

VPH NoE Concertation Day Report

The following document outlines proceedings of and future actions resulting from three Virtual Physiological Human (VPH) NoE-lead workshops held at the VPH Initiative (VPH-I) Concertation Day (22.10.08). Minutes for all plenary sessions and links to supplementary information are also included (Appendix 1).

Contents

General Meeting Summary	2
Workshop 1: Clinical and Industrial Applications of the VPH	3-7
Workshop 2: A Perspective on Data and the VPH Initiative	8-10
Workshop 3: Development of a Common EU training framework	11-13
Appendix I: Plenary session minutes	14-17

VPH CONCERTATION MEETING SUMMARY

The VPH Concertation Meeting was held on 22.10.08 in order to bring together, for the first time, all projects funded within the Framework Programme Seven (FP7) VPH Initiative (VPH-I), and VPH-related projects funded during Framework Programme Six (FP6). Organised jointly by the VPH NoE and the European Commission, the VPH Concertation Meeting sought to facilitate networking between projects/experts working in related VPH research areas, provide better visibility for project activities, and identify synergies and common areas of interests within the VPH -I that may be tackled collectively by groups of projects.

The VPH Concertation Meeting delegates heard from: the EC, on the past, present and future of the VPH-I; from the VPH NoE on its core project activities and how these aim to support the wider research community; and from four FP6 VPH-related projects (SEALIFE, INFOBIOMED, Virolab and Health-e-Child) which described their considerable successes and the legacy of VPH research upon which the VPH-I projects must build as we move forward into FP7.

A key aspect of the VPH Concertation meeting were three focused workshops, the topics for which were chosen in response to consultation with VPH-I project representatives through surveying, and included: 1) Clinical and Industrial Applications of VPH; 2) A Perspective on Data and the VPH Initiative, and; 3) Development of a Common EU Training Framework.

The goal for these workshops was to not only provide a forum for discussion of issues of cross-cutting interest to VPH-I and VPH-related projects, but also to identify ways in which VPH researchers can work collectively in the future to address challenges of common concern.

SUMMARY OF MAIN ACTION POINTS RESULTING FROM WORKSHOPS

WORKSHOP 1: Clinical and Industrial Applications of VPH

- VPH NoE to prepare a **dissemination leaflet target the clinical community**. May also consider an equivalent for Industrial sector.
- VPH NoE to set up a **VPH Standards Working Group** to develop a common standards description for model validation and verification in collaboration with competent standardisation bodies. Other VPH standards may be considered.
- The EC and VPH NoE to organize within the next year a **pilot industrial concertation event** covering achievements and strategic industrial perspectives in the VPH arena.

WORKSHOP 2: A Perspective on Data and the VPH Initiative

- VPH NoE to set up a **VPH Data Working Group** to have membership drawn from across the VPH-I projects, to discuss further the issues raised in workshop 2.
- A first task for the VPH Data WG will be a **White Paper on Sharing and Reuse of Clinical Data**.
- VPH NoE to collate information on what ontologies are currently in use by VPH projects and the obstacles to their use, followed by set up of an **ontology-related focus group**, including VPH-I project representatives.
- VPH NoE will schedule a VPH-I **meeting relating to data ethics** for 2009

WORKSHOP 3: Development of a Common EU Training Framework

- VPH NoE to establish a **VPH-I Working Group** (one key contact per VPH-I project – also to include ongoing FP6 project coordinators)
- Early tasks for the the VPH-I working group will include contribution to **VPH-I newsletter** and discussion on production of a **VPH-I booklet** of all projects (or other joint dissemination activities).

SUMMARY REPORT

VPH Concertation Day Workshop 1: Clinical and Industrial Applications of the VPH

This workshop aimed to address the creation of sustainable collaborations between academia, the biomedical industry and clinicians. Various aspects of securing buy-in and acceptance of developing technologies by the designated user community were discussed, led by a panel of experts with backgrounds ranging from bioinformatics to medical image computing and imaging, as well as anatomical and physiological computational modelling. These discussions were used to identify the *best strategy that the VPH NoE should pursue to ensure wider application and dissemination of the various VPH-I projects within the broader clinical/industrial communities (beyond individual consortia).*

The workshop consisted of three main sessions:

- (1) Clinical involvement in and acceptance of the Physiome approach**, which addressed the challenge of promoting cultural shifts in clinical practice to integrate further innovative medical engineering, diagnostic and predictive solutions emerging from VPH research;
- (2) Computational clinical systems, integrating validation and verification from day one**, which examined how VPH researchers can implement validation strategies from the onset of a project to help the process of clinical validation and verification, and how to establish accepted standards within academic research settings; and
- (3) Tightening VPH and Industrial take-up and exploitation**, focussing on how to forge connections between VPH researchers and industry, along with examining realistic targets in terms of industrial exploitation and time-to-market for these technologies.

Session 1: Clinical involvement in and acceptance of the Physiome approach

Clinical acceptance of physiome techniques is still a challenge and this session focussed on how to better involve clinicians and increase clinical acceptance of VPH methodologies.

