

HACKING HEALTH

Athens has HL7 FHIR IPS as its central theme



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e-Health Forum and Biomimicry Greece Research & Innovation brought HACKING HEALTH in Greece with the vision to promote digital health integration for equal access and a sustainable future. The 1st HACKING HEALTH ATHENS was organised in Athens on February 8 to 10 2019. During the Hackathon participants formed teams that worked to create innovative solutions for fostering HEALTH DATA AND MOBILITY, which was the core theme of the hackathon.

Hacking health (HH), a global movement, fosters collaborative innovation by engaging key groups of stakeholders to create solutions to healthcare challenges. The eHealth Forum is on a mission to build a community involving a broad range of stakeholders that learns by engagement with digital technology in health and medicine. Digital health requires health data that derive from different sources and are reliable. Electronic Health Records provide this information. However, the fact that health records may be very extensive or specialized, and complex to work with. Thus, the recognized need to work with a globally accepted minimum set of data, i.e. the International Patient Summary (IPS). The IPS dataset is a minimal and non-exhaustive patient summary dataset that is specialty-agnostic, condition-independent, but readily usable by clinicians primarily for the cross-border unscheduled care of a patient, but also as needed in citizen mediated and controlled settings.

The HH Athens Hackathon organizers approached universities and communities interested in the subject of digital health including citizens and health professionals & patients. During the HH weekend

hackathon, technology creators and healthcare professionals collaborated to provide human-centric solutions to front-line problems! Teams quickly formed, collaborated and tested ideas with functional prototypes – all in one weekend.

The Hacking Health Athens CHALLENGE:

A Patient Summary is a standardized set of basic medical data that includes the most important clinical facts required to ensure safe and secure healthcare. This summarized version of the patient's medical data gives health professionals the essential information they need to provide care in the case of an unexpected or unscheduled medical situation (e.g. emergency or accident). Though this data is mainly intended to aid health professionals in providing unscheduled care, it can also be used to provide summary information in planned medical care (e.g. in the case of citizen movements or cross-organizational care paths). CEN supported the event with approved draft European standard 17269 'The Patient Summary for Unplanned, Cross-border Care' was also proposed. SNOMED International offered the free set of terms in advance to its announcement. HL7 International offered support on site for the HL7 FHIR IPS resources.

The Trillium-II project that builds on the strength of the EU/US MoU on collaboration in eHealth/ Health Information Technology and as recommended



by Trillium Bridge project and noted in its 2015 roadmap "Advance an International Patient Summary standard to enable people to access and share their health information for emergency or unplanned care anywhere and as needed starting with immunizations, allergies, medications, clinical problems, past operations and implants".

Challenges addressed by the participants included:

- Illustration (user experience) of the information on the IPS for different users (medical doctors, nurses, patients, institutions...)
- Expansion of IPS and enhanced utilization for different use scenarios (chronic diseases e.g. diabetes, oncology patients, rheumatoid arthritis patients, pain management, opioid use ...)
- Decision support system for health professionals (e.g. contra-indications on co-administration of drugs)
- Develop apps with IPS inside for people with specific health problems: frailty, diabetes, hypertension
- Develop apps with IPS inside for specific age groups: elderly, health conscious, children, expecting mothers, etc.

The resources provided to the teams prior to the hackathon included literature and a webinar on Trillium-II.

**The winners:
TimelsBrain & HealthBeat: Using HL7 FHIR IPS in prehospital emergencies**



TimelsBrain in suspected stroke

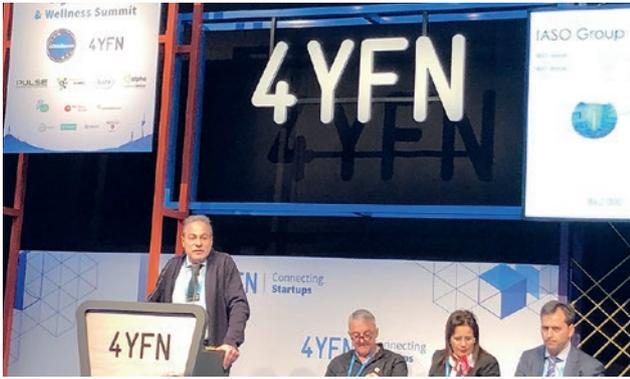
In case of a stroke, thrombolysis must take place in less than 3 hours. If the TimelsBrain platform is used, the time between the onset of the episode to the required thrombolysis is drastically reduced. The TimelsBrain platform comprises two connected applications. One is used by the rescue team in the ambulance and the other by the hospital stroke management team. Thus, the time between the first contact of the stroke patient with the healthcare professional of the ambulatory service and the thrombolysis treatment within the hospital is reduced. TimelsBrain won the first prize in Hacking Health Athens (see relevant article).

