Capacity Development to Leverage Advances in Health Informatics for All

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Abstract: In this essay we will discuss capacity development in health informatics research and application, which to us is among the major contributions of Professor John Mantas scholarship. Specifically, driven by the inspiration of his scholarship we will elaborate on advancing new applications areas, additional actors and geographical uptake of health informatics and eHealth solutions over time. We will illustrate capacity development in health informatics and address challenges that systematically foster digital health literacy, engagement and empowerment, and building health informatics capacities regionally, in Europe and globally.

Keywords: Capacity building; curriculum; accreditation; nursing informatics

1. Introduction

Using opportunities to commemorate contributions that matters to over time shape the field of Biomedical and Health Informatics is important to learn, celebrate and point out important priority areas going forward. The opportunity to give a tribute to Professor John Mantas and his scholarship under the heading "Achievements, Milestones, and Challenges in Biomedical and Health Informatics" is an excellent and much welcomed opportunity for us to do so.

Over time, as we have become active researchers ourselves in the field of health informatics, we greatly appreciate insights, projects and outcomes of activities under the leadership by Professor John Mantas and his extensive network. We see an unfolding trajectory of activities, always seeking to systematically grow capacity that ensure meaningful use health informatics research and development outputs, in particular to expand and develop educational offerings and health services. In this essay we will select examples that we find important to exemplify capacity development that address challenges and contribute solutions that leverage the achievements in health informatics for all. We draw from selected, significant examples of capacity development activities that matter for many constituencies, and these are initiatives which Professor John Mantas has initiated, contributed to shaping or inspired. It is not an exhaustive or comprehensive account but reflects our observations and reflections on the impact to grow the field over time. We seek to give special emphasis on importance of Professor

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Mantas initiatives that has developed and matured nursing informatics within the larger picture of Biomedical and Health informatics. These initiatives have indeed contributed to strengthen nurses' capacities to leverage eHealth solutions in ongoing health care transformations. These efforts are now inspiring inclusion of all actors, and we are especially excited about the recent efforts to support additional, traditionally underserved constituencies, in particular patients and their support network.

2. A trajectory of activities leading to capacity development for all

2.1. Capacity Building: planting the seeds

At the center of all capacity building is the people, creating opportunities for people to learn and comprehend is important for appraisal and uptake of any idea. For Biomedical and Health informatics, peoples' opportunities to develop competencies to explore, exploit, critically appraise and go forward with new insights are key drivers for responsible innovations and digital transformation. In Europe, led by Professor John Mantas and his team, Greece has paved the way, being early to provide undergraduate informatics courses to nursing students (since early 1980's) and advanced education in Health Informatics for health professionals, (since 1989) at the Faculty of Nursing of the National and Kapodistrian University of Athens (NKUA) [1]. These educational activities have started in nursing with a clear interdisciplinary perspective and outreach. It was therefore the term "Health Informatics" was used in the official name of the courses, for the first time in the 1990s (2). This change reflects developments that are significant for signaling that design and development of digital tools and services to be used in health care are not only to support medical doctors and their clinical information management, but usable eHealth tools are required by all health professionals. Another important fact is that the MSc program was also an Erasmus Inter-University Cooperation Program funded by the European Commission for 10 years. The program was coordinated by Professor Mantas and the NKUA [2], and enabled exchange of professors and students from more than 20 European Universities during the operative period. This MS Program developed to a national inter-university program that inherited the quality and expanded the strong interdisciplinary character of the study program, for the teaching faculty, the students, and graduates. The undergraduate courses and master program in health informatics at the NKUA are still offered after more than 30 years. Over those years, nurses joined the labor market well-equipped with the necessary health informatics skills and competencies. Furthermore, graduates from the master program in health informatics are prepared to take on and fulfill leading roles in the field.

The Faculty of Nursing of the NKUA has been the first to provide nursing education at university level in Greece since 1980. After that, other universities created nursing schools, and recent mergers in higher education led to even more nursing programs at university levels. Informatics topics and health informatics courses are now well incorporated in the curriculum of the nursing programs in Greece. Professor Mantas initiatives to introduce health informatics in nursing education already in the 1980´s might have played an important role. Furthermore, he played an important role in restructuring nursing higher education in Cyprus. Health Informatics and Nursing Informatics are taught in the undergraduate and postgraduate programs of Cyprian universities. This is in clear contrast to other countries that were late to introduce

informatics in undergraduate nursing education, for example in Norway digital skills and health informatics is included in the national curriculum guidelines in 2019 [3].

Capacity development is not only formal requirements to curriculum and structure of education programs. With new tools, offering hands-on experience is important, and this is another important aspect of Professor Mantas contribution to capacity development. With a wide variety of teaching, research and networking activities organized by the Health Informatics Laboratory that he established at the NKUA, there have been plenty of opportunities for hands-on experiences and skills acquisition. Several EU-funded projects, in which the laboratory was a partner, gave the opportunity to many students to harness skills and for young researchers to gain valuable experience from working in EU projects, collaborating with partners all over Europe. With his collaborators came the opportunity to participate in many international events, thanks to his wide network and his involvement in the European Federation of Medical Informatics (EFMI). EFMI is the leading federation for health informatics professionals in Europe (www.efmi.org). All these experiences are highly valued by and in the international job market, as many NKUA graduates and his collaborators have had the opportunity to continue their career inside Greece, in Europe and internationally.

