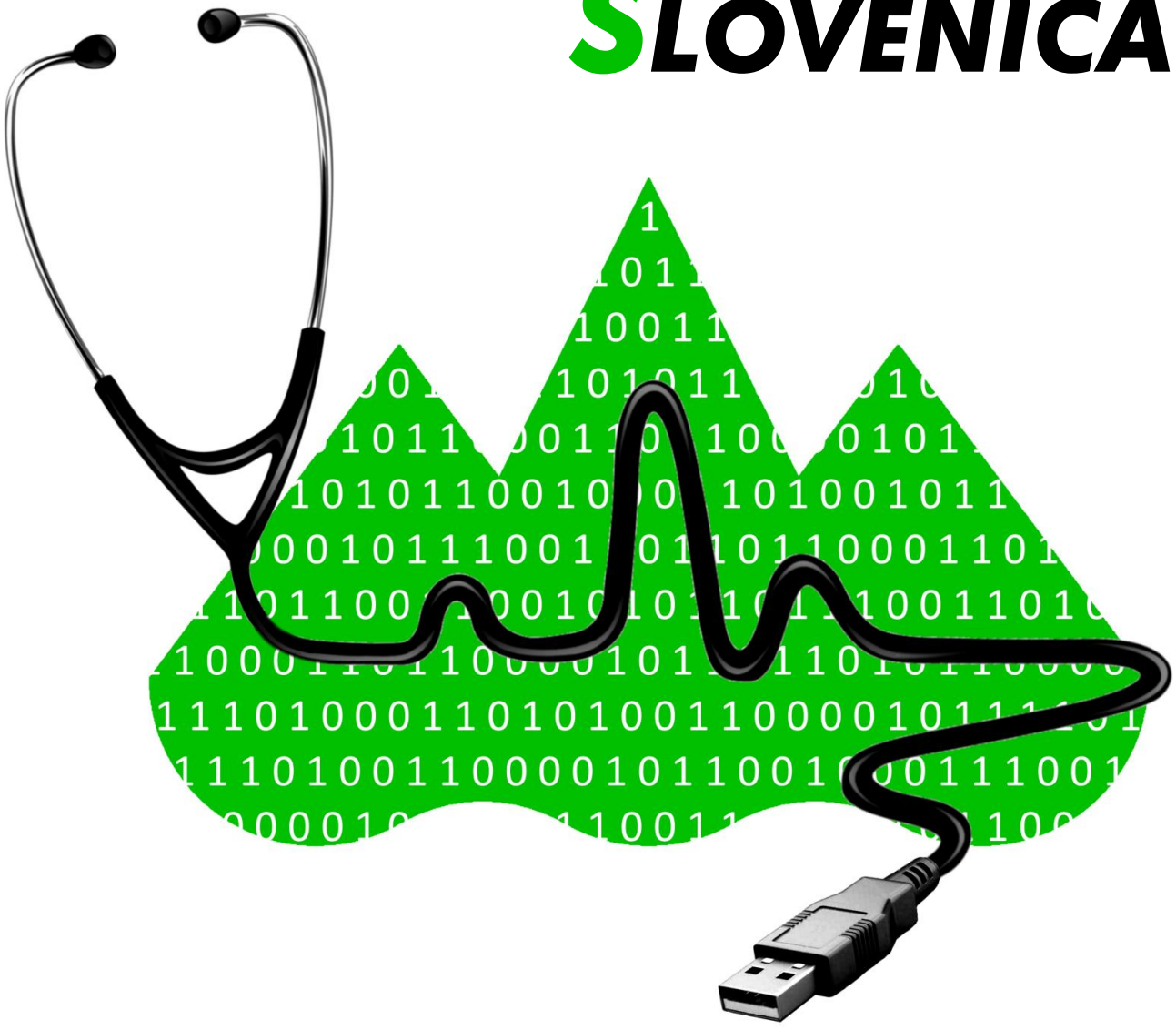
INFORMATICA MEDICA SLOVENICA



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About the Journal

Informatica Medica Slovenica (IMS) is an interdisciplinary professional journal that publishes contributions from the field of medical informatics, health informatics, nursing informatics and bioinformatics. Journal publishes scientific and technical papers and various reports and news. Especially welcome are the papers introducing new applications or achievements.

IMS is the official journal of the Slovenian Medical Informatics Association (SIMIA). It is published two times a year in print (ISSN 1318-2129) and electronic editions (ISSN 1318-2145, available at http://ims.mf.uni-lj.si). Prospective authors should send their contributions in Slovenian, English or other acceptable language electronically to the Editor in Chief Assoc.Prof. Gaj Vidmar, PhD. Detailed instructions for authors are available online.

The journal subscription is a part of the membership in the SIMIA. Information about the membership or subscription to the journal is available from the secretary of the SIMIA (Mrs. Mojca Paulin, mojca.paulin@gmail.com).

O reviji

Informatica Medica Slovenica (IMS) je interdisciplinarna strokovna revija, ki objavlja prispevke s področja medicinske informatike, informatike v zdravstvu in zdravstveni negi, ter bioinformatike. Revija objavlja strokovne prispevke, znanstvene razprave, poročila o aplikacijah ter uvajanju informatike na področjih medicine in zdravstva, pregledne članke in poročila. Še posebej so dobrodošli prispevki, ki obravnavajo nove in aktualne teme iz naštetih področij.

IMS je revija Slovenskega društva za medicinsko informatiko (SDMI). Izhaja dvakrat letno v tiskani (ISSN 1318-2129) in elektronski obliki (ISSN 1318-2145, dostopna na naslovu http://ims.mf.uni-lj.si). Avtorji člankov naj svoje prispevke pošljejo v elektronski obliki glavnemu uredniku izr.prof.dr. Gaju Vidmarju. Podrobnejša navodila so dosegljiva na spletni strani revije.

Revijo prejemajo vsi člani SDMI. Informacije o članstvu v društvu oziroma o naročanju na revijo so dostopne na tajništvu SDMI (Mojca Paulin, mojca.paulin@gmail.com).

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Vsebina

■ Uvodnik / Editorial

Končno je pred vami Informatica Medica Slovenica za leto 2016. Za ogromno zamudo sem po položaju in tudi dejansko najbolj odgovoren sam, zato se vsem bralkam in bralcem globoko opravičujem!

Zopet je izšla žal le ena dvojna številka, a nekaj je bolje kot nič, predvsem pa je realno pričakovati spremembe na bolje. Kmalu bo namreč Slovensko društvo za medicinsko informatiko prenovilo sestavo uredniškega odbora in način izdajanja našega časopisa. To naj bi prineslo večjo rednost izhajanja in korak naprej v mednarodni prepoznavnosti in odmevnosti časopisa.

Seveda pa ni vse črno (če nič drugega, so nekateri deli IMS zeleni) in časopis se ima tudi s čim pohvaliti, začenši z vsemi vidiki kakovosti prispevkov. Pohvalimo se lahko – celo že od leta 2002 – tudi z odprtim dostopom do vseh naših prispevkov. In to diamantnim (angl. *diamond open access*)! Za razliko od zlatega, pri katerem mora avtor objavo plačati, in zelenega, pri katerem je sicer vse brezplačno, a lahko avtorji sami objavljajo nerecenzirane prispevke.

Zato naj ponovim: *IMS nudi diamantni prosti dostop, kar vključuje brezplačno objavljanje, recenzentski proces in takojšnjo javno objavo končnih verzij prispevkov* (več na http://www.jasonmkelly.com/2013/01/27/green-gold-and-diamond-a-short-primer-on-open-access/).

V duhu čim bolj odprtega širjenja čim bolj kakovostnih informacij v zdravstvu in nasploh vam zato želim prijetno branje!

Informatica Medica Slovenica for the year 2016 is finally here. Formally and actually, the enormous delay is my fault, for which I deeply apologise.

Alas, the volume again consists of one double issue, but something is better than nothing, and most importantly, changes for the better can realistically be expected. The Slovenian Medical Informatics Association will namely soon appoint a new editorial board of our journal and reorganise the publishing process. That should bring about more regularity and a step forward in the international recognisability of the journal.

Naturally, not everything is black (if nothing else, some parts of the IMS are green) and the journal has got something to be proud about, starting with all aspects of quality of the papers. We can also brag – ever since 2002 – about open access to all our contents. Not only that, we provide *diamond open access*! Unlike the gold open access, where the author has to pay the publishing fee, and green open access, where everything is free of charge, but the authors can upload their papers without peer review.

So let me repeat: *IMS offers diamond open access, which entails free-of-charge publishing, review process and immediate public access to the final, published version of the paper* (see http://www.jasonmkelly.com/2013/01/27/green-gold-and-diamond-a-short-primer-on-open-access/).

In the spirit of maximally open dissemination of information of maximum possible quality in health care and elsewhere, I wish you pleasant reading!

Gaj Vidmar

■ **Infor Med Slov**: 2016; 21(1-2): 1

■ *Research paper*

Živa Rant, Vesna Levašič

Building the National Arthroplasty Registry of Slovenia

Abstract. National Institute of Public Health from Slovenia was the project leader of the PARENT Joint Action, which was co-funded by the European Commission. One of the deliverable of the PARENT Joint Action are Methodological Guidelines and Recommendations for Efficient and Rational Governance of Patient Registries. To test them in practice, we built the pilot version of the National Arthroplasty Registry of Slovenia. Its goal is to support quality and safe health care for the patients and to improve the orthopaedic profession as well. We encountered many challenges during the implementation. This article summarises our experiences with a view to help others who meet similar challenges in the future.

Izgradnja Registra endoprotetike Slovenije

Povzetek. Nacionalni inštitut za javno zdravje je vodil Skupni ukrep PARENT, ki ga je sofinancirala Evropska komisija. Eden glavnih izdelkov projekta so Metodološka navodila in priporočila za učinkovito in racionalno upravljanje z registri pacientov. Za preverjanje njihovih teoretičnih izhodišč smo zgradili pilotno verzijo Registra endoprotetike Slovenije. Cilj registra je nuditi podporo kakovostni in varni zdravstveni oskrbi za paciente ter izboljšati samo ortopedsko stroko. Med delom smo se srečali z mnogimi izzivi. Svoje izkušnje smo zapisali, ker upamo, da bodo v pomoč vsem, ki se bodo v prihodnosti srečali s podobnimi izzivi.

■ **Infor Med Slov** 2016; 21(1-2): 2-13

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Introduction

The establishment of the pilot version of the National Arthroplasty Registry of Slovenia (Register endoprotetike Slovenije, RES) was made within the PARENT Joint Action (JA). PARENT (PAtient REgistries iNiTiative) brings added value by providing Member States the recommendations and tools for implementation of interoperable and cross-border enabled patient registries. The project coordinator was the National Institute of Public Health from Slovenia. The contributing experts were form 25 countries.

The overall objective of PARENT JA was to support the EU Member States in developing comparable and interoperable patient registries in clinical fields of identified importance (e.g., chronic diseases, medical technology). Its aim is to rationalise the development and governance of interoperable patient registries, thus enabling the use of secondary data for public health and research purposes in cross-organizational and cross-border setting. To do so, it helped to improve the ability of patient registries to share data as well as improve the process of feeding data to the registries from their primary sources, such as Electronic Healthcare Records (EHRs).

The Joint Action objective is also to support the EU Member States in providing objective, reliable, timely, transparent, comparable and transferable information on the relative efficacy, as well as short-term and long-term effectiveness, of health technologies. This information should be effectively exchanged among the relevant national authorities or bodies. This will enable the rationalisation of the Health Terminology Assessment (HTA) processes. It will avoid the duplication of assessments and increase availability and quality of previously localized patient registries data.[1]

One of the main deliverables of the PARENT JA were the Methodological Guidelines and Recommendations for Efficient and Rational Governance of Patient Registries[2] (hereinafter The Guidelines). While working with the Guidelines, we wanted to test theoretical bases in practice. As a practical example, we chose the building of the National Arthroplasty Registry of Slovenia (in Slovenian: RES – Register endoprotetike Slovenije), which had been needed in Slovenia for a long time. The Valdoltra Orthopaedic Hospital (OBV) expressed great interest and the readiness to cooperate because of their experience with the Hospital Registry.[1] The Slovenian Orthopedic Society gave OBV full support to establish the RES collection within this project.[3]

The definitions from PARENT that affect patient registries are:

- The patient registry is defined as an organised system that collects, analyses, and disseminates the data and information on a group of people defined by a particular disease, condition, exposure, or health-related service, and that serves a predetermined scientific, clinical or/and public health (policy) purposes.[2]
- Primary arthroplasty is the first surgical procedure when a total or partial endoprostheses is implanted.[4]
- Revision arthroplasty is the surgical exchange or removal of any component (or all components) of an artificial joint replacement.[4]

Overview of the Current State

On the European level, there are many active national and regional Arthroplasty Registries, each with its own source of data, mode of analysis and reporting. It is of common interest to have a model for the main issues regarding all arthroplasty registries. Few hospitals in Slovenia collect the relevant forms only for their own purposes. On the other hand, there is an active hospital registry – Valdoltra Arthroplasty Registry at the OBV, founded in 2002, which is an important pool of information for different studies concerning the survival time of prostheses also on the European level.[5] As OBV surgeons perform about 40% of all arthroplasty procedures in Slovenia, this hospital registry already works as a regional one. There are eight other orthopaedic departments in Slovenian clinics and hospitals, and eight more traumatology departments where endoprostheses are implanted. This is the reason why establishment of the RES remains a challenge.[4]

Reasons for the Arthroplasty Registry

The Arthroplasty Registries (ARs) around the world are efficient instruments for the detection of success or failure of implants used for joint replacement. Some countries in Europe, including Slovenia, still do not have such control over the implants. The health care system in Slovenia allows very good control of the patients with implanted endoprosthesis because the patients use the hospital inside Slovenia for primary and revision operations. As they are free to choose the hospital and the doctor where they want to be operated, the hospital registry, like in Valdoltra, is not sufficient to cover the national needs. The implementation of national registries as tool to

medical device control is also one of the EU Directives COM2012/542 (article 83), which applies also to directives 2005/50/EC in 93/42/EEC. V) that came into force in 2015.[4]

Purpose of the Arthroplasty Registry

The purpose of an AR is to enable better control and data integration of implanted endoprostheses in individual health care centres at the national and international level. AR offers the possibility of immediate reaction of the profession to the possible increase in the number of revision surgeries due to failed implants. The goal is to support quality and safe health care for the patients, as well as to improve the orthopaedic profession.

AR is an infrastructure that allows the assessment of:

- Effectiveness of different implants in the real world;
- Safety and cost effectiveness of a new and existing device;
- Outcome monitoring of performance and potential safety issues over the entire lifecycle;
- Early signal detection of inferior outcome of device and surgical techniques;
- The impact of patient profile/ comorbidities/ risk classes on patient side of the outcome;
- Market monitoring concerning implants and health care providers;
- Feedback to health care providers;
- Comparison of different national registries;
- Identification of fields for improvement and monitoring of effects of the treatment.

Objectives of the Arthroplasty Registry in the PARENT JA[4]

The first objective was to establish the OpenEHR Framework for an AR Model based on European Arthroplasty Register (EAR) Minimal Dataset Forms. The second objective was to use the same archetypes for AR in Slovene language for the interested stakeholders in Slovenia with the possibility to expand the forms.

General AR objectives were:

- To achieve the traceability of implants used in Slovenia;
- To define the implants' survival in the human body;
- To identify all possible factors and events that influence the implants' survival in the human body;
- To define all the post-operative complications related to the device insertion;
- To facilitate feedback to stakeholders in order to support decision-making;
- To improve risk management;
- Other opportunities.

Methods

We designed the RES as a proof-of-concept of the Guidelines.[2] We knew that good project management is essential for successful software solution implementation. For project management, we used the Project Management methodology.[6-9]

The basic methodology used was Systems Analysis and Design.[10] We also considered Systems Development Life Cycle[10] methodology and Predictive Software Project Life Cycle[11] methodology (Figures 1 and 2).

For Process Model development and presentation, we used the Business Process Management (BPM) methodology on the ARIS Business Process Analysis platform.[12] We used the Aris Express – a free-of-charge modelling tool for business process analysis and management for occasional users and beginners in Business Process Management.[13] We made Process Landscape – the Value-Added Chain (VAD) and Event-driven Process Chain (EPC) Diagrams.

For data modelling, we used the OpenEHR methodology. OpenEHR is a virtual community working on interoperability and computability in e-health. Its main focus is electronic patient records (EHRs) and systems.[14] Usage of the existing OpenEHR archetypes and templates helps improving semantic interoperability because of using the same data models in different databases. We used CKM – Clinical Knowledge Manager for harmonisation, reviewing and publishing of OpenEHR Archetypes and Templates.[15] For the creation and editing of archetypes, we used Archetype Editor (AE) and for the definition of templates, we used Template Designer.

We created mind maps before we made the data model in the OpenEHR. We used the popular XMind[16] professional mind mapping tool, which is user friendly and helps medical experts and informatics specialists to talk to each other. We used Tableau[17] commercial business analytics software for the reports and analyses with graphical presentations of data from the RES.