HealthBeat networking citizens and rescuers

HealthBeat is a platform accessed through a mobile application, that effectively integrates health information from multiple sources, using HL7 FHIR IPS resources, for health professionals and trained volunteers to use when they need to provide assistance to an emergency call. Registered and validated users of HealthBeat can access a network of healthcare providers and helpdesks. HealthBeat allows to request services such as symptom assessment (ICPC2), medical record assessment, second medical opinion, telephone medical support 24/7, instantly detecting the location of the request. In all cases, health professionals have access to the HL7 IPS of the person requesting emergency assistance. With HealthBeat response time to an emergency call can be 3 to 4 minutes.

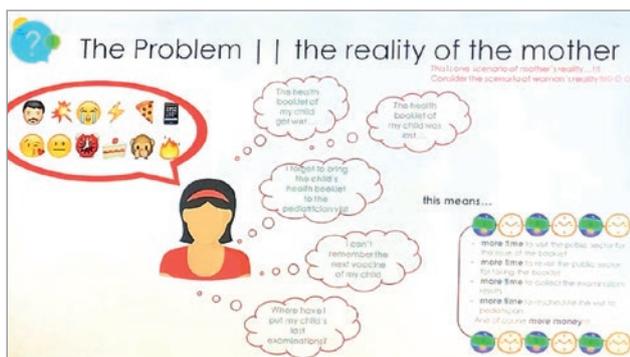
It all started from the idea to build a mobile app that in case of an emergency, helps a citizen to call for help by simply pressing a button on his/her mobile phone. Then, a whole ecosystem would be activated to rescue the person calling.

In this context, the HL7 IPS answers the question: how would the rescuer be informed about critical health information necessary to safely provide medical assistance? This is where the HL7 IPS came in the scene. HealthBeat received the 2nd prize of the HH Hackathon.



MyBabyCare: Using HL7 IPS to support parents in child health

MyBabyCare ambition is to be an innovative, interactive, user-friendly platform for healthcare services offered to parents and their health professionals. The platform uses high security systems to ensure access only to authorised users. To healthcare providers it provides medical record since childbirth or even pregnancy, notifications or alerts about vaccination, allergies, medications, diseases, precautions, procedures, laboratory test results, etc. A mobile app for parents reminds the vaccination schedule, medical appointments, as well as useful notices. A summary medical record, extension of the HL7 FHIR IPS for children is available. The app always provides information updates on health issues by trustworthy sources. MyBabyCare received the third prize and received a lot of interest in its presentation at the 4YFN, Health and Wellness Summit of the Mobile World Congress.



For more information

- Hacking Health Athens
<https://hacking-health.org/athens/>
- International Patient Summary Implementation Guide,
<http://hl7.org/fhir/uv/ips/2018Sep/index.html>
- International Patient Summary,
http://international-patient-summary.net/mediawiki/index.php?title=Main_Page
- Draft European standard 17269 'The Patient Summary for Unplanned, Cross-border Care' approved,
<http://www.ehealth-standards.eu/draft-european-standard-17269-the-patient-summary-for-unplanned-cross-border-care-approved/>
- Trillium II, <https://trillium2.eu/>
- Trillium-II Server of sample IPS resources offered by SRDC: <http://app.srdc.com.tr/fhir/stu3>
- CEN/TC 251 Health Informatics,
<http://www.ehealth-standards.eu/>
- The International Patient Summary Standards,
http://www.ehealth-standards.eu/wp-content/uploads/2018/04/CEN-and-HL7-Patient-Summary-Standards_Article.pdf
- International Patient Summary: Policy, deployment, competencies and standards,
<https://ec.europa.eu/digital-single-market/en/news/international-patient-summary-policy-deployment-competencies-and-standards>
- FYFN, Health and Wellness Summit,
<https://www.4yfn.com/barcelona/health-summit/>
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FORTH and University of Crete win the first prize at Hacking Health in Athens!



