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Innehåll

Utvärdering av eHälsa – 10 års erfarenhet

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Abstrakt. Hälso- och sjukvården har gjort omfattande satsningar på införande av IT-stöd för att få en bättre, säkrare och effektivare vård. IT-stöden ger dock inte alltid de avsedda effekterna och utvärdering blir då ett viktigt instrument i förbättringsarbetet. Vi har gjort en studie av 26 utvärderingsprojekt vid eHälsoinstitutet senaste 10 åren och kartlagt medarbetarnas erfarenheter av att utvärdera eHälsa. Dessa resultat kommer att användas för att förbättra metodik för utvärdering av eHälsa.

Nyckelord. eHälsa, utvärdering, , projekt, metod

1. Introduktion

Hälso- och sjukvården har gjort omfattande satsningar på införande av IT-stöd för personal och patienter, för att med säkrare informationshantering få en bättre och effektivare vård samt tryggare och friskare patienter och invånare [1-3]. Att införa IT i verksamheter är dock en komplex intervention, som inte alltid ger de effekter som avsetts [4-6]. Dessutom sker ständiga förändringar, vilket gör att ett IT-stöd som fungerar väl idag inte nödvändigtvis gör det i morgon. Utvärdering av eHälsa är därmed ett viktigt instrument i förbättringsarbetet [5, 7-8].

eHälsoinstitutet bildades år 2002 i Kalmar och ingår i det nuvarande Linnéuniversitetet [9]. Verksamheten är ett samarbete mellan offentlig sektor, näringsliv och akademi och utför både uppdrag och forskning inom utvärdering av eHälsa. Medarbetarna, som tillhör olika professioner och ämnesområden, har under åren samlat på sig omfattande erfarenhet av utvärdering av eHälsa. I denna artikel kommer vi att presentera resultat från en studie av 26 utvärderingsprojekt.

2. Metod

Denna studie har fokuserat på eHälsoinstitutets projekt inom *uppdragsutvärdering*, kriterium för urval har varit avslutade projekt. Vi har genomfört tre undersökningar av utvärderingsprojekten: genomgång av projektens slutrapporter, enkätundersökning till projektledarna och fokusgruppsintervju med projektmedarbetare. Referensramen som data analyserats utifrån baseras på teori, t ex [8, 10] och praktisk erfarenhet inom utvärdering och projektledning.

I *utvärderingsrapporterna* analyserades utvärderingsobjekt, utvärderade aspekter, strategi, metod, utvärderingens resultat samt rekommendationer. Det skickades ut en

[1] Korresponderande författare.

enkät för varje projekt till projektledaren. Av 26 enkäter inkom 22 svar med internt bortfall på vissa frågor. Enkäten innehöll frågor om uppdragsgivaren, uppdragsdirektiv, spridning av resultat och utvärderingarnas effekter. I *fokusgruppsintervjun* deltog 8 projektmedarbetare. De teman som diskuterades var uppdragsdiskussion, planering och genomförande av utvärderingsprojekt, rapportering och uppföljning samt upplevda behov av bättre metodstöd vid utvärdering av eHälsa.

3. Resultat

Här presenterar vi en sammanfattning av en del av resultatet från studien. Det totala resultatet är beskrivet i en intern rapport (arbetsmaterial). Delar av resultatet har använts [11] och kommer att användas i andra publikationer. Siffror inom parentes anger antal projekt av totalt 26 studerade.

3.1. Utvärderingsuppdrag

En stor del av eHälsoinstitutets uppdrag har utförts för de organisationer som finansierar verksamheten, som ett slags abonnemang på utvärdering. En ökande andel uppdrag kommer också från andra organisationer och externfinansieras. De två organisationer som stått för de flesta uppdragen har varit landsting (11) och apotek (9). Kommun har varit uppdragsgivare till ett projekt tillsammans med landsting. Övriga uppdragsgivare har varit SKL[2] (1) och LIF[3] (1).

Förfrågan om utvärderingsuppdrag har kommit från personer med olika befattningar inom sina organisationer, exempelvis IT-projektledare, IT-strateg, verksamhetsutvecklare och chefer för olika enheter.

Ibland har uppdragsgivarna kommit med ett tydligt direktiv för genomförandet av utvärderingen (10 muntligt och 3 skriftligt), men i flera fall (8) har det inte funnits. Oavsett vilket, har projektledarna från eHälsoinstitutet alltid haft genomgripande diskussioner med uppdragsgivarna om utformningen av uppdraget. Även om uppdragsgivaren inledningsvis kan ha haft en viss uppfattning om utförandet av utvärderingen kan uppdragsdiskussionen leda till en förändring av uppdraget (minst 4).

3.2. Utvärderingsobjekt

Oftast har ett specifikt IT-stöd utvärderats, få (2) har varit jämförelser av två eller fler IT-stöd av samma typ från olika leverantörer. Det har varierat mellan utvärdering av hela IT-stödet och enskilda moduler/funktioner. De två typer av IT-stöd som har utvärderats mest har varit förskrivarstöd/e-recept och journalsystem/VIS[4].

Vid eHälsoinstitutet utvärderas alltid IT-stödet i en verksamhet, som använder det eller som kan komma att använda det. Vilken verksamhet som IT-stödet har utvärderats i hänger ihop med typ av IT-stöd och enligt uppdragsgivarens föreslag. Vanligast har utvärdering i primär- och slutenvård (10) varit, följt av enbart slutenvård (5) och enbart primärvård (3). IT-stöd har utvärderats inom apotek/farmaci i fem projekt, enbart eller tillsammans med andra verksamheter.

[2] Sveriges Kommuner och Landsting

[3] Läkemedelsindustriföreningen

[4] Vårdinformationssystem

Även om det vore önskvärt är det sällan möjligt att utvärdera alla aspekter av ett utvärderingsobjekt. eHälsoinstitutet har utvecklat en egen utvärderingsmodell baserat på ett holistiskt socioteknisk synsätt [12]. Även om denna modell inte har använts explicit i så många av projekten kan man se att den genomsyrat sättet som medarbetarna bedriver utvärdering på. Utvärderingarna är ofta holistiska i att ett flertal olika aspekter utvärderas, i genomsnitt 3.9. Utvärderingarna är också socioteknisk a i att nytta, användbarhet, användarvänlighet och acceptans tillhör de mer frekvent utvärderade aspekterna.