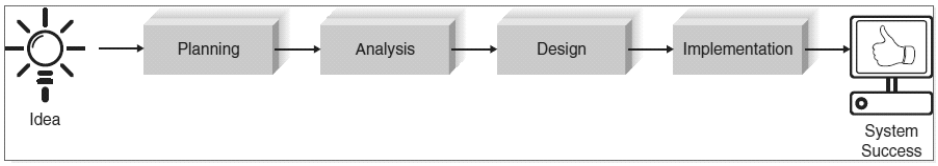

Figure 1 The Systems Development Life Cycle. Source: Dennis.[10 p. 10]

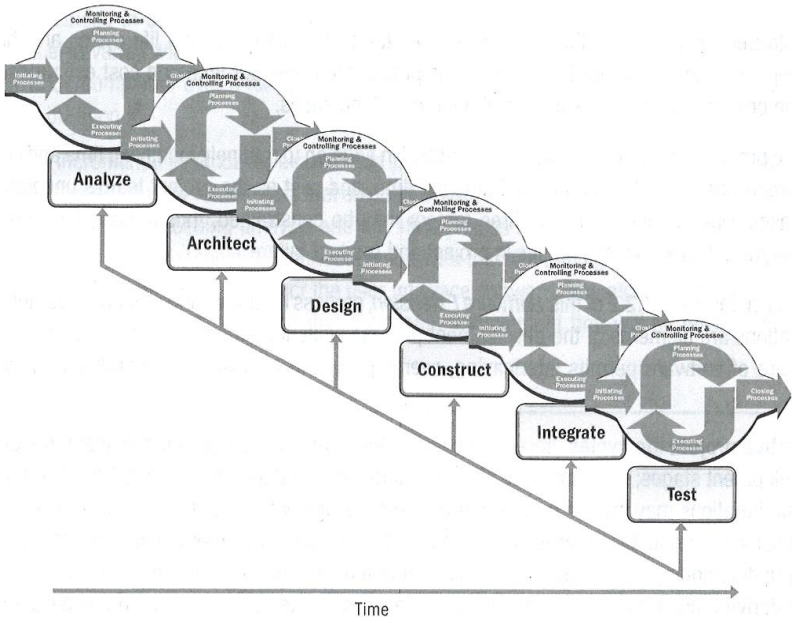

Figure 2 Predictive Software Project Life Cycle. Source: PMI.[11 p. 29]

Figure 3 VAD for building the new registry.

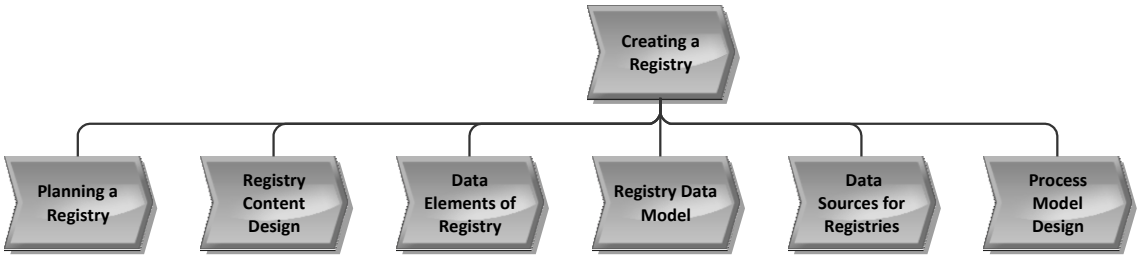

Figure 4 VAD for Creating a Registry.

Results

First of all we, decided to define the new registry process. We made the VAD[4] (Figure 3).

We had to define the purpose, objectives, circumstances, project limitation and other topics that are including in the planning. After that, we were able start with creating a registry. Than we set up the registry and started running it. The process of building a registry ends by changing and stopping the registry, but we have not considered those issues.

When creating the registry, we relied on the VAD[4] in Figure 4, which includes planning a registry, registry content design, data elements defining, registry data model, data sources for registry and process model design. These activities are not sequential; they can take place at the same time.

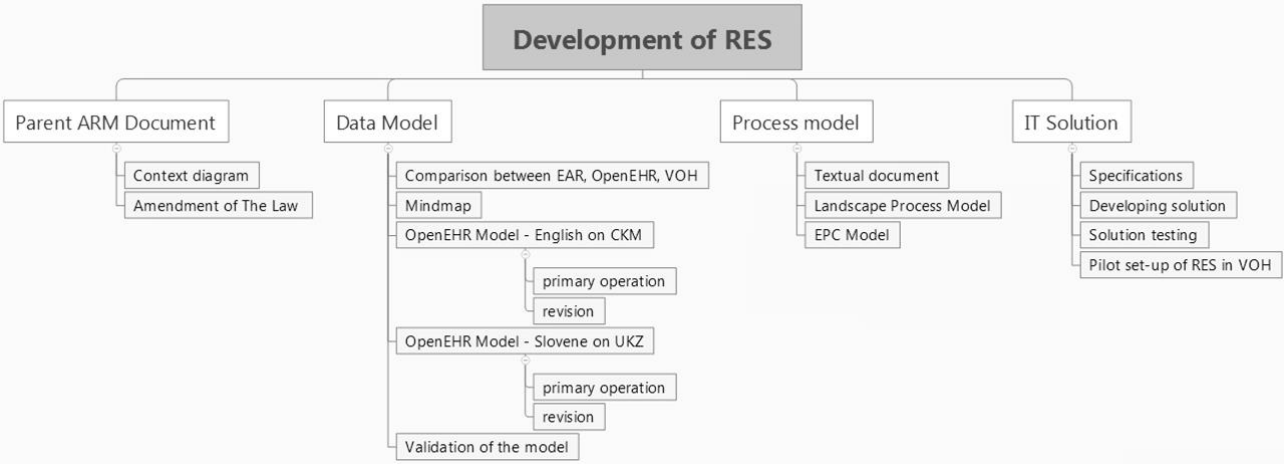

Figure 5 Work Breakdown Structure.

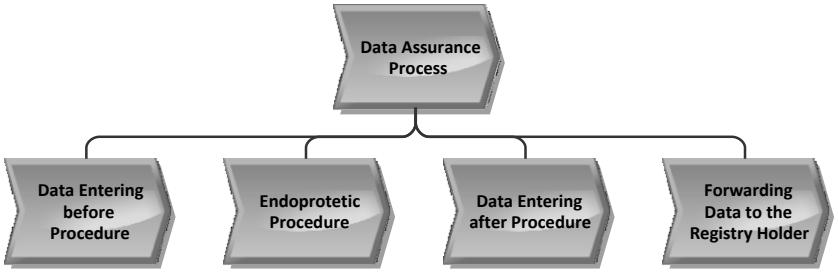

Figure 6 Data Assurance Process for RES – VAD.

Planning

We defined the reasons for the AR, its purpose and objectives. The reasons for ARs and the purpose of our AR have already been outlined above. As already stated, the goal was to support quality and safe health care for the patients and to improve the orthopaedic profession.[18] We followed two main objectives within the PARENT project: to establish the OpenEHR Framework for an AR Model based on EAR Minimal Dataset Forms, confirmed by the European Federation of National Associations of Orthopaedics and Traumatology (in 2015, it transformed into NORE – Network of Orthopaedic Registries of Europe)[19] and to use the same archetypes for AR in Slovenian language for the interested stakeholders in Slovenia with the possibility to expand the forms. We also had to follow the general objectives stated above. The stakeholder analysis was made in the form of a conceptual diagram. We made the Work Breakdown Structure (WBS, Figure 5) with the list of activities. It consist of PARENT ARM document, data model, process model and IT Solution.[18]

We defined the scope and limitations of the registry, the legal aspects and confidentiality. We described the resources (human, IT, financial and other resources) and the project team members. We discussed data sources for RES. We planned that data from all orthopaedic clinics, hospitals, departments and the divisions in hospitals in Slovenia where arthroplasty is performed will be included. We also made the Action Plan for the implementation of AR, risk and feasibility, and wrote down the assumptions of the inclusion and exclusion criteria, and made a list of the expected outputs of RES.

Analysis

We performed process and data modelling simultaneously, because they are interdependent. First, we simultaneously prepared a draft of data model and process model for primary operation.

Process modeling

Two medical experts and two informatics experts contributed to process modelling. Staff from OBV prepared textual data assurance process description. The working group analysed the proposals. We worked with Aris Express.[13] First we made VAD[4] (Figure 6).

We divided basic sub-processes in more detail and produced the Event-driven Process Chain (EPC) Diagram for data assurance process for RES.[4] For

describing Data Search and Retrieval process, we produced EPC diagram for Data Search and Retrieval.[4]

Data modeling

For data modelling, we chose the OpenEHR methodology.[14] We started with the mind map produced using XMind.[16] We included the Minimal data set from European Arthroplasty Register (EAR) form.[19] We contacted and asked for help the former vice-president of EAR, who was very supportive. Despite that, we still did not have enough knowledge until the medical expert from OBV contributed actively. First, we made a mind map for primary operation of hip replacement and after that for revision.[4] It took a lot of time, collaboration and synchronisation to produce the final mind map.

The Medical Device Archetype

We investigated data elements for implants and made a mind map for the arthroplasty component[4] (Figure 7).

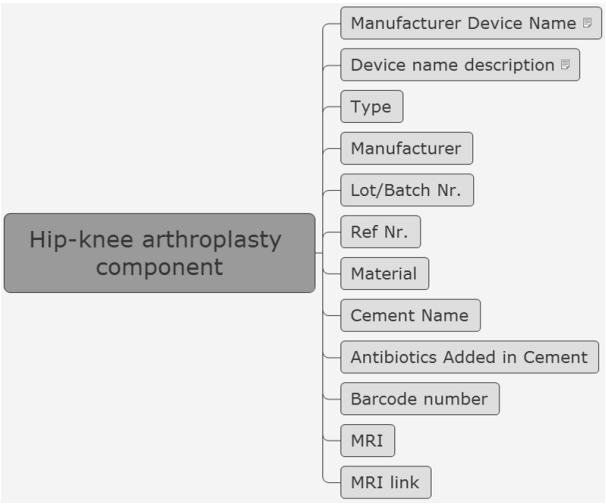

Figure 7 Mind Map for Arthroplasty Component.

The medical device archetype had already existed in OpenEHR methodology. Therefore, we decided to use the existing archetype, but it did not fulfil all our needs. Hence, we decided to review the clinical content of the Archetype Medical Device on the CKM. Thirty reviewers from Norway, New Zealand, Slovenia, Spain, Australia, Sweden, United States and United Kingdom contributed 47 reviews.[15] The archetype is available on the CKM webpage.[15] One can also find the data about the reviewing process there. The final version of the archetype is in Figure 8.[4,15]

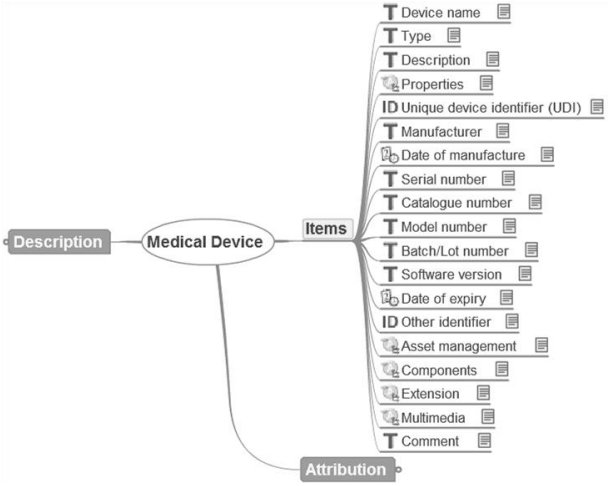

Figure 8 Archetype Medical Device.

Building the RES OpenEHR model

After the mind maps were done, we started building the OpenEHR model. The participants were Experts from OBV, informatics experts from NIJZ, OpenEHR experts from Ocean Informatics and Marand. We used the Archetype Editor (AE) and Template Designer for making archetypes and templates for RES.[14] Finally, we produced two models, one for primary hip operation and another for hip revision (Figure 9). The OpenEHR models are available on the CKM webpage.[20]

Data sources

We found out that in the analysis phase that OBV did not have a legal basis for collecting the required data at the national level yet. Therefore, the data for the RES will come from OBV alone in the initial phase. When the RES gets a legal basis by the Amendment of the Healthcare Databases Act (ZZPPZ), data from all orthopaedic clinics, hospitals, departments and the divisions in hospitals in Slovenia where arthroplasty is performed will be included. At that point, the whole target population, i.e., all Slovenian citizens who undergo the procedure of implantation of the endoprosthetic material, will be included. The data for estimating the survival curve need to be censored due to patient deaths. Therefore, a connection to the Slovenian Central Population Register (CRP) is also needed. Additional data on the implant parts came from the Implant Library from OBV.

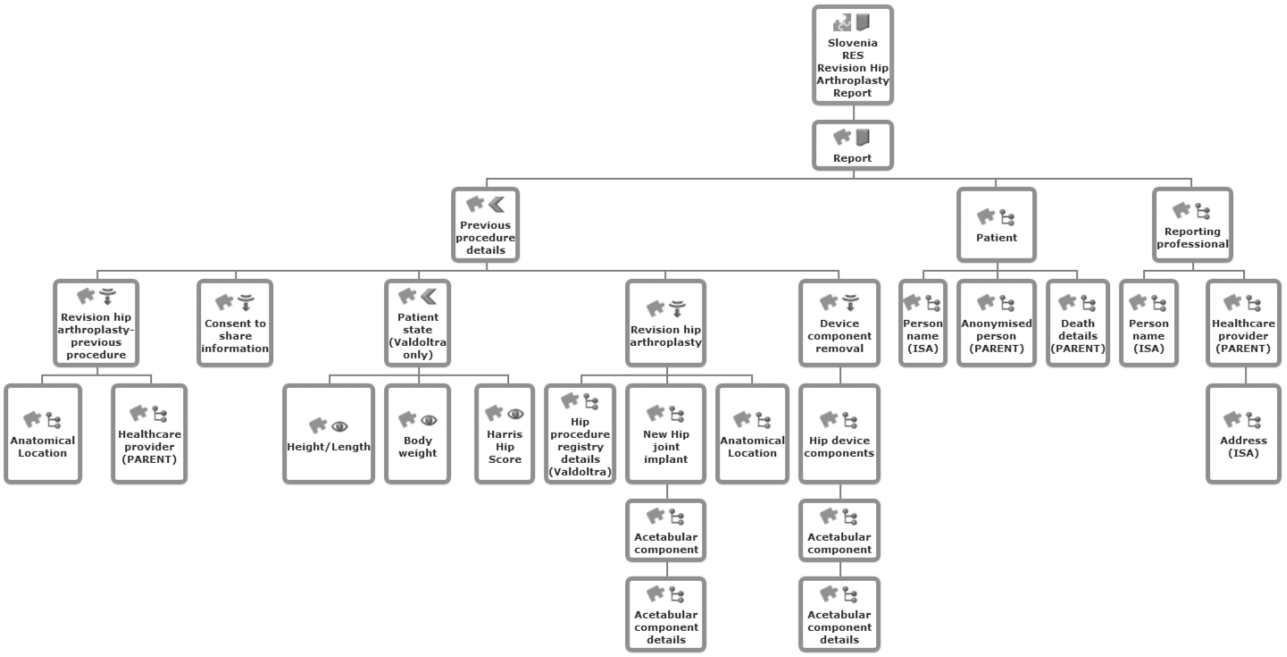

Figure 9 Slovenia RES Revision Hip Arthroplasty Report – Template Hierarchy in OpenEHR.

Design

We defined our requests for software solution. For the Patient Registry Information System Development we selected the Marand software company, which was selected based on the call for tender in the framework of thePARENT project. Marand is a Slovenian solution provider in healthcare offering products.

Implementation

A good implementation process is essential for a good solution and user satisfaction. The implementation comprised registry set-up and running the registry.

Registry set-up

Registry set-up was divided into four steps:

- Establishing the infrastructure
- Establishing secure connection and accesses
- Software installation and testing
- Data preparation

First, we needed to establish the operating infrastructure. We established the infrastructure at the NIJZ. We gathered technical inquiries from the software provider. After some harmonisation, we were able to establish adequate infrastructure.

The next challenge was to establish secure connections and accesses. NIJZ and OBV are health care institutions that work with sensible personal data and, according to the Personal Data Protection Act of the Republic of Slovenia, they are obliged to guarantee the highest level of data security. We decided to use the existing network of secure connections zNet between health providers in Slovenia. This caused some problems and access provision took a long time. We finally solved the problem when IT experts of all three partners (NIJZ, OBV and Marand) met in Valdoltra and cleared all obstacles on the spot.