The Institute of Computer Science of the Foundation for Research and Technology-Hellas (FORTH) and the Medical School of the University of Crete (UOC) participated in the first HACKING HEALTH HACKATHON in Athens and won the first prize, accompanied by 2,000 euros and the opportunity to participate in the Digital Transformation Programme of Roche Diagnostics Hellas.

Time Is Brain was developed to address the challenge of using the International Patient Summary (IPS) to find innovative solutions for Health Data and Mobility. Participants of the HACKATHON were asked to create innovative solutions to improve the specifications of the International Patient Summary (IPS) so that everyone can have access and share their personal health information, in order to get emergency unscheduled care, wherever needed, starting with vaccinations, allergies, drug therapy, and clinical problems.

The FORTH-UOC team developed and presented, Time Is Brain, a platform for the integrated management of emergencies focused on ischemic strokes. The Time Is Brain platform uses the HL7 FHIR IPS standard to manage emergency episodes of suspected ischemic stroke aiming at reducing the time between the first contact of the patient with the paramedics until the patient receives specialized treatment.



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Georgios Kavlentakis
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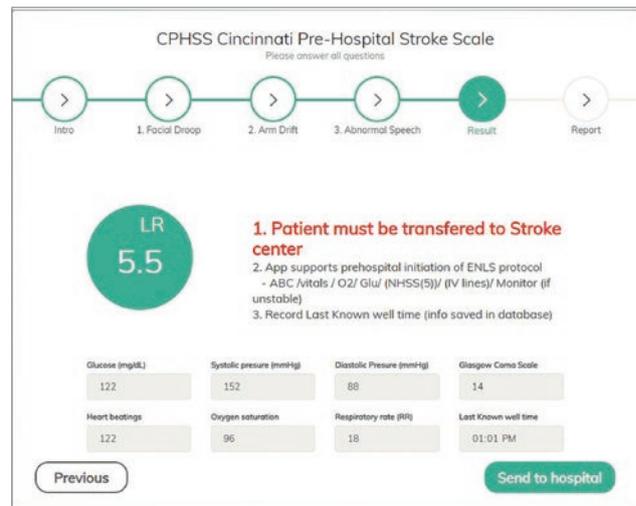
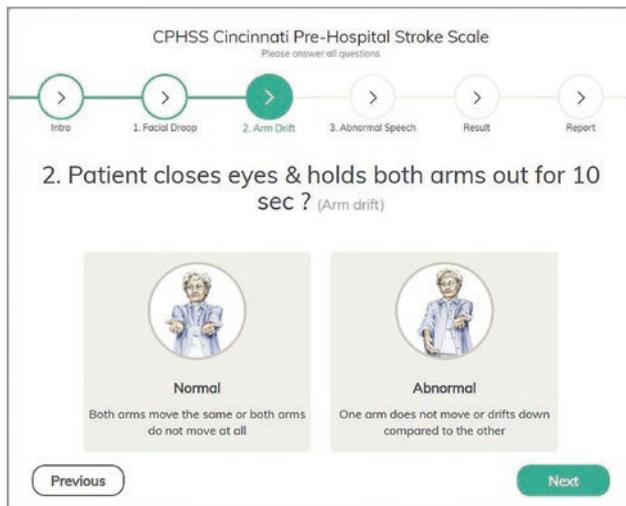
Dr. George Notas
Assistant Professor, UOC Medical School.

The application of the rescue team guides the rescuers to decide if the episode is a probable stroke using the Cincinnati Prehospital Stroke Scale. Then, the application directs the rescuers to perform the necessary actions and measurements and to record all findings in the application. At the same time, the application provides information about the nearest hospital with a stroke management team and directs the ambulance towards it through the most rapid route.

Through the physician application, the stroke team receives the information and actions recorded by the rescuers. The application informs the stroke team about the arrival time of the ambulance to the emergency room. Smart queries retrieve important decision support information from the IPS relevant to contraindications against administering thrombolysis. When the patient arrives, the stroke team, reviews the IPS, and completes all the rest of the necessary information through checklists. All stored information and the patient consent form are printed for verifications and signatures. The Time Is Brain platform aspires

to drastically reduce the time required from the onset of the episode to the possibility of the patient receiving thrombolysis which must take place within less than 3 hours and in some cases 4-5 hours from the onset of symptoms. Delays in administering appropriate treatment results in disabilities and lower quality of life.