Clinical systems require validation, and with no examples of physiome-like systems in use in the real world, the development path is long and the involvement of clinicians for this entire period (5-10 years typically) may be difficult. Many tools will be developed as a result of VPH-I projects and we need to work out how to better integrate these innovative tools emerging from VPH research.

Questions during this session focussed on; how we can more effectively engage clinicians and gain clinical acceptance? How can we more efficiently make use of clinician's time, which is essentially coming from freely providing time for research and clinical directives - can we better identify their specific roles in the project (minimise their committed time)? On the educational front, medical students are pushed towards specialisation, is there a way which they can also become interdisciplinary?

Session 1 outcomes

There is a need to clearly identify the medical impact of novel outcomes of VPH projects, and promote these via clinicians who are part of the team, along with involving clinicians from the onset of the project. Projects need to begin with a concrete hypothesis, using clinical trials as the drivers of data availability. Proof of concepts are fundamental for validation and influencing clinical practice, and these validated predictive models must be promoted as impacting clinical practice through editorials in high impact clinical journals.

On clinical research, the importance of bioengineers in the clinical team for translational purposes is imperative. In terms of education, integrating technical background into medical education.

Withint the VPH-I we need clinician's help to identify and 'own' problems which they would be unable to handle without VPH approaches - this will create a pull from their end to solve these problems. Finally, the publication of a leaflet with success stories, exemplifying reasons to engage, a story told by clinicians, along with an up to date repository of success stories, will go a long way to enhancing awareness and trust in VPH research, in the clinical sector.

Session 2: Computational clinical systems, integrating validation and verification from day one.

The effort of validation and verification is currently the led by industry via their development pipelines, taking clinical solutions developed in academia and applying the necessary quality assurance and standardisation to bring clinical products to market. This separation of academic and industrial responsibilities results in a much longer time-to-market for VPH technologies.

Questions posed in this session included; How can VPH researchers implement validation strategies from the onset of a project to help the process of clinical validation and verification, which could include technical, cultural, clinical elements and their interplay? How can we begin to establish accepted standards within academic research settings? How do we help ensure validation and verification of these computational clinical systems, given establishment of those standards within academic research settings?

Session 2 outcomes

A number of points were brought up for validation from the onset. It is generally clear who runs a full clinical trial on medical products, but it is unclear who funds clinical trials to demonstrate efficacy of simulation results, which seems currently to mostly lie with the academic research realm. In this case of a VPH project, clinical workflows need to be defined formally from the outset, including a data provenance and data processing trail, involving clinicians. There is also a need to define a number of validation scenarios that set the conditions for testing software involved, including definitions and conditions of scenarios for simulator testing; therefore part of the system design is testing-oriented.

It is not, however, entirely the responsibility of academia to validate clinical systems under clinical conditions; the academic community needs to input of industrial partners with the relevant domain experience. The validation could follow a three-level scheme alongside the pharmaceutical trial scheme: L1: based on retrospective data; L2: based on small-series of prospective data; L3: based on large-scale prospective data, the latter of which should be conducted in a similar manner than a full-scale trial. There is an issue here of time and funding. It was argued that the current duration and funding schemes at the EC level are not appropriate to cover all these levels of required validation.

Furthermore, academic partners can be instrumental not only in methodological development but also in supporting industry in designing and carrying out validation campaigns, particularly with respect to SMEs which may have less of their own resources and/or capacity for this critical task, which can thus be a barrier for penetration of VPH technologies in the market. It was suggested as a recommendation to the EC to secure that all EC-funded projects in this domain require a clear strategy and *minimal level of technology validation*. Validation at the L3 level will require at least a substantial contribution from industry and, particularly at the beginning of the VPH technology research and development. Note that this also implies the need for the EC to allow budgeting in ICT projects some level of data collection and pure technical work for data processing and validation. This was identified as a critical recommendation to be made to the EC.

Overall it was felt that a task-oriented approach towards validation of any VPH-technology developed should be focused such that any validation task should have a clearly identifiable and tangible benefit within the care cycle or care pathway. Where possible, it is essential to validate tools against recognized gold-standards or current best practice (i.e. against reference experimental measurements or recognized clinical performance measures). In any case, it is

important not to focus only on technical verification of methods and systems but also to focus on reasonably demonstrating clinical value in the form the clinical community is used to recognize it.

Important elements in this context are the role and support that standardization bodies¹ may provide in defining general guidelines and recommendations that all VPH-related EC projects should follow to secure a minimum level of validation of their results and thus contribute to a coordinated building of credibility of the VPH. As a recommendation to the VPH NoE, *it was suggested the creation of a working group to identify best practices in validating VPH technology*. Examples were provided of some ongoing multicentre validation campaigns and resulting publications, in some of the ongoing projects².