More recently, the PH-ELIM Erasmus+ project, lead from Montenegro is an example of further regional uptake of capacity building efforts, where focus on health informatics seeking to support public health with educational activities and services for health information management, sharing well-known EU best practices to ensure progress and sustainable development [4]. PH-ELIM has contributed tangible results that will help foster a sustainable public health community at national level in Montenegro, with necessary capacity to embrace the digital transformation in health care and civil society at large [5]. Working with faculty and giving them and their higher education institutions visibility, will create awareness and make efforts to meet the highest global standards, as a key prerequisite for building cooperation within the public health community and incorporate health informatics topics in all healthcare education.

To overview and drive for harmony of the Biomedical and Health informatics offerings, the AC^2 (Accreditation, Certification Committee) has been set up by EFMI under leadership of Professor Mantas. AC^2 collected and systematized information about health informatics educational offerings across Europe, and more than 500 universities and colleges in Europe were checked for educational programs in health informatics at all academic levels. The outcome of the research includes review of 316 study programs at undergraduate and postgraduate level including a variety of specializations [6]. To prepare health professionals the higher education programs in biomedical informatics and health informatics are continuously developing, and accreditation can help ensure quality, harmonize programs and support mobility. Therefore, AC^2 oversees a system with updated guidelines, and process for voluntarily accreditation of the educational offerings [6]. This will help the community of health professionals to become well prepared to respond successfully to the challenges in design, deployment and use of the digital solutions driving the transformation of the healthcare systems and their jobs.

2.2. *Broadening user-constituencies in Biomedical and Health Informatics*

Bringing digital opportunities to develop literacy, build proficiency and broadening capabilities in professional constituencies makes health care a complex, interdisciplinary activity is necessary for progress. Ensuring eHealth solutions that support decision – making, coordination of care and information to monitor treatment processes to support

all members of the interdisciplinary team is important for success. Professor Mantas have led important efforts to prepare the community with knowledge to take advantage of digital tools and services leading to transformation of health care services. This is contributions that over time have paved the way for us.

Early on, NIGHTINGALE [7] was a pioneer project in its goal to boost training in health informatics and digital health for nursing in Europe. The project set out to specifically educate and train nurses in a harmonious way across Europe, to be prepared for issues of concern in the upcoming field of nursing informatics and build capacity to use information systems in coordination with other health sector training initiatives [8]. Supported by the expertise of professional nursing users' group the project developed a curriculum and accompanying courseware material using multimedia technologies, appropriate software packages, books, and traditional teaching material as common training resources basis for the corresponding courses.

TELENURSE [9] is another early project, that set out to promote formalizing data entry and systematizing health information recorded by nurses. The project sought to drive the development and use of an International Classification for Nursing Practice (ICNP) and a clinical nursing minimum data set (NMDS) in Electronic Health Records (EHR). One of the discussions and concerns in TELENURSE was availability of and access to health information from different professional perspectives and future opportunities to combine such information in the care processes, and report on quality and patient's health outcomes [10]. Grappling with increasing requirements for formalization and standardization, outputs of efforts as initiated in the TELENURSE project, could counter the lack of uniform and comparative descriptive data about hospital nursing, their contributions to patient outcomes and its cost-effectiveness in Europe. Sharing information is important, and suitability of standardized terminologies, like ICNP that was the focus of this project, are still being investigated and evolving. Progress is underway, demonstrating the need for co-creation and collaboration. Insights into the representation of clinical processes and capacities of actors to present cross-disciplinary perspectives, continues as an important discussion to ensure continuity of care processes, including the nursing care contribution across health system levels to ensure safe quality care and cost effectiveness.

The H2020 funded project CrowdHealth; "Collective wisdom driving public health policies" is an example of evolving efforts to build momentum and bring out the full potential of health informatics and the ongoing digital transformation of health care [11]. Working with partners around the Mediterranean, CrowdHealth sought introducing the paradigm of Holistic Health Records (HHRs) that include all health determinants, demographics, diseases, lifestyle choices, nutrition, activity etc., in health systems in South Europe and North Africa. The novelty of HHR would contribute to stimulating robust communities where the clinical, social and human perspectives would constitute collective knowledge for these different factors pertaining to a population segment. Here is another contribution that demonstrates how to engage, create co-creation opportunities and make progress towards a "health in all policies" approach.

As demonstrated by Professor Mantas scholarship, necessary multi-disciplinary health informatics competencies are vital capacity for continuity, collaboration and information sharing between healthcare providers and their patients. As the ultimate beneficiary of health services, citizens; as patients and/or family caregivers, are the least supported and systematically "utilized" resource in contemporary health care. The challenges for timely information access, and active use of accumulated personal health information from multiple sources requires digital health literacy capacity to comprehend

and use the information [12]. Similar to early efforts to support all health professionals, as initiated by Professor Mantas, offering new, novel functionality, access to information and knowledge and digital health literacy comes with tremendous potential to empower citizens in everyday health choices that accelerate health transformation and personalize care across Europe and internationally.