3.3. Utvärderingsmetod

Det finns specifika utvärderingsmetoder [10], men dessa har sällan använts i de studerade utvärderingsprojekten. Oftast har projektledarna utformat utvärderingens metod skräddarsytt efter utvärderingens syfte och uppdragsgivarens förutsättningar.

Tidpunkten i implementeringsprocessen för utvärdering och mättillfällen hänger till viss del samman. Ungefär lika många utvärderingar har varit formativa (11) som summativa (8) och resten har inte varit tydligt det ena eller det andra. De flesta av utvärderingarna har gjorts efter införandet av IT-stödet (8 efter pilot och 10 efter full implementering). Färre utvärderingar har gjorts av IT-stöd i utveckling (2) och inför upphandling (2). I de flesta utvärderingarna har det enbart gjorts eftermätningar, medan enbart några få har varit före-efter- eller longitudinella studier.

Fördelningen mellan kvalitativa och kvantitativa utvärderingar har varit relativt jämn; en knapp tredjedel (7) kvalitativa, en knapp tredjedel (8) kvantitativa och en dryg tredjedel (11) med mixad metod. Den mest använda datainsamlingstekniken har varit enkäter (16), följt av intervjuer (11). Oftast har det använts mer än en datainsamlingsteknik inom varje projekt för olika former av triangulering. Om enbart en teknik har använts har det för det mesta varit enkäter. Enkäterna har vanligen genomförts som webbenkäter.

De flesta av eHälsoinstitutets utvärderingar har undersökt vad användarna tycker om IT-stödet. Användarna har varit vårdpersonal (18), chefer och administratörer (8), patienter/invånare (6) och farmaceuter (6). Övriga intressenter som tillfrågats har varit IT-personal, projektdeltagare, politiker, patientföreningar och anhöriga. Bland vårdpersonalen är läkare de som deltagit i flest utvärderingar (15) följt av sjuksköterskor (8), läkarsekreterare (5), undersköterskor (4) och övrig vårdpersonal (1). Oftast har flera olika yrkeskategorier inkluderats i urvalet.

3.4. Utvärderingsresultat

eHälsoinstitutet verkar enligt devisen: *”Utvärdera för att implementera”*. Detta innebär att alla utvärderingsrapporter innehåller förslag till förändringar baserade på utvärderingsresultaten. Utan att tillfråga uppdragsgivarna har det dock varit svårt att utröna vilka effekter utvärderingsresultaten har gett i de utvärderade verksamheterna.

I de flesta av utvärderingarna har både styrkor och svagheter identifierats hos IT-stöden. Användarna har generellt sett varit nöjda (12 av 16) och många IT-stöd har också visat sig ge nytta i verksamheten (10 av 19). Det har dock även identifierats mindre nöjda användare och brister i IT-stöden, och svagheterna ligger främst i brister i tekniken, användarvänligheten och funktionaliteten. I en del utvärderingar har vissa yrkeskategorier varit mer nöjda, medan andra varit mer missnöjda.

Alla utvärderingar har varit transparenta och den skriftliga slutrapporten har förutom att lämnas över till uppdragsgivaren även publicerats på eHälsoinstitutets webbplats [9]. I en del projekt har rapporterna även spridits till informanterna och andra interna eller externa intressenter. I ett fåtal projekt har det också funnits möjlighet att publicera resultat av utvärderingen i någon internationell vetenskaplig tidskrift.

Utvärderingsresultaten har vanligen också presenterats muntligen för uppdragsgivarna och ibland även informanterna och andra intressenter. Flera utvärderingar har också presenterats i professionella och akademiska sammanhang, lokalt och nationellt, såsom konferenser och seminarier.

4. Avslutning

Genom över 10 års utvärderande av eHälsa har medarbetarna på eHälsoinstitutet skaffat sig en omfattande gemensam erfarenhet och kompetens. Utifrån den här studien kan vi bättre förstå hur eHälsa kan och bör utvärderas. Vi kan ta vara på upplevda styrkor i arbetssättet och utveckla bättre metodstöd utifrån identifierade brister. Bra utvärderingar av eHälsa kan bidra till välfungerande IT-stöd och hälso- och sjukvårdsverksamheter och därigenom en bättre och effektivare vård samt tryggare och friskare patienter och invånare. Vi kommer att använda resultaten av denna studie för att ta fram ett *utvärderingskoncept för eHälsa*, bestående av: utvärderingsprinciper, modell till stöd för *vad* som ska utvärderas och metod till stöd för *hur*.

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A New Type Of Intubation Mannequin Based On Computer-Game Technology

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Abstract. A New Type Of Intubation Mannequin Based on Computer Gaming Technology

Background:

Medical staff in the field of anesthesia and students need to practise intubation. Medical staff that does not intubate on a regular basis, for example those working in the emergency room or in ambulance services even need to maintain their skills. Practise with conventional intubation mannequins is usually limited to only a few airway scenarios, so experience with patients is commonly required.

Methods:

A model of a human head with a normal airway as well as varieties of the normal airway and pathological airway was modelled in a 3D computer-modelling application.

The heads exterior, but not the airway detail, was moulded into plastic with neck and jaw held movable. The model was mounted to a tabletop. The airway was padded with foam rubber. User interaction with the model is by via a laryngoscope and endotracheal tube. In our application, the position of the instruments are tracked. Computer game software processes information from the model and instruments, enabling the user to see the head and airway on a computer-screen. Software menus give the user access to different scenarios associated with intubation. The screen picture can be switched between direct- and video-laryngoscopy.

Results:

Our airway mannequin has been presented internally to colleagues, who received it well and considered it realistic. At present, there only is an adult model, but a pediatric model is planned. Future development could be the add-on of mask ventilation or flexible bronchoscopic nasal intubation.