Session 3: VPH and Industrial take-up and exploitation

The session was open by introducing the main conclusions of the STEP Action Roadmap where an analysis of the industrial sector interested in VPH was carried out and their exploitation interests in VPH analysed. It was reminded that one the problems from industry in the VPH area is to find qualified and highly interdisciplinary employees. Based on the STEP Roadmap, three main industrial profiles were presented: a) *Clinically oriented industries*: they develop products oriented to clinical information interpretation, tools for decision/interventional support, tools for training/education of professionals; b) *Medical product oriented industries*: they develop medical devices and implants, pharmaceuticals like medicines and contrast media, etc.; c) *Enabling capacities oriented*: are companies developing technologies which underlie and enable VPH tools or applications like storage and computing technology, scientific computing and visualization, ICT infrastructure providers, ethical and legal advisors, just to name a few.

Three main questions were posed to the audience (1) Are we missing or conversely overemphasizing certain industrial clusters within the collective VPH consortia? (2) How can we best engage/support industry from within: a) the NoE VPH; b) your own consortium? Is there a critical level of responsibility through which this link should be should be industry approach? (3) What are realistic industrial targets to accomplish within 3-5 years? Very concrete high-impact VPH application/tools (even if modest modeling-wise).

Session 3 outcomes

So far the VPH-I was deemed to have a positive approach because there is a high level of industrial participation in VPH projects, where large companies participate in long-term R&D projects for reasons of capability building and access to relevant knowledge from academia. It has become clear that VPH is relevant to industry and that middle-term joint R&D is required for a proper take up of this technology by industry and subsequently its inception in the market.

A quick analysis to the industrial participation on ongoing VPH projects reveals a substantial involvement on medical imaging and sensing companies, medical device companies, high-performance and grid computing companies, companies developing simulation and visualization software, and companies developing information systems and decision support systems. Most of these companies are interested in diverse ways in VPH technology but a number of these applications focus more on horizontal integration rather than on vertical (multi-scale) integration. Without ignoring these business sectors and their needs, therefore, it was identified that more emphasis on VPH technology for the pharmaceutical industry particularly in the area of organ modeling and image-based biomarkers both for assessing computationally and in vivo treatment response is required. It was indicated that the VPH NoE should play a role in this domain by connecting with efforts like the Innovative Medicines Initiative, particularly in terms of efficacy and safety of drugs. This is where multi-scale modeling and simulation might be particularly relevant, and targets over the next 3-5 years can include using interaction between drugs and targets

¹ European Telecommunications Standards Institute <http://www.etsi.org>

² For example, connected to @neurIST, the Virtual Intracranial Stenting Challenge (VISC) was developed; cf. www.cilab.upf.edu/visc06/ and the published result at: Radaelli AG, et al. Reproducibility of haemodynamical simulations in a subject-specific stented aneurysm model—a report on the Virtual Intracranial Stenting Challenge 2007. J Biomech. 2008 Jul 19;41(10):2069-81.

coupled with biological pathways, coupling biological pathways with tissue and organ models, personalisation of these models with data from physiological monitoring and medical imaging systems, and generation of disease models based on mining and integration of heterogeneous data sources, particularly from electronic patient records. In this context, imaging is perceived as having a growing role in evaluating of treatment response through understanding changes in physiological structure and function induced by drugs.

Regarding linking VPH and Industry, a number of suggestions were collected as part of the break-out discussions. Primarily, it was recognized as a top priority to organise an annual event, similar to ICT-BIO, but targeted to an audience of industrial representatives at the top R&D strategic level. The goal of this event is to create a critical mass of European industry actively engaged in the VPH-I and from where a number of innovative projects could be started. Awareness and commitment would be best ignited through a medium-scale event combining VPH conceptual demonstrators plus ample time for guided discussions. This event, coordinated by the VPH NoE but highly supported by the EC in terms of issuing invitations and providing contacts, will have as an objective to increase the exposure of VPH concepts and their leveraging by industry into their strategic roadmaps. It will also lead to awareness of industry about the funding opportunities in this arena at the European level. The invitation should also be extended to Industry Associations. Possibly, the event will have to consider distinguishing between the interests of big companies and SMEs. The latter will have a key role in take up of the most innovative VPH concepts.

One key issue to cover at such an event is the best ways in which VPH results should be packaged for an efficient take up by industry. Some industrial delegates pointed to the need for clear IP rules for what is generated in the ongoing projects; preference for compact and well identifiable R&D components; and the preference, in many areas, for good ideas and publications as opposed to necessarily availability of tools or implementations thereof. Delegates from the ICT domain see, within VPH, the clear need for data and computing grids but some of the actual business cases still depend on a number of non-technical factors like ethical and legal implications inherent in seeking access to electronic health records and the existence of regional networks of information systems. Finally, from the point of view of industrial take up and connected to evaluation, it was made clear the need to develop a series of regular (annual) benchmarking challenges like those developed in connection to the biometrics industry³. These can help in stimulating validation and progress in critical areas of the VPH.

ACTION POINTS AND KEY CHALLENGES FOR THE VPH-I.

Session 1:

VPH NoE to prepare a dissemination leaflet target the clinical community and divided in two parts "*10 good reasons why VPH-I will support your clinical work*" and "*How can you get involved in the VPH-I?*" This leaflet has to be developed with the most active clinicians in the ongoing VPH projects and named clinicians should be providing their testimonies and endorsement covering all possible clinical disciplines throughout the leaflet. The contents of this leaflet will be defined and coordinated by NoE-WS1 members and the leaflet itself will be produced and disseminated at large through the NoE-WP5.