The software provider prepared a pilot version of the IT solution and installed the software. During the user testing, the software provider continued to improve the solution. We are aware that a good testing is key for user's satisfaction and consequently for all developers of the solution. The testing guarantees that the system performs as expected. The first testing was performed at the software provider's place. The main testing was performed in OBV. The testing, harmonisation and updating continued until the final acceptance of the solution. User training was also implemented and short user's guidelines were supplied. In the framework of the PARENT project call for tender, we also bought a tool for business analytics. OBV prepared the proposals for the data display (the outputs) and the software provider prepared templates for graphic displays. The RES application allows access to these graphs.

Two challenges appeared during the data preparation: initial data entry and ensuring regular electronic data entries. Because OBV had a similar registry within its hospital information system with data from 2014, the users requested that data to be transferred. This made

sense because most of Slovenian hospitals use the same hospital information system (HIS). For this purpose, we needed to motivate the software provider who developed the HIS solution to enable export from it. The users from OBV, system analysts from NIJZ and the experts of previous and new software providers first designed the content of the transmission table, and later the table itself. This coordination was very time consuming for the project, but proved to be worthwhile.

As all data in reporters' information systems are saved in electronic forms, it makes sense that these data are sent electronically. We defined the form of sending which we will forward to reporters and include the electronic data entry in the register. The IT solution for RES allows the possibility of importing data from file, which is prepared by reporters from their HIS.

There are two possibilities for entering data into the RES. One possibility is to type in the data for each patient manually. The other possibility is to export the data from the local HIS to the CSV file and then import it into the RES.

Functional Requests of the National Arthroplasty Registry of Slovenia foresee the connection with the CRP. Eventual patient's death is a very important piece of data for estimating the survival of the prosthesis. We can now type it in or import the data from the CRP by following a special procedure.

Running the registry

After the registry setup, we started to run the pilot version of registry for hips. The application allows us to add new persons, surgeries (revisions and primary), and we are able to browse and update the data. Screenshot from the application are shown below (Figures 10, 11).

Discussion

Challenges

The main advantage was that the financial resources were assured by the PARENT project. Despite that, we had many challenges.

First, we had to decide who would be invited into the project team. The informatics experts are usually not enough. We were very happy to cooperate with the Head of the Valdoltra Arthroplasty Register. Finally, we composed the project team of medical experts, informatics team and experts for business processes. We used the OpenEHR methodology, which is user friendly for medical experts and informatics specialists and helps them to communicate between. We had to decide what should represent the records in the new registry. Our options were implant exchange, patient, treatment, and we chose operation (surgery).

What to include into the data set? Should we model EAR forms or the data collected in the Valdoltra hospital? We decided to take the model of the EAR minimal data set, because this dataset was accepted by the Slovenian Orhopaedic Society as well, and for extension, the Valdoltra dataset.

Having access to the Implant Library, we can make informative graphics presentations (Figures 12, 13).

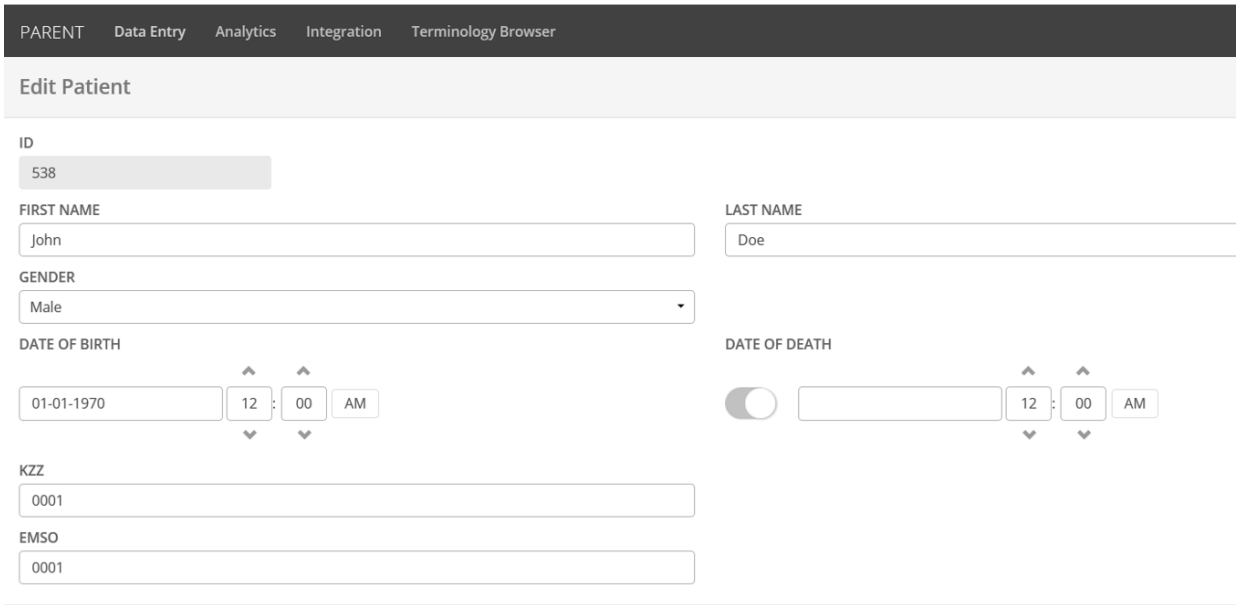

Figure 10 Application's screenshot – patient data.

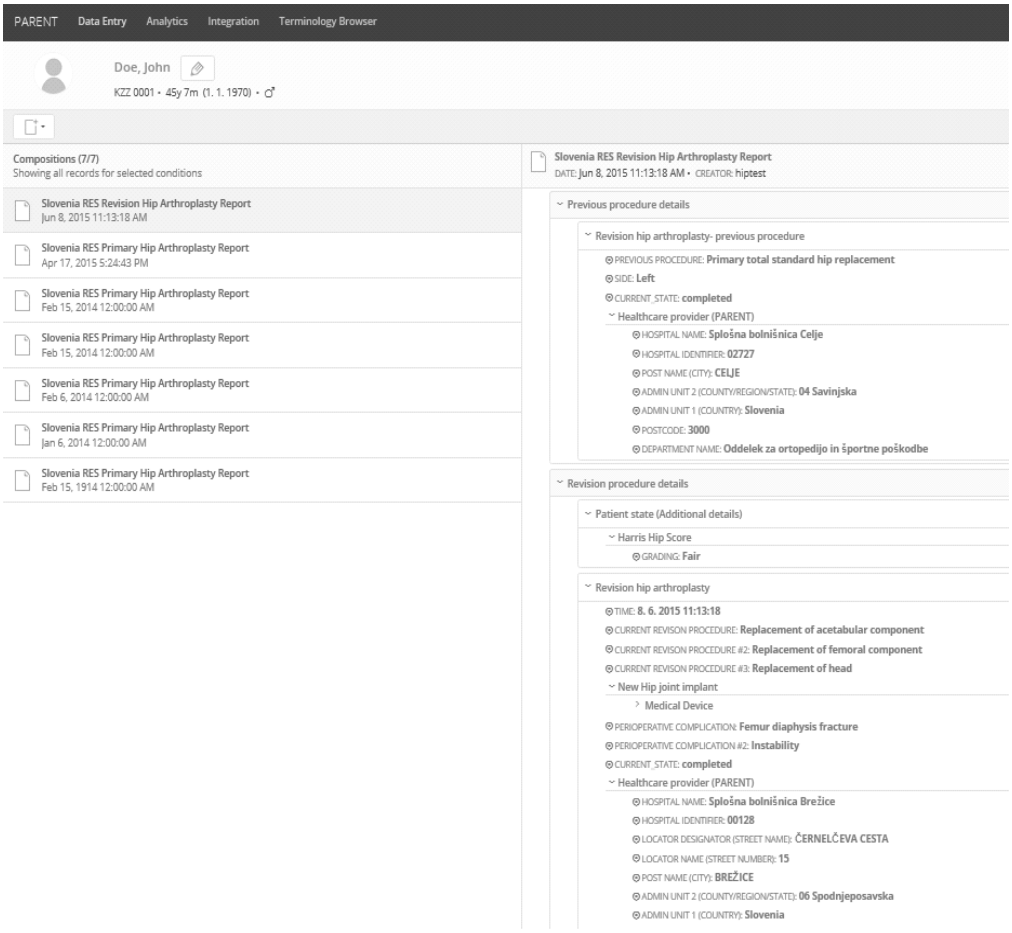

Figure 11 Application's screenshot – basic view.

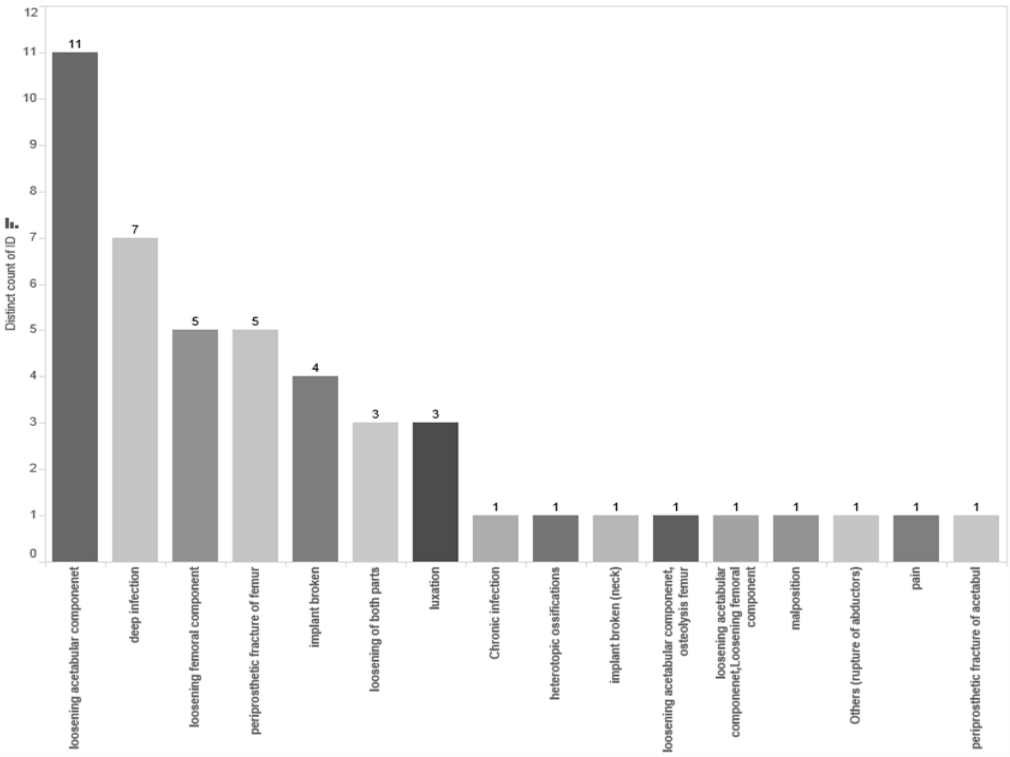

Figure 12 Reason for revision.

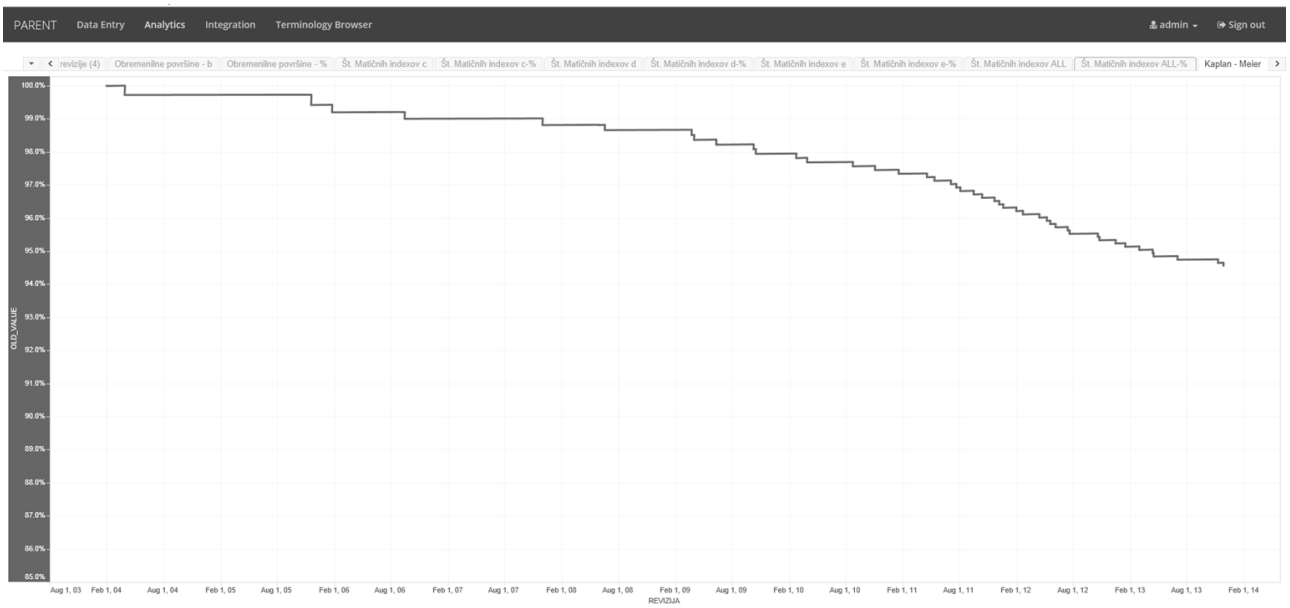

Figure 13 Kaplan-Meier curve of the survival of Profemur stem in the Valdoltra Orthopaedic Hospital.

Do we have a legal basis? We asked the Information Commissioner of the Republic of Slovenia for the opinion. She replied that we do not have a legal basis according to the existing legislation. Therefore, we prepared the Amendment of the Healthcare Databases Act of the Republic of Slovenia, which is currently under revision. We had three possibilities: to stop with our work, to make a data register based on subject's consent, or to start with Valdoltra patients. OBV has the legal basis for collecting data on its patients so the pilot solution was made for the patients of this particular hospital. Later, the procedure can spread to the national level.

Regarding assurance for as much interoperability as possible, we asked ourselves which standards could be included. For the set of data elements we use the EAR Minimal Dataset Forms,[19,20] which is accepted on the European level. For standardisation of diagnosis, should we use the ICD10, ICD10 Australian modification that is standard in Slovenian hospitals, SNOMED or something else? None of these could meet our needs, so finally we used the list from the EAR form,[19,20] which was coordinated on the European level. Similarly, we could not use the ACHI procedures collection, which is used in Slovenian hospitals. For the healthcare providers, we used the data from the Slovene HealthCare Providers Database. We used the Slovenian Implant Library, which is produced in the framework of OBV, which is its holder.

RES includes sensitive personal data that request the highest data security according to the Personal Data Protection Act of the Republic of Slovenia. We decided to use the existing Slovene health network of secure connections between hospitals – zNet and its security service. We located the registry data on the NIJZ server within the zNet.

All data we request is in reporters' HIS in electronic format. It will be send to RES electronically. We defined the form which we will forward to reporters and include the electronic data entry in the register. The IT solution for RES allows the possibility of typing in the data or importing data from CSV file, which is prepared by reporters from their HIS.

We would also like to import the data from existing registries in another IT solution. We made the agreement with their software provider and together we imported the data from their solution.

When a person with an implanted prosthesis dies, their data have to be excluded from the analysis of implant survival. That is why we need to get the date of the patient's death. We now can type it in or import it from the CRP.

Advantages

RES, the National Arthroplasty Registry of Slovenia, contains real-world data. Data are imported in the registry from the EHR in the hospital information system.

We used the existing OpenEHR archetypes and templates for improving and enabling the interoperability. We also had to make some new ones.

They were published and are available free on the CKM webpage.[21]

We achieved a really successful cooperation among medical experts and informatics team – system analysts, system engineers and developers of new IT solution and experts for business processes.

We have the Slovenian Implant Library, which is produced in the OBV. It helps us to fill the implant data automatically.

Patients and surgeries can be added in the RES, we can browse and update the existing data. The implant traceability is assured. Descriptive statistical analyses and informative graphics can be made using the Tableau tool.

Conclusion

The building of the National Arthroplasty Registry of Slovenia was a major challenge, but we were successful.

There were many unforeseen situations, which showed that building a registry in practice is very different from theory. The Methodological Guidelines and Recommendations for Efficient and Rational Governance of Patient Registries[2] were very helpful and we developed them simultaneously. Despite timely and comprehensive planning, we encountered many unforeseen complications during the implementation. It was proved once again that good planning is a precondition for the successful implementation of the project. The teamwork of all participants and their readiness is the clue to good joint final solution. The cooperation of medical experts with the informatics team and business process experts is also very important. We also comply with EFORT organisation regarding the definition of the dataset, and cooperated with experts in the OpenEHR community to synchronise the data model.

Building the registry lasted a lot longer than expected. We also had to carry out some unplanned activities. Unfortunately, OBV did not have a legal basis for data collection on the national level. On the other hand, OBV has the legal basis for collecting data on its own patients. Hence, as already stressed, the data for the RES come from OBV, which performs about 40% of all arthroplasty procedures in Slovenia. Their internal registry is also on the list of Arthroplasty Registries in Europe[22]. When RES will have the legal basis, the whole target population will be included.