Possible applications could be physician training and student education. Even re-validation of airway skills with regular intervals for those not intubating on a regular base may be an application.

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Keywords. Endotracheal intubation, simulation, serious game

Introduction

Every day people around the world are being anesthetized for an operation, diagnostic procedure or in an emergency setting.

Intubation or, more formal, endotracheal intubation, is the process where a flexible tube is being inserted into a patients windpipe, enabling the medical provider to provide controlled mechanical ventilation for a large range of medical causes. Prior to tube-placement, the patients mouth is opened and the tongue moved out of sight, so that direct vision of the vocal chords is obtained.

Intubation is usually chosen over the alternatives when required by the patients condition or the procedure performed. For this, the patient usually is anesthetized and muscle paralyzed, which impairs his breathing. Therefore, correct and fast endotracheal tube placement is important. Major complications in elective patients in hospitals are rare with an incidence of < 1:5.000 but nevertheless account for 25% of anesthesia-related deaths[3,4]. The incidence of serious complications in other non-planned settings is much higher, up to 1:200 in the emergency department[5,6]. In pre-hospital settings, intubations are often performed by providers who intubate less-often and succeed in 69-98,5% of intubations[7].

Minor intubation difficulties, such as problems with laryngoscopy or mask ventilation are common with an incidence of about 1%[1] and may delay operation room schedules and cause dental damage and hoarseness. To ensure providers are appropriately skilled, they need to be trained appropriately and providers not intubating regularly should practise regularly.

1. The Situation Today

Today, students and junior professionals both in the field of nursing and medical education receive theoretical training, followed by a short instruction of the practice of intubation at an intubation mannequin and then proceed training on patients. Today's airway simulators are usually mannequins that replicate a patients airway in detail. Some details of the airway can be changed in order to alter the conditions for the trainee.

The drawback of such simulators is however just the fact that they are a replica of a patient, effectively limiting the scope of possible training scenarios. Some simulators may warn when handled incorrectly, but instrument handling is not evaluated otherwise, which necessitates a teacher to be present and aid with evaluation. The traditional way of learning intubation from an experienced teacher is influenced by the fact that only one person can see into the airway at the same time because the angle of insight into the airway is very narrow. Swapping head positions with the trainer often leads to the instruments losing their correct position. The cases the student gets to see during practice may not always be optimal for training or patients wish not to participate in training.

In our own experience of different anesthesia-, intensive care- and emergency-departments, we have seen very different airways. We have also observed doctors with years of adult anesthesia experience struggle with pediatric intubation initially, which indicates that pediatric intubation skills may need periodic training to maintain skills , even when the practitioner in question intubates regularly otherwise.

To solve this, we made the following observations:

Users interact with the patients airway by means of instruments only. The opening of the patients trachea cannot be reached by the user unless instruments are correctly positioned. As a consequence, intubation relies heavily on the ability to visualize the airway.

Especially new practitioners have difficulties operating instruments bimanually and perform precision movements while watching and assessing what they see.

So why not have a simple patient model and evaluate instead what the trainee is doing with the instruments? That way, correct handling could be evaluated and taught.

A robust construction that can be moved to training locations instead of trainees needing to go to a fixed location was desirable, too.

A Solution

To accomplish this, we used standard computer-game based hard and software. A standard laryngoscope and endotracheal tube with guide wire were attached o standard game controllers using clip on adapters made by 3D printing

A patient head model and a range of airways with anatomical normal-variants as well as pathological conditions were drawn in a 3D modelling application. User input and interaction in relation to the model is calculated using a game engine.

Parts of the head and neck visible from the outside were 3D printed after remodelling to allow jaw and neck movement with natural degrees of freedom. The heads' inside anatomy was lined with soft padding and adjusted to give a realistic feeling of airway instrumentation. The model was mounted to a board and also holds the instruments controllers. A computer screen positioned close to the model's mouth shows the simulation and allows users to have both screen and head in their immediate field of view.

The software now calculates the image and presents it on the screen based on instrument and head position and orientation.

A patent application for this method is pending.

Practical Use and Application

Using this set-up, users can practice and train skills without the aforementioned obstacles, making it possible to learn and train interactively by means of audiovisual guides that for example guide the novice through a basic intubation step by step, allowing the user to complete the task in his or her own time. We chose to provide the user with a library of scenarios that may occur on intubation. There is also an option where users can make their own scenes by adjusting a range of parameters for different anatomical structures.

In recent years, a technique called video laryngoscopy has become popular and is available in almost all operation- and intensive care departments. Video laryngoscopy can be activated at any time in all scenarios by the user. Computer-game based virtual simulation not only offers the opportunity of a wider range of scenarios compared to more hardware based models, but even allows visualisation not normally possible. We have added a lateral-view of the head showing a cross-section of the head allowing the user to determine the position of the instruments tip in relation to airway anatomy. Both novice and experienced users may find this useful in becoming better and faster intubators since it contributes to an interactive understanding of applied anatomy.

Future development

Apart from skills training we are currently working on a teaching library featuring audio-visual and text content covering different aspects of intubation, such as methods, materials, alternative techniques and provide background-information based on state of the art practice and current literature.

Advantageously, trainees may be able to borrow the computer or the simulator for a few hours or overnight to study. That may be useful in student training where a flipped-classroom teaching technique[2] may be applied.

Not only future airway-specialists may embrace training with the new technology. Emergency room, intensive care, military and ambulance personnel, may find it useful to train a set of scenarios at regular intervals, thereby keeping their skills up to date for the benefit of their future patients.

A pediatric version and an online service for the simulator will be added. A cloud-based interactive service makes software upgrades easier and, new cases and educational content can easily be added for all or for subgroups of users. Teachers can log onto the cloud-service to evaluate student performance on a group or individual level.