Session 2:

The VPH NoE to coordinate and promote the generation of recommendations for all VPH projects to ensure minimal levels of validation of tools/models as an integral part of their project work plan. VPH projects should have a plan for achieving at least L1 and L2 validation studies during their course of activities. The VPH NoE should help with inventory and creation a repository of benchmark data sets, annotations and/or ground-truth meta data, which can be used by future

³ Cf. for instance: <http://zing.ncsl.nist.gov/biousa/>, <http://face.nist.gov/frvt/>, <http://face.nist.gov/frgc/>

projects in the evaluation of new methodologies. Furthermore, the VPH NoE recommends to and will lobby for the EC to ensure that current and future project are able to claim/budget costs for data collection and processing associated with L1 and L2 validation and to ensure that new funding mechanisms are open for L3 validation. The VPH NoE should stimulate/coordinate/disseminate regular and task-oriented benchmarking campaigns on tools and models. Finally, the VPH NoE to set up a working group to develop a common standards description in collaboration with competent standardisation bodies.

Session 3:

The EC and the VPH NoE to organize within the next year a pilot industrial concertation event oriented towards top R&D strategic managers from the relevant industries, and confronting ongoing project achievements and strategic industrial perspectives in the VPH arena. The VPH NoE to liaise with IMI and IMI-related industry as to indentify synergies which can be built between the VPH-I and the pharmaceutical sector. The VPH NoE to also consider the development of a leaflet similar to that to clinicians but oriented towards the industrial sector and reporting on success stories in terms of industry take-up.

For more information on the content of and/or activities resulting from Workshop 1 please contact:

Workshop Chair: Steven Manos (s.manos@ucl.ac.uk)

Workshop Rapporteur: Alejandro Frangi (alejandro.frangi@upf.edu)

VPH NoE Workshop Organisers: Steven Manos, Alejandro Frangi, Bernard De Bono (bdb@ebi.ac.uk), Serge Van Sint Jan (sintjans@ulb.ac.be).

SUMMARY REPORT

VPH Concertation Day Workshop 2: A Perspective on Data and the VPH Initiative

Workshop 2 began with a recap of the history of EU-funded projects and research, preceding the FP7 VPH-I. The point was made that, within FP6, there was considerable investment in 'infrastructure'. This is reflected in the fact that there is considerably less funding in FP7 for building VPH-related infrastructure – we need to build on what is already there (and the significant investment on infrastructure during FP6), and avoid duplication of effort.

VPH NoE WP3 has accordingly been working to establish what the VPH community needs in terms of computational and data capacities (or infrastructure), in order to bring together a 'VPH ToolKit' of resources currently available, to suit the communities needs and support enhanced collaborative and integrative research. This has, in the first instance, been achieved through a comprehensive 'requirements and technology assessment exercise' (RTAE), which involved the surveying of all VPH NoE and VPH-I project partners. A draft copy of the RTAE document is now available on the NoE website (www.VPH-NoE.eu/WP3).

As regards this VPH Concertation Day workshop, the topic of **data** was chosen for the session both because this was identified as being of significant interest in a survey of VPH Concertation Meeting delegates prior to the event. Furthermore, session organisers wanted a cross cutting theme with a broad interest to most VPH-I projects, who could be present/represented.

The workshop consisted of three main sessions, relating to data:

- (1) **Data types**, which addressed questions including: Where is your data? What is it? Can I use it? How do I share it?
- (2) **Ontologies**, which examined what ontologies are why we may need them to support VPH model-related research (development, integration) and application.
- (3) **Data and ethics**, focussing of the ethical-legal challenges inherent in working with patient medical data and reuse of clinical data collected within different VPH projects.

Session 1: Data types

The session started with four questions relating to data: Where is the data? What is it? Can I use it? How do I share it? The questions highlight the key challenges faced by WP3 ToolKit developers.

In more detail, the session involved a game in which delegates were split in to teams and asked to list as many file formats as possible. The large number of formats named by participants highlighted the wide variety of data formats that VPH researchers do and will work with, and hence the VPH NoE will have to deal with/cater for, within the VPH ToolKit. It was stated as very important, however, that despite this the VPH shouldn't restrict users of any facility to particular formats. Rather, the focus is on the VPH community to identify need for and subsequently develop converters to allow better data sharing/storage and mark up. Writing all the converters required is an enormous problem, but one we will have to face.

Regarding data interoperability, a talk and subsequent discussion session revolved around XML. It was put that XML is an essential component for data interoperability and VPH, and may help the NoE begin solve the problem. For the data challenge and markup languages, therefore, the following questions were raised:

- Is XML the way to go for data?
- Should we wrap existing data formats in XML?
- What standards should be priorities for development?
- What training if any is required?

It was noted that it is difficult to define generic ways to store data without having an idea of what the data is. A challenge exists regarding how open a standard is - i.e. can it be extended in such a way that it no longer is usable as a standard?

