a strategy for cooperation with Industrial and Clinical stakeholders in the VPH initiative. It describes the methods of engagement, the nature of the requirements analysis to be performed and the framework within which results will be reported.*
Keywords	VPH, NoE, Training, Physiology, Industry, Healthcare, Clinicians, Engineers

Version Log

Issue Date	Version	Author	Change
06-Apr-09	0.1	USFD	Initial shell version
17-Apr-09	0.2	USFD	Revised with multiple contributions
22-Apr-09	0.3	USFD	Further contributions
23-Apr-09	0.4	USFD	Added tables
23-Apr-09	0.5	USFD	Final text, corrections
23-Apr-09	1.0	USFD	Release for internal review
30-Apr-09	1.1	USFD	Final version

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Executive Summary

The global expansion in physiological modelling activities emerging from the ready availability of sophisticated computing platforms has brought about an increased demand for modelling skills from both clinical and industrial disciplines. Matching this user demand is the escalating interest from scientists and engineers in training programmes that would equip them for sustainable lifelong career paths within the VPH-related discipline.

The academic community has a responsibility to respond to this twin impetus by developing carefully-crafted educational processes that can align the desires of the individuals to the needs of the community. The benefits will be tangible, as both the healthcare and industrial sectors will see further developments in technology and concomitant improvements in treatments and outcomes. In order that academic research is translated smoothly into practice it will be important that a strategic approach be adopted, fulfilling and managing the emerging demand for training whilst carefully balancing provision and need.

The tasks for the Network of Excellence are therefore to identify and characterise the unmet needs, and to formulate optimised strategies for bridging the educational gaps. This involves understanding the current European training landscape, investigating the needs of end users and education providers, and putting forward cost-effective and timely proposals for the provision of a first-class educational framework for cooperative, supportive and sustainable action. Data collated in this initiative will inform the creation of more formal career structures for the developing VPH researcher and also guide the development of 'Continuing Professional Development' training packages directed at those who are already working in this area.

This document is the second Deliverable in a series from Workpackage 4 of the VPH Network of Excellence, and it addresses the identification of the needs of the two principal real-world (non-academic) career paths for VPH practitioners: the Design/Manufacturing Industries and Healthcare.

For each of these two career directions the document explores the background to the emergence of the VPH as an identifiable and increasingly significant area for activity, and considers key performance features that will be required of VPH practitioners hoping to employ their skills in these fields. It describes the proposed means of engagement with both the employers and those already, or hoping to be, employed, it considers the nature of the questions that must be answered by the engagement process, and it proposes means for obtaining those responses. Finally it includes three detailed lists - of VPH Projects, Industrial Organisations, and Healthcare Providers - to be considered as targets for the proposed data-seeking activities. The data-acquisition and processing is scheduled to take place over the next eighteen months, and the results will be formulated into a strategy in a subsequent Deliverable due to be released in November 2010.

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I. Introduction

The impressive level of investment in the Virtual Physiological Human (VPH) in Europe is being matched by similar enthusiasm in the Far East[1] and the United States[2], all the more impressive for taking place against a background of adverse economic circumstances. Similarly the publication rate in the field of physiological modelling is accelerating apace[3)], as the next great development in medicine gets seriously under way, and innovations become increasingly centred on the improved wisdom that comes from the distillation of fresh knowledge gained by innovative insights from new modelling technologies.

There is scarcely a field of medicine that is not experiencing a rich and exciting increase in the level of activity associated with enhanced modelling approaches to physiological understanding, and this brings with it a responsibility, particularly on educators, to match this growth with an assortment of teaching approaches that allow the concomitant societal need for a matching highly-competent workforce, able to meet the demands of medicine and industry.

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[1] STEP Consortium. Seeding the EuroPhysiome: A Roadmap to the Virtual Physiological Human. [Online] 5 July 2007, <http://www.europhysiome.org/roadmap>. Also see: Hunter, P. J. & Nielsen, P. M. F. 2005 A strategy for integrative computational physiology. Physiology. 20, 316–325.

[2] Besides STEP Consortium document also see: Hunter, P.J. & Borg, T.K. 2003. Integration from proteins to organs: the Physiome project. Nature, 4, (237) 243; and Hunter, P.J. 2006. Modeling living systems: the IUPS/EMBS Physiome project. Proceedings IEEE, 94, 678-991

[3] Clapworthy, G., Kohl, P., Gregerson, H., Thomas, S., Viceconti, M., Hose, D., Pinney, D., Fenner, J., McCormack, K., Lawford, P., Van Sint Jan, S., Waters, S., & Coveney, P. 2007, "Digital Human Modelling: A Global Vision and a European Perspective," In Digital Human Modelling: A Global Vision and a European Perspective , Berlin: Springer, pp. 549-558;

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Fenner, J.W., Brook, B., Clapworthy, G., Coveney, P.V., Feipel, V., Gregersen, H., Hose, D.R., Kohl, P., Lawford, P., McCormack, K.M., Pinney, D., Thomas, S.R., Van Sint Jan, S., Waters, S., & Viceconti, M. 2008. The EuroPhysiome, STEP and a roadmap for the virtual physiological human. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 366, (1878) 2979-2999 available from here ;

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Kohl, P. & Noble, D. 2009. Systems biology and the Virtual Physiological Human. *Molecular Systems Biology;* Kohl, P., Coveney, P., Clapworthy, G., & Viceconti, M. 2008. The Virtual Physiological Human: building a framework for computational biomedicine II. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 366, (1879) 3223-3224 available from here ;

Sadiq, S.K., Mazzeo, M.D., Zasada, S.J., Manos, S., Stoica, I., Gale, C.V., Watson, S.J., Kellam, P., Brew, S., & Coveney, P.V. 2008. Patient-specific simulation as a basis for clinical decision-making. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 366, (1978) 3199-3219;

Stoica, I., Sadiq, S.K., Gale, C.V., & Coveney, P.V. 2008. Virtual Physiological Human research initiative: the future for rational HIV treatment design? *Future HIV Therapy*, 2, (5) 419-425; Viceconti, M., Clapworthy, G., & Van Sint Jan, S. 2008a. The European Virtual Physiological Human. J Med Biomech 23, 19-25; Viceconti, M., Clapworthy, G., & Van Sint Jan, S. 2008b. The Virtual Physiological Human — A European Initiative for *in silico* Human Modelling. *Journal of Physiological Sciences*, 58, (7) 441-446

This report examines the changing circumstances of the Healthcare and Design & Manufacturing industries and identifies the strategy required to enable these groups to define, as best they can, their anticipated needs for human resources to meet the challenges of this shifting landscape. It does this by considering the aspects of these industries that are susceptible to technological change, and by identifying approaches to engaging with representative of these groups to obtain the information necessary for a training strategy to be adequately informed.

It continues by examining the nature of the guidance that is required from such an engagement, and categorising the issues that must be addressed by any exploratory dialogue. Finally, it proposes specific texts for the conceptual introduction and data gathering processes themselves.

This document is one of a series of outputs from Workpackage 4 of the VPH Network of Excellence. Other results will include documents recommending strategies for Academic Integrative Study, and for European Mobility. Additionally, the Workpackage is orchestrating a series of international study groups at which attendees' practical modelling problems can be explored, and it is designing and commissioning the first VPH-endorsed textbook that will serve as a primer for students approaching the field for the first time.

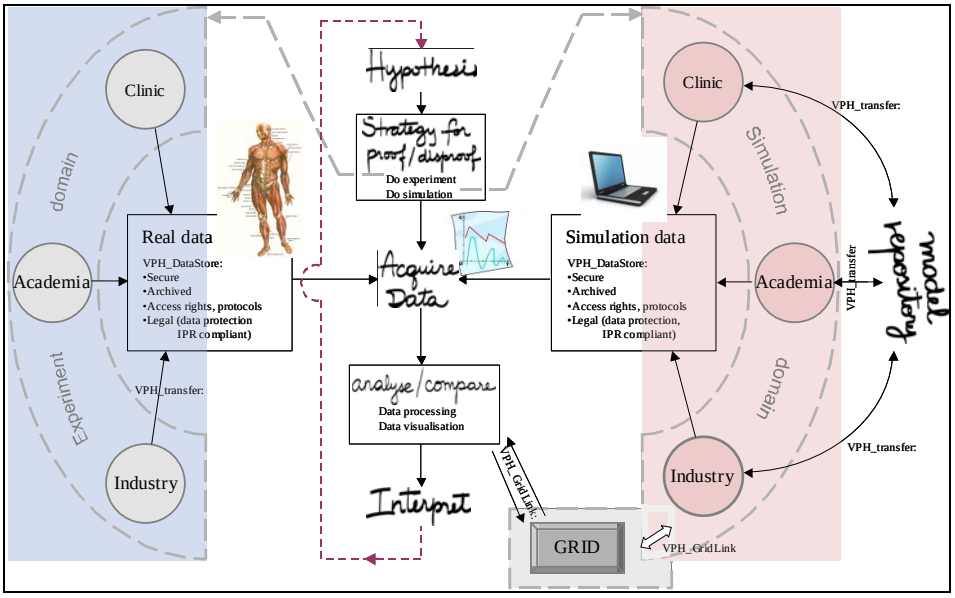
II. Current Industrial and Clinical Landscape

1. Introduction

Growth in the employment opportunities within Human Virtual Physiology, the mathematical, typically computer-based representation of the physical processes at work in humans, requires support from educators in order to equip the workforce with the skills required to meet the emerging training requirements for scientists and engineers wishing to forge careers in VPH-related activities.

The design and provision of any such support requires that the need is initially defined carefully, within the context of all three of the principal groups affected by these emerging opportunities, namely the academic, clinical and industrial sectors, and this definition can only be accomplished by a skilfully-designed process of consultation.

The Virtual Physiological Human Network of Excellence (VPH NoE) is tasked with the responsibility of performing this consultative process, and within Workpackage 4 a major exercise in interaction with academic stakeholders is already underway, the results of which will be presented in a group of complementary Deliverables D4.2, D4.6 and D4.9. This document seeks to present the Industrial and Healthcare landscape against which educational planning must now take place, and describes the processes to be adopted in pursuit of the basic data that will inform planning for the industrial and clinical sectors' educational needs.



Data Access Interactions between Academia, Clinical and Industrial VPH Participants

The formalisation of the Virtual Physiological Human (VPH) community that will emerge from the Network of Excellence will provide a foundation for the development of cross-disciplinary training and, as alluded to *in the diagram above*, offers exciting opportunities to match the training provision now being designed to the detailed needs of industrial and healthcare consumers across the European Union.

Designing data-acquisition systems to identify those needs, and that will generate results to inform properly the educational design process, is a non-trivial task as, firstly, the future vision for the emerging discipline must be established, secondly the long-term significance of the required decisions must be reinforced, and finally the questions must be formulated so as to stimulate a thoughtful, open and forward-looking viewpoint to encourage responses extending beyond the immediate; the approach to achieving this result is explored more fully in the sections that follow.

2. Industrial Landscape

Diagnostic Medical Equipment

Diagnostic medicine and basic (pathophysiology) research relies increasingly on imaging technology. Whereas in the past, the major aim of clinical imaging was to obtain detailed anatomical and morphological information for visual interpretation, there is now a growing demand for image quantification and functional imaging. In addition, in terms of basic experimental research, as working practice evolves away from traditional pathological/morphological analysis of ex-vivo preparations, a requirement for longitudinal follow-up and *in vivo* quantification of morphological, metabolic and functional processes is increasingly recognised.

The resulting change in need has led to the provision of additional approaches and analysis tools to complement the imaging equipment. This has led to two key developments; computational analysis tools which can be applied to images and, molecular imaging approaches where specific (bio-) markers are used to enhance the imaging features of the structures/processes being studied.

In order to meet these needs, the imaging equipment industry is expanding, from high technology (hardware) electronics-based companies to those with the essential software subsidiaries, where computational imaging and related simulation technologies are of major importance. In addition, through close collaboration with molecular biology and chemistry experts the development of specific imaging approaches and appropriate analysis tools, improvements in the functional performance of molecular imaging, a crucial component in the provision of input and verification data for cellular and organ modelling strategies, can be achieved.

By way of specific example, industrial gait analysis and musculoskeletal simulation software has been showing great progress over the last decade and several manufacturers compete for market share. Industrial organisations are now beginning to take into account integrated research, and complex applications are in development. The exchange of knowledge between the scientific and industrial community is contributing significantly, with conferences and workshops designed to stimulate discussion and interaction between different disciplines[4]. The development of extensive integrative tools, such as the VPH-NoE Toolkit, is a contributory step that will enable the further development of ever more complex modelling and simulation approaches to musculoskeletal diagnosis and treatment.

Pharmaceutical Development

The Pharmaceutical Industry has been one of the first medical sector industries to recognise the need to embrace new technologies. This is driven to a large extent by recognition that, the numbers of new drugs are falling, whilst R&D costs in the industry continue to escalate. These data are emphasised in a series of papers[5] on the future of the pharmaceutical industry, published by PricewaterhouseCoopers, which explore the current state of the industry and provide a projection for the industry in 2020.

The key points of the discussion of relevance in the current context relate to the increasing population age and concomitant increase/burden of chronic disease and the mismatch between R&D investment and outcome referred to above. R&D costs per new product are estimated to be $454m with only 11% of all drugs undergoing pre-clinical development reaching the market.

[4] (EBI VPH Industry Meeting Report: http://www.vph-noe.eu/vph-repository/cat_view/10-vph-noe-meeting-reports/20-open-vph-symposia)(3D MA conference http://www.3dma-08.org/)

[5] PriceWaterhouseCoopers public report 'Pharma 2020: Virtual Research and Development' available at www.pwc.co.uk/scotland/pdf/Pharma2020_VirtualRD_Final2.pdf

In the second of these reports 'virtualisation' of research is ranked highly amongst the strategies proposed for increasing innovation and reducing research costs. The power of predictive models both to advance understanding of molecular processes and disease pathophysiology and to simulation interactions of molecules with specific targets is highlighted. Clear synergies emerge between the thinking behind this document and the aims of the VPH NoE with recognition of the effort required to develop the necessary models, the need for both collaboration between academia and industry and a strong multidisciplinary approach.

Medical Devices

One of the most visible areas of uptake of VPH-related research tools by industrial stakeholders is the application of finite element analysis (FEA) and computational fluid dynamics (CFD) to the study of implantable medical devices. The academic application of these techniques to such problems has a long history, with early research reports dating from 1970[6]. The drivers for the uptake of simulation tools by industrial stakeholders are inevitably different from academic and clinical end-users issues, including:

- Improvement of the design process to reduce the time to market, thus enhancing competitiveness and reducing costs.
- Optimisation of existing product designs and development of novel designs. Virtualisation of testing allows more design parameters to be examined than traditional processes. Cost and other factors (complexity of design) can be included as design optimisation parameters.
- Availability of complex simulation results to users throughout the design workflow (CAD design etc.).
- Increased level of evidence of design suitability for clinical applications – compliance with regulatory requirements (see section IV). Reduction of exposure to litigation based on inadequate design process.

The degree of uptake by industry of FEA and CFD is based on the cost to benefit ratio of the technology. With the current availability of high-performance computing for relatively low costs, hardware considerations no longer pose a large issue, although these costs depend on the complexity and volume of analyses required, which will vary based on the specific application. Employing experienced engineers to undertake such analyses presents a significant overhead and the cost of commercial software licenses for established FEA and CFD products can also become significant if many analyses are to be undertaken at once.

Such cost implications have given rise to a multi-tier industrial interaction with FEA/CFD tools. Many large companies bringing medical devices to the market will employ a dedicated engineering division, with access to and experience with significant computational and software resources[7]. For medical device SMEs the costs associated with a dedicated FEA or CFD resource may be too high to justify a permanent provision in-house, resulting in the emergence of a market for engineering consultancy services, often SMEs themselves, to provide bespoke services for smaller device companies. At the current time the size of this market seems to be large enough to promote interest amongst many consultancy firms, but the historical applications of FEA/CFD and the relatively small size of the biomedical market mean that companies specialising in medical device design also deal with more traditional applications[8][9].