In conclusion, we have gained many new experiences and became more qualified for building new registries during the process of building the RES. This document is intended to help anyone who will encounter similar challenges in future.

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■ Research Review Paper

Jana Šimenc

mHealth and Self-quantification in Health Promotion: Some Critical Considerations

Abstract. The sphere of digital health and medicine is characterised by continuous and pervasive favourable, techno-utopian views. Transformative expectations and economic rationales are used across different sectors (e.g. medicine, industry, marketing and governmental strategic documents). Diverse eHealth solutions, more recently mobile health (mHealth), have become a spotlight for industry profits and governmental investments. This article gives an argument for why the focus on utopian and instrumental benefits of new technologies in health care is a problematic, reductionist view over the understanding of emerging wider social practices. After an introduction of the rise and difficulties of eHealth project implementation, the focus is put on critical consideration of wider social implications that arise from the integration of mHealth solutions in health promotion programmes. The article looks at the challenges health promotion programmes face with the growing popularity and use of health and healthy lifestyle apps. Frequently, references to Slovenian context are presented. In the conclusions, some vital recommendations are given for policy development when incorporating self-tracking apps into health promotion strategies. Further, the list of references represents a broad overview of recent critical digital health literature and leads to further exploration of the subject.

mZdravje in samokvantificiranje v kontekstu promocije zdravja: nekaj kritičnih razmislekov

Povzetek. Čeprav je področje t. i. digitalne medicine in digitalnega zdravja še vedno v razvojni fazi, ga od preloma tisočletja nenehno podpira in spodbuja nekritična tehno-utopična retorika, ki je prisotna v vseh sektorjih, izraziteje na področju medicine, industrije, oglaševanja ter tudi v strateških dokumentih javnozdravstvenih politik. Raznolike e- in m-zdravstvene rešitve med drugim postajajo središče finančnih interesov industrije in predmet javnega financiranja. Članek problematizira trenutno prevladujoč javni diskurz o instrumentalnih prednostih in utopičnem pogledu na »nove tehnologije« v zdravstvu. Po uvodni kontekstualizaciji vzpona in težav pri implementaciji eZdravstvenih projektov, avtorica natančneje analizira želene in neželene družbene posledice, ki nastajajo z vpeljevanjem mZdravja v strategije in programe promocije zdravja oziroma javnega zdravja. Dotakne se procesov samokvantificiranja ter tudi izzivov v promociji zdravja, ki nastajajo z naraščanjem priljubljenosti in rabo raznolikih mobilnih (prostodostopnih) aplikacij s področja zdravja, rekreacije in zdravega načina življenja. V članku so na več mestih podane navezave na slovenski kontekst. V zaključku so predlagana priporočila za oblikovalce ter razvijalce javnozdravstvenih programov in strategij, ki bodo vključevale rešitve mZdravja. V seznamu literature je naveden pregled najsodobnejše literature, ki napeljuje na nadaljnje razmisleke o digitalnem zdravju in digitalni medicini.

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Introduction

The digital medicine and digital health arena are rapidly expanding. Not only is there a challenge to keep pace with rapid technological shifts in the health care sphere, but also with the dynamic development of lay and professional terminology. With the turn of the millennium, only a few were familiar with the concept of eHealth (electronic health), while 16 years later, the concept of eHealth has gained several derivates (e.g. telemedicine, telehealth, most recently mHealth); it became a broader term used to encompass the vast range of emerging practices in health care. Today, numerous definitions of eHealth and its derivates can be found.[1-5] Similarly, new words and neologisms, like healthi, connected health, dataveillance, playbour, datafication, gamification, pushed tracking, imposed tracking, wearables and similar recurrently enter our vocabulary. Many rising trends and practices remain a puzzle for some health care professionals, and in particular, for the lay public (users).

However, despite far-reaching and rapid technological advances, the complex culture of eHealth is, evidently, in the phase of infancy. Policymakers, start-ups and hospital leaders have been struggling with large-scale implementation or integration of different digital innovations in the health care arena. One of the challenges is to make great ICT ideas, previously put down in project proposals or/and polished PowerPoint presentations, work in complex social realities.

eHealth: The Rise and Challenges

If eHealth was barely in use before 2000, it has quickly become a buzzword,[6] and offers great promise for the transformation of health care practice. In industry and governmental strategies, the dominant rhetoric is pervasive enthusiasm for how new technologies will improve health care, reduce costs, empower people and patients, facilitate paperwork and in all aspects, transform health care for the better. From an industry (developers of digital health care solutions) perspective, software is starting to play a central role in addressing problems of the aging society and the escalating cost of health care services. Enablers of such digital health are a growing number of sensors for sensing the human body and communication infrastructure for remote meetings, data sharing, and messaging.[7] As Lupton (a leading sociologist in critical digital health studies) argues, "digital health technologies are represented as offering an ideal, cost-effective solution to the wicked problem of health care delivery and encouraging people to change their behaviours in an effort to avoid ill health".[8]

Utopian discourse has resonated in governmental and EU policies as well. Since 2004, when the first eHealth Action Plan[9] was adopted on the European level, the European Commission has been developing targeted policy initiatives aimed at pushing forward and widening the adaptation of eHealth through EU member states. Despite these efforts, the implementation of different eHealth solutions has been rather slow and thorny on a wider scale and national levels. Several plans were not fully implemented; many EU-funded projects got stuck in the pilot phase.

Also, national eHealth projects face different financial manipulations, technical problems and delays in project delivery. For example, in the United Kingdom, the NHS Connecting for Health programme had failed by 2009, causing enormous financial losses, ultimately to be deemed "a fiasco";[6] later in 2013, some projects and responsibilities were taken over by the Health and Social Care Information Centre.[10] Similarly in Slovenia, there has been loud media criticism,[11] difficulties and delays in reaching the technical and organisational goals of the National eHealth Project. In December 2015, the project was taken over by the National Institute for Public Health but remained financed by the Slovenian Ministry of Health. In 2016, several steps were made towards organisational improvements, and visible implementations were made (e.g., e-prescriptions and the portal for users called zVem).[12]

By now, only isolated good practices and limited success in the sphere of improving medical practice, public health and medical conditions can be tracked. In Slovenia, several programmes and projects can be presented as examples of good practice; TeleKap (TeleStroke – a national programme and network of professionals who, from a distance, support and diagnose patients with brain stroke, using ICT communication channels) is presented as one of the most successful products of the National eHealth Project. This programme still faces several polemics and publicly run disputes. Another good example of telemedicine practice (presently limited to coronary and diabetic patients) is found at the General Hospital Slovenj Gradec and Community Healthcare Centre Ravne. A group of different interdisciplinary experts there is persistently trying to spread a successful model of their telemedical health centre, CEZAR, on a wider national level.[13,14]

Among Slovenian hospitals, the paediatric clinic of the University Medical Centre Ljubljana was one of the few and first to adopt the complex information system Think!Med™. As a rare thriving example, it served as a case study for Kumar, who, based on the theory of diffusion of innovations, analysed user perspective and experiences.[15] Additionally, among start-ups, mHealth solutions developed by Modra Jagoda (e.g. RheumaHelper, a mobile tool for rheumatologists, and Mediately – a drugs database), provide apps for doctors.[16] The company collaborates with clinicians in the process of app development. In the field of healthy lifestyles, the Slovenian-Croatian start-up Bellabeat is frequently exposed (in the media and at events) as a regional start-up with wider international recognition, sufficient financial support and commercial success. Bellabeat started with the production of monitors (e.g. foetal heartbeat, stress level) and gadgets for use during pregnancy; currently, the company is introducing smart jewellery for women, the skilfully designed Leaf tracks and monitors sleep, activity and reproductive health of female users, with the goal of reducing stress levels and improving health.[17]

Digital health projects and solutions in Slovenia are dispersed among several institutes, faculties, organisations, hospitals and technological parks. Since 2014, led by the active initiative HealthDay.si, a vibrant community of health-tech companies and organisations from Slovenia has developed. In September 2016 organisers of the initiative published a second version of The Green Book, presenting key actors and digital health solutions developed by Slovenian health-tech companies.[18] It is important to remember that this field is ever changing and developing.

Moving Beyond the Magic Bullet

On the EU level, the current *eHealth Action Plan 2012-2020: Innovative for health care in the 21st-century*[1] aims at addressing some of the previously recognised obstacles. However, the idealistic character and revolutionary potentials of eHealth remain its main driving motivators. According to the designers of this strategic document, eHealth "delivers more personalised 'citizen-centric' healthcare, which is more targeted, effective and efficient. It facilitates socio-economic inclusion and equality, quality of life and patient empowerment through greater transparency, access to services and information."[1]

There is no doubt that digitalisation and integrating new technology solutions in health care can facilitate many improvements. However, there is a need for a more balanced critical evaluation of contemporary practices and recurrent transformations in health care due to unleashed computerisation and digitalisation; immerging processes should be situated in wider socio-political context.

In the insightful book, *The Digital Doctor: Hope, Hype, and Harm at the Dawn of Medicine's Computer Age*, Robert Wachter gives a contextual analysis of the journey American health care has taken with health care information technology. He illuminates how technology changes medicine and how it does not. Among others, he mentions a study conducted by researchers at Johns Hopkins Hospital in 2013; they found out that medical interns spent just 12 % of their time talking to their patients and more than 40 % of their time using computers. The author also tackles one of the thorny issues in American health care concerning financial aspects, conflicts of interest and snowballing costs of health care; health care changed from a service to an industry when investors entered the field of health care, and all sorts of medical care were commercialised.[6]

Many other researchers tackled problems emerging in the health care arena along with the rise of intense digitalisation of health care or, as Watcher puts it, "digital bulldozer":[6] Topics from the introduction of expert patients, who, using self-tracking devices, will become experts and managers of their chronic disease or prevent ill-health,[19,20] to the hyper-medicalisation of cyberspace,[21] where people seek health information online[22] and form online health communities.[23,24] Professional medical associations, such as the Australian Medical Association, think that "doctor in a mouse" trend is alarming due to incorrect self-diagnoses by patients using Internet resources.[25] The distribution of power and authority in doctor-patient relationships is changing as well (see the *Journal of Medical Internet Research* for articles on the subject). Furthermore, with the growing popularity of wearables (self-tracking devices), intense quantification of human life functions, health habits and behaviour is emerging (e.g. the "quantified self" movement).[26]

Numerous commercial and profit-driven interests can be found behind many health apps. One of the most problematic aspects of health apps is the production, use and commercialisation of data generated by users. There is growing talk about lively data, data economy,[26-28] the monetisation of data, and the ways big data is becoming the new oil, a fundamental belief

motivating many companies and founders behind self-tracking technologies.

This article has covered but a few features of digital medicine and digital health. One aspect worthy of further focus is the relationship between digital health, consumerism and capitalism, where the apps industry is exploiting health problems and aspirations for healthy life, human fears, suffering and struggles, and turning them into enormous profit-making opportunities. If observed from a critical distance, the ideas of avoiding, controlling and measuring health and ill-health have a lot to do with the relationship between capitalism and hyper-commercialisation and health and ill-health.

mHealth: Current Trend and Buzzword

Deborah Lupton elaborates that a third wave of digital technology adaptation in health care is emerging: the process moves beyond the digitalisation, transmission and efficient management of health information towards the interaction (active involvement) and exchange of data between users, institutions, systems and stakeholders from various sectors.[27]

Therefore, mHealth is a predominant trend in the context of digital health, especially among users and the healthy lifestyle and technological industries. mHealth, as defined by the World Health Organisation, is "an area of eHealth, and it is the medical and public health practice supported by mobile devices, such as mobile phones, patient monitor devices, personal digital assistants, tablets, and other wireless devices."[29] It also includes applications (apps), such as lifestyle and wellbeing apps, "that may connect to medical devices or sensors (e.g. bracelets or watches) as well as personal guidance systems, health information and medication reminders provided by SMS and telemedicine provided wirelessly."[30] mHealth apps include the use of mobile devices in collecting community and clinical health data, delivery of health care information to practitioners, researchers, and patients, real-time monitoring of patient vital signs, and direct provision of care.[31]

The term mHealth is being replaced with "connected health" mainly in the USA. Even though is it not an utterly new term, there is no standard definition. Yet, "on a broader note, connected health is the umbrella term arrived to lessen the confusion over the definitions of telemedicine, telehealth and mHealth."[32]

Commercial Exploitation of Health and Healthy Life Style

Clearly, the market of health, healthy lifestyle and medical apps is booming. In 2014, nearly 100,000 mHealth apps were available across multiple platforms such as iTunes, Google play, Windows Marketplace, BlackBerry World;[30] by the end of 2015, more than 165,000 mobile health apps were available.[32] Financial predictions are heading towards the sky: "The global telemedicine market is expected to continue to expand to $27.3 billion in 2016."[30] EU made estimations, that in 2017, if its potential were fully unlocked, mHealth could save €99 billion in health care costs in the EU.[34] "By 2017, 3.4 billion people worldwide will own a smartphone and half of them will be using mHealth apps."[30].

Using quantified self-wearable sensors, apps and platforms makes it possible to capture and record data about nearly all aspects of human health and fitness, including mental, emotional, physiological, lifestyle and social dimensions. A large rise in use and popularity of different self-tracking devices (e.g. smartphones, smart watches, smart jewellery and similar wearables) can be observed. Most smartphones have activity-tracking capabilities; some of the most popular activity trackers are the Fitbit, Jawbone UP® and similar. On a broader sociocultural level, significant consequences of self-tracking practices are predominant cultural expectations concerning self-awareness, taking responsibility for managing and governing oneself, and improving one's life chances, which represents the apotheosis of the neoliberal, entrepreneurial citizen ideal.[26]

It is worth mentioning that a great proportion of health apps focus on healthy lifestyles (e.g. managing stress, improving fitness, controlling diet) and health promotion programmes. "Among 165,000 mobile health apps available, nearly two-thirds are focused on general wellness issues like fitness, lifestyle & stress, and diet. The remainder is made up by apps focused on specific health conditions (9 %), medication info & reminders (6 %), and women's health & pregnancy (7 %). Mental health apps led among disease-specific apps, followed by diabetes."[33]

Applying Apps in Health Promotion: A Critical Perspective

Today, public health programmes are no longer confined to clinical institutions but can be delivered through diffuse and fragmented networks of locations.[35] The many options people have, from commercial or governmental organisations, have led to the opening of many frontier zones of expertise to

the development of borderline practices, half way between medicine and self-care.

At first glance, with the use of health apps and different nagging technologies (leading people to desired behaviour), a set of promising options is opening for improvements in health promotion and public health programmes. In Slovenia for example, there is an app for encouraging blood donation called "Daruj kri" (*Donate blood)*; the app "Vem, kaj jem" (*I know what I eat*) was one of the first apps developed in Slovenia for diabetes patients (an overview of mHealth solutions for diabetes mellitus management in Slovenia is presented by Vrbnjak *et al.*[4]), and the 24alife portal is a result of interdisciplinary partners, mainly Slovenian professionals, offering a complete solution for healthier and happier life, to name a few.

The dominant idea behind integrating digital solutions and apps in health promotion programmes is that people can have a better understanding and control of their health status and their relationship with the world around them. By empowering people to easily measure, report and compare their own personal environment, such tools transform everyday citizens into reporting agents who uncover and visualise unseen elements in their lives and co-produce knowledge to improve both their individual lives and the lives of their communities.[36]

Although the critical examination of digital health remains relatively nascent, a growing body of so-called critical health digital studies literature is now available, where authors question forms of "healthism", also interpreted as the fetishisation of anything and everything deemed healthy[5,37] and problematise theoretical and practical consequences of the new ways of monitoring, measuring and commodifying health and healthy lifestyle in health promotion programmes.[35,38,39]

However, with the growth of mHealth apps and the increasingly popular self-tracking culture, there is a fine line between consensual, pushed and imposed self-tracking.[26] "According to recent research, the problem is that many off-the-shelf-tracking options, sold through appeals to "empowerment" do not actually help people. As a result, few people are getting out of their self-tracking devices what they hoped they would." Additionally, "around 60 % of health-related apps fall into disuse after six months of ownership."[38]

In a short, yet concise critical commentary on health promotion in the digital era, Lupton[40] points out a few crucial issues that need careful further attention, like possibilities of incorporating self-tracking technologies in health promotion programmes, past investigations into how websites and social-medical sites generate and disseminate information about strategies for promoting health, options to use digital gaming technologies (so-called gamification) in public health programmes, using big data to produce insights into population health and other issues. Lupton's conclusions are that governmental health programmes need to address issues of surveillance, ethics in big data use, questions about when encouragement become persuasion, the limits of participatory democracy via digital media (many people continue to struggle with access to digital technologies, the Internet or simply do not use them, or do not have the knowledge, skills or capacity to use it), commodification and commercial interests in digital media, and interference into personal space.[40]

Conclusions

In his book, *The Blind Giant: Being Human in a Digital World* Harkaway[41] playfully describes a digital dream world, where shining, healthy people move through a sunlit space filled with birds, plants and slick technology. They are fit because they monitor their own health and pay attention to what they eat; they know the pattern of their own DNA and risks that are unique to them. "They take steps to make sure they do not increase genetic predispositions to cancer or Alzheimer's; they work out and eat well, knowing the precise benefit of each effortful hour."[41] Interpreted as a caricature, the scenes of the brave new digital world could as well represent the dominant view of "Silicon Valley" future trends, where many health problems and unhealthy behaviours will be eliminated with the use of technological interaction.

