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CompBioMed

Research and Innovation Action H2020-EINFRA-2015-1 Topic: Centres of Excellence for Computing Applications

D3.4 Report on Dissemination and Training Material

3	
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1 Version Log

Version	Date	Released by	Nature of Change
V1.1	18/08/2017	Manuela Corsini/Hugh Martin	First Draft
V1.2	07/09/2017	Manuela Corsini	Second draft, including internal reviewers' comments
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3 Definition and Acronyms

Acronyms	Definitions
CoE	Centre of Excellence
DoA	Description of Action
НРС	High Performance Computing
КРІ	Key Performance Indicator
моос	Massive Open Online Course
PRACE	Partnership for Advanced Computing in Europe
SSC	Student Selected Component
ТР	Training Plan
TR	Training Repository
VPH	The Virtual Physiological Human



4 Executive summary

CompBioMed will undertake, under work package 3, the development and provision of a range of dissemination and training activities and associated supporting material, which are described in detail in previous WP3 deliverables (D3.2 Dissemination Action Plan and D3.3 Training Plan).

The present deliverable D3.4 Report on dissemination and training material aims at providing an overview of the dissemination and training activities carried out and the material developed in year one within the CompBioMed project, as well as an update of the Dissemination and Training Plans for the coming 2 years.

Through the dissemination of CompBioMed research findings to academia, industry, and the clinic alike, we will contribute to the strength and leadership of the EU in HPC technologies in Computational Biomedicine, also having an impact on emerging HPC markets. Through the building of networks between our community and the encouragement of collaboration activities, together with our training agenda, we will accelerate European excellence in Computational Biomedicine.

5 Introduction

Computational methods, based on human biology, are now reaching maturity in the biomedical domain, rendering predictive models of health and disease increasingly relevant to clinical practice by providing a personalized aspect to treatment. Computer based modelling and simulation is well established in the physical sciences and engineering, where the use of high performance computing (HPC) is now routine. CompBioMed is a user-driven Centre of Excellence (CoE) in Computational Biomedicine, designed to nurture and promote the uptake and exploitation of high performance computing within the biomedical modelling community. Our user communities come from academia, industry and clinical practice.

Work package 3, Training and Dissemination, aims at providing a focal point for the collaboration within the project, and also with external stakeholders, by developing and coordinating the training (led by UvA) and dissemination (led by CBK) activities that enable us to engage external stakeholders in academia, healthcare and industry with the activities of the project.

Within work package 3, three deliverables have already been completed:

- D3.1 Website Release (CBK) month 3 the project website provides a focal point for the dissemination activities of the project.
- D3.2 Dissemination Action Plan (UvA) month 3 A detailed and comprehensive report on the dissemination actions that will be carried out by the project.
- D3.3 Training Plan (UvA) month 6 A report with a detailed training plan, including both training events, ways of delivery, and partners responsible for the training.

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The present deliverable aims at providing an overview of the dissemination and training activities carried out and the material developed so far within the CompBioMed project, as well as an update of the Dissemination and Training Plans for the coming years.

6 Dissemination

Dissemination and outreach play an important role in the CompBioMed Centre of Excellence. We are promoting the project's outcomes (publications, codes, white papers) to stakeholders, be they members of the scientific community, user communities, vendors, other industries, regulatory authorities, and related international projects. The success of CompBioMed relies on its research and related developments and results being disseminated within the biomedical community, as well as growing and interacting with its user communities.

A combination of dedicated media work, participation in conferences, preparation and distribution of information material, and event organization are being employed to implement our impact objectives. We are maintaining the CompBioMed website for the external world and internal project communication, as well as a strong social media presence (LinkedIn, Twitter, etc.). We will organise a workshop which we will attach to other large conferences (such as ISCxy, SCxy, and so on). The events will promote CompBioMed results and success stories. We have also developed targeted dissemination material, and will produce white papers, which will be communicated to standards bodies and relevant international events.

The dissemination activities encompass many different aspects of the use of 'computing beyond the desktop' within the biomedical sciences community.

The CompBioMed Consortium is actively seeking participation in all the relevant concertation activities organised by and for the Commission in the e-infrastructure domain.

This approach and plan is described in detail in the CompBioMed Dissemination Action Plan (Deliverable 3.2).

There was a substantial amount of dissemination activity in the first year of CompBioMed. The key highlights during this period include:

- The organisation of a major public event
- The organisation of 4 workshops
- Participation at 42 major conferences and workshops
- The publication or submission of 15 scientific papers

We are targeting the project stakeholders through the following channels:

- CompBioMed website: www.compbiomed.eu
- CompBioMed Twitter account: @bio_comp
- Scientific Events (conferences, workshops, seminars etc.)
- Scientific Journals
- The mailing lists, websites, and social media channels of our partners, associate partners, and related projects

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6.1 Dissemination Material developed and Related Activity

We are targeting the various stakeholder groups using the following dissemination materials detailed in this section:

- Leaflets
- Posters
- Newsletters
- Scientific Papers
- Non-Peer Reviewed Publications
- Website content
- Social Media Content

The CompBioMed brand has been used in all of our dissemination materials, be it in the form of leaflets, posters, newsletters etc. Templates have been created for each dissemination material type in order to encourage recognition of the CompBioMed brand and therefore the project and its aims. The templates are currently available on the CompBioMed website intranet for project deliverables to the European Commission, for presentation slides, for project logo files, for posters, newsletters, and leaflets. More will be added as required.

During the course of the project, CompBioMed will also create white papers and make them available via the web. CompBioMed disseminates, via the website and other channels, the scientific publications resulting from the project's research. Additionally, flyers and posters are being distributed at workshops and conferences.

6.1.1 Project Logo

The CompBioMed logo has been designed to be clean, clear, and recognisable, with a strong image and style. The logo aims for simplicity while subtly hinting at CompBioMed's mission of computational (represented by the classic 'computer' font) biomedical research (hinted at through the DNA representation) related to the human body (represented by a human figure). The logo is shown below:



The logos are available in .png graphical format and .ai vector format, in high and low resolution.

6.1.2 Leaflets

A leaflet has been made and handed out to stakeholders at various events (conferences, workshops, seminars, etc.), with the purpose of making them aware of the project, its aims, and various aspects of it. It contains the following:

CompBioMed logo

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- A URL to the CompBioMed website
- A link to the CompBioMed twitter account
- The funding line "This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 675451."
- An image of the European flag
- A summary of the CompBioMed project
- A summary of our approach
- A summary of the research exemplars
- A summary of the project's connection to the clinic
- The logos of the CompBioMed partner institutions
- Images of CompBioMed research

The leaflet is shown below:



Figure 2: CompBioMed Leaflet

The leaflets were distributed at various events including CompBioMed & BioExcel Free-Energy Workshop – London UK, the CompBioMed session at PRACEdays 2017 – Barcelona Spain, The Cloud & High Performance Computing in Biomedicine Workshop – London UK, and The Virtual Human IMAX event at the Science Museum Lates – London UK.

6.1.3 Posters

A CompBioMed poster has been made to present at events such as conferences and workshops. The poster summarises various aspects of CompBioMed, containing the following features:

- The CompBioMed logo
- A URL to the CompBioMed website
- The funding line "This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 675451."
- An image of the European flag
- Images of CompBioMed research
- Images of HPC hardware
- Logos of CompBioMed Partners
- Description of Associate Partners role in the project
- Descriptive summaries on the subjects of Research, The Clinic, The Healthcare Value Chain, and High-Performance Computing

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The poster is show in Figure 3.



Figure 3: CompBioMed Poster

The poster was displayed at CompBioMed & BioExcel Free-Energy Workshop – London UK, the CompBioMed session at PRACEdays 2017 – Barcelona Spain, The Cloud & High Performance Computing in Biomedicine Workshop – London UK, and The Virtual Human IMAX event at the Science Museum Lates – London UK.

Other posters were prepared and are indicated in Table 9 of Appendix 2.

6.1.4 Branded Merchandise

CompBioMed has harnessed novelty branded items that have been distributed at various events during the project. These act to enhance the awareness of the project. At present, we have produced stress toys in the shape of hearts and brains, branded with the project logo, that act as striking mementos following their distribution. The stress toys are shown below:



Figure 4: CompBioMed Branded Stress Toys

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6.1.5 **Project Newsletters**

As of month 8 in the project, we have begun producing quarterly Newsletters, with two produced in the first 12 months of the project. These Newsletters allow us to capture the latest updates in the project and disseminate them widely in order to keep our stakeholders apprised of the center's progress. The first edition of the newsletter (released May 2017) contained the following features:

- The CompBioMed logo
- A URL to the CompBioMed website
- The funding line "This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 675451."
- An image of the European flag
- A link to our twitter account
- A link to our LinkedIn group
- A link to our Youtube Channel
- Descriptive sections on Welcome, Recent Events, Upcoming Events, Milestones, General Assembly News, and Associate Partners
- A section on "Towards The Computational Human: HPC-based Simulations For The Cardiovascular System"
- A section on "Bone DVC Service And Pulse Wave Analysis For Cerebral Vasospasm Detection"

An image of the cover of the first issue of the Newsletter is shown in Figure 5.



Figure 5: CompBioMed Newsletter First Edition, Front Page

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The first edition of the Newsletter can be downloaded <u>here</u>¹. The second edition of the Newsletter can be downloaded <u>here</u>².

6.1.6 Website

At the core of our dissemination activity is the CompBioMed website, where the project is described, its partners are listed, its activities are reported, helpful contact details are listed, and where there is a repository for the project's training programme and for project-related documents generally. The website can be accessed at the URL <u>http://www.compbiomed.eu/</u>. The website is addressed in detail in D3.1: Website Release, which is available on the website's intranet.