Moving on from data markup, the data challenge and virtualisation was discussed - a list of key challenges relating to the sharing of data that the VPH must address was also given.

- There must be a facility to expose data for sharing
- There must be a facility to find available data
- There must be a facility pulling content to the user who needs it.

Furthermore, the following challenges were identified:

- The multiple languages in which metadata may be stored presents a challenge to VPH researchers.
- The NoE must also try to address the problem of incentivising researchers to share their data in the first place.

John Fenner (USFD) outlined a proposed architecture based on system virtualization to address these challenges (for more information contact j.w.fenner@sheffield.ac.uk).

Session 2: Ontologies

Due to the short time available, a very quick introduction to how ontologies are used at the European Bioinformatics Institute (EBI) and how they could help VPH researchers was given. Of the delegates present, 6 people out of the group use ontologies in their work - molecular structure (2), (sub)cellular (3), anatomy - gross structure (4).

It was noted that VPH NoE is ideally placed to support development of ontologies and their use. One of the problems limiting the wider uptake of existing ontologies is their lack of expressiveness, and the fact that few projects have the resources to be able to populate ontologies with their terms.

For people needing anatomy ontologies, the use of OBO and NCBO frameworks was proposed. It was suggested that use of ontologies within VPH-I projects could be coordinated by the VPH NoE, to ensure that compatible anatomy terms are used across the VPH. The session highlighted a key challenge in getting different ontologies created for different reasons to interoperate easily. Problems with conflicting ontologies exist in many fields.

The question of whether more dynamic ontologies were needed, e.g. ones that described the heart. The consensus was that for such systems the model provides the description. There was general agreement that a repository of useful ontologies should be created. The pressing need for a geometric co-ordinates system that could be used to map individual organs of the body, in addition to ontologies, was discussed. It was noted that the VPH NoE could play a leading role in establishing such a system.

Session 3: data and ethics

This session started with descriptions of several scenarios, and delegates were asked to consider the ethical dilemmas involved. Once primed, the workshop participants discussed issues of anonymisation of data: even if data is anonymised ethical approval for its use is still required, and questions are raised on whether it should be fully anonymised or pseudonymised. It was concluded that VPH has a responsibility to tackle many problems regarding the use of clinical

data, including: restrictions on the use of data to a particular field, accessing legacy data with restricted consent, jurisdiction – access to data in different locations/countries, how data is cropped when anonymised.

A question was raised about the ownership of data: who owns the data depends on which country you're in. Questions were raised:

- Whether documents exist that describe what degree of firewalling you need to protect even anonymised data?
- What rules apply in scenarios where an emergency simulation could be performed to save someone's life? Can data protection laws be ignored?
- What are the ethical implications for failed simulations used to support clinical decisions? Are there ethical considerations in relation to modelling?
- How can tools be validated prior to their use in clinical practice? This is a core requirement for VPH to address generically.

A key challenge for the VPH NoE is to produce answers to these questions.

ACTION POINTS AND KEY CHALLENGES FOR THE VPH-I.

The following steps were listed as being useful to take the NoE data challenge forward:

- A **data working group** will be established with membership drawn from across the VPH-I projects, to discuss the issues raised in this workshop
- A **white paper on sharing and reuse of clinical data** will be an early task for the data working group
- All information regarding what ontologies are currently in use by VPH project and the obstacles to their use will be sent to Bernard de Bono (bdb@ebi.ac.uk), who will then coordinate the set up of an **ontology-related focus group**, within the VPH NoE. An analysis of what is required by VPH that go beyond what current ontologies provide will be conducted
- A meeting relating to data ethics will be scheduled for 2009

For more information on the content of and/or activities resulting from Workshop 2 please contact:

Workshop Chairs: John Fenner (j.w.fenner@sheffield.ac.uk) & Sharon Lloyd (Sharon.Lloyd@comlab.ox.ac.uk)

Workshop Rappoteur: Stefan Zasada (stefan.zasada@ucl.ac.uk)

VPH NoE Workshop Organisers: John Fenner, Sharon Lloyd, Stefan Zasada, Jonathan Cooper (Jonathan.Cooper@comlab.ox.ac.uk), Randy Thomas (srthomas@ibisc.fr), Keith McCormack (k.m.mccormack@sheffield.ac.uk)

SUMMARY REPORT

VPH Concertation Day Workshop 3: Development of a Common EU training framework

Workshop 3 started with an outline of the diversity of issues and challenges that the VPH NoE faces, in relation to development of a common EU VPH training framework. The workshop group itself was small (about 15 participants in total) so following the three initial presentations we launched straight into a discussion around the main questions outlined below.

Focus: VPH related postgraduate training and how to organize it in the EU

Q1. When does training in VPH start?

The advantages and disadvantages of an early training in 'VPH' (biomedical modelling and simulation and associated ICT) were discussed i.e. should training in this field start at school, undergraduate or postgraduate levels? The general consensus was that postgraduate is by far the most desirable level for developing a targeted training scheme, as specialisation in a certain discipline, followed by diversification/expansion into a new field, is the most reasonable and practical way to progress a cutting edge interdisciplinary career. That is, it is preferable to train people who already have a sound knowledge of a particular area so that once they are experts in that area, we can assist them to bridge the gap to a second area (through, for example, a VPH MSc). Motivating and informing young people in such an interdisciplinary career path, however, should become a crucial aspect of undergraduate teaching.