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Norrlandicus Care Lab – The Novel Test Method for Aging Society Innovations

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Abstract. Many countries with ageing populations need to work on how to incorporate innovations of different forms into the ongoing process of change in social service, support and care of the elderly. In Sweden, a national initiative to innovate elderly care is taken. Norrlandicus Care Lab (NCL) is a test environment formed as a Living Lab for actors aiming to develop health and social care for elderly through innovation. NCL offers organizations and companies a test and evaluation method as an activity in their intrinsic development process, suited to services, processes and products. The vision is to conceptualize NCL into a European model to forge the challenges of elderly care to progress with new innovative businesses and ideas. Thus, the objective is to create an interdisciplinary open collaboration platform for actors who want to develop long-term care through innovation. Each innovation is assessed in NCL via quality measures from the users' perspectives. This paper describes the foundation of the novel test method that is the basis for the NCL test process. Testing in NCL will be carried out by elderly themselves, health and social care staff and relatives together with different academic parts in a multidisciplinary test process. Products and services will be evaluated from three perspectives; the "care customer" (elderly or seniors), their relatives and health and social care professionals. There are two main quality criteria that guide the evaluation: quality as stated in the "National Values for Social Care of Elderly" and usability as a function of the innovation and its primary end-users. The expected result from an academic point of view is that the test method as such is validated and measures the contribution of the innovation in terms of "a dignified life for the elderly" as well as the degree of usability of the innovation. Expected results from the innovators and the aging society may vary depending on type of innovation. In Norrlandicus Care Lab, this unique method allows for interaction between innovators and senior stakeholders as well as other primary end-users in the elderly care sector. Thanks to the establishment of this novel method and the support from researchers, the users' quality aspects are kept in focus when innovations for the aging society are tested in Norrlandicus Care Lab.

Keywords. Aging society, elderly care, innovation, living lab, user participation, health/welfare development, test, evaluation, validation, usability, patient-centricity

Introduction

The Swedish "National Innovation Strategy" [1] states that 20% of the inhabitants in Sweden will be over 65 years old by 2030. In a medium-sized Swedish municipality, Sundsvall, the social service authority made a simulation of future care of the elderly

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[2]. It shows that between 2010 and 2030, the proportion of elderly (80 years old and over) increased by approximately 38 percent. Already today the need for care activities in the home increases. In 2011 about 911 000 care activities were executed in the local homecare area and in 2012 the number increased to approximately 982 000 care activities in Sundsvall [2]. Despite this increased need, a local savings requirement on social services is set to over 100 million SEK [2].

To handle this, the municipality has recently started to apply a "lean" method where one ambition is to work more oriented towards "the patient as a customer" and at the same time implement new ways to work with quality development and quality assurance through evidence-based practice [3]. Therefore it is imperative to bring in new methods, systems or tools to aid the renewal of life situations and work processes. Innovations or new ideas may arrive from different actors; e.g. from well experienced care personnel as well as from technical innovators. An important matter is that the innovations need to be tested in real-life situations before implemented in elderly care practice, to date an activity hard to achieve.

The purpose of this paper is to describe the foundation of the novel test method that is the basis for the test process used in the test bed Norrlandicus Care Lab (NCL).

1. Background - Norrlandicus Care Lab

As we wish to live longer, healthier, and in our own homes, elderly care innovations need to be tested in a realistic environment and by test participants that are potential users of the final product [4], preferably in the home of real users.

The assembly and management of a realistic testbed, both related to e.g. technology and real-life observations is costly and impossible for small innovative companies, especially when testing their first product. To enable relevant and qualitative testing, it is of outmost importance that test facilities are available, and on a per usage cost [5].

Norrlandicus Care Lab is such a test facility; a Vinnova funded, recently developed open innovation platform formed as a Living Lab to support actors aiming to develop and commercialize health and social care innovations for an aging society.

The NCL is based on the conceptual idea of enhancing quality of life for the elderly and each innovation (product, service or process) needs to be assessed using quality measures from the users' point of view. Addressing basic health and functional needs is important; however a salutogenic approach to health, considering participation and independence, promotes good health and rehabilitation [6]. Dignity and well-being are two dimensions of Dignity in Life that are important to consider. To our knowledge, there is a lack of such quality measures in the care sector. Further, healthcare to date has been focused on service for illnesses rather than addressing citizens' holistic health needs, including e.g. social services, prevention and support for informal care givers [7]. In recent publication, researchers call for the inclusion of social care informatics as an essential part of holistic healthcare, stressing the importance of this emerging field of research [8]. In order to strengthen the role of patients and relatives, the NCL method focuses on patient-centric provision of care, following the ongoing shift from organization to citizen-centred care [9]. The usability of the intended innovation is another quality measure, a key to failure or success of a product [10].

The target audience of NCL Living Labs consists of people older than 65 years with age-related needs. They live in various kinds of senior housing; from private houses to nursing homes, as well as retirement homes providing different degrees of

support. Seniors and their relatives, together with private or municipal health and social care staff, test and evaluate innovative solutions that aim to increase the quality of life or improve the use of resources in care processes in the immediate environment of the elderly. Multidisciplinary NCL experts from academia and industry who are experienced in evaluating usability, nursing and healthcare quality, innovation, business models, functionality and health economics assist in the assessments.

2. The Norrlandicus Method

The Norrlandicus approach to test an innovation is to combine a test of the usability of the innovation on one hand with, on the other hand, pre- and post-measurements of the elderly person's sense of dignity in life.

The Swedish National Board of Health and Welfare issues mandatory regulations for municipalities and other actors. In the case of care of elderly, the concept of dignity in life is used in such regulations and has been clarified by a number of texts and other material issued by the authority [11]. However, these materials do not constitute an operationalized definition of the construct, but clarifies that it should mainly be a combination of two parts, well-being and dignity [12].

To be able to measure the impact of an innovation/intervention in the experience of dignity of life for a person in elderly care, a scale with two dimensions, i.e. two sets of items is developed. Furthermore, the scale is developed using three different perspectives of the elderly person's experience of dignity of life, the actual persons' own perspective, relatives' perspectives and that of the care personnel. This means a triangulation of the measurement. In order to handle this, items of the questionnaires in three versions with almost similar wording are created. The differences will be limited to what is needed to distinguish between the different roles of the respondents.