Clearly, the reality is not as shiny as state-of-perfection predictions; health and social sciences professionals involved in public health programmes are familiar with obstacles and challenges in changing complex human behaviour into desired, healthier directions (e.g. quitting smoking, losing weight, exercising, reducing alcohol consumption, avoiding risky sexual practices). There is no short-cut or easy-fix solution.

My intention was to highlight the problematic, currently dominant idea of a technological fix in the landscape of digital medicine. In their article, Boyd and Crafward mention Kranzberg who argues, "technology is neither good nor bad; nor is it neutral technology's interaction with social ecology is such that technical developments frequently have environmental, social, and human consequences that go far beyond the immediate purposes of technical devices and practices themselves."[28]

Likewise, to this extent, apps cannot be stopped from being oppressive or emancipatory.[35] What is sure is that there is a whole range of unexpected negotiations, contradictions and complexities in human behaviour; social practices can be detected that cannot be reduced to instrumental benefits of using health apps. "Technologies are never value-neutral objects; they privilege some forms of actions and limit others."[27] Thus, health apps can be understood as sociocultural artefacts. For example, a study of sexuality and reproductive apps argues they represent and generate strongly gendered embodiment, supporting norms of male high-performing, competitive bodies on one side and reproductive, and good mother female bodies on the other.[42] It is important to challenge the social consequences of extended use of health apps; they are pushing the society towards exceeded normality, which is defined by digital algorithms.

Still, while humans have been traditionally characterised as agents, namely non-deterministic, creative, and self-reflexive subjects, now the tendency is towards a transformation of both objects and subjects into actants, namely deterministic mechanisms. Currently, while the value of users/citizens' empowerment through "by-design" approaches has been widely recognised also as a normative principle, "in-design" approaches protect and promote the active use of individual rights leads to privacy, but also to other rights of control of potential options within the architecture of the systems still require reflection for potential implementations.[43]

Most importantly, in designing health strategies, policy makers need to pay attention to the limited capacities and discriminatory nature of the Internet; economic and technological sources are not evenly distributed. Not everybody has equal skills, knowledge or desire to access the Internet and use smart technologies.[40] Disadvantaged social groups, chronically ill and older people often lack digital literacy or simply economic resources for obtaining technological solutions. Today, wearable and self-tracking technologies are often highly aestheticised, overpriced object only elites can afford. The author of this article conducted qualitative research about the use of preventive health programmes among healthy adults and selected chronically ill patients in remote (mostly rural) areas in Slovenia,[44] and found that the use of health apps or the Internet in relation to governmental health preventive programmes among the adult and older population remains out of their interest. What they predominately hope and wish for is a feeling of inclusion, intensified and better personal communication with doctors, and easier access to the health system.

Similarly, Neff and Nafus[5] argue that existing social and health inequalities might become even deeper with the extensive use of "healthy" self-tracking tools. Currently, concerns arise out the industry, where self-tracking tools are mostly designed for individuals who are young and already fit. Companies encourage people to conform to their narrow view of the way to health while ignoring other, potentially less-profitable customers, like the injured, poor, or middle-aged. On the other hand, looking outside this presumption, from the independent-living perspective, older people are treated as if they only need surveillance.[5]

To conclude, when designing public health strategies, governmental institutes and agencies must consider the limits of technological fixes and changes of human behaviour, hidden power relations, intensive dilemmas over surveillance and privacy issues, possibilities of commercial exploitation and many other interests of different actors in the mHealth ecosystems.

Conflict of Interest

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■ *Strokovni članek*

Matej Leskovšek

Uporaba mobilnih tehnologij v zdravstvu

Povzetek. Z napredkom mobilnih tehnologij in medmrežnih povezav se odpirajo možnosti lažje interakcije med bolnikom in zdravnikom. Informacije o bolnikovem zdravstvenem stanju, ki jo pridobi bolnik s stalnim beleženjem svojih telesnih funkcij, kot so npr. krvni tlak, srčni utrip, dihanje, spalni ritem itd. in jih posreduje zdravstvenemu osebju, lahko z njihovim takojšnjim odzivom pospešijo tako potek odkrivanja bolezni kot zdravljenje le-te. V članku so predstavljene nekatere rešitve na področju mobilnih tehnologij, ki jih že uporabljamo v zdravstvu oz. ki bi jih lahko v bližnji prihodnosti uvedli tako pri nas kot v tujini. Pričakujemo, da bi imele pozitiven vpliv na zdravje bolnikov in bi povečale učinkovitost zdravstvenega sistema. Predstavljeni so tudi strojna oprema in programski vmesniki za izvedbo.

Use of Mobile Technologies in Health Care

Abstract. With the evolution of mobile and internet technologies, possibilities of better interaction between doctors and patients arise. Information about the patient's medical condition gathered with regular recording of his/her body functions such as blood pressure, heart rate, breathing, sleeping rhythm etc., can be shared without delay among doctors to accelerate both the disease diagnostics and its treatment. The article presents some medical solutions built on mobile technology, which could be used in our health care system in the near future. Their use may cause marked improvements in the field of healthcare. Hardware and software modules for those solutions are also presented.

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Uvod

Vsak dan se na področju tehnologije pojavljajo novosti – od kuhinjskih aparatov do superračunalnikov, ki spreminjajo način našega dela in življenja. Vse vpliva na nas, naše razporejanje časa, naš dan in posledično tudi na naše zdravje. Opazimo lahko, da se ljudje vedno manj gibljemo, ker lahko veliko opravil opravimo kar od doma, preko telefonov in računalnikov. Življenjski stil marsikoga se je spremenil v "mačjega", saj nekateri velik del dneva preživijo sede ali leže. Ne glede na to pa ima razvoj tehnologije mnogo pozitivnih vplivov na nas in naše življenje. Lahko nam pomaga, olajša naše delo in nas bogati. Kako jo uporabimo, je odvisno je od nas samih.

Posebno področje uporabe mobilnih naprav je zdravstvo. Dolgotrajno čakanje v čakalnici je znano vsem, ki smo kdaj obiskali zdravnika. Posebno mladi ljudje imamo vedno manj časa za obiske pri zdravniku. Zato z obiskom odlašamo, ali pa o težavah raje povprašamo preko spletnih forumov ali prijatelje, ki pa velikokrat ne dajo najbolj zanesljivih nasvetov.

Hitrejša dostopnost zdravstvene oskrbe in zmanjšanje števila obiskov pacientov v ambulantah je nujno. V pomoč so lahko mobilne naprave in aplikacije,[1] ki pohitrijo interakcijo med bolnikom in zdravnikom, mogoče celo zmanjšajo potrebe po fizičnem obisku ambulante, kar bi nenazadnje vplivalo tudi na skrajševanje čakalnih vrst. Mnogo mobilnih aplikacij omogoča beleženje zdravstvenega stanja - od bitja srca, krvnega tlaka do koncentracije glukoze v krvi. S specializiranimi aplikacijami bi lahko zdravniku omogočili dostop do teh podatkov, ne da bi meritve izvajal sam, celo brez obiska bolnika v ambulanti. Bolnikom bi lahko omogočili dostop do lastne kartoteke in pregleda zdravstvenega stanja, zdravnikom pa omogočili enostavno širjenje informacij z drugimi zdravstvenimi delavci in z bolnikom. Velik korak k pohitritvi je bila pri nas nedavna uvedba eReceptov, kjer lahko bolnik v lekarni dvigne zdravila, na da bi pred tem obiskal svojega zdravnika. Le pokliče ga, zdravnik izda elektronski recept in že naslednji trenutek je lahko zdravilo v roki bolnika – brez obiska ordinacije! S tem smo prihranili tako na času bolnika kot na času zdravnika in medicinske sestre. S preverjanjem interakcij in kontraindikacij, kar tudi nudi sistem eRecepta, smo zmanjšali možnosti napak, s čimer smo zmanjšali stroške! Tako pri nas kot v tujini se namreč veliko govori o finančnih težavah zdravstva, o pomanjkanju sredstev za normalno delovanje zdravstvenih ustanov. Naraščanje povpraševanja in potreba po ohranjanju kakovosti zdravstva pa povzročajo velik pritisk na celotni sistem. Tudi z uvedbo mobilnih tehnologij in z zdravljenjem ter oskrbo na daljavo, ki bi skrajšale čas, potreben za oskrbo bolnikov, bi lahko vsaj malo pripomogli k finančni razbremenitvi sistema.

Mobilne tehnologije v zdravstvu

S splošnim razvojem in napredkom tehnologije na vseh področjih se na tržišču ves čas pojavljajo nove naprave in načini, ki bi lahko pripomogle tudi k našemu zdravju.[2] Med njimi so tudi mobilne – prenosne naprave, ki omogočijo hitro in učinkovito delo tako v ambulanti kot na terenu. Najmočnejša in najučinkovitejša je na voljo že zelo dolgo – pametni telefoni.

Pametni telefoni in mobilne aplikacije

Pametni telefon je naprava, ki jo posedujeta že več kot dve milijardi ljudi po celem svetu in ki lahko z uporabo mobilnih aplikacij nudi raznovrstno zdravstveno asistenco. Mobilne aplikacije pa bi lahko v zdravstvu razdelili na dva sklopa - na t.i. aplikacije za splošno javnost, ki so namenjene vsakemu izmed nas, in na aplikacije, ki so namenjene strokovni javnosti, tj. zdravstvenim delavcem.

Aplikacije za splošno javnost so večinoma iz segmenta zdravja in dobrega počutja (Health and Welness). Omogočajo nam, da bolje upravljamo s svojim zdravjem. Lahko jih npr. uporabimo kot žepne pomočnike, da merijo čas hoje, srčni utrip, nas opomnijo, kdaj je čas, da se malo razgibamo, nam pomagajo meriti porabljene in zaužite kalorije, nas vzpodbujajo pri dieti, pitju vode, opuščanju kajenja, opominjajo na obiske pri zdravniku in podobno.

Kaj pa mobilne tehnologije za zdravstveno osebje? Tudi tu lahko ločimo aplikacije na nekaj sklopov - na mobilne aplikacije, ki so namenjene podpori strokovnemu delu medicinskega osebja, na mobilne zdravstvene aplikacije, ki služijo interakciji med bolniki in strokovnim osebjem, in pa na mobilne aplikacije, ki so povezane z medicinskimi napravami.

Zdravniki najbolj uporabljajo tiste mobilne aplikacije, ki so namenjene predpisovanju zdravil in omogočajo preverjanje interakcij in kontraindikacij zdravil. To je pokazala tudi anketa, jo je opravil avtor članka in je opisana v nadaljevanju.

Mobilna aplikacija Anesthesiologist je enostavna aplikacija, ki s pomočjo podatkov o bolniku izračuna način in odmerek za ustrezno in učinkovito anestezijo pri kirurških posegih. Čeprav je aplikacija še v procesu

razvoja, je že sedaj učinkovita in zanesljiva, v prihodnje pa obljubljajo, da bo nudila še natančnejše rezultate, ki bodo zdravnikom in bolnikom še toliko bolj v pomoč.

Nekateri ponudniki mobilnih aplikacij so se povezali s strokovnimi delavci in v svojih aplikacijah sočasno ponujajo pomoč strokovnjakov, npr. pogovor s terapevtom, zdravnikom. Na tržišču je že veliko takšnih aplikacij, od katerih lahko izpostavimo Ginger.io – aplikacijo, ki je namenjena spremljanju duševnega stanja bolnikov. Preko senzorjev v telefonu, ki merijo gibanje, s spremljanjem navad osebe (pogostosti klicev, sporočil) aplikacija zazna morebitne spremembe v obnašanju uporabnika in "ugotovi" počutje uporabnika. Ti podatki se kasneje lahko uporabijo kot informacija zdravnikom, ki nudijo bolniku ustrezno pomoč tudi preko videokonferenc.

Velik potencial pametnih telefonov je tudi možnost izvajanja raziskav velikih razsežnosti. Zaradi razširjenosti pametnih telefonov, količine uporabnikov in dostopa do interneta so lahko telefoni odličen način zbiranja podatkov, potrebnih v raziskavah. Odkrivanje novih vzrokov bolezni in načinov zdravljenja je lahko pozitivna posledica teh raziskav. Apple je razvil aplikacijo "ResearchKit", ki raziskovalcem nudi dostop do potrebnih informacij za njihove raziskave, ki bi jih zbrali uporabniki iPhonov. Še en takšen primer je podjetje uMotif, katerega cilj je zbrati 100.000 udeležencev v raziskavi Parkinsonove bolezni z uporabo mobilnih telefonov.

Mobilne zdravstvene aplikacije v Sloveniji

Trg mobilnih zdravstvenih aplikacij je v Sloveniji že precej razvit. Izpostavimo naj le nekaj najprodornejših.

Mobilna aplikacija za učenje prve pomoči, imenovana kar Prva pomoč[3], vsebuje seznam najpogostejših poškodb in obolenj ter postopkov prve pomoči v izbranih primerih (na voljo za Android in iOs sisteme[1]). Pri nastanku aplikacije so sodelovali Telekom Slovenije, Rdeči križ Slovenije, UKC Ljubljana, Univerza v Ljubljani – Zdravstvena fakulteta, Katedra za javno zdravje in Univerza v Mariboru – Fakulteta za organizacijske vede – Laboratorij za ergonomijo.

Slovensko podjetje Codemonkee[4] je razvilo osebnega shranjevalca zdravstvenih podatkov, mobilno aplikacijo Axilla, s katero lahko uporabnik vzpostavi lastno zdravstveno kartoteko. Nekaj podobnega so razvili v podjetju Health Lord[5] – mobilno aplikacijo Gospodar zdravja – Osebni zdravstveni karton. Uporabniki lahko sami beležijo jemanje zdravil, meritve krvnega tlaka, sladkorja, si shranjujejo izvide, ki jih so jih dobili pri specialistu in podobno. Izkušnje pri uporabi tovrstnih aplikacij so pokazale, da posledično ljudje, ki aplikacijo uporabljajo, spremenijo svoje vedenje na bolje samo zato, ker te podatke zabeležijo (pravilno jemljejo zdravila, manj kadijo, se več gibljejo, pazijo na prehrano ipd.).

Globalno precej uspešna je slovenska aplikacija za nadzor stresa, imenovana @life, Razvojnega centra IKTS iz Žalca. Rešitev @life[6] sestavljata portal in mobilna aplikacija. "Z izpolnjevanjem vprašalnikov in testov ter vnosom podatkov o lastnih aktivnostih si uporabnik izdela @life dnevnik, preko katerega lahko spremlja svoje stanje, trende skozi določeno časovno obdobje in napredovanje".[7] S strokovnimi nasveti, ki temeljijo na preizkušenih metodah psihologije, medicine in kineziologije, pa poskušajo uporabnike usmerjati k zdravemu načinu življenja.

Med aplikacije, ki vključujejo interakcijo med bolnikom in zdravnikom, sodi tudi lepo oblikovana aplikacija Azumio,[8] ki je izdelek slovenske razvijalske ekipe iz Kalifornije. Nudi mnogo funkcij, kot so beleženje števila korakov, srčnega utripa, prehrane ipd. Od večine tekmecev se razlikuje po enostavnem oblikovanju in možnosti beleženja prehrane, ki je izjemnega pomena za bolnike s sladkorno boleznijo. Tem bolnikom je namenjena tudi aplikacija 2in1 SMART app.[9] Poleg elegantnega dizajna omogoča merjenje ravni glukoze v krvi s pomočjo posebne naprave, skozi ves proces pa bolnika vodi aplikacija sama. Podatke o stanju lahko uporabnik preko e-pošte enostavno posreduje zdravniku.

Obstaja tudi nekaj aplikacij slovenskih razvijalcev, namenjenih izključno strokovni javnosti. V podjetju Modra jagoda so razvili mobilno aplikacijo za iskanje po registru zdravil,[10] za katero so uspeli leta 2014 pridobiti tudi sredstva bolgarskega investicijskega sklada. Anketa, predstavljena v nadaljevanju, je pokazala, da je uporaba te aplikacije med našimi zdravniki na prvem mestu.

Podjetje XLAB[11] je razvilo sistem MedicView, ki omogoča prikaz in analiziranje trirazsežnih dentalnih in radioloških slik kar z uporabo mobilnih naprav in njihovega sistema ter mobilne aplikacije (slika 1). Zaradi zelo natančnega prikaza in možnosti merjenja razdalj lahko specialist enostavno razbere težave in jih hitreje ter učinkoviteje odpravi.