[6] G. Ray, N. Davids, Shear stress analysis of blood-endothelial surface in inlet section of artery with plugging, Journal of Biomechanics, Volume 3, Issue 1, January 1970, Pages 99-110, ISSN 0021-9290, DOI: 10.1016/0021-9290(70)90054-0. (http://www.sciencedirect.com/science/article/B6T82-4C0MRB7-3K/2/7d2cefe9ea2a19da1c7528968f259c4a)

[7] http://jobsearch.monster.com/Search.aspx?brd=1&re=515&q=fea&cy=us&lid=316&re=14#q=fea&indid=84&cy=us&lid=316&re=0&pg=1&dv=1

[8] http://www.idacireland.com/index.php4

[9] http://www.padtinc.com/proddev/medical/default.htm

Finite Element Methods - Detail

The application of FEA/CFD technologies to clinical applications has been driven both by the fundamental research questions of interest to clinical practitioners and medical device manufacturers and the capabilities of the numerical techniques, and available computational resources, at any particular time. Considering the technological aspects, problems can often be divided into a number of classes:

- Dimensionality (1d, 2d, 3d)
- Time dependence (Steady state, transient)
- Solution degrees of freedom (Single, eg. Thermal, multiple, eg. CFD)
- Constitutive equations (Linear, non-linear, large deformations)
- Multi-physics (Fluid-solid interactions, flow/drug-diffusion)

As computational power has increased the level of complexity of state-of-the-art analyses has advanced in each of these areas with current analyses capable of simultaneously incorporating, for example, 3d transient CFD analysis with fluid structure interaction and non-newtonian descriptions of the blood constituents[10].

Such advances have allowed more complex clinical questions to be addressed and some of the simplifications and assumptions to be removed from analyses, often leading to representations of biological features over a range of spatial and temporal scales. However, increases in model complexity have heightened the challenge of interpreting the results and it has become more important to ensure that the output of models remains appropriate to the clinical questions they were designed to address.

A particular application which has been the focus of significant interest in this area is the design of coronary stents. Coronary stents are a prime exemplar of the combination of a traditional engineering design approach (strength of materials, engineers theory of bending, shear stress) within an environment regulated by complex biological interactions (atherosclerotic disease, thrombus formation). This application also demonstrates the multi-physics nature of biomedical devices with considerations related to the interaction of the stent and the artery into which it is deployed (structural), the resulting haemodynamics within the vessel (fluid) and, in the case of drug-eluting stents, the convective-diffusive transport of drug from the stent into the vessel and the surrounding fluid. Recent special issues in engineering journals[11][12] and the proceedings of the 5th World Congress of Biomechanics[13] provide an overview of the current state-of-the-art in this specific application area.

Collaborations with academic and clinical parties, either as part of research motivated studies or commercial clinical studies, provide further opportunities for industry to carry out product evaluation. At the current time there are few, if any, clinical studies which include FEA and CFD analysis directly within the clinical workflow. Therefore, most research work, although motivated by clinical research questions, is based on either *in vitro* or *ex vivo* systems designed to elucidate *in vivo* behaviour more clearly or studies of historical patient-specific data which attempt to draw conclusions relevant to the patient population as a whole. The main objectives of several recent

[10] Bluestein, D.; Alemu, Y.; Dumont, K.; Verdonck, P. Flow induced platelet activation and damage in mechanical heart valves - numerical studies. Bioengineering Conference, 2007. NEBC '07. IEEE 33rd Annual Northeast 10-11 March 2007 Page(s): 169-170 Digital Object Identifier 10.1109/NEBC.2007.4413332

[11] Medical Engineering & Physics, Volume 31, Issue 4 2009.

[12] Computer Methods in Biomechanics and Biomedical Engineering, Volume 11 Issue 4 2008.

[13] Abstracts of the 5th World Congress of Biomechanics. Munich, Germany. 29 July-04 August 2006. Journal of Biomechanics, Volume 39, Supplement 1, Pages S1-S684 2006.

FP6 and FP7 projects are to translate the use of FEA and CFD directly into the clinic through direct collaboration with industrial partners[14][15][16].

A significant challenge that is yet to be fully addressed is the definition of mechanisms for integration of engineering tools within the clinical environment. Whilst clinicians have become familiar with aspects of biomedical technology such as western blot and histological analysis, it is currently unclear whether such an integrated approach is desirable for CFD and FEA tools. Future possibilities include either "*that biomechanical engineers will be actively involved in patient care or surgeons will be required to develop new clinical sensibilities related to cardiovascular mechanobiology"*[17]. It also seems likely that hybrid approaches may be adopted with some clinicians choosing to specialise in the application of engineering technology to their clinical practice. However, the horizontal nature of such technology, as evidenced by the wide range of engineering applications, presents a unique training challenge in the medical arena, where specialised training tends to occur on a pathology specific basis.

[14] www.@neurIST.org
[15] www.arch.eu
[16] www.euheart.eu
[17] Eugenio Neri, Massimo Massetti, Engineering cardiac and aortic procedures, The Journal of Thoracic and Cardiovascular Surgery, Volume 127, Issue 3, March 2004, Page 898, ISSN 0022-5223, DOI: 10.1016/j.jtcvs.2003.12.001.

3. Clinical Landscape

Whilst traditional clinical imaging could be considered as a technology simply to produce representative pictures of anatomical structures, current clinical imaging departments are starting to provide much more comprehensive services in which quantitative parameters, not only morphology but also function and metabolism, are provided to the requesting clinicians. These services rely heavily on the availability of computational tools to quantify the imaging data and also on simulation strategies, to provide either information on parameters that currently cannot be measured (but may be estimated using simulations) or predictions on the expected effects of different therapeutic strategies in order to guide the clinical decision making process.

Since these tools are still under development and, in the main, require expert operators, there is an ever-increasing need for staff trained in the understanding and the use of computational imaging tools and simulation strategies. These 'added-value' imaging services also rely heavily on the presence of an interdisciplinary team where the imaging specialist, the VPH clinical scientist and the clinicians work closely together to obtain the relevant results by leveraging clinical research and evaluating and treating the individual patient.

Projects nearing Clinical Introduction

A selection of projects in which the implementation of VPH-related activities is at or nearing the clinical introduction boundary includes the following:

Initiative, Project	**Description**	**URL**
GENIUS project	The *Grid Enabled Neurosurgical Imaging Using Simulation* project has been an active collaboration between computational scientists at UCL and interventional neuroradiologists at the National Hospital for Neurology and Neurosurgery (NHNN) which hosts an interventional angiography suite used to treat intracranial pathologies using stenting and embolisation. The project's aims were to provide patient-specific simulation of blood pressure, velocity and stress in the brain, assisting diagnosis and risk-assessment. Importantly, software developed in the project also offers the possibility of predicting the outcome of interventions. Predictive software's results must be available in clinically-useful timescales (15 mins), and much of the project's effort has been to optimise the computational pipeline.	http://gow.epsrc.ac.uk/ViewGrant.aspx?GrantRef=EP/F00561X/1
HemeLB project	Parallel lattice-Boltzmann code for efficient simulation of fluid flow in complex geometries. The fluid solver is highly optimized and the resulting computational core is very fast. Furthermore, communication is minimized and the novel topology-aware domain decomposition technique is very effective for large systems, allowing tuned code execution in geographically distributed cross-site simulations.	www.hemelb.org

Initiative, Project	Description	URL
Innovative Medicines Initiative	Joint venture between the EC and EFPIA, looking to speed up the pharmaceutical development pipeline through assisted public-private partnership	http://imi.europa.eu/index_en.html
euHeart project	The main outcome of euHeart will be a framework for the description and representation of normal and pathological multi-scale and multi-physics cardiovascular models, using the international encoding standards CellML and FieldML. In addition, a library of innovative tools for the execution of the biophysical simulations, the personalisation of the models and the automated analysis of multi-modal images will be developed. An environment for the viewing of and interaction with the biophysical models along with multi-modal images, functional information and simulation results will also be provided	www.euheart.eu
@neurIST project	@neurIST is developing an IT infrastructure for the management and processing of heterogeneous data associated with the diagnosis and treatment of cerebral aneurysm and subarachnoid haemorrhage. The data span all length scales, from molecular, through cellular to tissue, organ and patient representations. These data are increasingly heterogeneous in form, including textual, image and other symbolic structures, and are also diverse in context, from global guidelines based on the broadest epidemiological studies, through knowledge gained from disease-specific scientific studies, to patient-specific data from electronic health records. New methods are introduced to manage, integrate and interrogate the breadth of data and to present it in a form that is accessible to the end user.	www.aneurist.org
Mathematical Oncology initiatives	Mathematical modelling is becoming increasingly relevant to clinical practice including newly proclaimed areas such as “Mathematical Oncology”. Mathematical theory has been applied extensively applied in cancer modelling and particularly in oncology, for example the current use of dose-dense chemotherapy arose from mathematical considerations	http://jnci.oxfordjournals.org/cgi/content/full/95/4/254
Cancer prediction using mathematical modelling	A successful model in this area is the method developed by Kristin Swanson’s and colleagues, which is based on the patient's MRI history calculates the division and proliferation speed of cancer cells in the brain tissue to simulate the path of its spread. This model not only simulates how fast a patient's brain tumour is likely to spread and pinpoint with precision where a tumour will grow months ahead of time but also predicts how long a patient is likely to survive under various treatment scenarios.	http://www.amath.washington.edu/~swanson/jns_Dec03.pdf

Initiative, Project	Description	URL
Therapeutic optimisation. DBS initiative	Various sophisticated applied mathematics tools are being implemented in optimizing therapeutic methods such as deep brain stimulation (DBS). The DBS method involves the surgical implantation of an electrode in the subject's brain where it sends high-frequency electrical signals to targeted areas blocking the abnormal signals. Nowadays the DBS technique in widely being used for a number of neurological disorders Nada Yousif and colleagues have been developing a combined structural and mathematical model of the electrode/brain interface during DBS in humans aiming to use it for predicting stimulating parameter settings.	http://www3.imperial.ac.uk/pls/portallive/docs/1/4489909.PDF

Clinical Disciplines

As part of the data-gathering exercise described later an attempt will be made to map the level of participation in VPH-related activities of each of the major clinical disciplines. These are tabulated on the following page, together with generalised summaries of activity across different modelling length scales.

TABLE OF SPECIALTIES		Modelling Penetration (LengthScale)		
Group	**Specialty**	**Macro**	**Micro**	**Molec**
Surgical	Anaesthesiology	High	Medium	Medium
Surgical	Orthopaedic surgery			
Surgical	Otolaryngology			
Surgical	Paediatric surgery			
Surgical	Plastic surgery			
Surgical	Urology			
Surgical	Vascular surgery			
Surgical	Transplant surgery			
Surgical	Thoracic surgery			
Surgical	General surgery			
Surgical	Cardiovascular surgery			
Surgical	Trauma surgery			
Surgical	Maxillofacial surgery			
Surgical	Obstetrics and gynaecology			
Surgical	Ophthalmology			
Surgical (Onc)	Surgical oncology			
Surgical (IMed)	Emergency medicine			
Internal medicine	Cardiology	High	Medium	High
Internal medicine	Intensive care medicine			
Internal medicine	Endocrinology			
Internal medicine	Gastroenterology			
Internal medicine	Haematology			
Internal medicine	Hepatology			
Internal medicine	Infectious diseases			
Internal medicine	Nephrology			
Internal medicine	Proctology			
Internal medicine	Rheumatology			
Internal medicine	Geriatrics			
Internal medicine(ICU)	Pulmonology			
Neurology/surgical	Neurosurgery	Low	Low	Low
Neurology/other	Physical medicine and rehab			
Diagnostic specialties	Clinical laboratory sciences	High	Medium	Low
Diagnostic specialties	Radiology			
Diagnostic specialties	Pathology			
Diagnostic specialty	Clinical Neurophysiology			
Other	Dermatology	*TBA*	*TBA*	*TBA*
Other	Paediatrics			
Other	Oncology			
Other	Intensive care medicine			
Other	Palliative care			
Other	Psychiatry			
Other	Family Medicine			

Table Rudimentary assessment of modelling penetration by discipline.

III. Industrial & Clinical Advisory Boards

The **Industrial and Clinical Advisory Boards** are teams of independent, invited experts. Their role is to carry out an unbiased assessment of the Network activities and provide feedback, assistance and recommendations on;

- the way in which the Network is managed,
- on the scientific directions that the research is required to follow in order to meet end-user expectations and, finally
- to provide an industrial and clinical perspective on the VPH research as a whole, in order to promote the uptake and adoption of VPH technology with a view to potential exploitation.

Both Advisory Boards meet annually to perform a yearly review of the network activities from a clinical and industrial perspective with the first meeting scheduled for the end project-year 1 (early summer 2009). This external review provides complementary feedback to that provided by the Scientific Advisory Board.

The NoE Workpackage 4 will continue to consult widely with members of these Boards, both to develop the philosophy behind the planned strategy for Industrial and Clinical liaison and to establish the practical validity of the tools to be employed, by having the members assess the suitability of the proposed questionnaires

The **Industrial Advisory Board** focuses on the industrial and business perspective and, once recruitment is complete, will be representative of the interests of the VPH NOE with representation from the following organisations:

- **Biovista, Greece and USA;** *Andreas Persidis*
  Biovista supports the pharmaceutical and biotechnology industries supplies business intelligence products and services and finds new uses for existing drugs.
- **EDMA (European Diagnostic Manufacturers Association), Belgium;** *Christine Tarrajat, Gloria Galan*
  EDMA is the trade association representing the European *In Vitro* Diagnostic (IVD) industry. Through its affiliated National Associations, EDMA represents more than 500 companies (or over 700 legal entities) across Europe.
- **Philips Research Laboratories - Sector Technical Systems, Germany;** *Cristian Lorenz*
  Philips Research is one of the world's largest corporate research organizations developing new technologies and investigating potential growth areas. Fields of investigation and R&D cover a wide array of healthcare products and services including Healthcare Systems. The group also has significant expertise in the domains of Software Architectures for Medical Systems and for Connected Consumer Systems.
- **ANSYS France;** *Michel Rochette*
  ANSYS activities in healthcare focus on Simulation Driven Product Development (SDPD), relying on virtual product prototyping with computer-aided engineering (CAE) software, to support the visualisation and prediction of multiphysics phenomena including flow, structures, acoustics and electromagnetics. This approach is widely used in medical, pharmaceutical, and biomedical applications.
- **Simpleware Ltd, UK;** *Philippe Young*
  Simpleware develops software solutions for conversion of 3D images into high quality meshes, which can be used for Finite Element Analysis, Computational Fluid Dynamics, Computer Aided Design and Rapid Prototyping. Their activities have opened up image-based analysis to a variety of applications.

- **AstraZenaca International;** *Scott Boyer*
  AstraZeneca is one of the world's leading investors in biopharmaceutical research and development. AstraZeneca UK, one of the major hubs of AstraZeneca, has a wide range of high potential medicines focusing on six disease areas: cancer, cardiovascular, gastrointestinal, infection, neuroscience, respiratory & inflammation. Through Astra Tech, AstraZeneca is also engaged in the research, development, manufacture and marketing of medical devices and implants for use in healthcare, primarily in urology but also in odontology, diagnostic radiology and surgery.

Additional industry representatives are expected to join the VPH NoE Industrial Advisory Board in the second year of activity, to enlarge the panel of expertise and to further promote the economic potential of VPH research.

The **Clinical Advisory Board** currently gathers representatives of the following institutions:

- **Karolinska Institutet, Dpt of Medicine, Solna, Sweden;** *Anders Hamsten*
  Karolinska Institutet's standing as a leading European medical university stems partially from its top-quality research activities. The university conducts more than 40 per cent of all academic medical research in Sweden. Karolinska Institutet conducts research in a great many fields, which gives it the knowledge development it needs to be a world-leading centre in medical science. Research, postgraduate education and undergraduate education interact as mutually dependent entities which continually exchange experiences and guarantee excellence of the university. Research at Karolinska Institutet is performed in all areas of medicine:

  Cancer
  Circulation and Respiration
  Endocrinology and metabolism
  Public and International Health
  Infection
  Inflammation and Immunology
  Neuroscience
  Reproduction, Growth and Development
  Tissue and Motion

- **University of Birmingham, UK;** *Caroline Savage*
  The Division of Medical Sciences at the University of Birmingham plays major roles in the research and teaching carried out by the School of Medicine. Research in basic and clinical sciences is integrated, along with expertise in clinical trials, to advance the understanding and treatment of disorders affecting the liver, kidneys, heart, vasculature, and endocrine and nervous systems.