The two dimensions of the construct dignity of life—dignity and well-being—are operationalized as numerical variables, and differences in means between post- and pre-intervention measures in any of the two dimensions would indicate that the intervention had an effect on the dignity of life of the elderly persons in the sample. However, it is obvious that the innovation being tested may have a practically significant impact in a specific part of the elderly person's well-being or dignity, but still be of limited importance in measuring dignity of life. In such a case we anticipate that there will be no significant difference between pre- and post-intervention mean. Instead, we will be guided by a few specific items about the innovation together with the results from the usability test as to how we interpret the overall results of the investigation of the innovation.

Usability on the other hand, is a quality characteristic of interactive systems. According to the International standard (ISO 9241-11), usability is defined as "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" [13]. Usability is thus a characteristic or quality dimension that is only apparent in the interaction between a system and its users over a period of time, i.e. in real use. Usability is not an inherent system property, such as a function. Another important international standard in this area is ISO 9241-210 [14] describing the importance of user-centred development. When these standards are used, it is especially important to have a good understanding of the system's context, users' characteristics, their tasks and

requirements [4], issues that will be investigated in the usability part of the Norrlandicus Method.

3. Expected Results

As a result, the Norrlandicus method provides a statistical description of the structure of the factors from three perspectives, in order to see if the experience of dignity is changing with the introduction of an innovation. An innovation can affect the elderly directly or indirectly, and will in terms of an assessment design be considered as an intervention. The innovation will therefore be evaluated specifically, using the criteria of the International usability standard (ISO 9241-11). The effectiveness and efficiency of the innovation can thus be measured. Together with future user satisfaction questionnaires regarding the innovation, the potential benefits for current healthcare organization or the elderly care sector as a whole are estimated.

The results of tests conducted in NCL will thus benefit both elderly care sector innovators and its primary stakeholders. Currently, Norrlandicus method is primarily located in Västernorrland where the pilots are taking place. However national and international dissemination is planned. The vision is that NCL is an established brand and the European example of how the aging society will be supported through innovation.

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Towards National Deployment of Online Medical Records and eHealth Services

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Abstract. Information and Communication Technology for health and wellbeing ('eHealth') is becoming increasingly important to deliver top-quality care to European citizens. There are a number of currently ongoing national and international efforts related to public access to eHealth services. In Sweden, the action research project DOME (Deployment of Online Medical Records and eHealth Services) aims to study and contribute to ongoing national deployment projects. This paper presents the DOME project's objectives, goals and methods as well as expected results regarding the national deployment of online medical records.

Keywords. public eHealth services, electronic health records, case study, deployment, action research, patient-centred care.

1. Introduction

The idea of offering tools to patients to help them managing information is not new. Only in the last years, we have witnessed a sharp rise in the number and range of electronic tools and digital solutions to allow patients to access, manage, share and supplement their health data [1, 2, 3]. In this study, health information is brought to the citizen via online public eHealth services on home- or mobile devices

There are many potential benefits associated with the use of public eHealth services, both for patients and for healthcare professionals [4]. One expectation is that the services contribute to improved health and quality of life in the society, by the provision of quality-assured health information and efficient tools to handle your own health and treatment [2]. Another is that access to electronic health records (EHR), as a public eHealth service, provides opportunities for increased patient participation in care and improved understanding of care processes [3]. Increased patient safety based on secure high-quality eServices is also expected [4]

A national initiative in Sweden is thus to provide patients with online access to their own electronic health record (EHR) [2]. This paper presents the research project, DOME (Deployment of Online Medical Records and eHealth Services), that aims to study and contribute to ongoing national deployment efforts. By performing research studies on these novel deployment processes and citizens' use of new public eHealth

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services, the above expectations will be scrutinized and unique empirical data will be presented.

2. Background to the DOME project

It is evident that increased knowledge is essential for successful deployment of public eServices [5] and that such services in general are challenging to put into practice. A research project (DOME[2]) was created in July 2012 in order to connect the first European deployment project (SUSTAINS[3]) to a purposive research group consisting of 16 nationally spread researchers from various scientific fields. This multi-site and multi-disciplinary composition provides a unique opportunity to highlight the issues from various research aspects through different methods and studies. Currently the senior researchers cover the areas of information management, human-computer interaction, IT and work environment, management and business studies, information security, healthcare informatics, medicine, organization theory, eGovernment, information technology and engineering education.

The County Council of Uppsala (LUL) in Sweden is coordinator of the EU-project SUSTAINS and also pilot for providing patients with online access to the EHR of the Digital Agenda for Europe [4]. To date approx. 200 000 patients in the county have access to their EHR, containing medical notes, drug prescriptions, medical lab results, diagnoses, referrals and audit trails. On December 6th 2013, 40 441 unique users have used the service and the numbers are continuously increasing [6].

In March 2013 a national strategy decision was made to deploy LUL eHealth services nationally to provide all Swedish citizens with online access to their EHRs. In December 2013, 16% of the citizens in Sweden had activated their account on the national portal in order to gain access to several eHealth services [2]. Hence, there is a need to study how novel eHealth services reach a heterogeneous target group, geographically spread, of different ages, health status and interests to use the eServices.

The aim of DOME is to produce and disseminate knowledge about adaption and use of online EHRs and other public eHealth services aiming to benefit both patients and healthcare professionals.

3. Method

The overall research method is Action Research (AR), defined as an approach that "aims to contribute both to the practical concerns of people in an immediate problematic situation and the goals of social science by joint collaboration within a mutually acceptable ethical framework" [7] where "research is conducted *with* people rather than on them" [8]. This focus makes AR particularly suitable in DOME, as the AR goal is twofold; to understand and solve problems in practice and to contribute to science.

The DOME project works from three aspects, i.e. work packages, which are briefly described below. Figure 1 shows the research design of the integrated studies and publication work.

[2] DOME, http://www.it.uu.se/research/hci/dome/index.php?lang=1, retrieved 2014-01-15

[3] SUSTAINS, http://www.sustainsproject.eu/, retrieved 2014-01-15

WPA - Patients and Relatives focuses on perceived benefit of healthcare of patients and their relatives, including health benefits as well as aspects such as patient safety, accessibility, economy, efficiency and integrity. Aspects of patient empowerment will also be handled.