Slika 1 Primer trirazsežne dentalne slike v sistemu MedicView, ki ga je razvilo podjetje XLAB.

Podjetje Nova Vizija[12] je za zdravnike, ki delajo na terenu, razvila aplikacijo Mobilni zdravnik. Aplikacija nudi podporo pri zdravljenju na domu. Z mobilno napravo in digitalnim potrdilom zdravniku omogoči dostop do kartoteke bolnika. Aplikacija je trenutno povezana le z njihovim informacijskim sistemom ProMedica, a omogoča tudi povezljivost z ostalimi medicinskimi informacijskimi sistemi.

V podjetju Adora[13] so razvili sistem, ki zdravnikom olajša delo med operacijami. S svojim sistemom omogoča operaterju nazorno predstavitev bolnikovih podatkov, ki jih želi operater videti, brez dotika tipkovnice, miške ali zaslona. Navigacijo po podatkih izvaja kar 'po zraku'. Ker zdravniku ni več potrebno zapuščati operacijske sobe, da bi videl podatke pacienta, ali si ponovno razkuževati roke, ker je imel stik s tipkovnico, sistem skrajša potreben čas anestezije in poteka operacije ter s tem zniža stroške posega.

Slovensko podjetje Mediately[14] je razvilo sistem za pomoč revmatologom, ki ga uporablja že 70 % slovenskih revmatologov. Zaradi enostavne uporabnosti in pomoči pri strokovnem delu revmatologov je aplikacija hitro prodrla tudi v tujino. Uporabljajo jo revmatologi iz Brazilije, Argentine, Kolumbije, Indije in še v mnogo drugih državah. Za svoj uspeh je prejela tudi nagrado, ki ji jo je podelila revija Medicina danes.[15]

Mobilne medicinske naprave

Mobilne diagnostične naprave za nadzor zdravja so v zadnjih letih vse cenejše. Zato jih lahko imajo poleg zdravnikov in bolnišnic tudi bolniki kar doma, kjer lahko sami preverjajo svoje zdravje po navodilih zdravnika. Manjše naprave z natančnimi senzorji za opravljanje krvnih testov, merjenje krvnega tlaka, gibanja in drugih življenjskih znakov ter vitalnih funkcij so lahko povezane z mobilnimi aplikacijami, ki meritve samodejno prenesejo do zdravnika. Tehnologija je lahko v pomoč predvsem ljudem s srčnimi boleznimi, boleznimi dihal, sladkorno boleznijo in drugimi kroničnimi boleznimi ali invalidnostjo, saj lahko bolniki meritve opravijo doma sami ali s pomočjo svojcev.

Podjetje Mesi[16] je pri nas naredilo korak v to smer. Sami razvijajo naprave, ki so primerne za izvajanje meritev doma, vse naprave pa so povezali z mobilno aplikacijo. Na tržišču imajo že majhen, prenosni merilnik gleženjskega indeksa ABPI MD, ki temelji na oscilometrični metodi. Naprava omogoča tako merjenje nadlaktnega krvnega tlaka, gleženjskega indeksa in srčnega utripa. Preko USB priključka se lahko naprava poveže z računalnikom in izpiše izvid preko aplikacije MESIresult ali pa podatke pošlje njihovi mobilni aplikaciji mTABLET, ki sočasno omogoča pregled izvidov bolnika, analizo rezultatov in povezavo z različnimi drugimi merilnimi napravami.

V okviru evropskega projekta United4Health[17,18] (2013-2015), v katerega je bilo vključenih 34 partnerjev iz 15-ih evropskih držav, med njimi dva iz Slovenije (Splošna bolnišnica Slovenj Gradec in Zdravstveni dom Ravne na Koroškem), sta slovenska partnerja v sodelovanju s podjetjem MKS d.o.o. iz Ljubljane razvila in vzpostavila novo zdravstveno storitev telemedicinskega spremljanja zdravja kroničnih bolnikov v domačem okolju. S pomočjo merilnih naprav bolniki doma sami merijo krvni tlak, težo, zasičenost krvi s kisikom in/ali raven glukoze v krvi. Podatke mobilna aplikacija na Android telefonu sama posreduje telemedicinskemu centru, ti podatki pa so nato dostopni na kliničnem portalu na strežniku bolnišnice. Čeprav se je evropsko financiranje izteklo, projekt še vedno teče. Število vključenih pacientov so sicer omejili, vendar storitve celo nadgrajujejojo.

Veliko različnih naprednih tehnologij omogoča, da imajo bolniki in zdravniki boljši nadzor nad jemanjem zdravil. Redno jemanje seveda pomeni večjo učinkovitost zdravljenja. V ta namen sta leta 1992 Jerome Schentag in David D'Andrea razvila in prvič patentirala pametno tableto (ang. "smart pill"). Tehnologija, ki je tako majhna, da jo lahko pogoltnemo skupaj s tableto, se v želodcu aktivira, ko se tableta razgradi. Napravi zunaj telesa (telefonu ali kakšnemu drugemu "pametnemu" sprejemniku) pošlje informacije o razkroju in konstantnosti jemanja tablet. Prav tako bi bil ta sistem zelo učinkovit za

bolnike z demenco ali Parkinsonovo boleznijo, saj bi jih lahko opomnil na jemanje zdravil.

Poleg tablet se bodo na tržišču kmalu pojavile tudi naprave za sproščanje zdravil, ki bi jih bolnik lahko nosil na telesu ali v njem. Massachusetts Institute of Technology (MIT) razvija napravo, ki se jo lahko vstavi v telo, vsebuje pa na stotine manjših rezervoarjev, kamor se vstavi zdravilo in se s pomočjo senzorjev po potrebi sprošča v telo. Ta tehnologija naj bi bila tako uporabna, da bi se lahko iz enega čipa v telesu zdravila sproščala tudi do 10 let.

Neprofitna globalna organizacija Juvenile Diabetes Research Foundation (JDRF) je leta 2006 začela s projektom izdelave umetne trebušne slinavke, ki bo skrbela za nivo inzulina pri bolnikih z diabetesom tipa 1. Aplikacija na pametnem telefonu izračuna potreben nivo inzulina, ki bi ga bolnik moral prejeti glede na dejavnosti in dogodke tisti dan, nato pa informacije posreduje umetni trebušni slinavki, ki izloči potreben nivo inzulina.

Slovensko podjetje Kinestica[19] je razvilo sistem za pomoč bolnikom s poškodbami roke, sklepov in posledično manjši gibljivosti ter prisotnost bolečin. Za zdravljenje teh težav so razvili napravo, ki spodbuja gibanje roke, za povečanje zanimivosti in količine uporabe pa so v svoj sistem implementirali video igrice, ki popestrijo proces zdravljenja.

Medopad[20] je mobilni zdravstveni operacijski sistem, ki ga uporabljajo v NHS (National Health Service) bolnišnicah v Londonu. Jesko Bartelt, vodja poslovnih operacij v podjetju Medopad, pravi, da "Medopad ni ne aplikacija, ne naprava, ampak način povezave v zdravstvu. Je platforma, ki omogoča enostaven dostop do združenih in razumljivih informacij o bolniku z različnih področij in lokacij."

Medopad se poveže z delujočimi sistemi, združi informacije iz podatkovne baze bolnišnice in jih zbere v centralni vir. Preko Applove naprave iPad lahko zdravniki te podatke takoj dosežejo in delijo med seboj, vprašajo sodelavce za nasvet in ugotovitve delijo neposredno z bolnikom.

Mobilne tehnologije in bolniki

Ali so vsi bolniki pripravljeni na spremembe, ki jih prinašajo mobilne tehnologije, in ki bodo tudi njim spremenile življenje?

Raziskava, ki jo je opravila organizacija JMIR Mhealth Uhealth leta 2014[21], je dobro prikazala pogled bolnikov na stanje mobilne tehnologije. Po tej raziskavi ima pametne mobilne telefone le 51 % (anketiranih) bolnikov. Ta podatek je zaskrbljujoč, saj morebitnih mobilnih aplikacij ne bi mogla uporabljati kar polovica populacije. Raziskava je pokazala tudi nezaupanje približno petine bolnikov v varovanje njihovih osebnih podatkov. Očitno se še vedno pojavlja dvom o varnosti uporabe mobilnih tehnologij tako med bolniki kot tudi zdravniki. Kar 12 % bolnikov pa je izrazilo zaskrbljenost, da bi bila ta tehnologija, kljub poenostavitvam, prezahtevna za uporabo v zdravstvene namene.

V letu 2016 je potekala raziskava Pulse of Online Health,[22] ki je pokazala, da je skoraj dve tretjini (66 %) uporabnikov spletnega portala ITNOnline[23] pripravljenih uporabljati mobilne zdravstvene aplikacije za nadzor svojih bolezni, 32 % pa uporablja že vsaj eno mobilno medicinsko aplikacijo na svojih mobilnih telefonih; 79 % izmed teh je pripravljeno pri tem uporabljati še dodatno strojno opremo, kot sta Applova in Samsungova pametna ura.

V letnem poročilu PwC Health Research Instituta[22] ugotavljajo, da je 88 % ljudi pripravljenih deliti svoje osebne podatke z zdravniki za potrebe raziskav kljub strahu pred razkritjem osebnih podatkov. Aplikacije, kot je Medopad, so zelo dobrodošle, saj omogočajo neposredno dostopanje do informacij, z veliko količino podatkov, s katerimi razpolagajo, pa strokovnjakom pomagajo priti do novih ugotovitev ali celo novih načinov zdravljenja bolezni.

Zanimivo je tudi, da so v tej raziskavi ugotovili, da zaupanje bolnikov v mobilne aplikacije narašča, sočasno pa se krha vez med zdravnikom in bolnikom. Po podatkih raziskave le še 28 % Američanov zelo zaupa zdravstvenemu sistemu, 58 % vprašanih pa se strinja z izjavo, da lahko ne glede na vse popolnoma zaupajo zdravniku. V študiji kot možno rešitev tega predlagajo, da morajo zdravniki bolnike bolj aktivno vključiti v proces zdravljenja.

Mobilne tehnologije med zdravniki v Sloveniji – lastna raziskava

Kako je z digitalno osveščenostjo slovenskih zdravnikov? Opravil sem kratko spletno anketo med zdravniki po Sloveniji. Dostopna na naslovu https://docs.google.com/forms/d/1HaZ2kFwU-btcM3sgzah8sAHc9z-lDULM_tZ5vrtA12U/edit.

Vsi anketirani so imeli pametni mobilni telefon, kar 78 % vprašanjih pa jih telefon uporablja tudi pri opravljanju svojega poklica; večina za brskanje po internetu, elektronsko pošto in kot koledar, nekateri pa telefon uporabljajo tudi kot strokovni pripomoček.

Predvsem so izpostavili uporabo mobilnega telefona za pregled kliničnih slik, dostop do registra zdravil, preverjanje odmerkov zdravil in izračun odmerka otrokom glede na telesno težo. Najbolj uporabljena aplikacija je register zdravil, uporabljali pa so tudi aplikacije, kot so Rheumahelper (pomoč bolnikom z revmatičnimi obolenji), Anesthesiologist (izračun odmerkov anestezije in zdravil), ki jih po njihovem mnenju uporablja tudi precej zdravnikov iz tujine.

V anketo sem vključil tudi vprašanje, s katerim sem poskušal izvedeti, kolikšen delež njihovih bolnikov bi bil po njihovem mnenju sposoben uporabljati mobilne aplikacije za komunikacijo z zdravniki (npr. da v IS zdravnika vsakodnevno pošlje meritve krvnega tlaka ali sladkorja ali naroči recepte, medicinske pripomočke ipd.). Kar 61 % zdravnikov je odgovorilo, da bi znalo z aplikacijami upravljati manj kot četrtina njihovih bolnikov. Glede na razširjenost pametnih telefonov me je ta rezultat precej presenetil. Morda je razlog v starostni strukturi bolnikov.

Pri odgovoru na vprašanje, če bi bili pripravljeni v svojem IS vsakodnevno pregledati poslane podatke bolnikov (npr. da bi sistem izpostavil samo podatke tistih bolnikov, pri katerih bi zaznal odstopanje od običajnih meritev, 'običajne' bi pa videli le, če bi jih želeli), pa se je med zdravniki prikazala razdvojenost: 55 % jih je pripravljenih to početi vsak dan, 45 % pa je temu močno nasprotovalo (v glavnem zaradi pomanjkanja časa, pojavil pa se je tudi pomislek glede plačila, saj ZZZS takšnega dela zdravnikov ne financira). Predvsem počasnost prilagajanja načina financiranja tovrstnih storitev lahko očitno močno zavre razvoj digitalne medicine v prihodnje.

Zanimiv je podatek, da je velika večina zdravnikov (kar 83 %) prepričanih, da takšna interakcija z bolniki na daljavo preko mobilnih tehnologij lahko pozitivno vpliva na kakovost zdravljenja

Po mnenju 45 % zdravnikov bi lahko mobilno tehnologijo uspešno uvedli v zdravstveni sistem. Potrebo po tovrstnih aplikacijah so najpogosteje zaznali v nujni medicinski pomoči in družinski medicini. Eden od anketiranih meni, da bi "z mobilno lahko locirali prve posredovalce, ki so najbližje akutnemu dogodku, ter jih poslali na kraj akutnega dogodka. Tako bi bolniki prej dobili prvo pomoč".

Iz rezultatov raziskave je razvidno, da se zdravniki zavedajo, da so spremembe zdravstva v prihodnosti neizogibne in da bodo pri tem pomembno vlogo odigrale tudi mobilne tehnologije. Dejstvo je, da zdravniki ne smejo – tehnološko gledano – zaostajati za svojimi bolniki, saj na ta način izgubljajo njihovo zaupanje. Tega se zavedajo tudi sami in se vedno bolj vključujejo v svet digitalnega zdravstva.

Mobilne tehnologije in Evropska komisija

Še bolj kot pri nas je uporaba rešitev mHealth vpeljana in uporabljana v tujini. Kot nadzorni organ Evropske unije se tudi Evropska komisija strinja s prednostmi in uporabnostjo mobilnih tehnologij za zdravje. Predstavili so svoje mnenje o vplivih na zdravstvo v Evropi, kot so bolj učinkovit in trajen sistem zdravstvenega varstva, bolj ozaveščeni bolniki, višja kakovost življenja ter nižji stroški v zdravstvu: *"mHealth could contribute to a more efficient way of delivering care through better planning, reducing unnecessary consultations and better prepared professionals receiving guidance on treatment and medication"*.[24]

Zaključek

Bolniki želijo vedno bolj aktivno sodelovati pri svojem zdravljenju. K temu trendu je precej pripomogel tudi osupljiv napredek mobilne tehnologije. Z implementacijo mobilnih tehnologij bodo lahko zdravniki izboljšali komunikacijo z bolniki, odkrivanje bolezni in navsezadnje tudi zdravljenje le-teh.

Razvili se bodo novi načini interakcij in komunikacij med bolniki in zdravstvenim osebjem, spremenil se bo način nadzora zdravstvenega stanja bolnika, zdravljenja, pomoči ter oskrbe. Za doseganje teh ciljev morajo zdravstveno osebje in razvijalci programskih rešitev skupaj pripraviti infrastrukturo, ki bo zdravnikom omogočala res enostavno zbiranje in analiziranje podatkov, zbranih prek mobilnih aplikacij. Te informacije je potrebno deliti z drugimi.

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■ Bilten SDMI

Drago Rudel

Poročilo o aktivni udeležbi na mednarodnem kongresu in razstavi Med-e-Tel 2016

Kot že nekaj let zapored sem se v dneh od 6. 4. do 8. 4. 2016 udeležil mednarodnega kongresa in razstave **International Telemedicine and eHealth Forum, Med-e-Tel 2016** v Luksemburgu. Kongres in razstavo je organiziralo mednarodno združenje *International Society for Telemedicine and eHealth* (ISfTeH), katerega član je tudi Slovensko društvo za medicinsko informatiko (SDMI).

Na kongresu sem sodeloval z enim referatom in bil soavtor dveh drugih:

- **Rudel D**, Balorda Z. *et al.*: Reducing hospitalisation providing telemedicine support to CHF patients at home in Slovenia.
- Balorda Z, **Rudel D**. *et al.*: Reducing Hb1Ac marker by providing telemedicine support to patients with diabetes type2 at home.
- Khelifa A *et al.* (**Rudel D**): A Pan European Rapid Benchmark on the Stage of Development of Telemedicine in EU Member Countries.

Prva dva referata poročata o uspešnem delu slovenskih partnerjev v EU projektu United4Health (SB Slovenj Gradec, ZD Ravne in MKS d.o.o., Ljubljana kot podizvajalec) pri vzpostavitvi dveh telemedicinskih storitev na Koroškem, v tretjem pa primerjamo stanje razvoja telemedicine med 10-timi državami članicami EU. Opravljeno delo sovpada s področjem mojega dela v okviru SDMI in v raziskovalnem podjetju MKS d.o.o., Ljubljana.