  The Division of Medical Science is the largest in the School of Medicine, with over 250 university-employed staff and over 400 honorary staff with NHS appointments. Staff are also based in the University Hospital Birmingham NHS Foundation Trust at the Queen Elizabeth Hospital and Selly Oak Hospital, and within a number of other NHS Trusts, including City, Birmingham Heartlands, Good Hope, Women's and Children's Hospitals. The research themes underpin internationally-competitive research including:
  Cardiovascular
  Endocrinology
  Neurosciences
  Reproduction, Genes and Development

- **University of Sheffield, Cardiovascular Research Unit, UK*;*** *David Crossman*
  The Medical School of the University of Sheffield is composed of different Faculty departments and the Unit of Medical Education (AUME):

Cardiovascular Science	*Comprises strong groups working in basic and clinical science. These are the Cardiovascular Research Unit, the Academic Units of Mammalian Genetics of Disease, Immunobiology, Haematology, Anaesthesia, Medical Physics and Clinical Engineering.*
Infection & Immunity	*Includes basic science research groups together with clinical specialities including Respiratory Medicine, Infectious Diseases, Renal Medicine, Tumour Inflammation and Dermatology. The major strengths of the section currently are in the role of innate immunity in various diseases, and in host response to infection, particularly bacterial infections.*
Musculosketal Science	*Brings together laboratories with international reputations for research in both basic and clinical sciences. These include the Academic Unit of Bone Metabolism, the Academic Unit of Bone Biology, the Children's Bone Disease Group and the Academic Unit of Rheumatology.*
Endocrinology & Reproduction	*Focuses its work on translational research, specifically the introduction of new therapies: stem cells and drug delivery, cytokine agonists and antagonists, hormone replacement, development of complex interventions (diabetic education), and construction of models for service delivery (transitional care for adolescents).*
Neuroscience	*This Department is multifaceted, investigating neuroscience at every scale from pathological disease in humans, through studies of brain function in psychiatric disorders, to the biological development of neural tissue.*
Oncology	*This Department has developed rapidly since the early 1990s. Over the last ten years there has been a tremendous increase in the quality and quantity of both clinical and laboratory based research. High quality, senior appointments have been made to ensure the establishment and development of an internationally competitive cancer research programme.*

- **Hospital Clinic Barcelona Servicio de Neumología, Spain;** *Josep Roca*
  The University of Barcelona (UB) is Spain's leading research university, publishing more research than any other Spanish institution with the exception of CSIC, the national research council (Third European Report on ST Indicators, 2003).The UB has 109 departments and more than 5,000 full-time researchers, technicians and research assistants, most of whom work in the UB's 249 research groups as recognized and supported by the Generalitat de Catalunya (Catalan Government). In 2004 the UB was awarded 169 national research grants and 18 European grants and participated in over 500 joint research projects with the business sector. Research areas include:

  Biochemistry and Molecular Biology (Biology)
  Biochemistry and Molecular Biology (Pharmacy)
  Cell Biology
  Cell Biology, Immunology and Neurosciences
  Dentistry and Stomatology
  Genetics
  Medecine
  Microbiology
  Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy
  Pathological Anatomy, Pharmacology and Microbiology
  Pathology and Experimental Therapy
  Pharmacology and Therapeutic Chemistry
  Pharmacy and Pharmaceutical Technology
  Podiatry
  Public Health
  Surgery and Surgical Specializations

- **University of Cambridge, Dept of Medicine, UK*;*** *K Smith, N Ward, W Ouwehand*
  The School of Medicine of the University of Cambridge is conducting international clinical and translational research relating to a diverse range of medical conditions and treatments. Research at the Clinical School also houses the MRC Laboratory of Molecular Biology, the MRC

Dunn Nutrition Unit, the CRUK-Cancer Research Institute, which has close links with the Department of Oncology, and the Addenbrooke's Clinical Research Centre which includes the Wellcome Trust Clinical Research Facility. The Clinical School currently comprises over 600 academic and contract research staff including 81 Professors and Readers, 33 Senior/University Lecturers and 73 Senior Research Fellows (funded by MRC, Wellcome Trust, CRUK and other major medical charities). More than 500 NHS staff, both clinical Consultants and those in Professions allied to Medicine, make a major contribution to the teaching and research base of the Clinical School. The main research areas covered are:

School of Clinical Medicine Research Themes
Cancer Research
Cardio-Vascular Medicine
Stem Cells and Regenerative Medicine
Epidemiology and Public Health
Genetics and Genetic Medicine
Haematological and Transplantation
Medicine
Infection and Immunity
Diabetes, Endocrinology and Metabolism
Neurosciences and Mental Health
Women's Health

- **University of Leicester-Medical School, UK;** *Nilesh Samani*
  The Leicester Medical School research activities (introduced from August 2003) are structured around five substantial Departments that span the traditional clinical subject areas. These Departments are able to bring considerable intellectual resources to bear on a range of vital medical challenges and reflect the priorities of the National Health Service. They provide a stimulating environment for postgraduate study and offer a wide range of opportunities for professional training and development. A number of Clinical Divisions have responsibility for clinical excellence and links with the NHS clinical structure, as well as for liaison with the Department of Medical and Social Care Education on aspects of the delivery of the curriculum, the Postgraduate Dean on post-qualification clinical training and development, and the Royal Colleges and similar external bodies.

  Cancer Studies and Molecular Medicine
  Cardiovascular Sciences
  Health Sciences
  Infection, Immunity and Inflammation
  Medical and Social Care Education

- **King's College London, UK;** *Reza Rezavi*
  Health Schools at King's College London are: Biomedical & Health Sciences, Medicine, the Dental Institute, the Institue of Psychiatry and the Florence Nightingale School of Nursing & Midwifery. The Health Schools have funded five technical posts, initially for two years, to provide core laboratory research support for King's and other researchers. The five posts are for the following facilities:

  Genomics Centre
  Genomics Laboratory
  Proteomics Laboratory
  Tissue Imaging Facility
  Gene Targeting Facility

  The School of Medicine conducts more specific research, and in particular:

  Asthma, Allergy and Lung Biology
  Cancer Studies
  Cardiovascular Division
  Centre for Integrative Biomedicine
  Gene and Cell Based Therapy
  Genetics and Molecular Medicine
  Health and Social Care Research
  Imaging Sciences, including The Interdisciplinary Medical Imaging Group (IMIG)
  Immunology, Infection and Inflammatory Disease
  NIHR Biomedical Research Centre

- **National Blood Service, UK;** *Willem Ouwehand*
  As part of the Arm's Length Bodies review the National Blood Authority (NBA), which manages the National Blood Service, Bio Products Laboratory and the International Blood Group Reference Laboratory, and UK Transplant (UKT) has merged on 1 October 2005 to form a new organisation - NHS Blood and Transplant (NHSBT).

  This is a real opportunity as both organisations work to save and improve patients' lives. Last year alone more than 5,500 people benefited from having an organ or cornea transplant, whilst countless more benefited from receiving blood and blood products. The NBA and UKT will pool their experience of collecting and distributing blood, tissues and organs. NHSBT will be responsible for managing all the products and services currently provided by both organisations, including:

  Promoting blood, tissue and organ donation to the public
  Managing the supply of blood to hospitals in England and North Wales
  Working with hospital colleagues to promote the safe and appropriate use of blood
  Providing a range of tissues and other services to hospitals
  Managing organ transplantation in the UK
  Managing the British Bone Marrow Register
  Provision of a wide range of diagnostic service

- **Cardiff University, UK;** *Howard Young*
  The Cardiff University School of Postgraduate Medical and Dental Education is responsible for commissioning, overseeing and monitoring the provision of education and training for some 2,600 doctors and dentists in postgraduate training posts in the NHS across Wales. The School is made up of a number of sections and units. Each of these has a specific role in providing a service to Postgraduate students, to medical professionals and to staff at the School, and in particular:

  General Practice
  Hospital Practice
  Medical Education
  Welsh Institute for Minimal Access Therapy (WIMAT)
  Foundation and Speciality Training

- **Université Libre de Bruxelles, Brussels ;** *Marcel Rooze*
  The University includes five academic hospitals (Hôpital Erasme, CHU Saint-Pierre, CHU Brugmann, Hôpital des Enfants Reine Fabiola (HUDERF) and the Institut Jules Bordet) and also benefits from a large hospital training network covering Brussels, Brabant and Hainaut. The Faculty of Medicine bases its teaching on research carried out in the majority of specialist medical fields (detailed in the University's research unit directory available at http://www.ulb.ac.be/rech/inventaire/facultes/medecine.html). Many value-creation activities result from this joint research, often undertaken with the University's other Faculties and with associated Belgian and foreign research infrastructures; as a consequence many of the network's spheres of activity are significant areas of growth in the Brussels Region:
  :
  Molecular biology
  Immunology
  Public health
  Oncology
  Pharmaceutical Research

The number of clinical advisory board members continues to grow, and collectively and individually the members have come to understand the added value of VPH research in clinical care and practice. This feedback from the clinical community is all the more important as they are the final end -users of the technology, and prescribers of novel ICT tool specifications for the manufacturing

and bio-medical companies. Through this interaction and collaboration, VPH research is expected to bring the scientific VPH research agenda to overlap with users and clinical expectations.

Advisory board members have participated in many VPH NoE events, including the EBI VPH-Industry meeting (24-Feb-09) aimed at fostering connections between the VPH, and clinical and industrial communities. This meeting was attended by representatives of the VPH NoE, allied VPH Initiative projects, as well as medical geneticists, biological ontologists, murine disease modellers, pharmaceutical scientists, bioinformaticians, bioengineers, pharmaceutical regulatory physicians, and UK National Health Service clinicians.

IV. Trade, Professional & Management Associations

Background

In order to engage as widely as possible with authoritative representatives of the key professions relevant to the NoE activities, comprehensive contact will be established with representatives of the main consultative bodies.

Key European Bodies

The **European Science Foundation** (ESF) was established in 1974 to create a common European platform for cross-border cooperation in all aspects of scientific research. With its emphasis on a multidisciplinary and pan-European approach, the Foundation provides the leadership necessary to open new frontiers in European science. Its activities include providing science policy advice (Science Strategy); stimulating co-operation between researchers and organisations to explore new directions (Science Synergy); and the administration of externally funded programmes (Science Management). These take place in the following areas: Medical sciences; Physical and engineering sciences; Life, earth and environmental sciences; Humanities; Social sciences; Polar; Marine; Space; Radio astronomy frequencies; Nuclear physics.

The **European Medical Research Council** (EMRC) is the European Science Foundation's membership organisation for all medical research councils in Europe. The mission of the EMRC is to promote innovative medical research and its clinical application towards improved human health. The EMRC offers authoritative strategic advice for science policy making, research management, ethics, and better health services and seeks to improve the education, training and career structure and opportunities for scientists involved in patient-oriented clinical research.

Other National and International Organisations

Tabulated in **Annex 3** are the key consultative bodies identified as potential sources of authoritative information relevant to the VPH NoE data-gathering process. These are drawn from all aspects of the clinical environment and include representations from these sections of the community:

- Pharmaceutical
- Clinical/Medical
- Imaging
- Medical Physics
- Associations for Medical (Device, Diagnostics…) Industries

These bodies will be approached with an initial request to determine whether the information can be obtained directly from them, or whether they would prefer to identify an expert with appropriate skills and knowledge. Data gathering by online questionnaire, telephone interview or *in extremis* face-to-face meeting will then be conducted.

V. Regulatory Authorities

Previous sections of this document seek to identify groups within industry and clinical medicine who might be expected to benefit from, and thus seek to invest in, VPH-related technologies. Rapid and widespread uptake of the emerging technology will present significant challenges for agencies taxed with ensuring safety and regulation of products coming to market.

Whilst few would argue against the need for the EU portfolio of Directives which covers medicinal products, devices and equipment or the strong Regulatory Framework which underpins these, it is recognised Regulatory Compliance poses a significant challenge and overhead for manufacturers and developers seeking to introduce new products. It is acknowledged increasingly that the path to Conformity may slow the time to market considerably and, as discussed in section II, manufacturers are increasingly looking to stimulation to accelerate development and preclinical assessment.

Many manufacturers rely on Harmonised EU Standards to provide a common starting point for demonstrating Compliance with the requirements of the Directives. Appropriate, well-informed standards provide guidance, promoting minimisation of risk and increasing reliability and effectiveness. As technology accelerates apace, production of Standards will become increasingly challenging; current Standards do not cover all products or variants of a product. Lack of data for emerging technologies presents a significant barrier to the development of new Standards. These must be grounded on current medical knowledge and problems arise when there is insufficient established or conflicting knowledge. One potential outcome of the VPH is a repository of high quality, validated data which could inform the regulatory process.

The nature of Regulation is changing with emphasis evolving from the traditional Standards-based approach in which a product is subjected to tests as outlined in the relevant Standard, to demonstrate compliance with a more 'open-ended' risk-based approach. The manufacturer must identify, and attempt to eliminate, risks and test the product to appropriate protocols to verify that any risks is minimal. The risk assessment can be updated as new data become available. The VPH can play a part in this process since risk management includes the process of weighing alternative options to select the most appropriate action.

As manufacturers embrace new technologies in the search for better, more effective and smarter technologies, it will become increasingly difficult for the Regulatory Environment to keep pace with advances in technology. Although, in comparison to the demands of industry and clinical medicine, the training and recruitment needs of the Regulatory Authorities are likely to be small, it is critical that expertise is available in this area.

The VPH NoE will engage with key Regulatory Agencies; European Competent Authorities, the FDA, Third Party Agencies such as Notified Bodies and Standards Organisations (notably CEN and ISO) to explore their strategies for addressing this changing environment and to identify, and attempt to quantify, their training and personnel requirements.

VI. Data Acquisition Strategy

Background

The goal of the data acquisition process is to obtain, separately for the Industrial and Clinical sectors, an accurate employers' view of the requirements for future trained personnel capable of operating in VPH-related activities. For the NoE, the key information concerns the nature and extent of the education that is expected for new recruits and any associated assumptions concerning the additional training that will provided by the host organisation, whether in the healthcare or manufacturing disciplines.

Practicalities

It is clearly necessary to engage experts from each of the environments in a well-structured discussion to establish the background, expectations, needs and timescales for the changes envisaged as these new technologies escalate in significance. It would be highly desirable for these discussions to be dedicated, personal one-to-one and even face-to-face, but the scale and cost of such a process would be prohibitive. As a consequence the bulk of the information will be sought using a web-based questionnaire constructed from a set of questions purpose-designed for the task. As well as obtaining information on the educational aspects, advantage will be taken of the opportunity to ask additional relevant questions relating to the sector concerned.

In the case of particularly senior figures - those who may have particularly significant views but who would be unlikely to participate using a web approach - alternative means will be employed, either a telephone discussion or, if absolutely necessary, a face-to-face interview.

Question Strategy

For the key area of employment and education the principal focus will be on identifying current practice and contrasting this with the responders' future aspirations for personnel. This approach is exemplified in section 4 of the example questionnaire included in the Industrial section below. The questionnaires will be designed to minimise the time required for completion and to assist with automated analyses wherever possible. Some free text input will be desirable, and a system for categorisation of topics raised will be developed.

Timetable

The table below identifies the steps to be taken in acquiring data from Clinical and Industrial sources, culminating in the publication of the results in November 2010 (PM30)

Item	Date	Comment
Draft question set	(Done)	(See Industrial section)
Final question sets	May-09	Separate versions for each discipline
Web system	Jun-09	Optimum site to be selected
Clinical 1: Initial contact with Associations	May-09	Association or nominated expert
Clinical 2: Expert identification	Jun-Aug-09	Emails required
Clinical 3: Questionnaire completion	Sep-Dec-09	Assumes multiple reminders; also some face-to-face
Clinical 4: Analysis	Jan-Mar-10	Numerical and text
Industry 1: Selection of Organisations	Jun-09	Representative across spectrum
Industry 2: Expert identification	Jul-Sep-09	Emails required
Industry 3: Questionnaire completion	Oct09-Jan10	Assumes multiple reminders; also some face-to-face
Industry 4: Analysis	Feb-Apr-10	Numerical and text
Results feasibility assessment	May-Jun-10	Investigation of consequences of findings
Draft Report	Jul-Sep-10	Includes feasibility data
Internal Review	Oct-10	Complex document, allow adequate review time
Final Report	Nov-10	Significant revision time

VII. Industrial Data Acquisition

Introduction

As with Clinical organisations the principal data to be collected from Industrial responders concerns their current VPH-related personnel, their perceived future needs, and their expectations when employing new staff, including the seniority, experience, qualifications, level of training, subjects learned by applicants, and the in-house supplementary training they expect to provide.