Q2. Should there be VPH courses from the undergraduate or postgraduate level?

As noted above, the general consensus was that VPH courses should be for privileged individuals who are experts in their respective fields (i.e. biology, engineering, mathematics, physics, etc.). Reference was made to a course offered by Stanford University in the USA - a postdoctoral one year course which brings together 4 people from different backgrounds to work on a specific problem, bringing expertise from their respective fields to work collaboratively and seek new approaches to the scientific challenge at hand. The VPH NoE will seek to achieve a similar, albeit smaller scale equivalent, in the form of the VPH NoE Study Groups. It is a possibility that such an approach could be considered as part of a VPH MSc level course.

Q3. How do we get around the challenges of pan-European training?

The comment was made that different countries have different training backgrounds when embarking on PhD or postdoctoral training (i.e. UK students can begin a PhD after 3 years, whilst students from Spain only begin doctoral study after 5 years). This can create a large gap in knowledge of previous preparatory knowledge. In order to overcome this challenge, therefore, the VPH NoE will have to undertake a thorough analysis of graduate/postgraduate training schemes and cultures, particularly within core members institutions which will provide the resources for a pilot scheme. The problem is not insurmountable, but the training environment into which a VPH postgraduate course would be embedded must be well-characterised.

Q4. Is there a need for accreditation / a professional organization?

It was discussed whether or not there was a need for an accreditation body for the VPH, particularly for clinicians/researchers working within the clinical environment, using 'VPH' technologies. Whilst such a scenario may seem one for the future (when VPH-style modelling to support clinical intervention becomes more commonplace), should it be something we consider

now? Following discussion it was concluded that, as there are numerous challenges associated with this - not least the different accreditation requirements for various healthcare systems in various countries, it may be better to work towards a professional qualifications in the first instance, relating to specific techniques/technologies. This may more easily lead to the establishment of accreditation requirements by a professional body, in the future.

Q5. For VPH-related training, what 'tools' might be used?

The need for a textbook was mentioned, and the intention of the VPH NoE (WP4) to create one within the next 3-4 years was outlined. Other tools were also discussed as being important and to be considered, both for VPH postgraduate course development and for VPH researchers in general. These include focused online courses of both VPH-related academic (physiology, mathematics etc) and more applied (models, ontologies, tools) topics. It was noted that the textbook could be a combination of traditional text and internet support.

Q6. Is there a need for language courses for interdisciplinary communication?

We discussed the fact that there are uneven numbers of experts in particular disciplines, within different countries. The point was made that each country has differing funding opportunities for different scientific disciplines. This often results in widely differing numbers of people in one specific discipline from one country needing to interact with experts from other countries, not necessarily sharing a language. Resources to help progress a field in a given country may require translation into the native language, especially if much material is 'imported' yet insufficient national level funding is available to support this. Given the scale of the issue it was concluded, therefore, that whilst there may be a need for language courses/translation support and the lack of a common language may be a potential problem in making VPH research 'without borders', it is perhaps not the domain of the VPH NoE to provide language courses at this stage. The NoE should, however, attempt to ascertain the level of 'need' in this area, and lobby as appropriate for support from the EC.

Q7. Are summer courses a good idea?

Following earlier discussion on bringing together individuals who are experts from specific backgrounds, participants generally agreed that summer courses were an excellent opportunity to advance VPH training. In a similar vein, as the VPH research community is formed by people from different backgrounds, implementation of introductory courses for people working in the field already may also improve communication among VPH project participants (knowledge exchange etc) on a more local level. This follows a similar initiative by NIH.

Q8. Sustainability of VPH?

This issue was addressed from different points of view. One of them is the relation between education and posts in academia. The consensus is that there should be an effort to relate education/training to clinical and industrial needs. The issue of accreditation and professional organizations specific to VPH is also closely linked to sustainability. Professional qualification, especially relevant for the clinical sector, is another aspect of the discussion on sustainability. Looking for possible funding from the private sector, particularly possible in relation to educational material, can contribute to the sustainability of the VPH.

ACTION POINTS AND KEY CHALLENGES FOR THE VPH-I.

During the VPH Concertation Day contacts within all VPH-I projects were established by Tara Chapman. Immediately after the conference all VPH-I projects will be contacted in order to establish a **VPH I Working Group**. Early tasks for the the VPH-I working group will include:

- Contribution to VPH-I newsletter
- Discussion on production of a VPH-I booklet of all projects, in a similar format to the VPH NoE general flyer (June to Dec 2009)
- Expansion of a VPH-I networking plan (basis to be outlined in VPH NoE WP5 6 month dissemination plan).

The first **study group** within VPH NoE is being held in Nottingham in June 2009 - information on this group will be disseminated to potential participants from VPH projects as soon as the event has been approved by the Steering Committee.