WPB Professions and Management focuses on healthcare professionals and management in relation to eHealth services. Various studies will examine how the introduction of eHealth services creates changes in the relationships between different stakeholders. Furthermore the demands of the professionals regarding development of future eHealth services will be elaborated.

WPC Development and Implementation focuses on understanding and improving the methods and processes used in development and implementation of eHealth services. This also includes studies on quality aspects in the form of e.g. usability, security and operability.

Additionally, the DOME Project has about thirty organizations as reference groups at three different levels. The task is to support researchers in understanding and highlighting important issues from different perspectives, to influence the development of eHealth services, as well as to take advantage of the research conducted in the project.

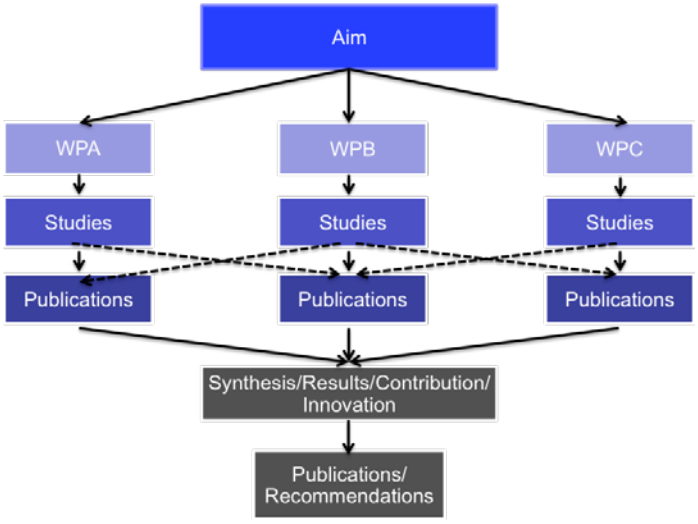

Figure 1. Research design: from aim to recommendations in DOME work packages.

4. Expected results

Expected results are, recommendations for the practice and suggestions for guidelines for implementing various types of national eHealth services. Some results are already published [9-12]. Thanks to the large number (16) of ongoing studies, a great amount of empirical data will be published in the near future.

Furthermore, the newly extracted knowledge will be returned to the practice through various new interventions. Assimilation of guidelines and recommendations will facilitate the introduction and use of online EHRs as well as other eHealth services.

DOME has two main contribution areas; to build knowledge and understanding of the adoption and use of eHealth services and to create conditions for healthcare professionals to participate in the change process that could have a major impact on their work. In addition to publishing in the scientific fields, the results will be disseminated in national and regional seminars and workshops with stakeholders.

Public eHealth services will provide support for patients and their relatives, but also for healthcare professionals. From a social perspective, it is essential to identify both opportunities and problems with the technological progress in the field, and to develop knowledge that will be useful to management, healthcare professionals, IT providers and not at least, the patients themselves.

Furthermore, it is of highest importance that potential benefits are investigated and evidence-based, and that effective dissemination of knowledge can occur in national and international contexts. The DOME project is an essential part of this knowledge development.

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Dokumentation av vitalparametrar i datorjournaler: En risk för patientsäkerheten?

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Abstrakt: Identifiering av tidiga tecken på försämring av kliniskt tillstånd hos riskpatienter är viktigt för patientsäkerheten. Dokumentation av vitalparametrar i elektroniska journaler är kanske inte tillräckligt för att effektivt identifiera tecken på försämring av patienters kliniska tillstånd**.**

Nyckelord: patientsäkerhet, vitalparametrar, elektroniska journaler

Introduktion

Tidig upptäckt och snabb hantering av riskpatienter har betraktats som det ’första steget i kedjan till överlevnad’ i hjärtlungräddning (HLR)[1]. Patienter uppvisar ofta tecken på försämring av kliniskt tillstånd under perioden före oväntad hjärtstopp [2]. För att förbättra identifieringen av försämring i kliniskt tillstånd hos patienter har många varianter på system för snabb respons införts med fokus på mätning, rapportering och hantering av patienter med avvikande vitalparametrar [3]. Datorjournaler journaler används allt mer inom vården för i stort sett all dokumentation. Däremot är kunskapen begränsad kring betydelsen av dokumentationen i datorjournalen för att upptäcka försämring av patienternas kliniska tillstånd. Syftet med denna studie var att undersöka dokumentationen av vitala parametrar i datorjournalen för sjukhusvårdade patienter, som efter inläggning drabbats av oväntat hjärtstopp.

Metod

En retrospektiv populationsbaserad studie genomfördes för att undersöka datajournaler på patienter som drabbats av oväntade hjärtstopp under tiden de varit inlagda på sjukhus och som genomgått HLR mellan 2007 och 2011 (n=228). Datainsamlingen utgick från Early Warning Score system, ViEWS. Data inkluderade följande vitala parametrar: puls, andningsfrekvens, temperatur, systoliskt blodtryck, syremättnad, medvetandenivå, och behandling med syrgas 24 timmar före hjärtstopp. Beskrivande analyser användes för att visa vart de vitala parametrarna registrerades i EHR. Programmet Statistical Package for Social Sciences (SPSS) version 19 användes för de beskrivande analyserna.

Resultat

Dokumentation av vitala parametrar registrerades på tre olika ställen i datorjournalen; i journalanteckningen, mallen och rapportbladen. Då data registrerades på tre olika ställen var det inte möjligt att få en överblick. Fördelningen av data var ojämn och i vissa fall registrerades data bara på ett ställe och i andra fall registrerades data på alla tre ställena, journalanteckning, mall och rapportblad. Exempelvis, blodtryck fördes in i mallen hos 50 % av fallen och pulsmätningarna fördes bara in hos en tredjedel, och då oftast i rapportbladen. Det som dokumenterades oftast var medvetandenivå. Andningsfrekvensen lagrades oftast både i mallen och i journalen.