Approach

The draft questionnaire shown below sets out to explore the organisations' data in three main categories…

- VPH Needs
- VPH Impacts
- VPH Personnel

The earlier sections provide evidence to the responder that the VPH is interested in the particular circumstances of the responder's own organisation, before seeking to obtain the key data that will illuminate the training needs. It is appreciate that a balance must be struck between maintaining interest and having an excessively long set of questions, and it is intended that the design will be further refined, in consultation with members of the NoE Advisory Boards, prior to conversion to web format.

Industrial Responder Categories

The range of industries to be covered by this process will be broad and inclusive. The categories already identified as requiring adequate representation includes:

Pharmaceutical	Wide-ranging pharmaceutical coverage. Note that some are also manufacturers of drug delivery devices
Imaging	Scanner manufacturers
Simulation	Surgical, anatomical, training…
Devices	Implantable, diagnostic
IT	Hardware vendors
Software	Multiplicity of Healthcare software applications

Industrial Questionnaire

Provided below is the draft text of the questionnaire to be used for the acquisition of data from Industry representatives. The questionnaire will be provided as a web-based tool for completion by invited experts chosen from the organisations listed in the Industrial Annex

Topic	Preamble	Question	Response
1. Introduction			
1.1 Identity	(Interview circumstances)	Company	(Text)
		TelNum	
		Person	
		Position	
		Date of interview	
		Interviewer (if personal contact)	
1.2 Introduction	We are exploring the possibility of a European-funded mathematical modelling resource that would provide facilities for computer simulations involving human physiology. We'd like your views on how best this might be achieved and, with your agreement, would like to spend 10 minutes exploring your views on the issues that we think may be most important to you.	Are you happy for us to use your results?	Identifiably? Anonymously? Not at all?
1.3 Products	We are interested in the views of all organisations that have any connection with medicinal interventions	How would you best describe the nature of your business?	(Text)
		Which aspects of physiology are you concerned with?	(Text)
2. Needs			
2.1 Simulation Usage	Many industries use computers to assist the design and performance of their products…	Do you use…	Y/N
		CAD	
		FEA/CFD	
		Name the software you use	Software
2.2 Categorise	Getting the most from simulation takes time, and experienced users tend to have established a particular approach to usage.	How would you describe your usage?	Optimisation Exploration Ruthlessly practical Pragmatic CAD only
2.3 Bottleneck	Sometimes, Technology could be considered to be a bottleneck to future developments	To what degree do you rely on this technology?	Lots/ Little/ some/ Essential/ Peripheral
2.4. Competition	There is often quite a spread of uptake of technology across an industry	Who are your principal competitors?	(Text)
		Do your competitors use modelling more than you?	Y/N (Text?)
2.5 Commitment and Cost	Different organisations commit different levels of investment (time and money) to technology that can assist product development. It's sometimes difficult to quantify the costs of a technology that involves both equipment and personnel and that deploys people in different ways	How much do you think your modelling costs?	Numbers
		How many personnel are involved in modelling?	
		Out of how many in R&D?	

Topic	Preamble	Question	Response
2.6 Savings	Even more difficult is the quantification of the benefits that accrue to new technology	How do you quantify the savings that result?	Text
2.7 Interface	Physiological models are probably only useful to organisations making products that are directly associated with human physiology	Do any of your products have physiological interfaces?	Text x lots
		Do you model the interface between your product and the world?	
		Would you like to?	
		Why don't you do so?	
		Where would you obtain the information for items that are not part of your product?	
2.8 Explore potential	Quite often a user-friendly GUI is sacrificed to enhance the technical level of the product	Should the physiome include an SDK/API (e.g. visualisation toolbox) to make it easy to explore some of the potential of the physiome data?	Y/N/Comments
2.9 Timescale	Modelling may still be considered to be an emerging technology, so many organisations may still be planning to introduce it at some point in the future	If you don't use models now, when will you?	1yr 3yrs 5yrs 10yrs Never (why not?)
2.10 Priorities	There are many aspects to a physiological interface…	Which elements do you need? Categorise as…	Essential/ Important/ WorthHaving/ Unnecessary/ TooMuchTrouble/ Counter-productive
		Joints (which?)	
		Cardiovascular	
		Pulmonary	
		Skin	
		Senses	
		…	
		…	
2.11 Model or Data	The EC's effort will be both to build models (or systems to allow them to be built) and to amass data on anatomy and physiology of healthy and diseased individuals.	Would you want…	Choice
		Anatomy	
		Model	
		Both	
		Neither	
2.12 Tech Details	Technical issues (May skip this question)	Are you aware of any detailed issues that are currently limiting physiological models?	Choice/Text
		File size	
		Model complexity	
		Mixed spatial resolution	
		Temporal resolution	
		3D/0D interface, coupling etc	

Topic	Preamble	Question	Response
2.13 Models	Large computer models take a long time to get working and solutions can be very lengthy, so models are often tailored precisely to the issues being investigated.	Would you wish to use ready-built general models or would you prefer to have tools with which to assemble a model precisely to your needs (or both)?	Ready-built Tools Both
2.14 Computing Resources	Large computer models often require specialist hardware to run them, e.g. super-computer or multi-processor clusters	Do you have the required hardware to solve your modelling problems?	Y/N
2.15 Effort	The EC will definitely be spending money to produce physiological simulation systems, so that European citizens and businesses will benefit. So…	What should that money be spent on? Where would you like to see effort directed?	Text
2.16 Cost	Value? Is this a resource that interests you?	Will you pay to have access to models and data?	Text
		How much will you pay?	£
3. Impacts			
3.1 Motives	What would be your motivation for investing in the use of the Physiome (time, money)?	Reduction in human trials	(Choice)
		Reduction in animal studies	
		Faster to market	
		More precise design	
		Keep up with/overtake competition	
3.2 Sales Arena	The Physiome is a world-wide venture, with independent activity in the US to further their expertise	What geographical area do you sell to at present, and what are your ambitions?	(Choice)
		UK	
		Europe	
		Europe & US	
		World	
		Will change?	
3.3 Competition	Device development is increasingly requiring modelling, and the number of organisations not doing so is shrinking. Companies are increasingly thinking globally…	Will access to organised physiological data make things better	(Choice)
		For Europe	
		For your industry	
		For your competitors	
		For you	
3.4 Benefit Source	The Physiome project has many facets. Broadly it will make available data, tools and models.	From where would you expect the biggest benefits to come ?	(Choice)
		Raw data	
		DIY model-building tools	
		Ready-built models	
		Access to academics	
		Community of modellers	
3.5 Issues	The EU are working on harmonising laws across Europe, including data protection, IPR, etc	Are there any issues that are a disincentive to using the technology, whether they stem from Europe or within the UK?	Y/N/Comments
3.6 Benefit	The availability of accurate physiological modelling systems will alter the landscape for product development.	What will you do with the Physiome?	(Choice)
		Existing products, but better	

Topic	Preamble	Question	Response
		New products –similar	
		New products – different	
		New products collaborative	
		Faster	
3.7 True Impact	In a competitive world success can be as simple as maintaining profitability, but for many – particularly in health care - the purpose of endeavour may run deeper.	How will you measure the impact of future technological developments?	(Choice)
		Financially	
		Academically	
		Human longevity	
		Alleviated suffering	
		Reduced inequality	
		Others?	
4. Human Factors			
4.1 Recruitment	There has been a view expressed by some, that there is some difficulty in recruiting suitable people into the Biomedical Engineering arena	Do you have difficulty in recruiting people to do the modelling?	Y/N/Comments
		Perhaps you contract out?	Y/N/Comments
A. Personnel	For a scientific career in your organisation, you probably employ people from a number of different disciplines.	Do you employ …	
		Biochemists	
		Biologists - Molecular, Cell, etc	
		Physical scientists	
B. Key Science Skills	What would you say are the key scientific skills you would expect your employees to have?		
C. Further Education	Roles/Education/In-house training…	Into which VPH roles will you be seeking to recruit over the next 5, 10, 15 years? Describe in terms of background, seniority, pre-existing skills	Text
		For each role…	
		How many recruits?	Text
		What level of difficulty do you expect to have in recruitment	Text
		What level of training are you expecting the applicants to bring?	Text
		Which VPH-specific training will you be expecting to find?	Text
		Which traditional core disciplines do you require?	Text
		From past experience which academic weaknesses do you expect to have to remedy?	Text
		Describe any in-house training you will provide	Text
		What salary ranges will be appropriate for these roles?	Text
		Career paths?	Text
		Interaction between Clinical and Industrial activities?	Text
D. Modelling	A significant background in mathematics/mathematical modelling may be required for research careers in organisations such as yours	Is this true in your organisation? How much does it affect recruitment of appropriate personnel?	Lots/ Little/ Some/ Not at all
E. Training	Many organisations provide management skills training. Given the nature of your organisation, you presumably need to provide additional scientific training as well.	Do you already provide this? What form does it take? i.e.Intensive courses based within the company or single modules taken elsewhere?	(Text)
		If you don't already provide this form of training would you foresee the need to do	Y/N (Text?)

Topic	Preamble	Question	Response
		so?	
F. Investment	Different organisations commit different levels of investment (time and money) into training and career development.	How do you invest into additional training? E.g. do you pay for individual courses in-career/within the company? Do you sponsor any MSc studentships who then become employess in your organisation? If other models are used, can you please describe them. If you don't already have schemes in place which model would you be most interested in using? E.g. 10 modules taken over a couple of years? A full MSc taken as a year out or even prior to employment?	
		If you could find a training scheme that perfectly suited your needs - would your organisation be interested in providing sponsored MSc places?	
G Training requirements	If you employ life scientists (biologist, geneticists), you may have specific requirements of them in terms of mathematical or modelling skills. Likewise you may employ physical scientists (physicists, mathematicians) - and with this group you may require them to obtain some understanding of biology/physiology etc.	If you could make up a training scheme aimed specifically at your employees, what subjects/skills would you like to include in it to address the issues just discussed? What level of biological knowledge would you expect to provide training in e.g. molecular/cell through to organ phyiology?	Text
4.2 End-users	Training the end-user is a large part of a project	How do you train end-users to use your products?	Text
		Would a virtual training resource be useful?	Y/N
4.3 Patient-specific	One of the objectives of the VPH *could* be to introduce patient-specific treatment/medicine	Is there anything to be gained by attempting to make your product/service patient specific?	Y/N/Comment
5. Wrap-up			
5.1 Regulators	Regulators, training and support bodies play a large part in (bio-)medical fields and we shouldn't miss out their views	Who else do you think we should take account of?	(Text)
5.2 Other	It's a big subject, and you've not had much notice…	Have we missed anything on which you'd like to express views?	(Text)

VIII. Clinical Data Acquisition

Introduction

As with Industrial organisations the principal data to be collected from Clinical responders concerns their current VPH-related personnel, their perceived future needs, and their expectations when employing new staff, including the seniority, experience, qualifications, level of training, subjects learned by applicants, and the in-house supplementary training they expect to provide.

Approach

The draft questionnaire developed for industry will be revised to identify not only the personnel-related data outlined above, but also to help populate the clinical/VPH activity table in section II, again striking an appropriate balance between data and engagement.

Clinical Responder Categories

The range of clinical specialties to be covered will include all those identified in the Section II table, and will therefore span the diagnostic and interventional. A categorical summary of disciplines is given below.

Surgical	Principal interventional activity
Diagnostics	All aspects of diagnostic activity
Imaging	Specific actions for imaging –perhaps the single most significant modelling-related activity
Devices	Prosthetic devices, whether implantable or not
IT	Specific case of IT-related activities – predominantly a Medical Physics initiative
Software	Software across all disciplines, used for diagnosis and therapy as well as treatment planning, risk analysis etc.

Clinical Questionnaire

As discussed above, the clinical questionnaire will be developed from the Industrial version shown in the preceding section.

Explanation of Annexes

Annex	Title	Description
1	CANDIDATE VPH PROJECTS	This is a comprehensive list of the VPH-related projects from FP6 and FP7 from which candidate responders will be selected for contribution to the opinions database
2	CANDIDATE INDUSTRIAL ORGANISATIONS	This is a selective list of medical industry organisations known to be already involved with or contemplating the introduction of VPH-related techniques for product design, from which candidate responders will be selected for contribution to the opinions database
3	CANDIDATE HEALTHCARE ORGANISATIONS	This is a selective list of clinical organisations, from which candidate responders will be selected for contribution to the opinions database

Annex 1: List of Candidate VPH Projects for Consultation

In this section are listed all FP6 and FP7 projects related to the VPH and which will provide candidate recipients for the industrial and clinical questionnaires.

- text reference code; FP – framework programme; Cat – category; Inst – funding instrument; Acronym – project acronym; End – project end date; Name – project name; Cost (€) – x1 million Euros; Prtnr – number of partners; Data – nature of project data

#	FP	Cat	Inst	Acronym	End	Name	Cost (€)	Prtnr	Data
T1	FP6	(n/a)	CA	RIDE	Dec-07	A Roadmap for Interoperability of eHealth Systems	1.22m	9	Semantic interoperability of EHRs
T2	FP6	(n/a)	CA	STEP	Mar-07	A Strategy; for the Euro Physiome	1.24m	9	CA: Roadmap for Physiome
T3	FP6	(n/a)	IP	@neurIST	Dec-09	Integrated biomedical informatics for the management of cerebral aneurysms	17.36m	29	Aneurysm CFD+, data mining, secure infrastructure, federated data
T4	FP6	(n/a)	IP	ACGT	Jan-10	Advancing Clinico Genomic Trials on Cancer	16.75m	14	Semantic grid support for clinical trials
T5	FP6	(n/a)	IP	CLINICIP	Dec-07	Closed loop insulin infusion for critically ill patients	11.26m	13	ICU monitoring
T6	FP6	(n/a)	IP	COCOON	Apr-07	Supporting physicians in reducing risk	10.4m	22	Tools for risk management, semantic retrieval
T7	FP6	(n/a)	IP	Health-e-Child	Dec-09	An integrated platform for European paediatrics based on a Grid-enabled network of leading clinical centres	16.7m	13	Vertical data integration, grid, mining
T8	FP6	(n/a)	IP	MyHeart	Dec-08	Fighting Cardio-Vascular diseases by Preventative Lifestyle and Early Diagnosis	34.73m	30	Smart textiles, data integration, central comms
T9	FP6	(n/a)	IP	NOESIS	Dec-06	Platform for wide scale integration and visual representation of medical intelligence	7.72m	12	Clinical data integration and visualisation
T10	FP6	(n/a)	IP	PIPS	Dec-07	Personalised Information Platform for Life and Health Services	14.25m	17	Health protection through knowledge
T11	FP6	(n/a)	IP	Smart HEALTH	Nov-09	Smart Integrated Biodiagnostic Systems for Healthcare	21.77m	28	Smart diagnostics integrated into healthcare systems
T12	FP6	(n/a)	NoE	BIO PATTERN	Dec-07	Computational Intelligence for Biopattern analysis in Support of eHealthcare	12.80m	26	NoE: Unified clinical profiles, distributed clinical databases
T13	FP6	(n/a)	NoE	INFO BIOMED	Jun-07	Biomedical Informatics to Support Individualised Healthcare	4.85m	18	NoE: Ontologies, integrative approaches, clinical/research linkages
T14	FP6	(n/a)	NoE	Semantic Mining	Jun-07	Semantic Interoperability and Data Mining in Biomedicine	6.38m	2	NoE: Uniting multidisciplinary experts to optimise semantic health data mining
T15	FP6	(n/a)	SSA	@HEALTH	Apr-07	EU-LAM community to foster international cooperation on eHealth applications and technologies	0.39m	8	Knowledge exchange
T16	FP6	(n/a)	SSA	eHealth ERA	Jun-07	eHealth priorities and strategies in European Countries	1.07m	7	Roadmap for eHealth
T17	FP6	(n/a)	SSA	Q-REC	Jun-08	European Quality Labelling and Certification of Electronic Health Record systems	1.33m	12	XML schemas for EHR
T18	FP6	(n/a)	SSA	Semantic HEALTH	Dec-07	Semantic Interoperability	0.97m	7	Research outputs from semantic interoperability of EHRs
T19	FP6	(n/a)	SSA	SHARE	Mar-08	Supporting and structuring Healthgrid Activities and Research in Europe	1.03m	6	Develop the grid for healthcare
T20	FP6	(n/a)	SSA	SYMBIOmatics	Nov-06	Synergies in Medical Informatics and Bioinformatics	0.55m	10	SSA: Synergies BI and MI