Figure 6: The CompBioMed Website Homepage

Key website statistics up to the end of September include:

- 11,235 views
- 73 pages

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• 53 news/events posts

Monthly visitor statistics are shown in the diagram below:

² http://www.compbiomed.eu/wp-content/uploads/2017/05/newsletter2_final.pdf

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¹ http://www.compbiomed.eu/wp-content/uploads/2016/09/compbiomed_newsletter_may2017.pdf





Figure 7: CompBioMed Website Views

6.1.7 Social Media

CompBioMed has an active and growing social media presence. Currently we are active on Twitter, YouTube, and LinkedIn. The twitter account has yielded a great amount of networking and dissemination capacity. A snapshot of the CompBioMed Twitter account is shown below:



Key statistics for the CompBioMed Twitter account up to the end of September include: Tweets: 193 Followers: 251 Likes: 99 Twitter Impressions: 68,900

We also created a YouTube page for CompBioMed in April 2017, which acts as useful hub for our video content.

Key statistics for the CompBioMed YouTube page up to the end of September include: 30 videos 14 subscribers 423 views

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The YouTube page can be viewed in the following $link^3$.

We also created a LinkedIn group for CompBioMed, which currently holds 73 members and 13 posts. The LinkedIn group activity was low and did not yield a worthwhile output for the time investment required. We have therefore decided to focus on Twitter and Youtube, while remaining open to other platforms, should they prove fruitful.

The LinkedIn group can be viewed in the following $link^4$.

Details	Date From	Date To	Audience(s) (see above table)	Number of People		
8 CompBioMed related Tweets via Twitter account @acellera	21/07/17	02/02/17	[Scientific Community (higher education, Research)], [Industry], [General Public], [Medias]	1000		
3 posts on LinkedIn (Acellera), https://www.linkedin.com/company- beta/2133167/	01/10/16	Present	[Scientific Community (higher education, Research)], [Industry], [General Public], [Medias]	100		
EPCC posted multiple tweets on CompBioMed activities at PRACEDays17 from the Women in HPC Twitter account	16/05/17	16/05/17	[Scientific Community (higher education, Research)], [Industry]	1500		
165 tweets on the official CompBioMed Twitter account	01/10/16	Present	[Scientific Community (higher education, Research)], [Industry], [Civil Society], [General Public], [Policy makers], [Medias], [Investors], [Customers], [Other]	45,226		
13 Stories posted in the CompBioMed LinkedIn group	01/10/16	Present	[Scientific Community (higher education, Research)], [Industry]	73		
30 Videos posted to the CompBioMed Youtube page	01/10/16	Present	[Scientific Community (higher education, Research)], [Industry], [Civil Society], [General Public], [Policy makers], [Medias], [Investors], [Customers], [Other]	300		

Table 1: CompBioMed Consortium Social Media Activity

6.1.8 Publications

In CompBioMed, we have to date published 15 peer reviewed publications. These are listed below:

- G. Závodszky, B. van Rooij, V. Azizi and A. Hoekstra, "Cellular Level In-silico Modeling of Blood Rheology with An Improved Material Model for Red Blood Cells", Front. Physiol., Available Online (2017), DOI: 10.3389/fphys.2017.00563
- S. Alowayyed, D. Groen, P. V. Coveney, A. G. Hoekstra, "Multiscale Computing in the Exascale Era", Journal of Computational Science, In Press (2017), DOI: 10.1016/j.jocs.2017.07.004
- 3. Morao, D. G. Fedorov, R. Robinson, M. Southey, A. Townsend-Nicholson, M. J. Bodkin, A. Heifetz, "Rapid and accurate assessment of GPCR-ligand interactions Using the

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³ https://www.youtube.com/channel/UCUiIfmesH_psiArXT3xcppA

⁴ https://www.linkedin.com/groups/8589674

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fragment molecular orbital-based density-functional tight-binding method", Journal of Computational Chemistry, Available Online (2017), DOI: 10.1002/jcc.24850

- 4. R. C. Eccleston, S. Wan, N. Dalchau, P. V. Coveney, "The role of multiscale protein dynamics in antigen presentation and T lymphocyte recognition", Frontiers in Immunology, Available Online (2017), DOI: 10.3389/fimmu.2017.00797
- P. S. Zun, T. Anikina, A. Svitenkov, A. G. Hoekstra, "A Comparison of Fully-Coupled 3D In-Stent Restenosis Simulations to In-vivo Data" Frontiers in Physiology, 8, 1-12 (2017), DOI:10.3389/fphys.2017.00284
- 6. Bueno-Orovio, K. Burrage, "Exact solutions to the fractional time-space Bloch–Torrey equation for magnetic resonance imaging", Commun Nonlinear Sci Numer Simulat., 52, 91-109 (2017), DOI:10.1016/j.cnsns.2017.04.013
- N. Altwaijry, M. Baron, D. Wright, P. V. Coveney, A. Townsend-Nicholson, "An Ensemble-Based Protocol for the Computational Prediction of Helix-Helix Interactions in G Protein-Coupled Receptors using Coarse-Grained Molecular Dynamics", Journal of Chemical Theory & Computation, 13 (5), 2254–2270 (2017), DOI: 10.1021/acs.jctc.6b01246
- S. Wan, A. Bhati, S. Skerratt, K. Omoto, V. Shanmugasundaram, S. Bagal, P. V. Coveney, "Evaluation and Characterization of Trk Kinase Inhibitors for the Treatment of Pain: Reliable Binding Affinity Predictions from Theory and Computation", Journal of Chemical Information and Modelling, 57 (4), 897–909 (2017), DOI: 10.1021/acs.jcim.6b00780
- 9. P. V. Coveney and R. Highfield, "Opinion: Is big data just big hype?", Longevity Bulletin: Big data in health, Institute and Faculty of Actuaries, 11-12 (2017), ISSN 2397-7213
- S. Wan, A. P. Bhati, S. J. Zasada, I. Wall, D. Green, P. Bamborough, and P. V. Coveney, "Rapid and Reliable Binding Affinity Prediction of Bromodomain Inhibitors: a Computational Study", J. Chem. Theory Comput., 13 (2), 784–795 (2017), DOI: 10.1021/acs.jctc.6b00794
- 11. L. J. B. Briant, Q. Zhang, E. Vergari, J. A. Kellard, B. Rodriguez, F. M. Ashcroft, P. Rorsman, "Functional identification of islet cell types by electrophysiological fingerprinting", Journal of Royal Society Interface, 14 (128), 1-20 (2017), DOI: 10.1098/rsif.2016.0999
- Sanchez, A. Bueno-Orovio, E. Pueyo, B. Rodriguez, "Atrial Fibrillation Dynamics and Ionic Block Effects in Six Heterogeneous Human 3D Virtual Atria with Distinct Repolarization Dynamics", Front. Bioeng. Biotechnol., 5, 1-13 (2017), DOI: 10.3389/fbioe.2017.00029
- Bhati, S. Wan, D. Wright, P. V. Coveney, "Rapid, accurate, precise and reliable relative free energy prediction using ensemble based thermodynamic integration", Journal of Chemical Theory and Computation, 13 (1), 210–222 (2017), DOI: 10.1021/acs.jctc.6b00979
- M. Paci, E. Passini, S. Severi, J. Hyttinen, B. Rodriguez, "Phenotypic variability in LQT3 human induced pluripotent stem cell-derived cardiomyocytes and their response to antiarrhythmic pharmacologic therapy: An in silico approach", Heart Rhythm, Available Online (2017), <u>DOI</u>: <u>10.1016/j.hrthm.2017.07.026</u>
- 15. J. Tomek, B. Rodriguez, G. Bub, J. Heijman, "β-adrenergic receptor stimulation inhibits proarrhythmic alternans in post-infarction border zone cardiomyocytes: a computational analysis", American Journal of Physiology – Heart and Circulatory Physiology, Available Online (2017), <u>DOI</u>: <u>10.1152/ajpheart.00094.2017</u>

The CompBioMed consortium has also produced a number of non-peer reviewed publications as shown in the table below:

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Details	Date From	Date To	Audience(s) (see above table)	Number of People
EPCC News two-page article, plus cover page, "CompBioMed: a new Centre of Excellence in Computational Biomedicine", E. Lumley, G. J. Pringle, EPCC News 81, June 2017, https://www.epcc.ed.ac.uk/newsletters/epcc- news-81	01/06/17	Present	[Scientific Community (higher education, Research)], [Industry], [Policy makers], [Investors], [Customers]	1000
Oxford University prepared an CompBioMed article for the newsletter of The Department of Computer Science, Winter 2016, Issue 9, online and printed	01/11/16	Present	[Scientific Community (higher education, Research)], [General public]	500
CBK and UCL produced and distributed the CompBioMed Newsletter, Edition 1	25/05/17	25/05/17	[Scientific Community (higher education, Research)], [Industry], [Civil Society], [General Public], [Policy makers], [Medias], [Investors], [Customers], [Other]	200
UCL produced and distributed the CompBioMed Newsletter, Edition 2	31/08/17	31/08/17	[Scientific Community (higher education, Research)], [Industry], [Civil Society], [General Public], [Policy makers], [Medias], [Investors], [Customers], [Other]	200

Table 2: Com	pBioMed (Consortium	Non-Peer	Reviewed	Publications



6.1.9 Video Content

The CompBioMed CoE has produced a number of videos during the first year of the project: these have been hosted on the project YouTube account. The video content produced so far is listed in the table below:

Details	Date From	Date To	Audience(s) (see above table)	Number of People
EPCC Produced a video "Big Data – what is it" – an introduction to Big Data, presented to University of Edinburgh's online MSc in Clinical Microbiology and Infectious Diseases in June 2017. https://youtu.be/BXdxRPFYJus	16/08/17	Present	[Scientific Community (higher education, Research)], [Industry], [Civil Society], [General Public], [Policy makers], [Medias], [Investors], [Customers], [Other]	10
Production of IMAX video "The Virtual Human" features various CompBioMed research areas, screened at a major event at the London Science Museum and distributed on the CompBioMed website and other channels	27/09/17	Present	[Scientific Community (higher education, Research)], [Industry], [Civil Society], [General Public], [Policy makers], [Medias], [Investors], [Customers], [Other]	500
The Science Museum filmed an Interview With Peter Coveney titled "How to build a virtual human" to promote the CompBioMed IMAX event.	14/08/17	Present	[Scientific Community (higher education, Research)], [Industry], [Civil Society], [General Public], [Policy makers], [Medias], [Investors], [Customers], [Other]	115
The Science Museum edited together a promotional video for the CompBioMed IMAX event, they have hosted it on the Science Museum Youtube page.	10/08/17	Present	[Scientific Community (higher education, Research)], [Industry], [Civil Society], [General Public], [Policy makers], [Medias], [Investors], [Customers], [Other]	57
15 talks were filmed from the CompBioMed/BioExcel Free Energy Workshop in London	31/05/17	Present	[Scientific Community (higher education, Research)], [Industry], [Civil Society], [General Public], [Policy makers], [Medias], [Investors], [Customers], [Other]	200
14 talks were filmed from the CompBioMed Cloud & HPC in Biomedicine event in London	27/04/17	Present	[Scientific Community (higher education, Research)], [Industry], [Civil Society], [General Public], [Policy makers], [Medias], [Investors], [Customers], [Other]	200

Table 3: CompBioMed Consortium Video Content

6.1.10 Activities with Related Projects

The CompBioMed consortium has conducted collaborative activity with the related Horizon 2020 projects in our network, which have attended our internal and external meetings and events, are included in our mailing lists and act as dissemination channels in their own right. In addition, we have organised major events with BioExcel and with OpenMultiMed as shown in the table below:



Details	Date From	Date To	Audience(s) (see above table)	Number of People
UCL and CBK rganized the joined CompBioMed and BioExcel event "Free Energy Calculations from Molecular Simulation: Applications in Life and Medical Sciences" held in London	31/05/17	31/05/17	[Scientific Community (higher education, Research)], [Industry]	96
UCL and CBK rganized a CompBioMed and OpenMultiMed Joint Session at EPMA 2017, Malta	15/09/17	15/09/17	[Scientific Community (higher education, Research)] [Industry]	50

Table 4: CompBioMed Consortium Activities with Related Projects

6.1.11 Other

In addition to the activities list in the sections above, the CompBioMed consortium also engaged in other types of activities, these are listed in the table below:

Details	Date From	Date To	Audience(s) (see above table)	Number of People
Pragna Kiri (CBK) conducted Networking at SET Squared Med Tech Investment Showcase	02/03/17	02/03/17	[Scientific Community (higher education, Research)], [Industry], [Investors]	100
Benjamin Pajot (Bull) Liaised with ETP4HPC & identified interested actors	01/02/17	Present	[Scientific Community (higher education, Research)]	N/A
CompBioMed All Hands Meeting held at BSC, attended by CompBioMed partners, associate partners, and related projects	11/04/17	12/04/17	[Scientific Community (higher education, Research)], [Industry]	50
Oxford: Invited expert panelist in the "Comprehensive in Vitro Proarrhythmia Assay (CiPA) Update Meeting; Duke-FDA MOU effort in Cardiac Safety Critical Path Initiatives". Washington DC, USA	06/12/17	06/12/17	[Scientific Community (higher education, Research)], [Industry] [Clinicians][Policy makers]	100
Paul Best (CBK) attracted in associate partner (Norton Straw) following UCL workshop on 27 th April 2017 – Cloud & High Performance Computing in Biomedicine – UCL, London	27/04/17	27/04/17	[Industry]	5
UCL and CBK organised the CompBioMed Kick-off meeting, inviting prospective associate partners and related projects to participate	03/10/17	04/10/17	[Scientific Community (higher education, Research)], [Industry]	40
Pragna Kiri (CBK) Attended IPR training event organized by the EEN (Enterprise Europe Network)	10/05/17	11/05/17	[Scientific Community (higher education, Research)], [Industry]	90

Table 5: CompBioMed Consortium Other Activities



6.2 Event Activity

6.2.1 Organisation of Events

In the first 12 months of the project, CompBioMed has organised and executed a number of major events. These events are shown in the table below:

Details	Date From	Date To	Audience(s) (see above table)	Number of People
Organisation of a CompBioMed IMAX screening "The Virtual Human" at the London Science Museum, including 4 speakers	27/09/17	27/09/17	[Scientific Community (higher education, Research)] [Industry] [General Public] [Customers] [Medias] [Civil Society]	400
Acellera organized an HTMD (High- throughput molecular dynamics) workshop	10/11/16	11/11/16	[Scientific Community (higher education, Research)], [Industry]	35
BSC and UCL organized a 4 hour session entitled "HPC for Innovation: When Science meets Industry" at PRACEdays 2017, a subevent of the European HPC Summit Week 2017	16/05/16	16/05/16	[Scientific Community (higher education, Research)]	357
UCL and CBK organized the event "Cloud & HPC in Computational Biomedicine", held in London	27/04/17	27/04/17	[Scientific Community (higher education, Research)], [Industry]	75

Below we now describe a few of these events in more detail.

CompBioMed at PRACEdays 2017

PRACEDays 2017 is the central event of the European HPC Summit Week held at Barcelona Supercomputing Centre over four days (15 – 18 May 2017). CompBioMed was allocated a dedicated 4-hour session in the afternoon of the 16 May where we held several talks and workshops focused on our Centre of Excellence. The event was held under the motto "HPC for Innovation: When Science meets Industry", bringing together experts from academia and industry who presented their recent advances in HPC-supported science and engineering.





Figure 12: Photograph taken during CompBioMed at PRACEdays17

Cloud & HPC in Biomedicine Workshop

Thursday, 27 April 2017 saw seventy researchers working in academia, industry and the healthcare sector travel from across Europe to attend the CompBioMed Cloud and High Performance Computing in Biomedicine Summit held at University College London. The event, the first of its kind, was organized by the CompBioMed (http://www.compbiomed.eu) project to provide a forum for software developers and scientists to meet with cloud and high performance computing providers to discuss the key challenges faced when computing beyond the desktop in biomedical research and organisedin patient treatment.

Speakers at the Microsoft sponsored meeting were drawn from cloud computing providers and HPC research centres, the pharmaceutical industry and academia. The meeting was opened by Professor Peter Coveney, leader of the CompBioMed project, who illustrated why the need for high performance computer simulation has never been more relevant to researchers in the field of biomedicine and healthcare. Coveney, however, pointed out that high performance computing has traditionally been an elite activity, with access to the largest scale resources based on academic reputation, and with a high barrier to use. Cloud computing has the potential to challenge this hegemony by organising access to the resources needed to run large scale *in silico* investigations.





Figure 13: Photograph taken during Cloud & HPC in Biomedicine



Figure 14: Photograph taken during Cloud & HPC in Biomedicine

Workshop: Free Energy Calculations from Molecular Simulation: Applications in Life and Medical Sciences

More than a hundred researchers from across Europe, from both academia and industry, were bought together for the first joint meeting organized by the CompBioMed and BioExcel Centres of Excellence (CoEs). The event, held at University College London on Wednesday, 31 May 2017, focused on the use of cutting edge computational techniques to calculate free energies relevant for applications in the life and medical sciences (such as drug design and treatment selection).

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The speakers in the main program had a diverse set of backgrounds, coming from both CoEs, a broad range of research groups in academia and industry as well as commercial software vendors. The meeting concluded with a wide-ranging panel discussion. Topics included the interplay between computational drug design and synthesis, the relationship between molecular simulation and sequencing, and the utility of blind tests (such as SAMPL) for driving improvements in the field. In particular, a lot of discussion revolved around the need to focus on difficult cases and develop standard benchmark calculations across the field. One of the most valuable parts of the discussion was how it stimulated conversations between researchers from academic and commercial pharmaceutical backgrounds.



Figure 15: Photograph taken during CompBioMed & BioExcel Free Energy Workshop



Figure 16: Photograph taken during CompBioMed & BioExcel Free Energy Workshop

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"The Virtual Human" IMAX event at the Science Museum Lates

The CompBioMed "The Virtual Human" IMAX event on 27 September 2017 was part of the Science Museum Lates series. The hour-long feature described recreating a human being *in silico*, including IMAX video composited on the Marenostrum supercomputer, at Barcelona Supercomputing Centre. The video showed stunning simulations on aspects of computational biomedicine using supercomputers.

The performance took place in front of an audience of 400 members of the general public, along with invited attendees from academia, industry, the clinic, the government, and the media. The Lates event itself attracted between 4,000 - 7,000 people.

In addition to the IMAX film, the Virtual Human feature contained short presentations from the following four speakers:

- Prof Blanca Rodriguez (Oxford University)
- Prof Peter Coveney (UCL)
- Prof Marco Viceconti (Sheffield University)
- Prof Alfons Hoekstra (University of Amsterdam)

This was followed by a discussion including questions from the audience, chaired by Dr Roger Highfield (Science Museum).

One image from the IMAX film is shown in Figure 17.