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Diskussion och slutsats

Denna studie visade dels att fullständig dokumentation av vitalparametrar saknades och dels att dokumentationen av dessa parametrar var fragmenterad och inkonsekvent. En brist på tydligt presenterade vitalparametrar kan förhindra identifiering av försämring av kliniskt tillstånd hos patienter. Den bristande dokumentationen av vitalparametrar i denna datorjournal kan ha inneburit en risk för patientsäkerheten.

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Digital innovations and self-determined exercise motivation: a person-centred perspective

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Abstract. Health care costs are increasing twice as fast as wealth, making health promotion and development of cost-effective care increasingly important in order to generate sustainable health care solutions. E-health, applications and interactive tools for exercise promotion flourish; but despite this and an overflow of information regarding health benefits of regular physical activity, exercise adherence has proven to be a significant challenge. This article concerns a project aimed to design an interactive tool based on comprehensive knowledge from the field of psychology combined with expertise from information technology and innovation, based on e-health industrial requirements and user needs. The research group will, together with the expertise and infrastructure of the collaborating companies Health Profile Institute AB and Tappa Service AB, support and progress an existing PhD-project on digital interventions in exercise motivation. This will be done by designing; applying and evaluating a person-centred digital intervention prototype for exercise motivation and adherence enhancement based on Self-Determination Theory [1, 2].

Introduction

Humans have probably never been as sedentary as in our modern society and World Health Organization consider physical inactivity to be the fourth leading risk factor for global mortality and burden of disease [3]; hence equivalent to the adverse effects of smoking [4]. The study of how sustainable and cost-effective physical activity (PA) promoting interventions could be tailored is highly important [5] and a decade ago, WHO stated 2 million deaths and 20 million DALY's (Disability Adjusted Life Years) could be prevented globally through effective PA promoting interventions [6], offering promising health and cost benefits on both societal and individual levels. However, it is well known that numerous exercise and PA interventions are ineffective in changing the desired behaviours, and it has been suggested this inefficiency in part is a result of inadequate research and intervention methods and lack of theory driven interventions [7, 8]. In addition, exercise research has for the past three decades shown that half of all exercise initiators drop out within 3-6 months [9-11]. Consequently, exercise adoption is not enough to sustain the behaviour in the long term as a daily lifestyle routine. The potential health benefits of exercise and PA interventions are of course dependent on their effectiveness, i.e. participants' ability to adhere to these programmes, and adherence is a considerable challenge in exercise promotion [12, 13]. Since adherence is closely related to motivational aspects [14], motivational research constitutes an important key in designing effective interventions supporting sustainable behaviour change. This is especially relevant considering peoples' own responsibility for their health and for the regulation of health related behaviours is noticeably pronounced in today's society.

Systematic reviews of the literature propose theoretically based exercise interventions to be more efficient than usual care [15], strongly advocating the use of adequate theoretical models in order to successfully enhance exercise motivation and behaviour change [16]. It is of particular importance to explore and understand the mechanisms of intervention efficacy (i.e. mediating and moderating effects) using appropriate mediating variable analyses (MVA) in order to identify the active ingredients of an effective intervention design and those elements that could (or should) be excluded [17]. Typically, exercise interventions and promotion programs lack sound theory foundations, thereby lacking structure and appropriate evaluation, making it problematic to explain why or why not a given intervention is effective. Using appropriate theory (e.g. SDT) will therefore not only promote cost effectiveness, but also contribute to the understanding of sustainable behavior change and provide valuable practical implications for intervention design [17].

Project description

The intervention in this project will be firmly based on Self-Determination Theory [1, 2], a prominent theory of motivation with substantial support for its application in the exercise area [e.g. 14, 18]. Self-determined

motivation also has strong predictive value for behavior adherence over time [2, 19]. Autonomy and involvement are central aspects in SDT- practice [2] as well as in person-centered care [20, 21], and is also emphasized in a meta-analysis on motivation oriented health care research [22]. By involving participants in health-related processes and decisions (bottom-up) instead of getting a fixed program (top-down) this project aims to facilitate commitment involvement in exercise behaviors. The research group will explore how to deliver meaningful experiences in the exercise domain by including customer and user experience design methods and techniques. Interactive tools are accelerating into healthcare, e.g. in terms of life logging, remote controlled and home-based healthcare services, applications etc. This posits challenges and issues rarely addressed regarding for example user demands and needs, technical solutions, personal data security, quality aspects and branding. Therefore, this unique project not only applies knowledge from psychology and behavioural science, but also from the fields of information technology and innovation science. Inspired by current research in these areas, the research group aim to create an innovative digital intervention prototype by turning theory into practice using a person-centred and proactive approach. The intervention prototype will be developed in cooperation with, and incorporated into the existing services of Health Profile Institute AB and Tappa Service AB and finally tested in a RCT study using modern recommended MVA analyses.

Measures

A battery of behavioral and motivational instruments will be used: a) Godin Leisure-Time Exercise Questionnaire [23], measuring exercise frequency, which will be complemented by accelerometers; b) Physical Activity Stages of Change Questionnaire 2:1 [24], measuring behavioral change preferences; and c) The Basic Psychological Needs in Exercise Scale [25], The Behavioral Regulation in Exercise Questionnaire-2 [26], Health Care Climate Questionnaire [27] and Goal Content for Exercise Questionnaire [28], the last four based on Self-Determination Theory and measuring factors related to motivation, with Swedish versions recently validated in the PhD-project [29]. These quantitative measures will be complemented by qualitative cross-disciplinary interaction design methodologies, such as user interviews and contextual inquiry [30], with the aim of capturing and understanding end-user goals, behavior, preferences, attitudes and frustrations in the form of personas and use scenarios [31]. A person-centered iterative design approach will be employed, where continuous user and stakeholder feedback on design solutions is essential. The focus of such methodologies is to ensure confidence in design solutions by engaging users to participate in the design process. Measurements of the user experience and usability of the created service(s) will follow established evaluation protocols, such as usability testing [32].