#	FP	Cat	Inst	Acronym	End	Name	Cost (€)	Prtnr	Data
T21	FP6	(n/a)	SSA	TMA-BRIDGE	Jul-05	A Bridge Towards Coordinated eHealth Implementation	0.55m	4	Coordinated eHealth Interoperability in Europe
T22	FP6	(n/a)	STREP	ALLADIN	Dec-06	Natural Language Based Decision Support in Neuro-Rehabilitation	4.03m	11	Exchangeable clinical quantitative measures
T23	FP6	(n/a)	STREP	ARTEMIS	Jun-06	A Semantic Web Service-based P2P Infrastructure for the Interoperability of Medical Information Systems	2.96m	7	MedInfo interoperability, web services, semantic enrichment
T24	FP6	(n/a)	STREP	ASSIST	Dec-08	Association Studies Assisted by Inference and Semantic Technologies	4.19m	12	United virtual patient records, semantic modelling, data mining
T25	FP6	(n/a)	STREP	AUBADE	Jul-06	A Wearable EMG Augmentation system for Robust emotional Understanding	3.57m	5	Face emotion sensor
T26	FP6	(n/a)	STREP	CAALYX	Dec-08	Complete Ambient Assisted Living eXperiment (CAALYX) in Second Life®	2.96m	8	Secure patient data transfer, data loggers
T27	FP6	(n/a)	STREP	CARDITIS	Sep-06	Simulation based automated Diagnosis, Treatment and prognosis of Cardiovascular diseases	3.64m	5	3D cardiac models, multimodal imaging, integration tools
T28	FP6	(n/a)	STREP	CARE-PATHS	Nov-06	An intelligent support environment to improve the quality of decision processes in health communities	3.78m	8	Web-based individual clinical pathways, semantic authoring
T29	FP6	(n/a)	STREP	DESSOS	Dec-08	Decision support for orthopaedics	4.62m	9	Local clinical data integration
T30	FP6	(n/a)	STREP	DICOEMS	Jun-06	Dicoems, emergency risk management e-health platform	3.49m	8	Emergency clinical data transfer
T31	FP6	(n/a)	STREP	Doc@Hand	Dec-06	Knowledge Sharing and Decision Support for healthcare Professionals	4.13m	8	Co-presentation of dispersed clinical data
T32	FP6	(n/a)	STREP	EMERGE	Oct-09	Emergency Monitoring and Prevention	4.01m	9	Early emergency alert through behaviour monitoring
T33	FP6	(n/a)	STREP	EuRESIST	Jun-08	Inegration of viral genomics with clinical data to predict response to anti-HIV treatment	2.97m	8	EU web-based antiretroviral resistance calculator
T34	FP6	(n/a)	STREP	Health Agents	Dec-08	Agent-based Distribited Decision Support System for Brain Tumour Diagnosis and Prognosis	4.12m	9	Multi-agent distributed database Decision Support System
T35	FP6	(n/a)	STREP	HEALTH PLUS	Feb-08	Improving knowledge and Decision support for Healthy Lifestyles	3.77m	10	Linked patient record, nutrition data
T36	FP6	(n/a)	STREP	HEARTFAID	Jan-09	A knowledge-based platform of services for supporting medical clinical management of heart failure within elderly population	3.22m	11	Knowledge, ontologies, decision support
T37	FP6	(n/a)	STREP	I-Know	Apr-09	Integrating Information from Molecule to Man: Knowledge Discovery Accelerates Drug Development and Personalised Treatment in Acute Stroke	3.88m	9	Computerized stroke disease progression models, integrated eHealth
T38	FP6	(n/a)	STREP	ImmunoGrid	Jan-09	The European Virtual Human Immune System Project	2.62m	8	Grid-based immune sytem multiscale modelling
T39	FP6	(n/a)	STREP	INTREPID	Dec-06	A Virtual Reality Intelligent Multi-sensor Wearable System for Phobias' Treatment	3.23m	8	Data fusion, sensors, emotion determination
T40	FP6	(n/a)	STREP	K4CARE	Feb-09	Knowledge Based Homecare eServices for an Ageing Europe	3.73m	14	EHR for Elderly Home Care, health record integration
T41	FP6	(n/a)	STREP	LHDL	Feb-09	Living Human Project	3.24m	5	Complete musculoskeletal simulation environment, with data, tools...

#	FP	Cat	Inst	Acronym	End	Name	Cost (€)	Prtnr	Data
T42	FP6	(n/a)	STREP	MATCH	Jul-08	Automated Diagnosis System for the treatment of Colon Cancer by discovering mutations on tumour suppressed genes	2.97m	9	Combining disparate nmedical data to compute colon cancer treatment
T43	FP6	(n/a)	STREP	MicroActive	Nov-08	Automatic Detection of Disease Related Molecular Cell Activity	2.78m	6	Molecular diagnostics in clinician's office
T44	FP6	(n/a)	STREP	MULTI-KNOWLEDGE	Mar-08	Data Integration for Medical Insight	3.78m	9	Data integration, clinical, lab, metabolic, genetic; EU/US research
T45	FP6	(n/a)	STREP	NEUROWEB	May-08	Integration and sharing of informationand knowledge in neurology and neurosciences	2.75m	11	Data integration, genetics, clinical, mining
T46	FP6	(n/a)	STREP	OFSETH	Aug-09	Optical Fibre Sensors Embedded into technical Textile for Healthcare monitoring	3.51m	11	Optical systems in smart textiles
T47	FP6	(n/a)	STREP	OLDES	Dec-09	Old people's e-services at home	3.65m	11	Tele-assistance for the elderly
T48	FP6	(n/a)	STREP	PALLIANET	Jun-06	Decision Support and Knowledge driven Collaborative practices in Palliative Care	4.22m	7	IT in palliative care: Reference Ontology, EHR Context, Natural language filtering, Knowledge Management
T49	FP6	(n/a)	STREP	RIGHT	Jun-08	Reducing diagnosis and treatment risks by leveraging knowledge and practices of Health Care Professionals	2.97m	11	Mobile semantic medical informatics
T50	FP6	(n/a)	STREP	SAPHIRE	Dec-08	Intelligent Healthcare Monitoring based on Semantic Interoperability Platform	2.92m	9	Wireless sensors, semantic EHR access, decision support
T51	FP6	(n/a)	STREP	SEALIFE	Mar-09	A Semantic Grid Browser for the Life Sciences Applied to the Study of Infectious Diseases	2.6m	6	Life sciences semantic grid browser
T52	FP6	(n/a)	STREP	SIMAP	Dec-08	Simulation modelling of the MAP kinase pathway	4.46m	10	Clinical data, mining, biochemical model
T53	FP6	(n/a)	STREP	TACIT	Aug-06	Technologies Augmenting Clinical InsighT	4.27m	9	Unlock tacit expert knowledge, web, linguistics
T54	FP6	(n/a)	STREP	ViroLab	Mar-09	A Virtual Laboratory for decision support in viral diseases treatment	3.5m	13	Distributed in-silico laboratory for infectious diseases
T55	FP6	(n/a)	STREP	WOUND MONITOR	Dec-08	Mobile system for non-invasive wound state monitoring	2.24m	9	Gas sensor arrays to diagnose bacterial infection onset
T56	FP7	ICT Policy Support	Policy	Smart Open Services (SOS)	Jun-11	eHealth initiative to support medical assistance while travelling and living abroad	23m	14	Transportable EHR, Prescriptions
T57	FP7	Personal	?IP	CD-MEDICS	Dec-11	Coeliac Disease Management Monitoring and Diagnosis using Biosensors and an Integrated Chip System	12.8m	21	Wireless communications
T58	FP7	Personal	?IP	Chronious	Jul-11	An open, ubiquitous and adaptive chronic disease management platform for COPD and renal insufficiency	10.36m	19	Disease Management, COPD/Renal Insufficiency; Smart wearables, intelligent comms services
T59	FP7	Personal	?IP	HeartCycle	Feb-12	Compliance and Effectiveness in HF and CHD closed-loop Management	21.99m	19	Home/hospital data links
T60	FP7	Personal	?IP	Metabo	Jun-11	Controlling chronic diseases related to metabolic disorders	11.42m	22	Diabetic multimonitoring, dynamic modelling
T61	FP7	Personal	?IP	Pocemon	Jun-11	Point-of-care monitoring and diagnostics for autoimmune diseases	11.27m	18	Remotely-linked pocket-labs; laboratory information system

#	FP	Cat	Inst	Acronym	End	Name	Cost (€)	Prtnr	Data
T62	FP7	Personal	?IP	TheraEdge	Dec-11	An integrated platform enabling Theranostic applications at the point of primary care	11.77m	15	Point-of-care test and standards
T63	FP7	Personal	?STREP	Perform	Jan-11	Continuous assessment and monitoring of motor status in Neurodegenerative Diseases	9.86m	18	Neurodenegenartion: Remote health status monitoring
T64	FP7	Personal	?STREP	PHS2020	Dec-08	Roadmap for ICT supported Personal Health Systems	0.62m		Ethical and legal issues, personal health
T65	FP7	Personal	IP	DIAdvisor	Feb-12	Personal glucose predictive diabetes advisor	9.28m	14	(Device; data transfers not disclosed)
T66	FP7	Safety	?STREP	ALERT	Jul-11	Early Detection of Adverse Drug Events by Integrative Mining of Clinical Records and Biomedical Knowledge	5.88m	15	Electronic Health Records, literature mining, chemical information
T67	FP7	Safety	?STREP	Avert-IT	Dec-10	The prediction of adverse events in the care of brain injury patients.	2.29m	10	Patient parameters, Clinical trial results
T68	FP7	Safety	?STREP	COMOESTAS	Dec-10	Continuous Monitoring of Medication Overuse Headache in Europe and Latin America: development and STAndardization of an Alert and decision support System	2.03m	10	Interactive Electronic Patient Report (IEPR)
T69	FP7	Safety	?STREP	DebugIT	Dec-11	Detecting and Eliminating Bacteria UsinG Information Technology	8.36m	11	Virtual Clinical Data Repository, records mining
T70	FP7	Safety	?STREP	Epilepsiae	Dec-10	Evolving Platform for Improving Living Expectation of Patients Suffering from IctAl Events	4.15m	6	Structured epilepsy DB
T71	FP7	Safety	?STREP	GAP	Dec-08	Guard, Anticipation and Prediction. A new approach to Health Risk Prediction	1.28m	10	Electronic crisis reporting
T72	FP7	Safety	?STREP	MEDNet	Dec-10	Latin America Health Care Network	2.18m	11	African adoption of EU medical information exchange
T73	FP7	Safety	?STREP	PSIP	Apr-11	Patient Safety through Intelligent Procedures in Medication	9.95m	14	Patient record mining, data warehousing
T74	FP7	Safety	?STREP	REMINE	Dec-10	Supporting hospitals in risk management	7.73m	13	Patient record and results mining, modelling
T75	FP7	VPH	CA	ACTION-Grid	Nov-09	The first European initiative on Grid Computing, Biomedical Informatics and Nanoinformatics	1.12m	7	Grid, Biomedical Informatics
T76	FP7	VPH	CA	RADICAL	Jun-10	Road mapping technology for enhancing security to protect medical and genetic data	1.25m	9	Enhanced security to protect medical and genetic data
T77	FP7	VPH	IP	ARTreat	Aug-11	Multi-level patient-specific artery and atherogenesis model for outcome prediction, decision support treatment, and virtual hand-on training	10.52m	19	Patient-specific artery/atherogenesis model
T78	FP7	VPH	IP	euHeart	May-12	Integrated Cardiac Care using Patient-specific Cardiovascular Modelling	19.05m	17	Multiscale multiphysics cardiovascular models, MLs, tool libraries...
T79	FP7	VPH	IP	VPHOP	Aug-12	The Osteoporotic Virtual Physiological Human	12.07m	19	Multiscale orthopaedics
T80	FP7	VPH	NoE	VPH NoE	Nov-12	Virtual Physiological Human Network of Excellence	9.65m	13	All physiology
T81	FP7	VPH	STREP	ARCH	May-11	Patient specific image-based computational modelling for improvement of short- and long-term outcome of vascular access in patient on hemodialysis therapy	5.68m	8	Image-based computational modelling of vascular access

#	FP	Cat	Inst	Acronym	End	Name	Cost (€)	Prtnr	Data
T82	FP7	VPH	STREP	Contra Cancrum	Jul-11	Clinically oriented translational cancer multilevel modelling	5.17m	9	Multilevel clinical cancer modelling; cell biology, imaging, clindata
T83	FP7	VPH	STREP	HAMAM	Aug-11	Highly accurate breast cancer diagnosis through integration of biological knowledge, novel imaging modalities, and modelling	4.25m	11	Breast cancer: Integration of multi-modal images and patient information on a single workstation
T84	FP7	VPH	STREP	IMPPACT	Aug-11	Image-based multi-scale physiological planning for ablation cancer treatment	4.55m	7	Intervention planning for RF ablation of liver tumours; augmented reality
T85	FP7	VPH	STREP	NeoMark	Aug-10	ICT enabled prediction of cancer reoccurrence (NeoMARK)	4.21m	10	Cancer prediction; imaging and genomic/ proteomic markers
T86	FP7	VPH	STREP	PASSPORT	May-11	Patient specific simulation and preoperative realistic training for liver surgery	5.46m	10	Patient specific simulation/training for liver surgery
T87	FP7	VPH	STREP	preDICT	May-11	Predicting Drug Effects on the Heart	5.55m	9	NoE: Cell and tissue models
T88	FP7	VPH	STREP	PredictAD	May-11	From patient data to personalised healtcare in Alzheimer's disease	3.98m	7	Multimodality imaging, eeg
T89	FP7	VPH	STREP	VPH2	Jun-11	Virtual pathological heart of the virtual physiological human	5.18m	16	Virtual pathological heart;
T90	FP7	Infra-structure	Integr. Activity	BBMRI	Apr-10	Biobanking and Biomolecular Resources Research Infrastructure	7.08m	18	Network of biobanks and biomolecular resources
T91	FP7	Infra-structure	Integr. Activity	EATRIS	Dec-10	The European Advanced Translational Research Infrastructure in Medicine	5.48m	20	Translation to clinic; ethical/legal, QA, harmonised infrastructure
T92	FP7	Infra-structure	Integr. Activity	ECRIN	Feb-11	European clinical research infrastructures network for clinical trials and biotherapy	7.84m	20	Infrastructure for clinical trials
T93	FP7	Infra-structure	Integr. Activity	ELIXIR	Dec-10	European Life-science Infrastructure for Biological Information	5.87m		Sustainable infrastructure for biological information
T94	FP7	Infra-structure	Integr. Activity	InfraFrontier	Feb-11	European infrastructure for phenotyping and archiving of model mammalian genomes	5.69m	15	Linked infrastructure networks for phenotyping and archiving of mouse models
T95	FP7	Infra-structure	Integr. Activity	INSTRUCT	Mar-10	An Integrated Structural Biology Infrastructure for Europe	6.85m	12	Multiscale link of structural and cell biology
T96	FP7/ *NoE*	Exemplar	EP	NoE_SeedEP1	Dec-09	A multi-organ core model of arterial pressure and body fluid homeostasis	0.5m	1	Guyton renal ontology, MLs, libraries
T97	FP7/ *NoE*	Exemplar	EP	NoE_SeedEP2	Dec-09	Integrative multi-level modelling of the musculoskeletal system	0.5m	1	MAF visualisation, data storage, fusion, interdisciplinary links (musculoskeletal/CV)
T98	FP7/ *NoE*	Exemplar	EP	NoE_SeedEP3	Dec-09	The vertical and horizontal Atherome (WHAM)	0.5m	2	Patient descriptions, protocols, gene expression, interaction results,
T99	FP7/ *NoE*	Exemplar	EP	NoE_SeedEP4	Dec-09	Multiscale simulation and prediction of drug safety problems related to hERG	0.5m	1	Mutiscale drug interactions, molecular-level and electrophysiological simulations
T100	FP7/ *NoE*	Exemplar	EP	NoE_SeedEP5	Dec-09	Modelling and visualisation of brain function and pathophysiology	0.5m	2	Brain function signalling, imaging/3D visualisation, patient records

Annex 2: List of Candidate Industrial Organisations for Consultation

In this section are listed the contact points for identified professionals working in medical VPH-related industries. Selected individuals from this list will be contacted and requested to complete the VPH NoE Industrial Questionnaire. Large organisations may feature multiple times, as information from multiple individuals may be required to establish an accurate and comprehensive view.