Figure 17: Render from "The Virtual Human" IMAX Video

6.2.2 Participation in Events

The CompBioMed consortium participated in many events during the first year of the project, giving talks and presenting posters at them. This included 42 major events, listed below:

- 1st Conference of the European Association of Systems Medicine, Berlin, Germany, 28 October 2016
- 20th Congress of GGMM, Reims, France, 9-12 May 2017
- 4th Biophysics in Drug Discovery Novalix, Strasbourg, France, 6-9 June 2017
- 61st Biophysical Society Meeting, Louisiana, United States, 11-15 February 2017

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- 9th International Workshop on Science Gateways, IWSG 2017, Poznan, Poland, 19 June 2017
- Advances in Turbulence XXIII, International Workshop Congress in Bio-environmental Turbulence Experiments and Simulations, Vilanova i la Geltrú, Spain, 1 June 2017
- Basic Science Summer School, the European Society of Cardiology, Antipolis, France, 18-22 June 2017
- Cardiac Arrhythmia Mechanisms, Gordon Research Conference, California, United States, 5-10 February 2017
- Centre for Clinical Magnetic Resonance Research (OCMR) Study Day, Oxford, UK, 3 March 2017
- Cloud and High Performance Computing in Biomedicine Meeting, London, UK, 27 April 2017
- Computational & Mathematical Biomedical Engineering, CMBE 2017, Pittsburgh, United States, 10-12 April 2017
- Computing in Cardiology, Lyon, France, 24-27 September 2017
- DSFD 2017, Erlangen, Germany, 10-14 July 2017
- EHRA Working Group on Cardiac Cellular Electrophysiology, Vienna, Austria, 18-19 June 2017
- EPMA World Congress 2017, Malta, 14-17 September 2017
- ESC (European Society of Cardiology) Congress 2017, Barcelona, Spain
- European Medical and Biological Engineering Conference (EMBEC) in Tampere, Finland, 11-15 June 2017
- Exploitation of EU Project Results with a Focus on IP in the Field of Health and Biotechnology, Prague, Czech Republic, 10-11 May 2017
- Free Energy Calculations from Molecular Simulation: Applications in Life and Medical Sciences, London, UK, 31-May 2017
- Heart Rhythm 2017, Illinois, United States, 10 May 2017
- ICCS 2017, Zurich, Switzerland, 12-14 June 2017
- iNEW 2017, Zurich, Switzerland, 15-17 February 2017
- International High Performance Computing Summer School 2017, Colorado, United States, 26 June 2017
- International Symposium Biomechanics in Vascular Biology and Cardiovascular Disease, Rotterdam, Netherlands, 4-5 April 2017
- Ion Channel Symposium; Copenhagen Meeting on Cardiac Arrhythmia, Copenhagen, Denmark, 31 May – 2 June 2017
- ISC'17, Frankfurt, 20 June 2017
- MICCAI 2017, Quebec, Canada, 10 September 2017
- Modelisation and Computational Biology Workshop, Lyon, France, 9 June 2017
- NC3Rs/Safety Pharmacology Society Regional Meeting, Coventry, UK, 3 May 2017
- New York Scientific Data Summit (NYSDS) 2017, New York, United States, 8 June 2017
- Oxford 3Rs Research Day, Oxford, UK, 24 February 2017
- Platform for Advanced Scientific Computing, PASC 2017, Lugano, Switzerland, 26-28 June 2017
- PRACEdays17 during the HPC Summit Week, Barcelona, Spain, 16 May 2017
- Quantitative Systems Pharmacology: Is there a case for model reduction?, Oxford, UK, 29 June 2017
- Safety Pharmacology Society Annual Meeting, Berlin, Germany, 24-27 September 2017

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• SciVis 2017, Rotterdam, Netherlands, 20 June 2017

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Grant Agreement No **675451**

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- Solid Mechanics Workshop 2017, Oxford, UK, 5 May 2017
- STAFF Meeting, Bled, Slovenia, 10-11 November 2016
- The 23rd Congress of the European Society of Biomechanics, ESB2017, Seville, Spain, 2-5 July 2017
- VII International conference on coupled problems in science and engineering, Rhodes Island, Greece, 12-14 June 2017
- Workshop Final SyeC 2017, Barcelona, Spain, 26 April 2017
- XXVI Congress of the International Society of Biomechanics, ISB2017, Brisbane, Australia, 23-27 July 2017

The detailed list of events is shown in Table 9 of Appendix 2.

6.3 Dissemination Network and Target Audiences

In this section, we describe the network of partners, associate partners, and related projects that aid in our dissemination efforts, while also describing how we are targeting our various types of stakeholders.

6.3.1 The CompBioMed Network

The CompBioMed Centre of Excellence leverages its network of partners, associate partners, and related projects in order to help widen its dissemination reach. Some partners/projects are set up with a key aim of disseminating effectively, such as the VPH-Institute and the Science Museum, but all partners have their own unique reach to different types of audiences in different domains. They represent industry (from SME to large companies), academia, the clinic, the general public, and many have reach in HPC poor countries.

Our 15 core partners are as follows:

- Acellera
- Barcelona Supercomputing Center
- Bull (ATOS)
- CBK Sci Con Limited
- Evotec AG
- Janssen
- LifeTec Group
- SURFsara
- Universitat Pompeu Fabra
- University College London
- University of Amsterdam
- University of Edinburgh
- University of Geneva
- University of Oxford
- University of Sheffield

Our 28 Associate Partners are as follows:

- Academic Computing Centre Cyfronet AGH
- Aix-Marseille University

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- Alces Software
- Avicenna Alliance
- Birmingham City University
- Brunel University
- Convergence Pharma
- DNA Nexus
- Electric Ant Lab BV
- European Society of Cardiology's e-Cardiology Working Group
- GSK
- Hamad Medical Corporation
- Heidelberg Institute for Theoretical Studies
- ITMO University, St Petersburg
- KINDI Centre for Computing Research
- Leibniz Supercomputing Centre
- Microsoft
- Norton Straw Consultants
- Oxford NIHR Biomedical Research Centre
- Pozlab, Poznan
- Rutgers University
- Science Museum
- The Hartree Centre
- Universidad Católica de Murcia
- University of Leeds
- University of Southampton, Immunology Group
- VPH Institute
- Zayed University, Abu Dhabi

There are 13 related projects associated with our network:

- BioExcel Centre of Excellence for Computational Biomolecular Research
- CoeGSS Centre of Excellence for Global Systems Science
- ComPat Computing Patterns for High Performance Multiscale Computing
- e-COST OpenMultiMed Open Multiscale Systems Medicine
- EoCoE Energy orientated Centre of Excellence for Computing Applications
- ESiWACE Centre of Excellence in Simulation of Weather and Climate in Europe
- ETP4HPC The European Technology Platform for High Performance Computing
- European HPC Centre of Excellence
- EXDCI The European Extreme Data & Computing Initiative
- MaX Materials design at the Exascale
- POP Performance Optimisation and Productivity A Centre of Excellence in Computing Applications
- The Nomad Laboratory A European Centre of Excellence
- UKCOMES UK Consortium on Mesoscale Engineering Sciences

6.3.2 Targeting Academia, Industry, and the Clinic

CompBioMed is focused on three main types of stakeholder, academia, industry and the clinic. CompBioMed deliverable 'D3.2 Dissemination Action Plan' outlines our approach to targeting these stakeholders. Each of the tables in this document list the type of audience reached by each piece of material or activity, including academia, industry and the clinic.

6.3.3 Targeting the General Public

CompBioMed deliverable 'D3.2 Dissemination Action Plan' outlines our approach to targeting the General Public, the most prominent activity aimed at the general public is CompBioMed's "The Virtual Human" IMAX event at the London Science Museum, giving a direct viewing to 400 members of the public and raising awareness to 4,000-7,000 more. Each of the tables in this document list the type of audience reached by each piece of material or activity, including the General Public.

6.3.4 Targeting HPC Poor Countries

The CompBioMed Centre of Excellence is targeting HPC-poor countries in its activities, primarily through our network of partners and via events.

To perform outreach to and engagement with countries and regions within the EU and associated states with fewer HPC resources, CompBioMed has been collaborating with the COST (European Cooperation in Science and Technology – see www.cost.eu) platform, through trans- European networking of research. COST is based on a European intergovernmental framework for Co-operation in Science and Technology with 36 Member Countries and one Co-operating State. It also encourages active participation by institutions from Near Neighbour Countries and International Partner Countries. Near neighbour countries include Armenia, Russia, Ukraine; Lebanon, Libya, Palestine Authority, Jordan, Syria, Tunisia, Egypt and Algeria, while Turkey is currently seeking membership. Bosnia & Herzogovina are also being considered. Several CompBioMed partners (e.g. UCL, UvA) are also participants in the OpenMultiMed COST Action CA15120 on Open Multiscale Systems Medicine.

On 15 September 2017, CompBioMed and OpenMultiMed held a Joint Session at the EPMA 2017 (The European Association for Predictive, Preventative & Personalised Medicine) World Congress in Malta. This involved a mix of speakers from OpenMultiMed and CompBioMed.

CompBioMed will also be holding a dedicated session at the 14th Congress of the World Federation of Interventional and Therapeutic Neuroradiology, WFITN 2017, Budapest, Hungary, October 2017.

Our Network contains a growing list of partners from HPC-poor countries Current Associate Partners in this category include:

- Zayed University, United Arab Emirates
- KINDI, Centre for Computing Research, Qatar
- Hamad Medical Corporation

In the process of joining as Associate Partners:

- Institute of Molecular Biology, National Academy of Sciences, Armenia
- Bioinformatics Core Facility, Luxembourg Centre for Systems Biomedicine, Luxembourg

Our CompBioMed events have attracted attendees travelling from Cyprus, Portugal, Romania, and United Arab Emirates.

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6.4 Plans for the Second Year of the Project

After an extremely active and productive first year in the project, we aim to continue the momentum into the second year, with many plans for event participation and organisation in the pipeline, discussions to expand our network of partners and related projects.

CompBioMed will be holding a dedicated session at the 14th Congress of the World Federation of Interventional and Therapeutic Neuroradiology, WFITN 2017, Budapest, October 2017. We are planning a major presence at VPH2018, September 2018 in Zaragoza, at the 8th World Congress of Biomechanics, July 2018 Dublin, and at Supercomputing SC17, November 2017 in Colorado, USA. We are holding the next CompBioMed All-Hands Meeting in Amsterdam in March 2018, inviting associate partners, prospective associate partners, representatives from industry and the clinic.