Na konferenci, ki se je je udeležilo okoli 500 delegatov, je svoje razvojno-raziskovalne in tržne dosežke predstavilo več kot 300 udeležencev. Prispevki so pokrivali področij telemedicine in eZdravja na primarnem in sekundarnem področju zdravstvene oskrbe, obvladovanje bolezni, pametnih tehnologij in podpore iz okolij za samostojno življenje (AAL), telerehabilitacije, e-učenja kot tudi kliničnih disciplin, npr. telekardiologije, obvladovanje sladkorne bolezni na daljavo, telekirurgije, urgentne medicine, dolgotrajne oskrbe na domu, telemedicinskega spremljanje bolnikov na daljavo, e-farmacije, mobilnega zdravja in oskrbe na daljavo. Nekateri smo predstavili delo v okviru evropskih oz. nacionalnih projektov, drugi nacionalne iniciative ali prispevke s področja večje uveljavitve žensk v e-zdravju. Nekaj prispevkov je bilo namenjenih ekonomiki zdravstvene oskrbe (na daljavo), zakonski ureditvi področja e-zdravja, zdravja na daljavo in telemedicine, standardom, informacijski varnosti in etičnim dilemam. Poudarek je bil na vlogi uporabnikov, tako neposrednih (bolnikov) kot posrednih (njihovi oskrbovalci, zdravstveni delavci), ter drugih deležnikov. Zanimivo je, kako se posebna skrb namenja razvoju nizkocenovnih rešitev, ki bi bile primerne za ekonomsko šibkejše, vendar po številu potencialnih uporabnikov velike države, kot so Indija, Brazilija, Rusija idr. Referati so dostopni na portalu Med-e-Tel pod »Baza znanja« (https://www.medetel.eu/?rub=knowledge_resources&page=info).

Na kongresnem delu Med-e-Tel sem želel s primerjanjem ovrednotiti rezultate dela slovenske skupine v EU projektu United4Health z rezultati dela, ki so jih na področju telemedicinskih storitev za kronične bolnike na domu predstavljali drugi udeleženci. Presenetljivo je, da je večina projektov na področju sladkorne bolezni in srčnega popuščanja (dve storitvi, ki ju ponuja SB Slovenj Gradec s svojim telemedicinskim centrom CEZAR), še v pilotni fazi v primerjavi s slovensko rešitvijo, ki je že v produkcijski fazi. Razlika je očitna tudi v številu uporabnikov telemedicinskih storitev, saj so npr. iz Brazilije poročali o 15 uporabnikih s sladkorno boleznijo, medtem ko smo jih v center CEZAR vključili že več kot 400. Prav tako je zanimivo, da je ekonomsko vrednotenje telemedicinskih storitev še zelo na začetku. V Braziliji računajo predvsem na prihranke pri potnih stroških, medtem ko smo v projektu United4Health naredili obsežno analizo za 14 EU regij z vključenimi stroški uvajanja in izvajanja storitev. Sam sem v referatu predstavil dva modela izračuna možnih prihrankov pri zmanjšanju hospitalizacij ob uporabi telemedicinske podpore bolnikom s srčnim popuščanjem.

Razstavni del kongresa je bil tudi letos manj številčen (okoli 20 razstavljavcev iz vsega sveta), vendar zanimiv za tiste, ki iščejo rešitve za svoje države.

Razstavljavci so prikazali orodja za izvajanje telemedicinskih med zdravstvenimi delavci (za izvajalce B2B storitev) ter orodij za neposredno telemedicinsko podporo zdravstvenih delavcev in pacientom na domu (za izvajalce B2P storitev).

Kongresa sem se udeležil tudi kot predstavnik Slovenskega društva za medicinsko informatiko (SDMI). Sestal sem se s tajnikom in hkrati blagajnikom ISfTeH, g. Frankom Lievensom (http://www.isfteh.org). V pogovoru sem poudaril, da SDMI z rednim plačevanjem članarine od leta 2009 naprej in tudi s prisotnostjo člana UO SDMI na konferenci potrjuje svojo zainteresiranost za nadaljnje sodelovanje z ISfTeH. Gospod Lievens se je zahvalil za zgledno sodelovanje SDMI kot nacionalnega združenja v ISfTeH in seveda izrazil željo, da se še bolj vključimo v svetovno skupnost pionirjev uvajanja telemedicinskih storitev. Predlagal je, da svoje delo na tem področju bolj promoviramo v mesečnem e-glasilu ISfTeH Newsletter (http://www.isfteh.org/media/category/newsletters) in e-reviji Journal of the International Society for Telemedicine and eHealth (http://journals.ukzn.ac.za/index.php/JISfTeH), ki ju razpošljejo na 60.000 e-naslovov.

Povabilo g. Lievensa prenašam bralcem IMS, da promovirajo svoje delo in rezultate s pomočjo ISfTeH. Povabil je SDMI, da bi na ISfTeH organizirali slovensko stojnico in jo uporabili kot odskočno desko do potencialnih kupcev oz. partnerjev pri razvoju in uvajanju storitev zdravja na daljavo. Na ISfTeH so namreč prisotni številni predstavniki večjih držav v razvoju iz Azije (npr. Indija, Pakistan, Iran, Indonezija), Afrike (Gana, Uganda, Južna Afrika) in Latinske Amerike (Brazilija), kjer je okolje že dovolj senzibilizirano za sprejemanje tovrstnih storitev.

Ocenjujem, da je bila moja udeležba na ISfTeH 2016 koristna tako kot promocija dela in rezultatov Slovenije kot zaradi mreženja za morebitno razvojno sodelovanje. UO SDMI se zahvaljujem za kritje dela stroškov moje udeležbe na Med-e-Tel 2016.

■ **Infor Med Slov** 2016; 21(1-2): 28-29

Drago Rudel

Kaj ima Škotska kot vodilna država EU na področju storitev zdravja in oskrbe na daljavo povedati Sloveniji?

Na povabilo Slovenskega društva za medicinsko informatiko (SDMI) je na kongresu Medicinska informatika 2016 (MI'2016), ki ga je v dneh od 10. do 11. novembra 2016 v Zrečah organiziralo SDMI, kot uvodničar nastopila dr. Margaret Whoriskey s Škotske. Na Škotskem je odgovorna za razvoj storitev za zdravje na daljavo. V okviru Ministrstva za zdravje Škotske vodi oddelek za nove storitve v oskrbi, ki temeljijo na tehnologijah in digitalnih inovacijah (*Technology Enabled Care and Digital Healthcare Innovation – TECe&DHI*). Odgovorna je za 30-milijonsko vrečo investicijskih sredstev programa za uvajanje storitev, ki jih omogoča tehnološki razvoj na področju informacijskih in telekomunikacijskih tehnologij. V tej vlogi tudi predseduje nacionalnemu odboru za zdravje in oskrbo na daljavo. Je tudi predstavnica Škotske vlade v *Evropskem inovacijskem programu za aktivno in zdravo staranje* (*European Innovation Programme for Active and Healthy Ageing – EIP AHA*).

Dr. Whoriskey smo povabili, da bi predstavila pot Škotske na področju zdravja in oskrbo na daljavo (telehealth, telecare), ki je s svojih aktivnim pristopom, finančnimi investicijami in rezultati postala ena od vzorčnih regij Evropske unije na področju storitev za zdravje in oskrbo na daljavo. T.i. »digitalno zdravje«, ki je širši pojem kot eZdravje, je postalo za škotski zdravstveni sistem prioriteta. V sistem »digitalnega zdravja« vgrajujejo nove storitve in procese, ki niso le dodatek k obstoječemu sistemu, pač pa njegov osrednji del. Storitve zdravstvene oskrbe postopoma integrirajo s storitvami socialne oskrbe v enoten sistem »integrirane oskrbe«. Delo izvajajo v skladu s strategijo »*Digitalno zdravje in strategija oskrbe 2017-2020* (*Integrated strategy: Digital Health and Care Strategy*), katerega del je tudi nacionalni model za spremljanje zdravja na daljavo (telemonitoring). Ta strategija je rezultat večletnega razvoja in je nadgradnja vseh, ki so nastale od leta 2008. Vsaka strategija vsebuje tudi akcijski načrt z merljivimi cilji, ki jih uspešno izvajajo in v celoti dosegajo. Izvajanje strategije skrbno upravljajo in skrbijo, da zberejo in analizirajo njene učinke. To je mogoče, ker so vzpostavili ustrezne službe in za njihovo delo zagotovili potrebna sredstva. Že leta 2008 so ustanovili *Škotski center za zdravje in oskrbo na daljavo* (*Scottish Centre for Telehealth and Telecare*), ki se je razširil in prevzel zgoraj omenjen naziv TEC&DHI. Škotska vlada bo v obdobju 2015-2016 samo za pripravo strategij, za podpiranje uvajanja novih storitev in za zbiranje ter analizo objektivnih učinkov namenila 10 milijonov EUR. Seveda center TEC&DHI skrbi tudi za ustrezno mednarodno promocijo škotskega pristopa, katere rezultat je, da TEC&DHI in druge škotske organizacije sodelujejo v številnih EU projektih, kamor jih vabijo kot uspešne partnerje z dobrimi referencami.

Dr. Whoriskey je na kongresu MI'2016 opravila tudi razgovore z več akterji na področju eZdravja ter zdravja in oskrbe na daljavo v Sloveniji. Na koncu njenega obiska sem jo prosil, da morda strne svoja opažanja v nekaj priporočil za nadaljnji razvoj zdravja in oskrbe v Sloveniji. Zapisala je naslednje:

- Dogovorite in uskladite nacionalne prioritete na področju eZdravja in celostne oskrbe.
- Oblikujte svojo vizijo in bodite pri tem ambiciozni.
- Zagotovite, da bo eZdravje (z vključenim zdravjem na daljavo) najvišja prioriteta za slovensko vlado (Ministrstvo za zdravje), kar se mora odražati v vseh politikah (strategijah) in zakonih.
- Združite strategije eZdravja, zdravja na daljavo in razvoja informacijske družbe.
- Združite zdravstveno in socialno oskrbo in se osredotočite na rezultate, ki so namenjeni neposredno državljanom kot uporabnikom storitev.
- Stalno nadgrajujte sistem, ne začenjajte stvari vedno znova.
- V pripravo in izvajanje strategij vključujte vse deležnike, tudi politike, strege, strokovne delavce in državljane.
- Sodelujte z izvajalci na nacionalnem in lokalnem nivoju, zbirajte izkušnje, učite se iz njih in evidentirajte dobre prakse od vsepovsod.

- Imenujte odgovorne osebe z izkušnjami za delo na nacionalnem in na lokalnih nivojih.
- Določite kriterije uspešnosti in primerjajte rezultate med seboj.
- Odkrivajte ovire in pospeševalne dejavnike ter jih ustrezno upoštevajte.
- Podpirajte uporabo novih storitev in njihovo uvajanje v obstoječi sistem in zagotovite ustrezne vire za to.
- Trajno spremljajte napredek in ga vrednotite. Z izsledki izpopolnjujte strategije in izvedbene načrte ter njihovo izvajanje.
- Ustvarite pogoje za uvajanje in izvajanje storitev »digitalnega zdravja« na lokalnem nivoju.

Vsa priporočila so zelo aktualna za Slovenijo, ki mora v kratkem času pripraviti strategijo eZdravja za obdobje 2017-2020.

Infor Med Slov 2016; 21(1-2): 30-31

■ Bilten SDMI

Ema Dornik, Vesna Prijatelj

Moč sodelovanja za zdravje: poročilo s srečanja Sekcije za informatiko v zdravstveni negi 2016

Tradicionalno srečanje članov Sekcije za informatiko v zdravstveni negi (SIZN), ki deluje pri Slovenskem društvu za medicinsko informatiko (SDMI), je potekalo v Zrečah 11. novembra 2016 (slika 1). Tokrat je bil programski sklop Sekcije za informatiko v zdravstveni negi (SIZN) v okviru kongresa MI'16. Vsakoletno srečanje je namenjeno strokovnemu druženju članov.

V uvodnih besedah je podpredsednica sekcije dr. Ema Dornik predstavila poročilo o delu SIZN v letu 2016 ter načrt dela za leto 2017. V nadaljevanju so predstavljeni povzetki predstavitev v zaporedju, kot so si sledili po programu.

Vladislav Rajkovič: Proces zdravstvene nege v luči informacijskega procesa

Proces zdravstvene nege (PZN) je zaporedje organiziranih korakov, namenjen medicinskim sestram za izvajanje zdravstvene nege. Je organizacijski model, ki sledi znanstveni metodiki sistematičnega opazovanja, merjenja, postavljanja hipotez, preverjanja in modifikacije, če je ta potrebna. Govorimo o fazah PZN: (1) zbiranje podatkov o pacientu, (2) postavljanje negovalne diagnoze, (3) načrtovanje zdravstvene nege na osnovi ciljev, pričakovanih izidov in intervencij, (4) izvajanje negovalnih intervencij in (5) ocenjevanje, če so bili doseženi cilji in pričakovani izidi. PZN ni teorija zdravstvene nege, teorija organizacije ali teorija informatike in računalništva. Je metoda dela, ki v svojih korakih uporablja teoretične izsledke in modele, jih prepleta med seboj in jih s tem udejanja. V prispevku je poudarjena podatkovna in informacijska komponenta PZN, na osnovi katere medicinska sestra presoja in sprejema odločitve v posameznih fazah procesa. Gre za osebno in/ali timsko interpretacijo podatkov na osnovi strokovnega znanja ter širokega in kritičnega premisleka.

Anja Zagoričnik, Marija Milavec Kapun: Robotizacija v zdravstveni negi

Robotika ima pomembno vlogo v številnih industrijskih procesih kot nepogrešljiv del moderne, ekonomične in človeku prijazne tehnologije, kjer prevzema dela človeka. Njena širitev na področje zdravstvene nege je aktualna tema, ki lahko vpliva na razvoj in področja dela strokovnjakov zdravstvene nege v prihodnosti. Z uvajanjem robotizacije na področje zdravstvene nege je smiselno identificirati in raziskovali možnosti aplikacij različnih robotov v delo strokovnjakov.

Uporabljen je bil sistematični pregled znanstvene in strokovne literature, omejene na objave v angleščini ter izdajo v časovnem obdobju 2010−2016. Izbor člankov je bil določen glede na določene kriterije, ki so izključevali telenavzočnost in se osredotočali le na robotsko tehnologijo. Opravljena je bila kvalitativna vsebinska analiza vključenih podatkov.

Rezultati pregleda 22 člankov so podali pet področij robotizacije: kirurgija z operacijsko zdravstveno nego, rehabilitacijska zdravstvena nega, zdravstvena nega starostnikov in robotizacija, transport, robotizacija intervencij v postopku zdravljenja in etika robotizacije zdravstvene nege.

Robotizacija dela ni vsesplošna rešitev. Ob primerni in smiselni uporabi je aplikacija robotov lahko dobrodošla pomoč pri reševanju globalnih problemov v zdravstveni negi. Stroka mora intenzivno raziskovati možna aplikativna področja ter hkrati proučevati vpliv vključevanja robotov v svoje delo, njihovega vpliva na kakovost in varnost obravnave pacientov ter etične vidike njihovega vključevanja.

Samanta Mikuletič, Tamar Štemberger Kolnik, Boštjan Žvanut: Tvegano vedenje in zavedanje uporabe IKT ter z njo povezana informacijska varnost na področju zdravstvene nege

Na področju zdravstvene nege je verjetnost nepooblaščenega dostopa do podatkov razmeroma visoka. Dolžnost medicinske sestre je, da podatke varuje. Zaposleni predstavljajo grožnjo za informacijsko varnosti, saj lahko namerno, zaradi malomarnosti ali pomanjkanja znanja razkrijejo zaupne podatke. V raziskavo, ki je potekala od 29. 4. do 31. 8. 2015, je bilo vključenih 174 medicinskih sester, zaposlenih na vseh treh ravneh zdravstvenega

varstva in socialno varstvenih zavodov. S pomočjo ankete smo preverili stanje na področju potencialno tveganega vedenja in zavedanja na področju informacijske varnosti. Za zbiranje podatkov smo uporabili vprašalnik Users' Information Security Awareness Questionnaire. Rezultati so pokazali, da samo 37 % anketiranih spoštuje varnostne ukrepe na področju informacijske varnosti. Slednje odpira številna vprašanja na področju varovanja osebnih podatkov pacientov, še posebej, ko so ti v rokah medicinskih sester, ki se ne zavedajo pomena informacijske varnosti. V povezavi z rezultati je potrebno razmišljati o tem, da se nevarnost uhajanja podatkov veča sorazmerno s povečevanjem uporabe informacijsko komunikacijskih tehnologij. Glede na smernice uvajanja e-zdravja v slovenski zdravstveni sistem je medicinske sestre nujno potrebno dodatno oborožiti z znanjem na tem področju. Zaradi navedenega je problematiko informacijske varnosti v zdravstvu potrebno dodatno izpostaviti na vseh nivojih zdravstvenega in socialno varstvenega sistema.