Sector	Organisation	Town	Country	Email
Dental	Avinent Implant System	Santpedor - Barcelona	Spain	avinent@avinent.com
Dental	Bioner, S.A.	Sant Just Desvern - Barcelona	Spain	bioner@bioner.es
Dental	Bti Biotechnology Institute, S.L.	Miñano - Álava	Spain	bti.implantes@bti-implant.es
Dental	Dental Espana	San Lorenzo de El Escorial - Madrid	Spain	dental@dental.com.es
Dental	Eckermann	Orihuela - Alicante	Spain	ecklab@eckermann.es
Dental	Electromecanica Navarrete, S.A.	Montcada I Reixac - Barcelona	Spain	navfram@navfram.com
Dental	Implant Microdent System	Sta. Eulalia de Ronçana - Barcelona	Spain	jportella@microdentsystem.com
Dental	Infomed Servicios Informaticos, S.L.	Barcelona	Spain	lmorales@infomed.es
Dental	Laboratorios Inibsa, S.A.	Lliçà de Val - Barcelona	Spain	international@inibsa.com
Dental	Madespa, S.A.	Toledo	Spain	internationl@madespa.com
Dental	Mestra - Talleres Mestraitua, S.L.	Sondika, Bilbao - Vizcaya	Spain	mestra@mestra.es
Dental	Nueva Fedesa, S.A.U.	Arganda del Rey - Madrid	Spain	fedesa@fedesa.com
Dental	Union Dental, S.A.	Tielmes de Tajuña - Madrid	Spain	unidesa@unidesa-odi.com
Electromedicine, medical technology	Albyn Medical, SA	Cordovilla - Navarra	Spain	luis.collantes@albynmedical.com
Electromedicine, medical technology	Anko Europa, SA	Sebastián de los Reyes - Madrid	Spain	impex@anko-europa.com
Electromedicine, medical technology	Ansabere Surgical, SL	Noain - Navarra	Spain	ag@ansaberesurgical.com
Electromedicine, medical technology	Aparatos y Sistemas de Medida, S.A.	Sant Adria del Besos - Barcelona	Spain	comercial@asimed.es
Electromedicine, medical technology	Biotap, S.L.	Canet de Mar - Barcelona	Spain	biotap@biotap.com
Electromedicine, medical technology	Cardiplus Telemedicina Internacional, S.A.	Sevilla	Spain	francisco@cardiplus.com
Electromedicine, medical technology	Davi & Cia	Sant Boi de Llobregat - Barcelona	Spain	info@davicia.com
Electromedicine, medical technology	Enco Electronic, S.A.	errassa - Barcelona	Spain	enco@encoworld.com
Electromedicine, medical technology	Everest	Molins de Rei - Barcelona	Spain	info@everest-tecnovet.com
Electromedicine, medical technology	Eymasa	Barcelona	Spain	eymasa@eymasa.com
Electromedicine, medical technology	Guido Rayos X, S.A.	Madrid	Spain	guidorx@guidorx.com
Electromedicine, medical technology	Hersill, S.L.	Móstoles - Madrid	Spain	export@hersill.com
Electromedicine, medical technology	Mc Medical, S.L.	Móstoles - Madrid	Spain	mc@grupomc-medicina.com
Electromedicine, medical technology	Medical Research & Development	Coslada - Madrid	Spain	info@medicalrd.com
Electromedicine, medical technology	Meditel Ingenieria Medica	Zaragoza	Spain	export@bitmed.com
Electromedicine, medical technology	Morpheus Medical	Barcelona	Spain	c.magana@morpheus-medical.com
Electromedicine, medical technology	Oncovision	Valencia	Spain	info@gem-imaging.com / sales@gem-imaging.com
Electromedicine, medical technology	Optomic Espana, S.A.	Colmenar Viejo - Madrid	Spain	export@optomic.com
Electromedicine, medical technology	Ordisi, S.A.	L'Hospitalet de Llobregat - Barcelona	Spain	comercial@ordisi.com
Electromedicine, medical technology	Osatu, S. Coop.	Ermua - Vizcaya	Spain	mcerezal@osatu.com
Electromedicine, medical technology	Phyto - Esp, S.L.	Zaragoza	Spain	international@phyto-esp.com
Electromedicine, medical technology	Radiologia, S.A.	Algete - Madrid	Spain	radiologia@radiologia-sa.com
Electromedicine, medical technology	Rgb Medical	Madrid	Spain	info@rgb-medical.com
Electromedicine, medical technology	Sibel S.A.	Barcelona	Spain	export@sibelmed.com
Electromedicine, medical technology	Simuplast, S.R.L.	San Fernando de Henares - Madrid	Spain	simuplast@simuplast.com
Electromedicine, medical technology	Sociedad Espanola de Eletromedicina y Calidad, S.A.	Algete - Madrid	Spain	marketing@sedecal.com
Electromedicine, medical technology	St - Electromedicina, S.A.	Rubí - Barcelona	Spain	export@stelec.com
Electromedicine, medical technology	Suinsa Medical Systems, S.A.	Torrejón de Ardoz - Madrid	Spain	suinsa@suinsa.com
Electromedicine, medical technology	Telic, S.A.	Bigues - Barcelona	Spain	export@telic.es
Electromedicine, medical technology	Transcom	an Sebastián - Guipúzcoa	Spain	info@transcomsl.com

Sector	Organisation	Town	Country	Email
Electromedicine, medical technology	Uroan 21, S.L.	Palma de Mallorca - Baleares	Spain	uroan@uroan.com
Electromedicine, medical technology	Vica Medica, S.L./Invimed	Paterna - Valencia	Spain	vicamedica@vicamedica.com
Emergency equipment	Asens, S.L.	Barcelona	Spain	asens@asens.com
Emergency equipment	Bergadana Solutions S.L.	Gironel a - Barcelona	Spain	bergadana@bergadana.com
Emergency equipment	Elite Bags	Agost - Alicante	Spain	info@elitebags.es
Emergency equipment	Emergencia 2000, S.A.	Fuenlabrada - Madrid	Spain	export@emergencia2000.es
Emergency equipment	Gasinox, S.L.	Hospitalet de Llobregat - Barcelona	Spain	gasinox@gasinox.com
Emergency equipment	Stagi International, S.A.	Madrid	Spain	info@staglife.com
Information Technology	Kanteron Systems	Valencia	Spain	info@kanteron.com
Information Technology	Nte, SA	Llissa d'Amunt - Barcelona	Spain	sales_hss@nte.es
Laboratory, Diagnostics	Biokit, SA	Llissa d'Amunt - Barcelona	Spain	biokit@biokit.com
Laboratory, Diagnostics	Biosystems S.A.	Barcelona	Spain	biosystems@biosystems.es
Laboratory, Diagnostics	Bunsen, S.A.	umanes de Madrid - Madrid	Spain	aglae@bunsen.es
Laboratory, Diagnostics	Certest Biotech, S.L.	Zaragoza	Spain	certest@certest.es
Laboratory, Diagnostics	Chemelex, S.A.	Canovelles - Barcelona	Spain	chemelex@chemelex.es
Laboratory, Diagnostics	Conda	Torrejón de Ardoz - Madrid	Spain	export@condalab.com
Laboratory, Diagnostics	Deltalab, S.L.	Rubí - Barcelona	Spain	export@deltalab.es
Laboratory, Diagnostics	Genomica	Coslada - Madrid (	Spain	jbataller@genomica.es
Laboratory, Diagnostics	Ingenieria de Climas para Processos, S.L.	Badalona - Barcelona	Spain	sales@ingclimas.com
Laboratory, Diagnostics	Isomed, S.L.	Madrid	Spain	inter@isomed.com
Laboratory, Diagnostics	Kern Frio, S.A.	Hospitalet de Llobregat - Barcelona	Spain	info@kernfrio.com
Laboratory, Diagnostics	Labolan, S.L.	Esparza de Galar - Navarra	Spain	info@labolan.es
Laboratory, Diagnostics	Linear Chemicals, S.L.	Montgat - Barcelona	Spain	info@linear.es
Laboratory, Diagnostics	Nirco, S.L.	Barberá del Vallés - Barcelona	Spain	nirco@nirco.com
Laboratory, Diagnostics	Operon, S.A.	Cuarte de Huerva - Zaragoza	Spain	info@operon.es - sales@operon.es
Laboratory, Diagnostics	Orto Alresa	Ajalvir - Madrid	Spain	info@ortoalresa.com
Laboratory, Diagnostics	Progenika Biopharma, S.A.	Derio - Vizcaya	Spain	jpuelles@progenika.com
Laboratory, Diagnostics	Quimica Clinica Aplicada, S.A.	Amposta - Tarragona	Spain	export@qca.es
Laboratory, Diagnostics	Ral Tecnica para el Laboratorio, S.A.	Sant Joan Despí - Barcelona	Spain	ral@ral-sa.com
Laboratory, Diagnostics	Selecta, J.P.	Barcelona	Spain	selecta@jpselecta.es
Laboratory, Diagnostics	Spinreact, S.A.U.	Sant Esteve de Bas - Girona	Spain	spinreact@spinreact.com
Laboratory, Diagnostics	Telstar	Terrassa - Barcelona	Spain	telstar@telstar.es
Laboratory, Diagnostics	Vitro, S.a.	Sevilla	Spain	vitro@vitrosp.com
Medical equipment, furniture	Aragonesa de Mobiliario Profesional, S.L.	Puebla de Alfindén - Zaragoza	Spain	info@mobiliariojeb.com
Medical equipment, furniture	Desan Flex, S.L.	Madrid	Spain	rafael.rodriguez@flex.es
Medical equipment, furniture	Flores Valles, S.A.	Madrid	Spain	export@floresvalles.com
Medical equipment, furniture	Hermo Medica, S.L.	Arganda del Rey - Madrid	Spain	info@lettinovital.com
Medical equipment, furniture	Hidemar, S.A.	Coslada - Madrid	Spain	export@hidemar.com
Medical equipment, furniture	Industrias Hidraulicas Pardo, S.A.	Zaragoza	Spain	export@pardo.es
Medical equipment, furniture	Inmoclinic, S.A.	Arganda del Rey - Madrid	Spain	info@inmoclinc.com
Medical equipment, furniture	Medical Iberica, S.A.	Fuenlabrada - Madrid	Spain	export@medical-iberica.com
Medical equipment, furniture	Metal Apotheka	Cadrete - Zaragoza	Spain	export@metalapotheka.com - asolanas@apotheka.com
Medical equipment, furniture	Ornalux, S.A.	Gijón - Asturias	Spain	ornalux@ornalux.com
Medical equipment, furniture	Red Solaria, S.L.	Madrid	Spain	solaria@solaria.es
Medical equipment, furniture	Tedisel Iberica, S.L.	Badalona - Barcelona	Spain	info@tedisel.com
Orthopaedy, rehab, technical aids	2 Mill Artesania Sanitaria, S.L.	Alpedrete - Madrid	Spain	2mill@2miil.com
Orthopaedy, rehab, technical aids	Comercial Quirurgica Farmaceutica, SA	Olías del Rey - Toledo	Spain	international@cqfarma.com
Orthopaedy, rehab, technical aids	Ecopostural, SL	Castellón de la Plana - Castellón	Spain	info@ecopostural.com
Orthopaedy, rehab, technical aids	Electromedicarin, SA	Parets del Valles - Barcelona	Spain	exportacion@electromedicarin.com
Orthopaedy, rehab, technical aids	Flexor, SA	Barberà del Vallès - Barcelona	Spain	info@flexorsa.com
Orthopaedy, rehab, technical aids	Fresco Podologia, SL	Barcelona	Spain	info@frescopodologia.com
Orthopaedy, rehab, technical aids	Intex, SA	Andoain - Guipúzcoa	Spain	intex@intex-sa.com
Orthopaedy, rehab, technical aids	J Mainat, SA	Canet de Mar - Barcelona	Spain	mainat@mainat.com
Orthopaedy, rehab, technical aids	Lablosan	Alcorcón - Madrid	Spain	info@laboratorioslosan.com
Orthopaedy, rehab, technical aids	Luga Suminostros Medicos, SL	Casarrubios del Monte - Toledo	Spain	info@luga.es
Orthopaedy, rehab, technical aids	Manufacturas Vettel, SL	Pamplona - Navarra	Spain	vettel@vettel.es
Orthopaedy, rehab,	Medi Care System, SLU	Mataró - Barcelona	Spain	info@medisystemsl.com

Sector	Organisation	Town	Country	Email
technical aids				
Orthopaedy, rehab, technical aids	Medilast, SA	LLeida	Spain	admin@intermed-europa.com
Orthopaedy, rehab, technical aids	Minos, SL	Sondika - Vizcaya	Spain	cronda@minos97.com
Orthopaedy, rehab, technical aids	Orliman	Catarroja - Valencia	Spain	orto@orliman.com - dexport@orliman.es
Orthopaedy, rehab, technical aids	Ortobea, SA	Andoain - Gipuzkoa	Spain	chair@obea.es
Orthopaedy, rehab, technical aids	Ortoinsa Export, SL	Madrid	Spain	export@ortoinsa.es
Orthopaedy, rehab, technical aids	Prim, SA	Móstoles - Madrid	Spain	direccion.comercial@ortoprim.com
Orthopaedy, rehab, technical aids	Productos Herbitas, SL	Foios Valencia	Spain	comercial@herbitas.com
Prosthesis, implants, others	Biomet Spain Orthopaedics, S.L	Valencia	Spain	mail@biomet.es
Prosthesis, implants, others	Lafitt, SA	Valencia	Spain	lafitt@lafitt.es
Prosthesis, implants, others	Socinser 21, SA	Gijón - Asturias	Spain	socinser@socinser.com
Prosthesis, implants, others	Traiber, SL	Reus - Tarragona	Spain	traiber@traiber.es
Sterilisation, hygiene…	Cartay Productos de Acogida, SA	San Fernando de Henares - Madrid	Spain	nfo@cartay.com
Sterilisation, hygiene…	Jalsosa, SL	Pinos Puente - Granada	Spain	jalsosa@jalsosa.com
Sterilisation, hygiene…	Matachana	Barcelona	Spain	int@matachana.com
Sterilisation, hygiene…	Tecnicas de Higiene, SL	Barcelona	Spain	export@fagesa.com
Sterilisation, hygiene…	Vesismin, SL	Barcelona	Spain	vesismin@vesismin.com
Biotecnology Agraria	Agrasys, S.L.	Barcelona	Spain	pilarbarcelo@agrasys.es
Agricultura, Ambiente-Biotecnology	Monsanto Agricultura Espana, S.L.	Madrid	Spain	rosa.m.moreno@monsanto.com
Agricultura, Ambiente-Biotecnology	Bayer BiosScience N.V.	Gent	Spain	Stefania.meloni@bayercropscience.com
Agricultura, Industria Agroalimentaria	Eurosemillas, S.A.	CÃ³rdoba	Spain	eurosemillas@eurosemillas.com
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Asesoramiento operacional	Alma Consulting Group Espana	Madrid	Spain	morueta@almacg.com, jacosta@almacg.com
Bioagricultura, Nutraceuticos y alimentacion, Fermentaciones industriales, Biofarmacia	Pevesa, S.L.	El Viso del Alcor	Spain	imielgo@pevesa.es
Biociencias	Noray Biosciences Group (Noray BG)	Derio	Spain	font@noraybio.com
Bioenergy	Calantia Biotech, S.L.	Paterna	Spain	mlladro@calantia.com
Biofarmaceutico	Pharmamar, S.A.U.	Colmenar Viejo	Spain	abenavides@pharmamar.com
BioFarmaceutico	BioMarin Europe Ltd. Sucursal en EspaÃ±a	San SebastiÃ¡n de los Reyes	Spain	figlesias@bmrn.com
Biofarmaceutico	Palau Pharma	Palau-solitÃ i Plegamans	Spain	lsanmarti@palaupharma.com
Biofarmaceutico	Bioftalmik	Derio	Spain	Jon.careaga@bioftalmik.com
Bioinformatics	Bioalma	Tres Cantos	Spain	lcornide@bioalma.com
Bioinformatics	Era7 Information Technologies, S.L.	Armilla	Spain	epareja@era7.com
Bioinformatics	Integromics, S.L.	Armilla	Spain	Vicente.rodriguez@integromics.com
Bioinformatics	Noray Bioinformatics, S.L.U.	Derio	Spain	font@noraybio.com
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Biomedicina	Dracena Bioresearch Canarias S.L.	Las Palmas	Spain	cgonzalez@dracenabio.com
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Biotechnology	BIOMOL-INFORMATICS	MADRID	Spain	bioinfo@bioinfo.es
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Biotechnology	Biotech Projects	Barcelona	Spain	joan.trenchs@biotech-projects.com
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Biotechnology	Imbiosis, S.L.	Tres Cantos	Spain	jsruiz@genetrix.es
Biotechnology	Microbionta	Tres Cantos	Spain	mdegrado@microbionta.com
Biotechnology	Natraceutical Group	Valencia	Spain	info@natraceuticals.com
Biotechnology	Omnia Molecular, S.L.	Barcelona	Spain	lsalto@omniamol.com
Biotechnology	Oryzon Genomics	Barcelona	Spain	varroyo@oryzon.com
Biotechnology	Sensia, S.L.	Tres Cantos	Spain	jsruiz@genetrix.es
Biotechnology	Sylentis, S.A.U.	Madrid	Spain	aijimenez@sylentis.com
Biotechnology	Laboratoris Sanifit, S.L.	Palma de Mallorca	Spain	laboratoris@sanifit.com
Biotechnology	Araclon Biotech, S.L.	Zaragoza	Spain	gdevilchez@araclon.com
Biotechnology	Neuroscience Technologies, S.L.	Barcelona	Spain	cquiles@nsc-tec.com
Biotechnology	Clean Biotec	La Rioja	Spain	nathalie@clean-biotec.com
Biotechnology	Chimera Pharma	Tres Cantos	Spain	agarcia@bionostra.com