CompBioMed will re-design parts of the website including the homepage to better guide different types of visitors and to clearly mark out the various features and services that the website has to offer.

We will continue to grow our network of Associate Partners and related projects. Interest from Associate Partners is accelerating, with discussions currently ongoing with 9 prospective new partners. As for related project, we currently have ongoing discussions with 2 projects that start in the coming months.

7 Training

One of the key objectives of our Centre of Excellence is to train future generations of scientists within the field of computational biomedicine, by running training courses on topics such as HPC use, software engineering and algorithm design, as well as training medical practitioners in the basic medical and clinical contexts of HPC simulation, at events with maximum community exposure such as community workshops and leading international conferences.

The CompBioMed Training Plan aims to:

- ✓ bridge High Performance and Cloud Computing communities to biomedical communities
- ✓ offer a roadmap to access High Performance and Cloud Computing for Biomedicine
- $\checkmark\,$ assess High Performance and Cloud Computing code useful for Biomedicine and find exemplars for training
- \checkmark $\;$ reduce the complexity of Computational Biomedicine for novices
- ✓ cater for diverse user bases including trainers (and train the trainers)

We aim at the user groups that lie at the heart of CompBioMed: academic, industrial, and clinical users.

The training will be delivered by CompBioMed scientists alongside HPC experts within the project. The material will be produced by those experts. All training materials will be made publicly available (this includes copy of the course slides, code examples, exercises and when available a record of audio and/or video of the training event): this should result in a

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sustainable open access educational and training resource for Computational Biomedicine, including HPC. Our approach will be to re-use as much as possible the available material, keeping the development of new material to an absolute minimum.

The training forms will include face-to-face, classroom, workshops, webinars, coursera, etc:

Training Events

- Co-located with VPH2018 (September 2018, Zaragoza)
- Winter school at partner BSC (February 2018, Barcelona)
- Winter school at partner BSC (Winter 2018/2019)

Bi-monthly webinars

- Starting in October 2017, every two months
- In collaboration with the VPH-institute

University courses for medical students at UCL and postgraduate researchers at University of Sheffield

- Starting in academic year 2017-2018

At least one joint workshop with other Centres of Excellence

- Joint training event with BioExcel, Free Energy Calculations from Molecular Simulations: Applications in Life and Medical Sciences (London, 30 May 2017)

This approach and plan is described in detail in the CompBioMed Training Plan (Deliverable 3.3).

7.1 BioExcel & CompBioMed joint workshop

The BioExcel & CompBioMed joint workshop on "Free Energy Calculations from Molecular Simulations: Applications in Life and Medical Sciences" was held at UCL, London on 30 May 2017.

The workshop was attended by 25 participants, mainly coming from the two Centres of Excellence (CoEs), and focused on scientific and technical discussions pertaining to the theory, algorithms and their implementation on high performance architectures.

7.2 Webinar Series

CompBioMed foresees as from October 2017 the organization, every 2-3 months, of regular webinars on a range of topics, for a range of audiences. In order to ensure that the webinar series maintains the CompBioMed "flavour", the topics will rotate between the 3 CompBioMed's application fields (cardiovascular, molecularly-based and neuro-musculoskeletal medicine) and the HPC-cloud perspective.

The calendar of the first 3 webinars is as follows:

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N.	Date	Delivering Organisation	Title
1	18 October 2017 (tbc)	University of Oxford	The introduction to whole organ electrophysiological simulations in CHASTE
2	December 2017	TBD	A practical guide to cloud computing for the VPH (tbc)
3	February/March 2018	TBD	Advanced molecular simulations for the VPH (tbc)

Table 7: CompBioMed Webinar Calendar

The following topics and dates will be decided upon as the project progresses. All webinars will be recorded and, where possible, the recordings will be enriched with teaching material and hands-on exercises, then made freely available as MOOCs on the CompBioMed training Portal.

In this context, we are setting up a collaboration with the Virtual Physiological Human (VPH) institute, who is already organizing regular webinars, to create synergies and boost each other's training potential. In particular, the VPH institute will host the foreseen CompBioMed webinars under their "umbrella" (also granting us access to their webinar platform), allowing us to exploit their extended network and portal for advertising them and to ensure their sustainability, even after the project's end.

CompBioMed will, in return, nominate 2-3 PhD students from our network to become part of the VPH institute student council, currently running the VPHi webinars, and to support them in their organization.

7.3 Major training event at BSC Winter school 2017/2018

The Barcelona Supercomputing Center's Winter School "Biomedicine and high-performance computing education" will take place on 14-16 February 2018 in Barcelona, at the UPC Campus.

Three full days of training will be dedicated to the CompBioMed exemplars and the use of HPC in biomedical applications. The Winter School will focus on the following topics: HPC, Cardiac modelling, Molecularly-based and Neuro-musculoskeletal medicine.

The format foresees both theoretical and hands-on sessions.

The audience comprises PhD students, master students, engineers.

The event will be disseminated through the CompBioMed website, partners' websites and networks, social media.

Teachers have already been identified within the consortium, as follows:

- HPC: Xavier Vigoroux (Bull/Atos)
- Molecular-based Medicine: David W. Wright and Andrea Townsend-Nicholson (UCL), Alex Heifetz (Evotec), Gianni de Fabritiis (UPF + Acellera)
- Cardiac Modelling: Jazmín Aguado-Sierra
- Neuro-musculoskeletal medicine: Alberto Marzo, Xinshan (Shannon) Li

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All lectures and material will be in English. Students will receive a Certificate of Attendance.

The event will be recorded and, where possible, the recording will be enriched with teaching material and hands-on exercises, then made freely available as MOOCs on the CompBioMed training Portal.

7.4 Major training event at VPH2018

The University of Oxford has taken the lead in planning CompBioMed's presence in the <u>VPH2018</u> conference (Zaragoza, 05-07 September 2018).

Currently, the possibility of hosting a training event on 04 September 2018, the day before the start of the conference, is being explored with the local organisers. The event might be held in conjunction with the <u>CuraBone project</u> European Industrial Doctorate (EID) at the Paraninfo, where the VPH2018 registrations and welcoming event might take place, thus maximizing visibility and ensuring a wide participation.

The event will be recorded and, where possible, the recording will be enriched with teaching material and hands-on exercises, then made freely available as MOOCs on the CompBioMed training Portal.

7.5 CompBioMed in medical curriculum at UCL

The Student Selected Component (SSC) of UCL's Medical School Curriculum provides an opportunity to educate medical students in Years 1, 2 and 6, which are the years of study for which the medical school runs these SSCs. This is an ideal scenario for providing a training capability that can be used to support relevant intercalated BSc degrees at UCL. We have developed a proposed SSC workflow that has a primary focus on genomics in Year 1, on cardiovascular and blood flow modelling in Year 2 and in modelling-informed stent design and fabrication in Year 6. To achieve this, we have created a Year 1 SSC module that has been formally approved by the Medical School (SSC-334a) and will run as 8 three-hour sessions that are timetabled from November 2017 to January 2018. The module organizer, A. Townsend-Nicholson, is the UCL lead for WP3, providing a link between the medical school and CompBioMed. SSC-334a is currently available for selection by Year 1 students who are returning for the 2017-2018 academic session and initial feedback from students suggests that demand will exceed the 20 available places on the course.

SSC-334a will provide medical students with the opportunity to use state of the art laboratory and computational resources to complete a metagenomics project in molecular medicine. Using conserved 16s regions of ribosomal RNA gene sequences, the identity of the different bacterial species present in skin samples obtained from student volunteers will be determined. Under supervision, students will design and carry out original experimental work, analyse data, compare results of their specific experiments with the group and write a report on the findings. A test of the theoretical aspects of the experimental techniques will be taken. SSC activities will include a combination of field work, wet laboratory-based experimental work, taught lectures, supervised workshops and small group tutorial sessions. The SSC timetable and programme of work is as follows:

Week 1 (09 Nov 2017: Introduction to the module, Protocol design), Week 2 (16 Nov 2017: Introduction to NGS (Next Generation Sequencing), Workshop in Computing, Python and High Performance Computing), Week 3 (23 Nov 2017: Collection of skin swap samples from volunteers, DNA isolation, PCR amplification), Week 4 (30 Nov 2017: Sample purification, NGS (Illumina) sequencing), Week 5 (07 Dec 2017: Introduction to computing, command line, programming basics (Python), ssh), Week 6 (14 Dec 2017: Analysis of cut down sequence data using Qiime, Introduction to HPC), Week 7 (11 Jan 2018: Analysis of sequence data using Qiime at CompBioMed HPC facilities) and Week 8 (18 Jan 2018: Comparison of cut-down data and summary of findings, continuation of supercomputing analyses)

All module resources will be placed on GitHub and made available to students via the UCL institutional virtual learning environment, Moodle, and will also be published on the CompBioMed training portal.

7.6 Other Trainings

Two CompBioMed sessions were held within the <u>PATC Course: "HPC-based simulations,</u> <u>Engineering and Environment"</u> (BSC, Barcelona, 14 -16 February 2017): an introductory session of the CompBioMed CoE on Day 1 and a session on Cardiac Computational Modelling on Day 3. Approximately 40 participants attended, with basic and intermediate level of HPC. The students were mainly users of HPC applications and code developers.

7.7 Training Portal and Repository

The <u>Training Portal</u> is currently being developed and populated. The Portal aims to be a sustainable open access educational and training resource for Computational Biomedicine, including HPC, and it displays:

- ✓ the past and upcoming **training events** organized within the CompBioMed project
- ✓ the training material developed for each course (course slides, code examples, exercises, audio/video recording)
- ✓ the trainings offered by the partners that are relevant for the CompBioMed user community

The Training Repository (TR)

The TR will display all those **trainings and related material** that are relevant for the CompBioMed user community, including those offered by the partners. As a start, the TR will in fact include all the trainings reported in the training overview table (Appendix 1 of the Training Plan), which has been recently updated by the CompBioMed partners.