Rok Drnovšek, Marija Milavec Kapun: Potencial Interneta za podporo pacientom pri skrbi za njihovo zdravje

Zaradi porasta pojavnosti kroničnih obolenj pridobiva na pomenu k pacientu osredišče pristop oskrbe, ki temelji na aktivni vlogi pacienta. Aktivno vlogo pacienta lahko spodbujamo s modernimi pristopi zdravstvene obravnave in vključevanjem sodobne informacijsko-komunikacijske tehnologije. Podrobneje želimo analizirati lastnosti interneta zaradi njegove razširjenosti, ekonomske ugodnosti in možnosti multimedijske, interaktivne uporabe.

Namen prispevka je predstaviti možne načine uporabe interneta za podporo k pacientu osredišče skrbi ter identificirati njihove prednosti in slabosti.

Uporabljena je bila deskriptivna metoda, za tehniko zbiranja in analize podatkov pa sistematični pregled literature v bazi PubMed.

Na podlagi pregleda literature smo identificirali 6 različnih načinov uporabe interneta za podporo k pacientu osredišče skrbi: internet kot vir objektivnih informacij, internet kot komunikacijski kanal med pacienti, izobraževalni moduli za komunikacijo z velikim številom pacientov, internet kot komunikacijski kanal med pacientom in zdravstvenim delavcem, osebni elektronski zdravstveni zapisi in informacijski sistemi za podporo pri odločanju pacienta.

Internet ima zaradi svojih lastnosti komunikacijskega kanala in baze podatkov velik potencial za podporo k pacientu osredišče skrbi. Načini uporabe se med seboj razlikujejo glede na to, koliko truda mora vložiti zdravstvena organizacija za aplikacijo in kako individualizirane so informacije za posameznega pacienta. Internet ima največji potencial za uporabo v zdravstveni negi v obliki informacijskih sistemov za podporo pri odločanju in v obliki izobraževalnih modulov.

Petra Pavlič, Mateja Ocepek Osredkar: Model ocenjevanja ogroženosti za okužbo kirurške rane

Operacija je invazivni poseg in pomemben dejavnik tveganja za zaplet. Pacient je vedno v središču dogajanja in enakovreden član tima, zato moramo zdravstveni delavci stremeti h kontinuiranemu pridobivanju znanja, boljši kvaliteti dela ter s tem varnosti pacienta. Za preprečevanje okužb kirurške rane moramo poznati predoperativne postopke, kirurško načrtovanje in procese v predoperativnem in pooperativnem obdobju. Celostna ocena bolnika in individualna obravnava je pogosto ključna za uspešno zdravljenje kirurške rane. Poleg tega je potrebno poznavanje in preprečevanje dejavnikov tveganja, ki vplivajo na okužbo kirurške rane. S pomočjo strokovne literature so bili izpostavljeni najbolj pogosti dejavniki tveganja, ki so bili uporabljeni in primerjani pri pacientih. Naš namen je prikazati, da je vsak pacient poseben in zahteva individualen pristop strokovnjakov. V skladu z večparametrsko odločitveno metodo DEX in pripadajočim programom DEXi smo ocenili stopnjo ogroženosti pacienta za okužbo kirurške rane. Odločitev o pristopu zadeva samega pacienta, medicinsko sestro in kirurga, ki lahko glede na izbrane kriterije že vnaprej predvidevajo, večjo ali manjšo ogroženost pacienta in posledično ustrezno ukrepajo. Končna ocena našega modela je bila skladna s pričakovanji, saj so bili že na začetku določeni najpomembnejši kriteriji in funkcije koristnosti, ki jim dejavniki ustrezajo. Ta odločitveni model, bi bil lahko koristen pripomoček kirurgom in medicinskim sestram. Izpostavi se vpliv posameznih dejavnikov in njihovih povezav, kar pripomore k ustreznim odločitvam in posledično h kvalitetnejši oskrbi pacienta.

Rok Drnovšek, Tanja Rupar: Model ocenjevanja ogroženosti za nastanek ventilatorske pljučnice

Ventilatorska pljučnica (VAP) se še vedno pojavlja v kliničnem okolju, najpogosteje v enotah intenzivne terapije, kjer je tudi ena najpogosteje prisotnih bolnišničnih okužb. VAP je lahko za pacienta tudi smrtno nevarna, zdravljenje pa vključuje povečano rabo zdravil in podaljšano ležalno dobo. Zaradi

Pacienta samega in stroškov zdravstvene organizacije je smiselno poiskati način kako preprečiti VAP še preden se okužba pojavi. Za iskanje pacientov, ogroženih za nastanek VAP, lahko uporabimo odločitveni model, ki zdravstvenim delavcem služil kot vodilo. Zato smo s pomočjo pregleda literature in kliničnega znanja raziskovalne skupine izdelali odločitveni model, zasnovan za odkrivanje ogroženih pacientov. Uporabili smo večparametersko odločitveno metodo DEX s pripadajočim programom DEXi. Kriterije v odločitvenem modelu smo razdelili na kriterije tehnologije, kriterije pacienta in kriterije procesov zdravstvene obravnave. Funkcije koristnosti posameznih kriterijev smo določili glede na konsenz članov raziskovalne skupine. Končna ocena ogroženosti pacientov, ki smo jo izvedli, je bila skladna z našimi pričakovanji. Vrednost odločitvenega modela se pokaže šele, ko zagotovimo njegovo integracijo v organizacijo dela zdravstvene organizacije. Integracija odločitvenega modela je potrebna na ravni klinične dokumentacije, kjer izpostavljamo predvsem kompatibilnost odločitvenega modela z elektronsko dokumentacijo organizacije. Največji potencial ima odločitveni model pri prevzemanju podatkov iz obstoječe elektronske dokumentacije. Programska oprema odločitvenega modela lahko omogoči zbiranje in uporabo potrebnih podatkov avtomatično, brez napora zdravstvenih delavcev. Takšna uporaba omogoča neprekinjen nadzor oziroma preverjanje ogroženosti vseh hospitaliziranih pacientov ob minimalnem naporu zdravstvenih delavcev.

Nedisa Bosankič, Danilo Mencinger: Vpliv e-dokumentacije na kakovost obravnave pacientov v intenzivni terapiji otrok

Do leta 2011 smo v Univerzitetnem kliničnem centru Ljubljana na Kliničnem oddelku za otroško kirurgijo in intenzivno terapijo (KOOKIT) uporabljali temperaturni list za beleženje bolnikovega stanja, kar je uradni dokument vsakega bolnika, izključno v papirnati obliki. Jeseni leta 2011 smo začeli uporabljati temperaturni list kot dokumentacijo bolnikovega stanja v e-obliki. Problem je nadzor nad vstavljenimi tujki (endotrahealni tubus, osrednji venski kateter, stalni urinski kateter, nasogastrična sonda in drugi.) in zdravstvena nega tujka. Zaradi zagotavljanja večje sledljivosti nad intervencijami, kot so vstavitev, oskrba in odstranitev tujkov, je bil za potrebe Pediatrične klinike in KOOKIT-a, razvit modul Posegi. V tem modulu imamo shemo otroka z izborom lokacije vstavitve tujka, velikosti, dolžine in vrste tujka z uporabo šifrantov. Za vsak tujek je možno vnesti posebnosti, prevezo, menjavo in druge opombe. Kontrola vstavljanja in odstranjevanja tujkov se izvaja v tabelarični obliki oz. v preglednici. Namen raziskave je bil preučiti e-dokumentacijo (e-temperaturni list) z vidika dveh najbolj pogostih tujkov, endotrahealnih tubusov (ET) in osrednjih venskih katetrov (OVK). Preučili smo tujo in domačo s področja raziskave. Naslednji koraki so bili: popis procesov dokumentiranja ET in OVK pred in po uvedbi e-dokumentacije z ustrezno notacijo; analiza dokumentacij pacientov pred in po uvedbi e-dokumentacije; analiza poročil o neželenih dogodkih vezanih na ET in OVK pred in po uvedbi e-dokumentacije; vodeni intervjuji z zdravstvenimi delavci, ki uporabljajo dokumentacijo ET in OVK pri svojem delu; izdelava kritične analize e-dokumentacije; na osnovi analize preučiti možnosti izboljšav in podati predloge vodstvu.

Darja Perko: Sistem za izboljšanje sodelovanja v zdravstveni negi

Moč sodelovanja za zdravje je jasno vidna pri sodelovanju v zdravstveni negi. Dobro sodelovanje med negovalnim timom in drugim osebjem v zdravstveno-negovalni ustanovi vodi do dobrih zdravstvenih rezultatov. Prvi pogoj za dobro sodelovanje je dobra in jasna komunikacija. Pomemben nivo komuniciranja med bolniki in osebjem je zagotovo sestrski klic. Z njim lahko bolnik pokliče medicinsko sestro v primeru, da potrebuje pomoč, ta se na klic lahko takoj odzove in tudi drugo osebje je o klicu in poteku dogodka sproti obveščeno. Okoli te komunikacije med bolnikom in osebjem pa je še vrsta postopkov, ki morajo biti izvedeni, da lahko zdravljenje uspešno poteka. Ključno je sodelovanje negovalnega osebja, ki mora vse nadaljnje postopke nege pravilno in pravočasno izvesti. Pri tem jim lahko v veliki meri pomaga napredna tehnologija. Tako je nastal sistem NurseCare, ki poleg sestrskega klica omogoča tudi sprotno beleženje vseh opravljenih storitev v bolniški sobi neposredno s sobnim prikazovalnikom na dotik. Zabeleženi podatki se povežejo z obstoječim bolnišničnim informacijskim sistemom, s čimer so odpravljeni dvojni vnosi, možnost zabeleženih napak in kar je najpomembnejše – močno je izboljšana sekundarna komunikacija v zdravstveno-negovalni ustanovi. Znano je namreč, kdo je bil pri pacientu, v kateri sobi, ob katerem času, katera storitev je bila opravljena in kako dolgo se je osebje v sobi zadržalo. Vsi ti podatki so nato ključni za nadaljnje procesiranje in komuniciranje – na njihovi podlagi se izdelajo plani nadaljnje zdravstvene nege, opomniki, opozorila o stanjih bolnikov, na katera se je treba odzvati, in statistični pregledi obremenjenosti osebja ter pregledi opravljenih storitev, na podlagi katerih lahko ustanova izdela učinkovitejši plan dela. Tovrstni sistemi z optimizacijo

delovnih procesov v zdravstveno-negovalnih ustanovah pripomorejo k boljšemu sodelovanju vseh vpletenih v zdravstveni negi. Optimizacija delovnih procesov vodi tudi h glavnemu cilju evropskih zdravstvenih ustanov, to je varnosti pacientov.

Ines Baškovč, Marija Milavec Kapun: Primer e-izobraževanja o zdravstveni negi pacienta po vstavitvi tumorske endoproteze kolka

Z razvojem in spreminjanjem načina življenja se spreminjajo tudi potrebe po strokovnem izobraževanju in izobraževalni proces. E-izobraževanje je namenjeno uporabnikom, ki si želijo samostojno odločati o načinu, času in kraju pridobivanja znanja. Vstavitev tumorske endoproteze kolka v Sloveniji ni pogost poseg, je pa zelo zahteven. Zato je pomembno, da imajo medicinske sestre, ki se vključujejo v obravnavo pacienta, za to potrebno znanje in veščine.

Namen prispevka je predstaviti e-izobraževanje na specifičnem področju delovanja medicinskih sester, kjer bi lahko udeleženci obnovili in posodobili svoje znanje.

Uporabljena je bila opisna metoda dela s strategijo akcijskega raziskovanja. V spletni učilnici smo predstavili vsebino na temo zdravstvene nege pacienta po vstavitvi tumorske endoproteze kolka. Z začetnim in končnim kvizom smo preverjali pridobljeno znanje ter izvedli anketo o zadovoljstvu z e-izobraževanjem.

V spletno učilnico se je prijavilo 34 udeležencev, celotno učno pot jih je dokončalo 30. Anketirani so bili zadovoljni z e-izobraževanjem. Pridobljeno znanje je bilo primerno, udeleženci so dobro sodelovali v spletni učilnici.

V splošnem je bilo izobraževanje sodelujočim všeč in večina od njih bi se v prihodnje še želela udeleževati e-izobraževanja. Ugotovili smo, da je e-izobraževanje uspešen način za nadgradnjo znanja v zdravstveni negi, kar ugotavljajo tudi drugi raziskovalci.

Urša Presekar, Marija Milavec Kapun: Preventiva v virtualnem okolju

Uporaba interneta in sodobnih komunikacijskih poti narašča tudi na področju zdravstvene oskrbe pacientov. S tem se spreminja vloga pacienta in izvajalcev storitev. Pacienti iščejo različne informacije v povezavi z zdravjem tudi na svetovnem spletu.

Želeli smo predstaviti možnosti za izvajanje preventivne dejavnosti, oblikovati vsebine in jih v ustrezni obliki posredovati obiskovalcem spletnih forumov z zdravstvenimi vsebinami ter tako spoznati nove pristope v preventivnem delovanju strokovnjakov.

Podajamo poročilo o primeru zdravstveno-vzgojnih intervencij v virtualnem okolju.

Pri oblikovanju različnih zdravstveno-vzgojnih vsebin so sodelovali študenti Fakultete za socialno delo in Zdravstvene fakultete. Na spletnem portalu Zavoda Med.Over.Net so se na osnovi predhodnih ugotovitev strokovnjakov določile različne preventivne tematike. Po raziskavi teme je sledila priprava strokovnih vsebin in njihova predstavitev skozi različne pristope na spletnem portalu. Obujen je bil forum o demenci, študenti so sodelovali na številnih forumih, izvedena je bila javna tribuna, objavljeni so bili intervjuji s strokovnjaki in pacienti.

Analiza števila obiskov, objavljenih komentarjev, všečkov in delitev povezav do določenih vsebin na spletnih socialnih omrežjih priča o uspešnosti in pomembnosti takega sodelovanja strokovnjakov v virtualnem okolju. Strokovnjaki zdravstvene nege skoraj ne delujejo v virtualnem okolju, ki postaja pomembno tudi z vidika preventivnega delovanja, to pa lahko vpliva na prepoznavnost našega poklica v splošni javnosti.

Simon Torkar, Peter Benedik, Uroš Rajkovič, Olga Šušteršič, Vladislav Rajkovič: Zasnova priporočilnega sistema za obravnavo kroničnega bolnika

Naraščanje števila kroničnih bolnikov in kakovostna zdravstvena obravnava le-teh predstavljata vedno večji izziv za primarno raven zdravstvenega varstva. Kronične bolezni so dolgotrajne, navadno počasi napredujoče bolezni, ki zahtevajo dolgotrajno zdravljenje, največkrat do konca življenja. V prispevku predstavljamo zasnovo priporočilnega sistema za spremljanje celostne obravnave kroničnega bolnika. Znanje obravnave kroničnih bolnikov, zapisano v obliki ontologije, ter procesni model omogočata spremljanje obravnave kroničnega bolnika v referenčni ambulanti ter analizo podatkov, prejetih preko različnih storitev za zdravje in oskrbo v domačem okolju. Priporočilni sistem temelji na strukturi multi-relacijskega lastnostnega grafa, ki je zelo fleksibilna podatkovna struktura. Pri procesu obravnave kroničnega bolnika je poudarek na razumevanju trenutnega delovanja procesa, povezanosti podprocesov, vhodov in izhodov iz podprocesov in vzročno-posledičnih povezav med različnimi podatki obravnavanega kroničnega bolnika. Namen priporočilnega sistema je preko opazovanja in beleženja procesa obravnave pridobiti praktično znanje, ga povezati s teoretičnim znanjem,

neposredno dodajati novo znanje in ga isti trenutek tudi uporabiti v praksi, olajšati delo zdravstvenega osebja in preprečiti administrativne, postopkovne in strokovne napake preko opozarjanja in vodenja.

Zaključek

SIZN obeležuje 15. obletnico delovanja. V zaključni razpravi so bile opredeljene naslednje usmeritve za nadaljnje delo Sekcije za informatiko v zdravstveni negi:

Prizadevali si bomo za dodatno spodbudo uporabe e-dokumentacije v zdravstveni negi ter povezovanje teorije in prakse z vidika e-ZN.

Iščemo poti za boljšo vidnost zdravstvene nege kot samostojne stroke in iščemo odgovor na vprašanje, kje v projektu eZdravja je mesto zdravstvene nege.

Smiselna je gradnja in uporaba arhetipov za potrebe zdravstvene nege, kjer želi SIZN aktivno sodelovati in povezati ključne deležnike na tem področju.

V Sloveniji bi na državni ravni morali definirati minimalne standarde za informatizacijo zdravstvene nege in sistemizirati delovna mesta informatika v zdravstveni negi.

Zahvala

Zahvaljujemo se SDMI, ki je omogočilo naše srečanje. Zahvala gre tudi članom SIZN, ki sodelujejo v naših aktivnostih, ter avtorjem, ki so pripravili povzetke predstavitev.

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Slika 1 Utrinek s srečanja SIZN2016.