Sector	Organisation	Town	Country	Email
Biotechnology	InmunologÃa y GenÃ©tica Aplicada, S.A. INGENASA	Madrid	Spain	cvela@ingenasa.es
Biotechnology	Biopolis, S.L.	Paterna	Spain	Marta.tortajada@biopolis.es
Biotechnology	Seaweed Canarias	Las Palmas de Gran Canaria	Spain	scaceres@seaweedcanarias.com
Biotechnology	BTI Biotechnology Institute	Vitoria	Spain	eduardo.anitua@bti-implant.es
Biotechnology	Innofood I+D+I S.L.	Armilla	Spain	jmfernandez@innofood-idi.com
Biotechnology	Thrombotargets Europe S.L.	Barcelona	Spain	ignasimiquel@thrombotargets.com
Biotechnology	Amgen, S.A	Barcelona	Spain	jesteban@amgen.com
Biotechnology	VidaCord S.L.	Madrid	Spain	mlbarahona@vidacord.es
Biotecnología	Biomaslinic, S.L.	Armilla	Spain	biomaslinic@biomaslinic.es
Biotecnología	Mejoran	Madrid	Spain	rdemingo@mejoran.es
Biotecnología	Vita Aidelos	Sondika	Spain	info@vita-aidelos.com
Biotecnología	ZF Biolabs, S.L.	Tres Cantos	Spain	jguinea@zfbiolabs.com
Biotechnology	Laimat Soluciones Cïentífico Técnicas, S.L.	Armilla	Spain	fpedrajas@laimat.com
Biotechnology	Suanfarma Biotech S.G.E.C.R. S.A.	Alcobendas	Spain	gonzalomarin@suanfarma.com
Biotechnology	Ceifer, S.L.	Granada	Spain	info@ceifer.com
Biotechnology	EuroGalenus Executive Search	Madrid	Spain	informacion@eurogalenus.com
Diagnostics	Biobide	Donostia-San SebastiÃ¡n	Spain	ruizdeazua@biobide.es
Diagnostics	Sistemas GenÃ³micos, S.L.	Paterna	Spain	lucia.perez@sistemasgenomicos.com
Diagnostics	Operon, S.A.	Cuarte de Huerva	Spain	Info@operon.es
Diagnostics	Biotools B&M Labs, S.A.	Madrid	Spain	bach@biotools.eu ; srodriguez@biotools.eu
Diagnostics	Universidad de Navarra	Pamplona	Spain	jmzumaquero@unav.es
Biotecnology	Bioorganic Research And Services S.L. (Bionaturis)	El Puerto de Santa MarÃa	Spain	victor.infante@bionaturis.com
Biotecnology	Biot	Armilla	Spain	direccion@biot.es
Farma	Alexion Pharma Spain SL	Barcelona	Spain	casalsj@alxn.com
Farma	Archivel Farma, S.L.	Badalona	Spain	archivel@archivelfarma.com
Farma	Grupo Farmasierra	San Sebastian de los Reyes	Spain	tomas@farmasierra.com
Farma	Laboratorios Ovejero, S.A.	LeÃ³n	Spain	Gerencia@labovejero.es
Ganadero, Agroalimentario	Farm Biocontrol, S.L.	Ejea de los Caballeros	Spain	internacional@farmbiocontrol.com; r.arlegui@farmbiocontrol.com
Biotecnology	Newbiotechnic, S.A.	Bollullos de la MitaciÃ³n	Spain	mrey@nbt.com
Farma	Esteve	Barcelona	Spain	evalenti@esteve.es
Farma	Laboratorios LETI, S.L.	Barcelona	Spain	groe@leti.com
Farma	Juste, S.A.Q.F.	Madrid	Spain	roguinea@juste.net
Farma	Schering-Plough	Alcobendas	Spain	fernando.garcia.alonso@spcorp.com
Engineering	Engineering for Business, WT (E4b)	Madrid	Spain	loic@eforb.com
Engineering	Grifols Engineering S.A.	Parets del Valles	Spain	oriol.argemi@grifols.com
Engineering	Histocell, S.L.	Derio	Spain	acilu@histocell.com
Engineering	CPQ Ingenieros S.L.	Barcelona	Spain	rgene@cpqingenieros.com
Ingredientes bio activos	Exxentia, Grupo Fitoterapeutico	Madrid	Spain	jcquintela@exxentia.com
Investigative	Neocodex, S.L.	Sevilla	Spain	rpascual@neocodex.es
Investigative	Vivotecnia Research S.L.	Tres Cantos	Spain	vilacoro@vivotecnia.com
Investigative	Institut Univ. de CiÃ¨ncia i TecnologÃa, S.A. (IUCT)	Mollet	Spain	Iuct.sales@iuct.com
Investigative	Roche Applied Science	Sant Cugat del Valles	Spain	carlos.manchado-perdiguero@roche.com; neus.diez@roche.com
Medio Ambiente	Bosques Naturales, S.A.	Alcobendas	Spain	teresajimenez@bosquesnaturales.com
Chemical	Soluciones Extractivas Alimentarias, S.L. (SOLUTEX)	Alcobendas	Spain	fgsantos@solutex.es
Chemical	Merck, Sharp & Dohme de EspaÃ±a, S.A.	Madrid	Spain	regina_revilla@merck.com
Chemical	Zeltia	Madrid	Spain	ceibe@zeltia.com
Chemical	Noscira	Tres Cantos	Spain	mrodriguez@neuropharma.es
Chemical	A&B Laboratorios en Biotecnología, S.A	Vitoria	Spain	kepa@ab-laboratorios.com
Chemical	Adecco Medical & Science	Madrid	Spain	Oscar.porcel@adecco.com
Chemical	Arquebio	Barcelona	Spain	jaume.mir@arquebio.com
Salud	Bristol- Myers Squibb, S.L.	Madrid	Spain	concha.serrano@bms.com
Salud Humana	Biokit, S.A.	Barcelona	Spain	jguixer@biokit.com
Salud Humana	Biotecnet I+D, S.A.	Madrid	Spain	pquintan@faes.es
Salud humana	Canvax Biotech S.L.	CÃ³rdoba	Spain	e.paz@dominion.es
Salud Humana	Genomica, S.A.U.	Coslada	Spain	rcospedal@genomica.es
Salud Humana	Genzyme, S.L.	San Sebastián de los Reyes	Spain	genzymespain@genzyme.com
Salud Humana	Gilead Sciences, S.L.	Madrid	Spain	roberto.urbez@gilead.com
Salud Humana	InBio Intervalence Biokinetics, S.L.	Valencia	Spain	blanca.mentrida@inbio.eu
Salud Humana	Instituto Biomar, S.L.	Armunia	Spain	agustin@institutobiomar.com
Salud Humana	Pharmakine	Derio	Spain	lmendoza@pharmakine.com
Salud Humana	Tetra Therapeutics, S.L.	Las Palmas de Gran Canaria	Spain	acgles@tetratx.com
Salud Humana	Vircell, S.L.	Santa FÃ©	Spain	arojas@vircell.com
Salud Humana	Vivia Biotech	Madrid	Spain	jballesteros@viviabiotech.com; ipulido@viviabiotech.com
Diagnostics	Labgenetics, S.L.	San SebastiÃ¡n de los Reyes	Spain	jorge.puente@labgenetics.com.es
Human health	Neuron BPh	Armilla	Spain	info@neuronbp.com
Human health	EntreChem, S.L.	Oviedo	Spain	info@entrechem.com
Human health	Asteria Biotech, S.L.	Valencia	Spain	info@asteriabiotech.eu
Human health	Advancell in Vitro Cell Technologies, S.L.	Barcelona	Spain	advancell@advancell.net
SALUD Y BIENESTAR	3P Biopharmaceuticals	Noain	Spain	dmolero@3pbio.com
Sanidad Animal	Laboratorios Calier, S.A.	El Prat de LLobregat	Spain	jmarca@calier.es
Sanidad y Terapia Celular	Miltenyi Biotec	Pozuelo de AlarcÃ³n	Spain	macs@miltenyibiotec.es
Semillas Agricultura	Pioneer Hi-Bred Spain, S.L.	Sevilla	Spain	Alberto.Ojembarrena@pioneer.com

Sector	Organisation	Town	Country	Email
Servicios	BIOVAL	Paterna	Spain	info@bioval.org
Servicios de Investigacion	Infociencia	Barcelona	Spain	Jordi.naval@infociencia.com
Suministros	Sigma Aldrich Química, S.A.	Tres Cantos	Spain	jmarquez@europe.sial.com
Transferencia de tecnologia	Bioaurum Solutions, S.L.	Madrid	Spain	solutions@bio-aurum.com
HealthTech	3M Health Care	.	UK	innovation@uk.mmm.com
HealthTech	A Algeo Ltd	.	UK	sales@algeos.com
HealthTech	Accentus Medical	.	UK	enquiry@accentus.co.uk
HealthTech	ACE Europe	.	UK	Info.uk@ace-ina.com
HealthTech	Advanced Bionics UK Ltd	.	UK	uk@advancedbionics.com
HealthTech	Advanced Neuromodulation Systems, UK Ltd	.	UK	ans-uk@ans-medical.com
HealthTech	AIM Consulting Ltd	.	UK	janicekite@btinternet.com
HealthTech	Albyn Medical Ltd	.	UK	sales@albynmedical.com
HealthTech	Alcon Laboratories (UK) Limited	.	UK	ukcustomer.services@alconlabs.com
HealthTech	Altomed Ltd	.	UK	admin@altomed.com
HealthTech	American Medical Systems UK Ltd	.	UK	caroline.willis@americanmedicalsystems.com
HealthTech	Andersen Products	.	UK	info@anderseneurope.com
HealthTech	Anetic Aid Ltd	.	UK	sales@aneticaid.co.uk
HealthTech	AngioDynamics UK Ltd	.	UK	info@diomedinc.com
HealthTech	Ansell (UK) Ltd	.	UK	ansellcsuk@eu.ansell.com
HealthTech	ApaTech Ltd	.	UK	info@apatech.com
HealthTech	Avental Ltd	.	UK	info@avental.co.uk
HealthTech	B. Braun Medical Ltd	.	UK	info.bbmuk@bbraun.com
HealthTech	Bailey Instruments Ltd	.	UK	sales@baileyin.u-net.com
HealthTech	Baker & McKenzie Solicitors	.	UK	london.info@bakernet.com
HealthTech	Barema	.	UK	barema@btinternet.com
HealthTech	Bausch & Lomb UK Ltd	.	UK	custsvc_uk@bausch.com
HealthTech	BDTA	.	UK	tonyreed@bdta.org.uk
HealthTech	Bedfont Scientific Ltd	.	UK	info@bedfont.com
HealthTech	BioCote Ltd	.	UK	biocote@biocote.com
HealthTech	Biotronik UK Ltd	.	UK	customer.service@biotronik.co.uk
HealthTech	BITECIC Ltd	.	UK	info@bitecic.com
HealthTech	Blaze Venture Technologies Ltd	.	UK	enquiries@blaze-vt.com
HealthTech	BM Polyco Ltd	.	UK	sales@superglove.co.uk
HealthTech	Bodyguards	.	UK	sales@bodyguards.co.uk
HealthTech	Bolton Surgical Ltd	.	UK	enquiries@boltons.co.uk
HealthTech	BSI Product Services Ltd	.	UK	info@bsi.org.uk
HealthTech	Carina VT Ltd	.	UK	mail@carinavt.com
HealthTech	Centre of Excellence for Life Sciences Ltd	.	UK	opportunities@celsatlife.com
HealthTech	Cirrus Healthcare Products	.	UK	cirrushealthcare@btconnect.com
HealthTech	Clement Clarke International Ltd	.	UK	res@clement-clarke.com
HealthTech	CMS Cameron McKenna	.	UK	info@cmck.com
HealthTech	Containment Technology Ltd	.	UK	kidiscus@tiscali.co.uk
HealthTech	ConvaTec Ltd	.	UK	convateccustomer-service.chester@bms.com
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HealthTech	Corin Ltd	.	UK	medical@corin.co.uk
HealthTech	Cyberonics Europe S.A.	.	UK	cyberonics@cyberonics.be
HealthTech	Decon Sciences Ltd	.	UK	info@deconsciences.com
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HealthTech	Denton Wilde Sapte	.	UK	info@dentonwildesapte.com
HealthTech	Dixons Surgical Instruments Ltd	.	UK	info@dixons-uk.com
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Modelling, Anatomy	Malmo University Hospital	Malmo	Sweden	kerstin.pehrsson@lung.mas.lu.se
Modelling, Anatomy	Marconi Medical Systems Finland	Vantaa	Finland	gosta.ehnholm@marconimed.fl
Modelling, Anatomy	Marienhospital Gelsenkirchen	Gelsenkirchen	Germany	u.keske@st-augustinus.de
Modelling, Anatomy	Medilink (Yorkshire & Humber)	Sheffield	UK	s.reed@medilink.co.uk
Modelling, Anatomy	Medisch Spectrum Twente	Ka Enschede	Netherlands	jjklein@knmg.nl
Modelling, Anatomy	Medish Centrum Haaglanden	Den Haag	Netherlands	j.den-hertog@wxs.nl
Modelling, Anatomy	Medizinische Univ	Wurzburg	Germany	m.schmidt@medezin.uni-wuerzburg.de
Modelling, Anatomy	Medway Hospital	Gillingham	UK	alaisdair@culings.freeserve.co.uk
Modelling, Anatomy	Mercy Hospital	Cork	Ireland	nbrennan@indigo.ie
Modelling, Anatomy	National Heart & Lung Institute	London	UK	p.haslam@ic.ac.uk
Modelling, Anatomy	ndd Medizintechnik AG	Zürich	Switzerland	buess@ndd.ch
Modelling, Anatomy	NEC Europe Ltd	Sankt Augustin	Germany	lonsdale@ccrl-nece.technopark.gmd.de
Modelling, Anatomy	Netherlands Cancer Institute	Amsterdam	Netherlands	zandwijk@nki.nl
Modelling, Anatomy	Nieuwpoortse Steenweg 57	Oostende	Belgium	dr.desmet.oostende@skynet.be
Modelling, Anatomy	North Manchester General Hosp.	Manchester	UK	eclipse@eclipse-conferences.co.uk
Modelling, Anatomy	Novartis	Horsham	UK	nicholas.lowther@pharma.novartis.com
Modelling, Anatomy	Onassis Cardiac Surgery Center	Athens	Greece	vlahakos@otenet.gr
Modelling, Anatomy	Osped. Mazzoni - ASL 13	Ascoli Piceno	Italy	rpela@qubisoft.it
Modelling, Anatomy	Ospedale Bellaria & Maggiore	Bologna	Italy	vepolet@tin.it
Modelling, Anatomy	Ospedale Civile	Vittorio Veneto	Italy	snardini@qubisoft.it
Modelling, Anatomy	Ospedale San Giovanni	Bellinzona	Switzerland	francoquadri.osg@eoc.ch
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Modelling, Anatomy	P-KKS	Joensuu	Finland	tuomo.kava@pkshp.fi
Modelling, Anatomy	Prima Medicina	Brescia	Italy	corda@master.cci.unibs.it
Modelling, Anatomy	Profile Therapeutics plc	Bognor Regis	UK	Ivan.Prince@profiletherapeutics.com
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Modelling, Anatomy	Royal Brompton Hospital	London	UK	r.dubois@rbh.nthames.nhs.ukl
Modelling, Anatomy	Royal Devon and Exeter Hosp	Exeter	UK	nwithers65@hotmail.com
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Modelling, Anatomy	Ruhrlandklinik Essen	Essen/Heidhausen	Germany	nikolaus.konietzko@t-online.de
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Modelling, Anatomy	Rutherford Appleton Laboratory	Didcot	UK	m.j.barlow@rl.ac.uk
Modelling, Anatomy	Sainte Elizabeth Namur	Namur	Belgium	martinot@usa.net
Modelling, Anatomy	Santo Angel de la Guarda	Huesca	Spain	lborderias@separ.es
Modelling, Anatomy	SensorMedics Italia Srl	Milano	Italy	proby@iol.it
Modelling, Anatomy	Servicio de Pneumologia / HUC	Coimbra	Portugal	crobalo@mail.telepac.pt
Modelling, Anatomy	Sheffield Pharmaceuticals	Ashby de la Zouch	UK	ppay@talk21.com
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Modelling, Anatomy	Smith and Nephew Research Centre	York	UK	Stephen.Curran@Smith-Nephew.com
Modelling, Anatomy	SOC. CIV. SPRL	Kain (Rsc 254)	Belgium	micgel.tafforeau@skynet.be
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Modelling, Anatomy	Stadtspital Waid	Zurich	Switzerland	christoph.kronauer@waid.stzh.ch
Modelling, Anatomy	The Kenton Bridge Med. Ctre	Harrow	UK	MarkLevy@animalswild.com
Modelling, Anatomy	Thoraklinik Iva Baden	Heidelberg	Germany	EndoscopyHD@t-online.de
Modelling, Anatomy	Thoraxklinik Heidelberg	Heidelberg	Germany	prof.drings@tonline.de