The Repository will feature a filter engine to allow for a quick search, with the following 3 filter options:

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Topic

- 1. Modelling and simulation
- 2. Application codes
- 3. Advanced computing (HPC, GPU)
- 4. Cloud Computing
- 5. How to get access to and how to use resources (hands-on)
- 6. Intro Computing
- 7. Data Management
- 8. Visualisation
- 9. Large scale data processing
- 10. Big Data
- 11. Linux command line
- 12. Subject specific: molecularly-based medicine

User community

- 1. Clinical
- 2. Academia
- 3. Industry

Level

- 1. Novice
- 2. Semi
- 3. Expert

For each filtered course the following info will appear:

- Title of the course
- Training **type** (Face-to-Face, Webinar, MOOC, Online self-drive)
- Organisation delivering the course
- Short description
- URL
- Training dates
- Recurrence

The possibility to host on the TP a "Driving test" tailored towards Computational Biomedicine, similar to the one <u>developed by ARCHER</u> is currently under discussion.

7.8 Sustainability

To ensure the sustainability of the training materials and outputs beyond the end of the CoE, WP3 will sustain the following:

- Online provision of training materials including slides, practical problem sheets and relevant software examples/submission scripts. This will be handled under a suitable license for future use (e.g. the Creative Commons License). The content will be archived in alignment with the sustainability plan (WP4) for all CoE outputs.

Where possible, video/audio recordings of each course type will be taken to provide online resources in alignment with the CoE's sustainability plan.

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8 Key Performance Indicators

CompBioMed is committed to a list of Key Performance Indicators (KPIs). Five of these KPIs related to dissemination and training are listed below:

- Number of people attending the two workshops events organised by WP3: 50 attendees per workshop Current progress: 2 CompBioMed Workshops organised, reaching 70 and 95 attendees.
- Number of publications in peer-reviewed international journals that acknowledge the support of CompBioMed. Target: by the end of the three-year deployment phase, at least 10 publications (two in impact factor ten or higher journals) from 5 different research groupings with the CoE Current progress: 15 Publications
- Number of companies engaged. Target: by the end of the three-year deployment phase, at least 20 companies, at least 30% being SMEs, have accessed CompBioMed services Current progress: 15 companies engaged (47% are SMEs)
- If training participants report that the training was useful: 12 months after the training with 75% positive responses Current progress: Not due yet, but arrangements are being made so that trainees can be contacted 12 months after the training to collect their feedback via a questionnaire
- Number of trainees attending training events: 150 in total (25 in the first one) Current progress: 25 participants attended the Joint BioExcel and CompBioMed training on 30 May 2017 in London.

9 Conclusions

As reported in the previous paragraphs, there was a substantial amount of dissemination and training activity in the first year of CompBioMed. The actions of the CompBioMed consortium are meeting and going beyond the plans laid out in the dissemination action and training plans and the project's description of work.

On the dissemination front, the CompBioMed consortium targeted many events and dissemination channels of various scales and with a wide variety of themes, covering numerous domains aligned with our aims.

On the training side, strong foundations are being laid and the first important results are being achieved. A strong collaboration with the VHP institute is being set up, which will contribute to ensuring positive and long-lasting results. The consortium is committed to achieve the ambitious goals set.

The project's dissemination and training KPIs are being met on both sides.

We believe that, through our dissemination and training activities, expected impacts will be accelerated and strengthened. Through the dissemination of CompBioMed research findings to academia, industry, and the clinic alike, we will contribute to the strength and leadership of the EU in HPC technologies in Computational Biomedicine, also having an impact on the emerging HPC markets. Through the building of networks between our community and the encouragement of collaboration activities, together with our training agenda, we will accelerate European excellence in Computational Biomedicine. PU Page 34 Version 1.3



10 Appendix 1

Table 8: CompBioMed Consortium Website Activity						
Details	Date From	Date To	Audience(s) (see above table)	Number of People		
On Acellera.com, link and logo of CompBioMed shared	01/10/16	01/10/16	[Scientific Community (higher education, Research)], [Industry], [General Public], [Medias]	250		
BSC posted an article "CompBioMed, a centre of excellence in computational biomedicine, is born" on the BSC website	10/02/17	Present	[Scientific Community (higher education, Research)], [General Public]	250		
BSC posted an article "Crean un nuevo centro de investigación en biomedicina computacional" on lavanguardia.com	01/02/17	01/02/17	[Scientific Community (higher education, Research)], [General Public]	500		
BSC posted an article "Neix CompBioMed, un centre d'excel·lència en biomedicina computacional" on gacetamedica.com	02/02/17	02/02/17	[Scientific Community (higher education, Research)], [General Public]	500		
BSC posted an article "CompBioMed meeting on Cloud & HPC In Biomedicine, April 27, London" on etp4hpc.eu, recapping a CompBioMed event	27/04/17	27/04/17	[Scientific Community (higher education, Research)], [General Public], [Industry]	500		
EPCC website: page dedicated to CompBioMed: https://www.epcc.ed.ac.uk/projects- portfolio/compbiomed	01/10/17	Present	[Scientific Community (higher education, Research)], [Industry], [Civil Society], [General Public], [Policy makers], [Medias], [Investors], [Customers], [Other]	500		
Oxford have published their conferences/workshops/meetings/others on the group's website. www.cs.ox.ac.uk/ccs//latest-news	01/10/16	Present	[Scientific Community (higher education, Research)], [Industry] [Clinicians][Policy makers][General Public]	200		
Oxford have posted their publications on the website www.cs.ox.ac.uk/ccs/publications	01/10/16	Present	[Scientific Community (higher education, Research)], [Industry] [Clinicians][Policy makers][General Public]	200		
Oxford has posted notification of The CompBioMed Project on the news of the website. http://www.cs.ox.ac.uk/ccs/latest- news/5	01/10/16	Present	[Scientific Community (higher education, Research)], [Industry] [Clinicians][Policy makers][General Public]	200		
Oxford has listed their awards on the website http://www.cs.ox.ac.uk/ccs/awards	01/10/16	Present	[Scientific Community (higher education, Research)], [Industry] [Clinicians][Policy makers][General Public]	200		
50 news stories posted to the CompBioMed website	01/10/16	Present	[Scientific Community (higher education, Research)], [Industry] [Clinicians][Policy makers][General Public]	9382		
12 publications posted to the CompBioMed website	01/10/16	Present	[Scientific Community (higher education, Research)], [Industry] [Clinicians][Policy makers][General Public]	236		



UCL has posted regular CompBioMed news stories on the homepage of the website for the Centre for Computational Science (CCS). http://ccs.ucl.ac.uk/	01/10/16	Present	Scientific Community (higher education, Research)]	200
UvA created the website for HemoCell (www.hemocell.eu).	01/07/17	Present	[Scientific Community (higher education, Research)] , [General Public]	50



11 Appendix 2

Details	Date From	Date To	Audience(s) (see above table)	Number of People
Sheffield: CompBioMed Stand at INSIGNEO Showcase	11/05/17	11/05/17	[Scientific Community (higher education, Research)], [Industry]	200
Sheffield: Presented Poster at INSIGNEO Showcase, poster title "In silico identification of cerebral vasospasm biomarkers"	12/05/17	12/05/17	[Scientific Community (higher education, Research)], [Industry]	200
Sheffield: Presented Poster at INSIGNEO Showcase, poster title "3D full field strain distribution in the mouse tibia under loading measured by digital volume correlation"	13/05/17	13/05/17	[Scientific Community (higher education, Research)], [Industry]	200
Acellera Presented a Poster at 4th Biophysics in Drug Discovery Novalix, Strasbourg, France 2017 (june 6-9), poster title "Small molecules binding pathway and kinetics with HTMD"	06/06/17	09/06/17	[Scientific Community (higher education, Research)], [Industry]	136
Acellera gave a conference talk at 20th Congress of GGMM, Reims, France 2017 (May 9-12) , talk title "Small molecules binding pathway and kinetics with HTMD"	09/05/17	12/05/17	[Scientific Community (higher education, Research)], [Industry]	108
Andrea Townsend-Nicholson (UCL) Presented talk title "Computational Biomedicine: Innovations in Training and Education" at PRACEdays17 as part of Outreach within CompBioMed	16/05/17	16/05/17	[Scientific Community (higher education, Research)], [Industry]	20
Federica Sacco (BSC) attending Advances in Turbulence XXIII, International Workshop Congress in Bio-environmental Turbulence Experiments and Simulations, Vilanova i la Geltrú, Spain	01/06/17	01/06/17	[Scientific Community (higher education, Research)]	N/A
Federica Sacco (BSC) attended the event ESC Congress 2017, Barcelona, Spain	25/08/17	30/08/17	[Scientific Community (higher education, Research)]	N/A
Jazmin Aguado (BSC) gave a talk on "Transcatheter pacing systems: coupled fluid-electro-mechanical cardiac computational model" at Computational & Mathematical Biomedical Engineering. CMBE 2017	10/04/17	12/04/17	[Scientific Community (higher education, Research)]	500
Jazmin Aguado (BSC) gave a talk on "Fully coupled fluid-electro-mechanical cardiac problems" at the Platform for Advanced Scientific Computing. PASC 2017	26/06/17	28/06/17	[Scientific Community (higher education, Research)]	100
Robin Richardson (UCL) gave a Poster at 1st Conference of the European Association of Systems Medicine (Berlin), title "Pre-interventional multiscale modelling of Flow Diverters for patient- specific clinical decision making". Won best poster prize for Modelling and Computation session.	26/10/16	28/10/16	[Scientific Community (higher education, Research)]	200