VPH NoE WP4 team **develop VPH textbook proposal** and expand discussions to include VPH-I WG members/VPH-I project participants during development.

VPH NoE WP4 team will distribute an internal questionnaire to gather/confirm information on education programmes currently being offered by core members in order to complete the preliminary review of training programmes. This will lay the foundations for proposal of a VPH MSC-level training programme. Information on this will be disseminated to VPH-I WG members/VPH-I project participants as it becomes available. The WP4 team will also explore the U. Stanford interdisciplinary training course and investigate whether a similar strategy can be applied with VPH NoE (also other types of courses or training activities complementary to undergraduate or master level courses).

For more information on the content of and/or activities resulting from Workshop 3 please contact:

Workshop Chair: Bart Bijmens (bart.bijmens@upf.edu)

Report prepared by WS3 contacts : Tara Chapman (tchapman@ulb.ac.be) & Carlos Martin (Carlos.Martin@upf.edu)

VPH NoE Workshop Organisers: The VPH NoE work package 4 team (vph-noe-wp4@ercim.org)

Annex I

VPH Concertation Day

22 October 2008

Minutes

Opening

Ilias Iakovidis, Deputy Head - ICT for Health

This group of projects must deliver results, not R&D Roadmap, quickly – it's not a 30-year mission to the moon, but a mission to convince politicians of the value of our approach.

There is an “infrastructural consensus-based process” we must go through as a cluster of projects. We need new knowledge and research, but also standards for data exchange, modelling exchange, etc.

If you are suited to independent research/discovery, make sure somebody in your lab is working on collaboration and standards.

Please see the Communication Guide (provided in handouts) to develop and promote our group identity: mention your funding, mention that you are part of a cluster of related projects.

Joël Bacquet, DG-INFISO Project Officer

VPH to be key facilitator for early diagnostics and predictive medicine, personalised (patient-specific) healthcare. The next VPH call will focus only on international cooperation with a limited budget of 5M€ linking EU and non-EU projects. The call will be opened on 19th of November and will close on 1st of April 2009 (Objective 5.4: International Cooperation on VPH). Objective 5.3 VPH will follow in later 2009.

OBJECTIVE 5.3: Target outcomes: patient-specific computer-based models and simulation: multiscale models and simulation of organs/systems
Better understanding of the function of the organs and pathologies, aiming for prediction/early diagnosis

ICT tools, services and infrastructure for bio-medical researchers to support at least 2 of these 3:

- 1) Share data and knowledge
- 2) Jointly develop and share models/simulators
- 3) Create collaborative environments

Target outcomes: support action on evaluation and assessment of VPH projects re: optimal use and contribution of sharing tools/clinical achievements/market potentials;
coordination/support actions on: observatory on achievements and evolution of the broader BMI field e.g. bioinformatics, Medical informatics, etc).

OBJECTIVE 5.4: we need international cooperation because many issues not limited to Europe (standardisation, handling data volume, interoperability of models and applications, etc)

Target outcomes: interoperability: joint development of interfaces between scientific databases, web services, markup languages, metadata, ontologies.

VPH NoE Aims and Objectives

Peter Coveney

www.vph-noe.eu

Main goals:

Collaborative projects within the call to reach specific goals

Help the approach spread: research infrastructure, training and dissemination

Specifically:

- Identify user needs, define standards, ontologies and applications, and develop VPH ToolKit and contribution to an international standardisation/validation environment
- Develop VPH training activities and materials: joint advanced degree programme, interdisciplinary study groups, focused journal issues, textbook.
- Provide research/news dissemination services and international EU/international networking.

Project structure:

WP1: Management (co-led by [Cat Gale](#), UCL, and [Katherine Fletcher](#), University of Oxford)

WP2: Exemplar Projects (led by [Randy Thomas](#), CNRS)

WP3: VPH ToolKit (led by [Sharon Lloyd](#), Oxford)

WP4: Education, Training, Mobility (led by [Carlos Martín](#), UPF)

WP5: Dissemination (led by [Rémi Ronchaud](#), ERCIM)

Please check with the NoE when developing tools for your project, and consider making your own tools as generic as possible for future sharing. Contact [Jonathan Cooper](#), University of Oxford, for details.

Each VPH project to identify VPH Initiative Working Group representatives, to contribute to newsletters and facilitate VPH I networking. Contact [Tara Chapman](#), ULB, for details.

Presentations of results of selected FP6 projects

SeaLife: Albert Burger (ab@macs.hw.ac.uk)

Semantic Grid Browser for the Life Sciences Applied to the study of Infectious Diseases.

- Semantic grid browsers link the current web to the emerging eScience infrastructure.
- Semantic hyperlinks dynamically link text through ontologies to services.
- GoPubMed (www.gopubmed.org) – search papers for given search terms, plus a particular “go” concept, enabling richer searching.
- COHSE: software agent that generates and presents links on behalf of an author and a reader – just-in-time markup to dynamically link to other webpages that have the same concepts.
- Corese: semantic search engine with ontologies that govern linking, documents that get marked up, and semantically-linked pages.