The IPS provides the minimal patient clinical dataset to support cross-border emergency and unplanned care. HL7 FHIR IPS was used for information retrieval in order for the healthcare professional to have all the required clinical data to decide about the specialized stroke treatment.. A public FHIR Server provided by HL7 (Public HAPI STU3 server) was used to create sample patients and their patient summaries based on the IPS standard. The Time Is Brain platform queried FHIR server's IPS for clinical data of the patient related to stroke treatment. The FHIR RESTful API used for the communication between the platform and the FHIR server. FHIR RESTful API also provided specified transactions on FHIR resources allowing flexibility on the criteria used for retrieving the



Figures 1-2: screens shots from the rescue team application

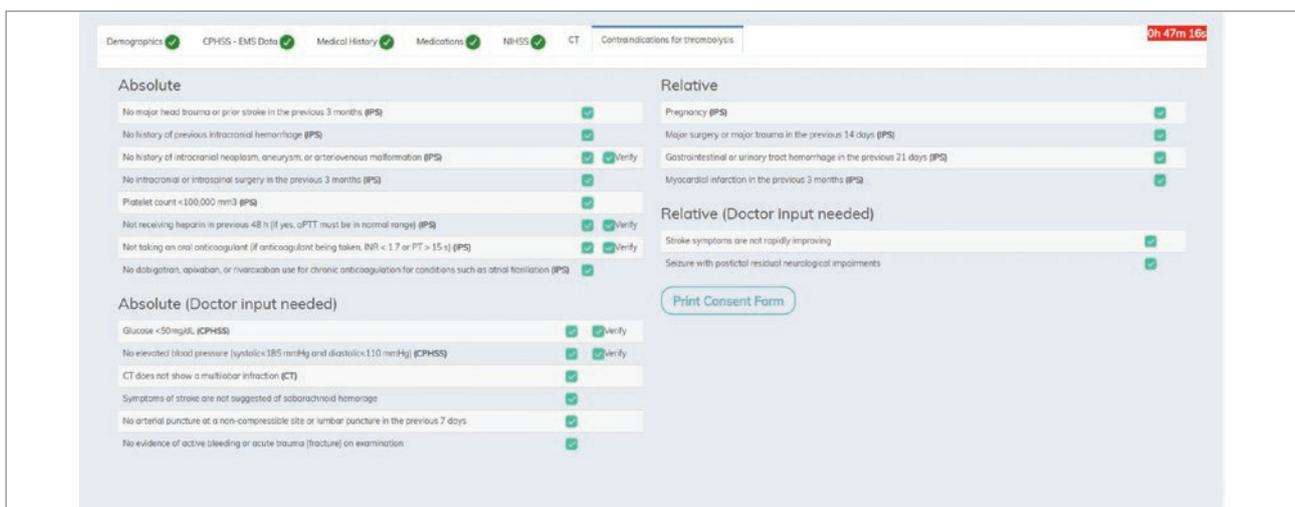


Figure 3: The Time Is Brain platform queried FHIR server's IPS for the patient clinical data related to stroke treatment.



required clinical data. IPS and FHIR integration was a vital part of the Time Is Brain platform since clinical data needed for stroke treatment is very specific and require complicated search criteria.

Time Is Brain platform is a prototype. Once funding is ensured, a full commercial product will be developed and used in a pilot study to demonstrate the health and social impact of timely management of ischemic stroke emergencies. The potential markets for Time Is Brain platform are national and private healthcare and prehospital emergency care organizations and large companies such as Google, Amazon, Apple and Microsoft.

The team would like to thank all the mentors of HACHING HEALTH and especially Mr. Dimitrios Katehakis, Head of the Center for eHealth Applications and Services of FORTH and general secretary of HL7 Hellas for his valuable mentoring advice.

For more information:

- Cincinnati Prehospital Stroke Scale
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5994852/>
- Institute of Computer Science FORTH
<https://www.ics.forth.gr/>
- Medical School, University of Crete
<http://en.uoc.gr/courses/faculty-sciences-health/medical-school.html>
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