Table 9: CompBioMed Consortium Event Participation



EPCC Chaired two sessions, plus talk: "Current Hardware for HPC, HTC and Data Management for CompBioMed", Pracedays17, Barcelona, May, 2017	16/05/17		[Scientific Community (higher education, Research)], [Industry], [Policy makers], [Investors] , [Customers]	50
Oxford: "STAFF Meeting", Bled, Slovenia, a talk on "Computer simulations of the human ischaemic ventricles for risk stratification and ECG biomarkers evaluation", Hector Martinez-Navarro.	10/11/16	11/11/16	[Scientific Community (higher education, Research)] [Clinicians]	100
Oxford: Invited talk, Blanca Rodriguez, at the Cardiac Arrhythmia Centre, Washington University in St Louis, MO, USA, 2017 on "Understanding variability in human electrophysiology: Populations, drugs and disease"	03/02/17	03/02/17	[Scientific Community (higher education, Research)]	70
Oxford: Blanca Rodriguez invited speaker at the Cardiac Arrhythmia Mechanisms, Gordon Research Conference in California, "Experimentally Calibrated Population of Models Predicts and Explains Inter-Subject Variability""	05/02/17	10/02/17	[Scientific Community (higher education, Research)]	200
Oxford: Poster presented at the Cardiac Arrhythmia Mechanisms, Gordon Research Conference in California. "Whole atria mechanisms of inducibility and persistence of atrial arrhythmias by depletion of neuronal Nitric Oxide Synthase in human", Muszkiewicz A, Liu X, Bueno-Orovio A, Rodriguez JF, Casadei B, Rodriguez B	05/02/17	10/02/17	[Scientific Community (higher education, Research)]	200
Oxford: A poster at the Cardiac Arrhythmia Mechanisms, Gordon Research Conference in California. "Gain of function KCNQ1 G229D mutation can counteract action potential upstroke and impair conduction safety" Zhou X, Harmer S, Bueno-Orovio A, Burrage K, Tinker A, Rodriguez B.	05/02/17	10/02/17	[Scientific Community (higher education, Research)]	200
Oxford: A poster at the Cardiac Arrhythmia Mechanisms, Gordon Research Conference in California. "Modulation of electrical function by cardiac tissue microstructure: Fractional diffusion frameworks for cardiac modelling and MRI analysis" Bueno-Orovio A, Kay D, Teh I, Schneider JE, Rodriguez B, Grau V, Burrage K.	05/02/17	10/02/17	[Scientific Community (higher education, Research)]	200
Oxford: A poster at the Cardiac Arrhythmia Mechanisms, Gordon Research Conference in California. "Human-based in Silico Drug Trials Predict Drug Cardiotoxicity and Identify Sub-Populations at Higher Risk", Passini E, Britton OJ, Bueno-Orovio A, Rodriguez B.	05/02/17	10/02/17	[Scientific Community (higher education, Research)]	200

Oxford: A poster at the Cardiac Arrhythmia Mechanisms, Gordon Research Conference in California. § "Investigating the effect of anatomical variability on the ECG using MRI-based computer models of the human heart and torso", Minchole A, Zacur E, Lyon A, Ariga R, Carapella V, Cardone- Noott L, Villard B, Martinez-Navarro H, Bueno-Orovio A, Watkins H, Grau V, Rodriguez B.	05/02/17	10/02/17	[Scientific Community (higher education, Research)]	200
Oxford: Invited talk, Blanca Rodriguez, at the Biophysical Society Meeting, NOLA, LA, USA, 2017 on "Towards in Silico Drug Trials using Human Multiscale Cardiac Models".	11/02/17	15/02/17	[Scientific Community (higher education, Research)]	200
Oxford: Invited talk, Elisa Passini, at the Oxford 3Rs Research Day, on "In Silico Drug Trials Predict Drugs Cardiotoxicity and Identify Sub-Populations at Higher Risk".	24/02/17	24/02/17	[Scientific Community (higher education, Research)]	100
Oxford: Invited talk, Blanca Rodriguez, Centre for Clinical Magnetic Resonance Research (OCMR) study day, the University of Oxford, "Computational Cardiovascular Science and CMR - How to get the most out of our data"	03/03/17	03/03/17	[Scientific Community (higher education, Research)] [Clinicians]	50
Oxford: Talk, Ana Minchole, Centre for Clinical Magnetic Resonance Research (OCMR) study day, the University of Oxford, "Distinct ECG phenotypes identified in HCM using a machine learning approach associate with clinical features and markers of arrhythmic risk"	03/03/17	03/03/17	[Scientific Community (higher education, Research)] [Clinicians]	50
Oxford: Invited talk Ana Minchole. UCL London. Cloud and High Performance Computing in Biomedicine Meeting, CompBioMed. Talk on "High Performance Computing for the investigation of electrophysiological activity of human heart in control and disease.	27/04/17	27/04/17	[Scientific Community (higher education, Research)]	75
Oxford: A talk at the NC3Rs/Safety Pharmacology Society regional meeting, Elisa Passini, "The use of human tissues for safety assessment".	03/05/17	03/05/17	[Scientific Community (higher education, Research)]	50
Oxford: A poster at the NC3Rs/Safety Pharmacology Society regional meeting. "In Silico Population of human models to investigate drug cardiotoxicity in cardiac Purkinje cells" Trovato C, Passini E, Nagy N, Varro A, Severi S and Rodriguez R.	03/05/17	03/05/17	[Scientific Community (higher education, Research)]	50
Oxford: A talk at the Solid Mechanics Workshop 2017, University of Oxford, Francesc Levrero"Electro-mechanics of the human heart"	05/05/17	05/05/17	[Scientific Community (higher education, Research)]	40



D3.4 Report on dissemination and training material

Oxford: Heart Rhythm 2017 - Chicago, Illinois, Wednesday. "High arrhythmic risk and low ST segment elevation in subendocardial compared to transmural acute ischemia", Martinez-Navarro H, Minchole A, Bueno-Orovio A, Rodriguez B.	10/05/17	10/05/17	[Scientific Community (higher education, Research)]	20
Oxford: CompBioMed, PRACEdays17, 16 May 2017, BSC, Barcelona, Spain. Talk by Hector Martinez on "High arrhythmic risk and low ST segment elevation in subendocardial compared to transmural acute ischemia".	16/05/17	16/05/17	[Scientific Community (higher education, Research)]	50
Oxford: A poster at the Basic Science Summer School, the European Society of Cardiology "The electrophysiology of conduction velocity in the human ventricles: an in silico study Regulation of human ventricular conduction velocity by the Ina– IK1 macromolecular complex under hypo/hyper kalemic conditions" P. Marinov, B. Rodriguez, A. Bueno'Orovio	18/06/17	22/06/17	[Scientific Community (higher education, Research)]	40
Oxford: Invited talk, Alfonso Bueno-Orovio at the Ion Channel Symposium; Copenhagen Meeting on Cardiac Arrhythmia, Copenhagen, Denmark, "Sudden death in the young: Decoding cellular profiles of hypertrophic cardiomyopathy."	31/05/17	02/06/17	[Scientific Community (higher education, Research)]	100
Oxford: A poster at the European Medical and Biological Engineering Conference (EMBEC) in Tampere, Finland. "Risk stratification in hypertrophic cardiomyopathy using ECG-based clustering and personalized computer simulations" Lyon A, Ariga R, Minchole A, Zacur E, Laguna P, Grau P, Neubauer S, Watkins H, Rodriguez B.	11/06/17	15/06/17	[Scientific Community (higher education, Research)]	30
Oxford: A poster at the European Medical and Biological Engineering Conference (EMBEC) in Tampere, Finland. "A Novel Model of Human Cardiac Purkinje Action Potential". Trovato C, Passini E, Nagy N, Varro A, Severi S, Rodriguez B.	11/06/17	15/06/17	[Scientific Community (higher education, Research)]	30
Oxford: Invited talk Blanca Rodriguez. EHRA Working Group on Cardiac Cellular Electrophysiology, Vienna, Austria. "Computational prediction of acquired Long QT and drug-induced Torsades de Pointes." on the session "the power of electronic health records and computational technologies".	18/06/17	19/06/17	[Clinicians]	100



Oxford: A poster at the EHRA Working Group on Cardiac Cellular Electrophysiology, Vienna, Austria. "Unravelling the ionic mechanisms responsible for specific ECG-based phenotypes in hypertrophic cardiomyopathy using personalized computer simulations" Lyon A, Ariga R, Minchole A, Mahmod M, Ormondroyd E, Laguna P, de Freitas N, Neubauer S, Watkins H, Rodriguez B.	18/06/17	19/06/17	[Clinicians]	50
Oxford: A poster at the EHRA Working Group on Cardiac Cellular Electrophysiology, Vienna, Austria. "In Silico Trials in Human Ventricular and Purkinje Cell Models Predict Safety and Efficacy of 10 Antiarrhythmic Drugs" Trovato C, Passini E, Tissier A, Nagy N, Varro A, Severi S, Rodriguez R.	18/06/17	19/06/17	[Clinicians]	50
Oxford: A poster at the EHRA Working Group on Cardiac Cellular Electrophysiology, Vienna, Austria."Whole atria mechanisms of inducibility and persistence of atrial arrhythmias by depletion of nNOS in human", Muszkiewicz A, Liu X, Bueno-Orovio A. Rodriguez JF, Casadei B, Rodriguez B.	18/06/17	19/06/17	[Clinicians]	50
Oxford: Poster presented at the International High Performance Computing Summer School 2017 in Boulder CO, USA, "Electro-mechanics of the human heart" Francesc Levrero	26/06/17	26/06/17	[Scientific Community (higher education, Research)]	100
Oxford: Alfonso Bueno-Orovio, invited talk: at the 'Quantitative Systems Pharmacology: Is there a case for model reduction? Department of Physiology, Anatomy and Genetics of the University of Oxford. What are the benefits of building a non-identifiable model?" The talk is entitled: "Responders vs non-responders to anti-arrhythmic drug therapy: In silico approaches for efficacy stratification.	29/06/17	29/06/17	[Scientific Community (higher education, Research)]	25
Oxford: A poster at the Safety Pharmacology Society Annual Meeting" In Silico Electro-Mechanical Window Shortening and Repolarisation Abnormalities Predict Clinical Risk of Torsade de Pointes for 40 Reference Compounds", Elisa Passini, Alfonso Bueno- Orovio, Pierre Morissette, Frederick Sannajust, Blanca Rodriguez	24/09/17	27/09/17	[Scientific Community (higher education, Research)], [Industry] [Clinicians][Policy makers]	50
Oxford: A poster at the Safety Pharmacology Society Annual Meeting " Virtual Assay: a User-Friendly Framework for In Silico Drug Trials in Populations of Human Cardiomyocyte Models" Elisa Passini, Oliver Britton, Alfonso Bueno- Orovio, Blanca Rodriguez	24/09/17	27/09/17	[Scientific Community (higher education, Research)], [Industry] [Clinicians][Policy makers]	50