Sector	Organisation	Town	Country	Email
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Modelling, Anatomy	u.z Gasthuisberg	Leuven	Belgium	kristiaan.nackaerts@wz.kubeuven.ac.be
Modelling, Anatomy	Upperton Ltd	Nottingham	UK	rjohnson@upperton.com
Modelling, Anatomy	Valdes	Santa Cruz De Tenerife	Spain	igmoitf@nacom.es
Modelling, Anatomy	Victoria Hospital	Kirkcaldy	UK	106676.3044@compuserve.com
Modelling, Anatomy	Warwick Hospital	Warwick	UK	mjtweed@warwick.ac.uk
Modelling, Anatomy	Whitstable Health Centre	Canterbury	UK	hpinnock@gplag-asthma.org
Modelling, Anatomy	Wilhelminenspital	Vienna	Austria	horst.koehn@nuk.wil.magwien.gv.at
Modelling, Anatomy	Willow house	Kettering	UK	tim.williams@talkrl.com
Modelling, Anatomy	Woodbrook Medical Centre	Loughborough	UK	ryan-dermot3@virgin.net
Modelling, Anatomy	Worcester Royal Infirmary	Worcester	UK	steve.ohickey@virgin.net
Modelling, Anatomy	Wythenshaw Hospital	Manchester	UK	100046.1102@compuserve.com
Modelling, Anatomy	Zentralkrankenhaus Bad Berka	Bad Berka	Germany	rkjm.bonnet@t-online.de
Modelling, Anatomy	Zentralkrankenhaus Gauting	Gauting	Germany	k.haeussinger@asklepios.com

Annex 3: List of Candidate Healthcare Organisations for Consultation

In this section are listed the contact points for the key industrial and clinical trade and professional associations that will be contacted with requests to provide details of experts knowledgeable in the fields in which the VPH NoE is active.

Category	Organisation	URL
Pharmaceutical	European Federation of Pharmaceutical Industries and Association	http://www.efpia.org
	Association of the British Pharmaceutical Industry (ABPI)	http://www.abpi.org.uk
	Farmaindustria is the National Association of the Pharmaceutical Industry in Spain.	http://www.farmaindustria.es/Farma_Public/index.htm
	Commonwealth Pharmacists Association (CPA) is a non-government organisation representing professional pharmaceutical societies from over 40 Commonwealth countries.	http://www.commonwealthpharmacy.org/site/
	European Federation for Pharmaceutical Sciences (EUFEPS) is the only pan-European body to represent the interests of scientists in industry, academia, government and other institutions engaged in drug research, development, regulation and policymaking through Europe.	http://www.eufeps.org/
	International Pharmaceutical Federation (FIP) is the global federation of national associations representing 2 million pharmacists and pharmaceutical scientists around the world.	http://www.fip.org/www/
Clinical (Main)	Institute of Clinical Research (ICR) The largest professional clinical research body in Europe and India. Covers all aspects of work in clinical research and clinical trials. Licensed body of the Science Council, awards the designation, Chartered Scientist, to individual scientists who meet the high standards for the qualification. Works with universities to provide post graduate certificate, diploma, MSc and PhD qualifications internationally.	http://www.pharmaceutical-int.com/categories/clinical-research/institute-of-clinical-research-events-conferences-training.asp
	The Chartered Scientist qualification (CSci) reflects best practice in science and is set at a benchmark level throughout the science professions. Revalidation of both Licensed Bodies and of Chartered Scientists takes place every five years.	http://www.sciencecouncil.org/ChartScienceIntro.php
	European Organisation for Research and Treatment of Cancer (EORTC) one of the main spearheads of European cancerology. This independent body has been receiving considerable support from the European Commission for a number of years.	http://www.eortc.be/
	International Society of Biomechanics	www.isbweb.org
	Bone and Joint Decade Association	www.boneandjointdecade.org
Medical Associations (UK)	Academy of Medical Scientists	http://www.acmedsci.ac.uk/
	British Association of Oral & Maxillofacial Surgeons	http://www.baoms.org.uk/
	British Andrology Society	http://www.britishandrology.org.uk/
	British Dental Association	http://www.bda-dentistry.org.uk/
	British Heart Foundation	http://www.bhf.org.uk/
	British Institute of Musculoskeletal Medicine	http://www.bimm.org.uk/
	British Medical Association	http://www.bma.org.uk/
	British Orthopaedic Association	http://www.boa.ac.uk/
	British Society of Haematology	http://www.b-s-h.org.uk/
	British Society for Immunology	http://immunology.org/
	British Thoracic Society	http://www.brit-thoracic.org.uk/

Category	Organisation	URL
	British Transplantation Society	http://www.bts.org.uk/
	Council for the Registration of Forensic Practitioners	http://www.crfp.org.uk/
	European Society for Medical Oncology	http://www.esmo.org/
	Institute of Biomedical Science	http://www.ibms.org/
	Institute of Cancer Research	http://www.icr.ac.uk/
	The Institute of Urology & Nephrology	http://www.ucl.ac.uk/uro-neph/index.htm
	The Intensive Care Society	http://www.ics.ac.uk/
	Royal College of Anaesthetists	http://www.rcoa.ac.uk/
	Royal College of Nursing	http://www.rcn.org.uk/
	Royal College of Obstetricians and Gynaecologists	http://www.rcog.org.uk/
	Royal College of Paediatrics and Child Health	http://www.rcpch.ac.uk/
	Royal College of Pathologists	http://www.rcpath.org/
	Royal College of Physicians	http://www.rcplondon.ac.uk/
	Royal College of Physicians, Edinburgh	http://www.rcpe.ac.uk/
	Royal College of Physicians and Surgeons of Glasgow	http://www.rcpsg.ac.uk/
	Royal College of Physicians of Ireland	http://www.rcpi.ie/
	Royal College of Radiologists	http://www.rcr.ac.uk/
	Royal College of Surgeons of Edinburgh	http://www.rcsed.ac.uk/
	Royal College of Surgeons of England	http://www.rcseng.ac.uk/
	The Royal Medical Foundation	http://www.royalmedicalfoundation.org/
	Royal Pharmaceutical Society of Great Britain	http://www.rpsgb.org.uk/
	Royal Society	http://www.royalsoc.ac.uk/
	Royal Society for the Promotion of Health	http://www.rsph.org/
Medical Associations (Int)	American Academy of Orthopaedic Surgeons	http://www.aaos.org/
	American College of Rheumatology	http://www.rheumatology.org/
	American Liver Society	http://www.liversociety.org/
	American Medical Association	http://www.ama-assn.org/
	Danish Medical Association	http://www.dadl.dk/
	European Society for Therapeutic Radiology and Oncology	http://www.estro.be/
	European Society for Paediatric Urology	http://www.espu.org/
	European Union of Medical Specialists	http://www.uems.net/
	European Respiratory Society (ERS).	http://dev.ersnet.org/
	European Society of Cardiology (ESC). .	http://www.escardio.org/
	European Association of Neurosurgical Societies	http://www.eans.org/
	European Society for Vascular Surgery.	http://www.esvs.org/
	European Medical Association	http://www.emanet.org/
	European Society for Surgical Research.	www.essr.info/
	Society of Academic and Research Surgery	www.surgicalresearch.org.uk/
	European surgical association	www.eurosurgical.info/
	European Society for Vascular Surgery.	www.esvs.org/
	European Society of Thoracic Surgeons	http://www.ests.org/
	European Society of Cardiovascular Surgery	http://www.escvs.org/
Imaging	European Society of Cardiology	www.escardio.org
	European Society of Radiology	http://www.myesr.org
	European Association of Nuclear Medicine	https://www.eanm.org
	Cardiovascular and Interventional Radiological Society of Europe	http://www.cirse.org
Medical Physics EFOMP	European Federation of Organisations for Medical Physics (EFOMP) covers 34 national organisations and 3 affiliated national organisations which together represent more than 5000 physicists and engineers in the field of Medical Physics.	http://www.efomp.org/index.html
	Austria (A): Austrian Society of Medical Physics (ÖGMP)	http://www.oegmp.at/
	Belgium (B): Société Bèlge des Physiciens des Hospitaux (SBPH), Belgische Vereniging Ziekenhuis	http://www.bhpa.be/

Category	Organisation	URL
	Fysici (BVZF)	
	Bulgaria (BG): Bulgarian Society of Biomedical Physics and Engineering (BSBPE)	http://www.usb-bg.org/Bg/BG_society_of_biomedical_EN.htm
	Croatia (HR): Croatian Medical & Biological Engineering Society (CROMBES)	http://diana.zesoi.fer.hr/ISBE/
	Cyprus (CY): Cyprus Association of Medical Physics and Bio-Medical Engineering (CAMPBE)	http://www.campbe.org
	Czechia (CZ): Czech Association of Medical Physicists (CAMP)	http://csfm.cz/
	Denmark (DK): Danish Society for Medical Physics	http://www.dsmf.org/
	Estonia (EE): Estonian Society for Biomedical Engineering and Medical Physics	http://www.physic.ut.ee/ebmy/
	Finland (SF): Sairaalafyysikot ry, Finnish Association of Hospital Physicists	http://www.sairaalafyysikot.fi/
	FYRO Macedonia (FYROM): Former Yogoslav Republic of Macedonia Association for Medical Physics and Biomedical Engineering (AMPBE)	http://www.efomp.org/members/fyro_macedonia/fyro_macedonia.html
	France (F): Société Française de Physique Médicale (SFPM)	http://www.sfpm.asso.fr/
	Germany (D): Deutsche Gesellschaft für Medizinische Physik e.V. (DGMP)	http://www.dgmp.de/
	Greece (GR): Hellenic Association of Medical Physicists (HAMP)	http://www.efie.gr
	Hungary (H): Hungarian Association of Medical Physics (in the Hungarian Biophysical Society)	http://www.efomp.org/members/hungary/hungary.html
	Ireland (IRL): Association of Physical Scientists in Medicine (APSM)	http://www.apsm.org/
	Italy (I): Associazione Italiana di Fisica Medica (AIFM)	http://www.aifm.it
	Latvia (LV): Latvian Medical Engineering and Physics Society	http://www.efomp.org/members/latvia/latvia.html
	Malta (MT): Malta Association of Medical Physicists (MAMP)	http://www.efomp.org/members/malta/malta.html
	Moldova (MOL): Moldova Association of Medical Physicists (MAMP)	http://www.efomp.org/members/moldova/moldova.html
	The Netherlands (NL): Nederlandse vereniging voor klinische fysika (NVKF)	http://www.nvkf.nl/
	Norway (N): Norwegian Society of Medical Physics (NFMF)	http://www.medfys.no
	Poland (PL): Polish Society of Medical Physics (PSMP)	http://www.efomp.org/members/poland/poland.html
	Portugal (P): Medical Physics Division of the Portuguese Physics Society	http://spf.pt/dvtFM/
	Romania (R): Romanian Medical Physicists Association (RMPA)	http://www.arfm.go.ro
	Russia (RVS) and former SU: Association of Medical Physicists of Russia (AMPR)	http://www.efomp.org/members/russia/russia.html
	Serbia (YU): Society of Biomedical Engineering and Medical Physics (BIMEF)	http://www.efomp.org/members/serbia_montenegro/serbia_montenegro.html
	Slovakia (SK): Society of Medical Physics and Biophys. of the Slovak Medical Society	http://www.efomp.org/members/slovakia/slovakia.html
	Slovenia (SLO): Slovenian Biophysical Society	http://www.drustvo-biofizikov.si
	Spain (E): Sociedad Espanola de Fisica Medica (SEFM)	http://www.sefm.es/
	Sweden (S): Swedish Hospital Physicists Association	http://www.sjukhusfysiker.se/
	Switzerland (CH): Schweizerische Gesellschaft für Strahlenbiologie und Medizinische Physik (SGSMP), Société Suisse de Radiobiologie et de Physique Médicale (SSRPM), Società Svizzera di Radiobiologia e di Fisica Medica (SSRFM)	http://www.sgsmp.ch/
	Turkey (TR): Medical Physics Association (Turkey)	http://www.efomp.org/members/turkey/turkey.html
	Ukraine (UA): Ukrainian Association of Medical Physics	http://www.efomp.org/members/ukraine/ukraine.html

Category	Organisation	URL
	United Kingdom (UK): Institute of Physics and Engineering in Medicine (IPEM)	http://www.ipem.ac.uk/
	EFOMP Affiliate: Algeria (DZ): Algerian Association for Medical Physics (AAMP)	http://www.efomp.org/members/algeria/algeria.html
	EFOMP Affiliate: Israel (IL): Israel Society for Medical Physics	http://www.efomp.org/members/israel/israel.html
	EFOMP Affiliate: South Africa (ZA): South African Medical Physics Society (SAMPS)	http://www.saapmb.org.za/Samps/
	EFOMP Pending: Albania: Albanian Organisation for Medical Physics	http://www.efomp.org/members/albania/albania.html
Industry Associations (EF)	Varian medical systems (Oncology, X-ray, CT equipment and support services)	http://www.varian.com/
	PTW Freiburg (Ionizing Radiation Products)	http://www.ptw.de
	CMS software (The Elekta group) (Radiation treatment planning)	http://www.cms-euro.com
	Iba Dosimetry (Customized high-end dosimetry, cancer diagnosis and therapy, sterilization and ionization)	http://www.iba-dosimetry.com/
	GE Healthcare	www.gehealthcare.com
	PHILIPS	www.medical.philips.com
	ELEKTA (Gamma knife and Oncology – Hardware and software)	www.elekta.com
	Standard Imaging (QA software, Ion chambers, Phantoms, Beam QA, Electrometers, Brachytherapy.)	http://www.standardimaging.com/
Industry Associations	BioIndustry Association, the trade association for innovative enterprises in the UK's bioscience sector.	http://www.bioindustry.org/
	EuropaBio (Promotes an innovative and dynamic biotechnology-based industry in Europe, 1800 small and medium sized enterprises.)	http://www.europabio.org/
	Innovation In Europe: Research and Results in Health and Medicine (also networks)	http://ec.europa.eu/research/success/en/med/succ-med.html
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