2.3. *The multiplier effect*

The impact of Professor Mantas work goes beyond the activities that he participated personally. Through his role as a teacher and supervisor for students and PhD candidates and as mentor for colleagues he has actively passed on his knowledge and ideas to others. This continue his mission in Greece but also in several other countries, and here is a clear multiplier effect of his scholarship. Health informatics, as taught and debated at the Faculty of Nursing of the National and Kapodistrian University of Athens, have been successful in preparing health informatics professionals to understand these sensitive and complex topics. Those benefiting from and inspired by Professor Mantas can continue to make a difference for their students and colleagues, creating a multiplier or snowball effect that has the potential to develop health informatics and transform health care. In this section we mention some of these activities, and although Professor Mantas has not been directly involved, they are certainly in line with his teachings and builds from his initiatives.

The potential of eHealth to empower citizens as taught and advocated by Professor Mantas, has been explored by several research projects. The eRehab project in Northern Norway (2010-2014, funded by Northern Norway Regional Health Authority) aimed in supporting the self-management of cardiovascular disease patients after cardiac rehabilitation [13]. The eRehab intervention had the ambition to be a tool for citizens for assisting them to maintain their level of physical activity after a cardiac rehabilitation stay. The project addressed the dilemma of who knows best what the citizens need from eHealth: the citizens, health professionals or technologists [14]. eHealth solution for this project was not implemented as a tool, not even for other health professionals.

The EU-funded project BETTEReHEALTH (Horizon 2020) aims to increase international cooperation in eHealth, strengthen end-user communities and policy makers in making decisions for the successful implementation of eHealth and digital solutions in Africa [15]. As it has been crucial for health professionals in Greece and Europe to be educated in Health Informatics, the project is also promoting the capacity building initiatives targeting health professionals and IT developers in Health Informatics, to give them the tools, but also the empowerment they need to lead the development of effective eHealth solutions. Professor Mantas career is also legacy for international cooperation and networking. In a similar manner, BETTEReHEALTH has strengthen the cooperation between several African and European countries and has established four Regional Hubs in the respective regions of Africa to disseminate eHealth knowledge in host country and countries around. Finally, the BETTEReHEALTH project, following the example of earlier successful EU projects, is collaborating with policy-makers in the participating African countries to promote eHealth at policy level. Involving policy-makers has the potential to improve uptake of eHealth at large scale, as effective eHealth policies and transformation strategies can unlock the unharnessed potential of eHealth both in developing and developed countries.

Gravitate-Health Public-Private Partnership is another on-going project that seek to bring innovative digital health information tools for person-centred healthcare, in efforts

to engage and empower users with digital information tools, specifically safer use of medicines for better health outcomes and quality of life [16]. Gravitate-Health's digital tools with focusing mechanisms offer easy access to health information from trusted sources and ensure good understanding of this information mindful of context, user capabilities and therapy. This is important for everyday health related self-management and open opportunities for active use of personal health information [17].

3. Significance of contributions

Professor Mantas has been teaching Health Informatics at a Nursing department, educating nurses and other health informatics professionals. We envision that this environment, in the spirit of the ancient academic tradition of Athens, inspired the dialectics between nursing theories and theories of informatics that led to the flourishing of the field of health informatics. Interprofessional capacity building, as demonstrated over the trajectory of Professor John Mantas' scholarship, particularly efforts to develop programs and prepare all health professionals for the opportunities to prepare for and influence the health informatics driving health systems evolution and digital transformation. Curriculum development and accreditation of programs as well as post-graduate education and professional development has over time built digital literacy and digital health literacy. Investing in the people and seeking to strengthen capacity is at the core for advancement in eHealth and sustainable health care transformation [12]. Over time, health professionals, patients and their support network can now take advantage of eHealth regionally, in Europe and globally.

Capacity development following the initiatives by Professor Mantas work goes beyond the careers of his collaborators and students. By passing the torch of his engagement and dedication to his field on his collaborators and students, they are in position to develop capacity among their collaborators and students. This snowball effect has the potential to continue for generations, and lead to further advancements in health informatics and as a result in health care in general.

4. Conclusions and congratulations

Our view, as presented here, is that initiatives which Professor Mantas spearheaded and led has been very important to successfully prepare generation of nurses, other health professionals and health informaticians for collaboration to develop the dynamically evolving field of Biomedical and Health Informatics. Furthermore, Professor Mantas has been working from within at a Nursing Faculty, many initiated activities stemmed from needs and opportunities observed there. This has been an important multiplier for the role of nurses in health informatics. We believe this as a driver for interdisciplinary approaches, making sure there is support for the full health care team including patients and their support network, emphasizing coordination and collaboration in addition to health care decision making. Continuing to expand the application areas and introducing knowledge and new services to professionals, patients and their support network will be important to continue to build capacity in Biomedical and health informatics and to reap benefit of ongoing health care transformations for all.

Congratulations to Professor Mantas and your team and thank you for the important imprint your scholarship has made for biomedical and health informatics to ensure capacity development for all.

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