Oxford: A talk at Computing in Cardiology - Rennes (France), Aurore Lyon "Investigation of the presence of action potential alternans in hypertrophic cardiomyopathy"	24/09/17	27/09/17	[Scientific Community (higher education, Research)], [Industry] [Clinicians]	50
Oxford: A talk at Computing in Cardiology - Rennes (France), Peter Marinov "The Role of the Ina-Ik1 Complex on Human Ventricular Conduction Velocity"	24/09/17	27/09/17	[Scientific Community (higher education, Research)], [Industry] [Clinicians]	50
Oxford: A talk at Computing in Cardiology - Rennes (France), Ana Minchole "Investigating the Dependency of the QRS Complex with the MRI-based Heart/torso Geometries Using Personalised Computer Models"	24/09/17	27/09/17	[Scientific Community (higher education, Research)], [Industry] [Clinicians]	50
Oxford: European Society of Cardiology Meeting. Blanca Rodriguez, invited speaker: "The future of computer modelling in heart disease" at the session Computer modelling and simulation"	26/08/17	30/08/17	[Clinicians]	50
Sheffield: Podium Presentation at ESB2017 in Seville, talk title "Digital volume correlation measurements of 3d full field strain distribution in the mouse tibia under loading"	02/07/17	05/07/17	[Scientific Community (higher education, Research)]	100
Sheffield: Invited talk at ISB2017 in Brisbane, talk title "Internal strain distribution of the human femur under compressive loading measured by digital volume correlation"	23/07/17	27/07/17	[Scientific Community (higher education, Research)]	1200
Pragna Kiri (CBK) presented a talk on CompBioMed events and dissemination activities at PRACEdays17 in Barcelona	16/05/16	16/05/16	[Scientific Community (higher education, Research)]	40
Peter Coveney (UCL) gave a keynote Speaker at IWSG 2017. Talk title "Exploiting International e-Infrastructures for Large Scale Computational Science	19/06/17	19/06/17	[Scientific Community (higher education, Research)] [Industry]	100
Peter Coveney (UCL) gave a presentation at HPC Summit Week during CompBioMed Session. Talk title "Computational Biomedicine: an agenda for 21st century medicine"	16/04/17	16/04/17	[Scientific Community (higher education, Research)] [Industry]	40
Peter Coveney (UCL) gave a keynote talk at the New York Scientific Data Summit (NYSDS) 2017 titled "Big Theory for Big Data"	08/08/17	08/08/17	[Scientific Community (higher education, Research)] [Industry]	100
Peter Coveney (UCL) gave a talk at ISC'17 in Frankfurt on "Rapid, Accurate and Reliable Binding Affinity Calculations for Drug Discovery"	18/06/17	22/06/17	[Scientific Community (higher education, Research)] [Industry]	100
UvA: Participation and oral presentation at ICCS 2017 conference, Zurich.	12/06/17	14/06/17	[Scientific Community (higher education, Research)]	200
UvA: Participation and oral presentation at PASC 2017 conference, Lugano	26/06/17	28/06/17	[Scientific Community (higher education, Research)]	50



UvA: Participation with oral and poster presentation at DSFD 2017 conference, Erlangen.	10/07/17	14/07/17	[Scientific Community (higher education, Research)]	120
UvA: Participation and oral presentation at CMBE 2017 conference, Pittsburg.	10/04/17	12/04/17	[Scientific Community (higher education, Research)]	120
UvA: Participation and invited lecture at iNEW 2017 conference, Zurich.	15/02/17	17/02/17	[Scientific Community (higher education, Research)]	60
UvA: Participation and invited lecture at SciVis 2017 conference, Rotterdam.	20/06/17	20/06/17	[Scientific Community (higher education, Research)]	60
UvA: Participation and poster presentation at the International Symposium Biomechanics in Vascular Biology and Cardiovascular Disease, 2017, Rotterdam.	04/04/17	05/04/17	[Scientific Community (higher education, Research)]	50
UvA presented a Poster on "Cell-resolved Thrombus modeling" presented at Lugano on PACS2017 conference.	26/06/17	28/06/17	[Scientific Community (higher education, Research)]	100
UvA presented a Poster on "In- and Outflow boundary conditions for cellular suspensions" presented at Erlangen on DSFD2017 conference.	10/07/17	14/07/17	[Scientific Community (higher education, Research)]	150
BSC: Keynote presentation at "VII International conference on coupled problems in science and engineering". Talk title "Compact Interface Quasi-newton algorithm for fluid-structure interaction problems".	12/06/17	14/06/17	[Scientific Community (higher education, Research)]	20
Acellera gave a talk at the modelisation and computational biology workshop, title "Towards Computerized Drug Discovery"	09/06/17	09/06/17	[Scientific Community (higher education, Research)], [Industry]	25
Federica Sacco (BSC) attended a VPH summer school workshop	22/05/17	26/05/17	[Scientific Community (higher education, Research)]	N/A
Federica Sacco (BSC) attended a VPH summer school workshop	30/05/16	03/06/16	[Scientific Community (higher education, Research)]	N/A
Jazmin Aguado (BSC) gave a Lecture at PRACE Advance Training Centre, PATC Course. HPC-based simulations, Engineering and Environment: Computational Mechanics.	14/02/17	16/02/17	[Scientific Community (higher education, Research)]	20
Mariano Vazquez (BSC) gave a talk "CompBioMed: The Center of Excellence for Computational Biomedicine" at SyeC 2017	26/04/17	26/04/17	[Scientific Community (higher education, Research)]	50
Robin Richardson (UCL) gave a Presentation at UKCOMES Workshop on Lattice Boltzmann Methods and Applications, talk title "Building a pipeline for patient specific stent modelling"	12/12/16	13/12/16	[Scientific Community (higher education, Research)]	100
EPCC gave talk "Cloud & HPC in Biomedicine", G. J. Pringle, Cloud & HPC in Biomedicine, London, April, 2017	27/04/17	27/04/17	[Scientific Community (higher education, Research)], [Industry], [Policy makers], [Investors] , [Customers]	150
EPCC gave two talks at CompBioMed AHM, Barcelona, April, 2017	11/04/17	12/04/17	[Scientific Community (higher education, Research)], [Industry]	200

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EPCC Participated in "Exploitation of EU Project Results with a Focus on IP in the Field of Health and Biotechnology", May, 2017	10/05/17	11/05/17	[Scientific Community (higher education, Research)], [Industry], [Policy makers], [Investors] , [Customers]	100
Oxford: A poster at MRI-MICCAI, 2017.MICCAI workshop on Bio- Imaging and Visualization for Patient-Customized Simulations "based heart and torso personalization for computer modeling and simulation of cardiac electrophysiology, " Zacur E, Minchole A, Villard B, Carapella V, Ariga R, Rodriguez B, Grau V.	10/09/17	10/09/17	[Scientific Community (higher education, Research)], [Industry] [Clinicians]	50
Paul Best (CBK) Represented CompBioMed at ETP4HPC presentation "Developing European Technology to Serve the HPC Ecosystem"	16/05/17	16/05/17	[Scientific Community (higher education, Research)]	1
Peter Coveney (UCL) attended "European HPC Extreme-scale Demonstrators Workshop for Industrial End-Users" at ISC 2017 in Frankfurt	22/06/17	22/06/17	[Scientific Community (higher education, Research)]	1
Peter Coveney (UCL) gave a Presentation at Free-Energy Workshop. Talk title "Ensemble-based molecular dynamics: principles and applications	31/05/17	31/05/17	[Scientific Community (higher education, Research)] [Industry]	90
Peter Coveney (UCL): Cloud & HPC in Biomedicine Workshop. Talk title "Biomedical high performance computing within and outside clouds"	27/04/17	27/04/17	[Scientific Community (higher education, Research)] [Industry]	70
Peter Coveney (UCL) has given a talk at the EPMA World Congress 2017 in Malta on "Biomedical high performance computing within and outside clouds"	14/09/17	17/09/17	[Scientific Community (higher education, Research)] [Industry]	50
UvA: Participation and oral presentation at 3DPrinting Workshop 2017, Amsterdam.	05/07/17	05/07/17	[Scientific Community (higher education, Research)]	12
Federica Sacco (BSC) attended the 3rd International BSC Doctoral Symposium 2016, Barcelona, Spain	01/05/16	01/05/16	[Scientific Community (higher education, Research)]	N/A
Federica Sacco (BSC) attended the Simula Summer School	01/06/16	01/08/16	[Scientific Community (higher education, Research)]	15
Robin Richardson (UCL) gave a Presentation of progress in stent design and blood-flow validation at UKCOMES consortium meeting at Daresbury Laboratory	21/06/16	21/06/16	[Scientific Community (higher education, Research)]	25