- Automatic term generation/natural language expertise: syntactic variation normalisation, finding labels, ranking candidate terms, incorporation of corpus specific background knowledge, grouping in term groups, curation support for fast terminology acquisition. Idavoll = prototype tool.
- Word Sense Disambiguation: best friend, metadata, closest friends, annotation generator for NeLI webpages (adaptation/application of existing tools and approaches).
- Protégé: Terminus plugin. Simple interface for rapidly populating OWL ontology with candidate terms.
- Protégé: SKOSEd plugin. Plugin for building and editing SKOSEd vocabularies, currently in pre-alpha with 80 downloads, being used by NeLI group to develop NeLI vocabulary.
- Semantic distance: distance in conceptual graphs, distance can be basis of similarity (as relationships demonstrated in a genetic tree – further apart = less semantically similar).
- User profiling: webpage suggestions for users who match a particular profile.
- Service Composition: Argumentation. Users can see reasoning behind the matches and “argue” to have semantic links rearranged.

INFOBIOMED: Ferran Sanz (fsanz@imim.es)

Network of Excellence: Integration of “omics” and clinical information with preventive, diagnostic and therapeutic purposes.

- INFOBIOMED website: www.infobiomed.org & www.infobiomed.net
- Main objective: Set a durable structure for BMI at the European level that supports its consolidation as an integrative scientific discipline that exploits the synergies between BI and MI that are two separate disciplines.
- Specific objectives:
 - “Community”: education, mobility, training, creating a self-sustainable structure;
 - “Scientific”: data integration, methods, technologies and tools, pilot applications.
- Some projects:
 - Ethics and confidentiality: Privacy protection for clinical and genomic data.
 - Biomedical text mining tool (OSIRIS).
 - Pilots:
 - Biomedical text mining: High-throughput analysis combined with detailed knowledge of pathway biology enabling a patient-specific therapeutic regime.
 - Peridontitis: multifactorial complex disease (polygenic, infectious component, environmental influences, high prevalence, non-invasive sampling).
 - Colon cancer: detection and follow-up of families at risk of colon cancer: integration of clinical information, genotype, storage and analysis of family pedigree information.
 - Pharmacoinformatics: integration of heterogeneous biomedical information to gain better view of mechanisms of pharmacological treatments (all the way through disease, pathway, target, ligand).
- Training: Multidisciplinary student groups spent one week (semi-sequestered) on a specific case study, with best presentation at end awarded with a one-month stay at an INFOBIOMED partner institution. High student satisfaction, good media coverage.

VIROLAB: Peter sloot (sloot@science.uva.nl)

Virtual laboratory for infectious diseases (HIV epidemic focus).

- Complex interplay between disease, agent, toxicity, therapy, duration of infection, etc: need to map patient needs to drugs available (which combination to prescribe?).
- Had to cover all scales/aspects of disease: molecule -> human -> population.
- Molecular level: Developed rapid and accurate ranking of saquinavir-resistant mutations (measure of binding affinity of particular drug in patient). Compute resources used: US TeraGrid, UK National Grid Service, DEISA.
- Protein level: Agent-based model of coreceptor tropism, managed to come up with model virus mutation which matches literature description of action.
- Combined virology, physics, etc. Then had to add behavioural aspects to account for actual epidemiology.
- Built social/sexual network based on NCDC data, which can evolve over time, with node dynamics (e.g. superspreaders against background population activities, heterosexual/homosexual/IVDU populations, individuals who do/don't know they are infected, etc). Managed to reproduce historical data, now working on prediction.
- Virolab "cauldron": trial in 7 hospitals using platform to give tools to clinicians to choose prescriptions (plug in patient information, get ranking of drug candidates with links to further information, incl. literature supporting that suggestion).

Health-e-Child: Joerg Freund (joerg.freund@siemens.com)

Severe, complex paediatric diseases (low incidence, complex treatment, not up-to-date in textbooks).

- Address vertically by linking multiple data sources and horizontally linking at multiple sites.
- Understand anatomy, morphology, physiology and pathology; support patient management.
- Focus on organ-level models, disease models.
- Take account of progress in medical image acquisition, image processing.
- Projects:
 - Best timing for pulmonary valve replacement, taking into account clinical factors: anatomical model created from HeC data, semi-automatic initialisation of model based on detection library, multisequence view for model editing. Fast, accurate. Generate anatomical 4D model of area in question based on patient clinical data. Categorise/describe pathology. Patient-specific cardiac electromechanical simulation, to get 3D strain and stress, therapy planning using simulation (clinical decision support).
 - @neuLink tool: 3D Knowledge browser (extract data from MedLine: results ranking, text extraction, graphical overview of results).
 - SPIDeR: proposed follow-on project under next VPH call (e-Infrastructure).

*** AFTERNOON WORKSHOP SESSIONS ***

Concluding Remarks

Ilias Iakovidis

All projects to be proactive in organising smaller VPH-call technical workshops/discussions.

Projects are encouraged to target medical conferences, not IT/Computing, as the goal is to spread knowledge and acceptance of VPH approach in clinical medicine.