Project strengths

The collaboration with the two companies enables access to a large sample (N> 10 000) and possibility to combine subjective PA measures (self-reports) with objective measures (accelerometers). The longitudinal RCT-design will have multiple measure points, enabling advanced analyses of the mechanism (i.e. mediating and moderating effects) behind behavior change and adherence, providing valuable information on the active ingredients in an intervention. Since the major part of the research on exercise motivation is based on self-reported measures and cross-sectional data, this project not only provides exclusive and interesting possibilities to cross-reference subjective an objective data with each other, but also with central motivational theory concepts and temporal aspects.

Purpose

The main aim of the project is to design, test and evaluate a digital exercise motivation intervention prototype founded in comprehensive knowledge from the field of psychology combined with expertise from information technology and innovation, based on e-health industrial requirements and user needs. Related to the overall aim, the most central research question is to identify how such a multifaceted and interdisciplinary project can be organized and mastered.

More specific research questions from a *Psychological perspective* concerns

a) the efficacy of using Self-Determination Theory (SDT) in designing, constructing and evaluating an exercise motivation intervention;
b) how behavior change and exercise adherence could be facilitated in a digital intervention; and
c) how SDT concepts and proposed psychological mechanisms relate to and promote exercise behaviors.

From an *Interaction/UX design perspective*, research themes involve

d) how user-involvement and SDT can be part of a person-centered design method for health-promoting services such as digital exercise promoting tools;
e) how SDT-related components like autonomy support could be implemented in digital artifacts;
f) what new principles based on an interaction design are most attractive to try out, implement and examine; and
g) how information of the relation between subjective and objective measures could be used to ground self-reported information on activity level with measured activity levels.

Finally, questions from an *Innovation perspective* relate to

h) how customers or customer driven innovation affect in what way firms develop integrated and interactive business models.

Expected outcomes

Primarily, the project is expected to generate a prosperous interdisciplinary fusion, facilitating and diffusing innovative digital solutions for e-heath industry which, in turn, could promote participants' (self-determined) exercise motivation and adherence and in that way possibly also promote health and quality of life on both individual and societal levels.

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Rörelseanalys över tid för bättre anpassad medicinering av Parkinsonsjuka

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Abstrakt. Genom att samla data om en parkinsonpatients tillstånd vid flera tidpunkter kan behandlingen förbättras. Vi har visat att med rörelsemätning är det möjligt att få objektiva mått på förändring av rörelseförmåga beroende på parkinsonmedicinering.

Nyckelord. Parkinson, patienttrygghet, innovativa produkter, beslutsstöd

Inledning

Vid behandling av Parkinsons sjukdom (PS) styrs doseringsregimen av patienternas beskrivning, egen bedömning och hågkomst av sitt tillstånd. Ofta är det svårt för patienterna att avgöra om symptom beror på för lite eller för mycket medicin. Vid läkarbesök kan man endast få en ögonblicksbild av personens tillstånd som förändras under dygnet och veckan beroende av trötthet, stress, medicinering, etc.

Med tillgång till information om patientens tillstånd vid fler tidpunkter kan läkaren ta hänsyn till flera faktorer som påverkar patientens funktionsnivå, såsom medicineringsnivå, trötthet, tid på dygnet, stress, etc. Tack vare de senaste årens utveckling av rörelsemätningssensorer finns nu möjligheten att logga en patients rörelser. Även dagens smartphones kan användas för rörelsemätning.

Hittills har huvudsakligen accelerometrar använts för utvärdering av PS, t.ex beskriver Weiss[1] och Costa[2] hur accelerometrar har testats för analys av parkinsonpatienter. Likaså har Griffiths[3] utvärderat Global Kinetics Kinetigraph för analys av en patients grad av bradykinesi och dyskinesi, medan Garcis Ruiz[4] har utvärderat korrelationen mellan AAM ActiTrac och UPDRS-skalan[5-7]. Bägge dessa produkter är baserade på enbart accelerometrar. Ett av de få exemplen på användning av en komplett rörelsemätning är Delano's[8] analys med hjälp av en smartphone.

Med den begränsning som enbart accelerometrar ger och att en smartphone är relativt stor och tung har vi i stället använda dedikerade rörelsemätningsenheter. Dessa innehåller både accelerometrar och gyron, vilket därmed förser oss med mer data, samtidigt som de är små och lätta.

1. Metod

Konceptet med rörelsemätning för insamling av information av parkinsonpatienters tillstånd, har vi utvecklat i samband med så kallade Posturo-Locomotion-Manual-tester

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(PLM) [9] utförda på Sahlgrenska Universitetssjukhuset (SU). Parallellt med att personerna har genomfört PLM-testet, har de även utfört en teströrelse med en sensorenhet för rörelsemätning. Dessutom har vi vid två tillfällen under testet filmat patienter för en senare läkarbedömning.

1.1. Rörelsemätningsenheter

Under arbetet har vi använt två olika sensorenheter. Dels, en egenutvecklad sensor, IDM21, och dels en kommersiell sensor, Shimmer3. Bägge dessa innehåller en 6-axlig IMU, dvs en tre-axlig accelerometer och ett tre-axlig gyro.

Rörelsedata har analyserat med hjälp av MatLab, med syftet att beräkna ett mått som är representativt motoriska PS symptom. Måttet skall överensstämma med hur en läkare eller sjukgymnast skulle bedöma patienten och med resultatet från PLM-testet.

Figur 1. IDM21 till vänster och Shimmer3 till höger.

1.2. PLM-test

PLM-testet används på SU huvudsakligen i samband med utvärdering av medicineffekt vid parkinsonism. Testet bygger på analys av en testpersons rörelser. Testpersonen ombeds plocka upp ett föremål från golvet, placerat vid hans fot, och ställa detta på en hylla i axelhöjd 1,5 m framför honom, se figur 2. Detta upprepas tre gånger i direkt följd. Sju stycken reflexbollar är fästa på testpersonen och en vision-kamera registrerar rörelsen hos dessa reflexbollar. Rörelsen analyseras och tiden för testpersonen att utföra delar av och hela rörelsen beräknas.

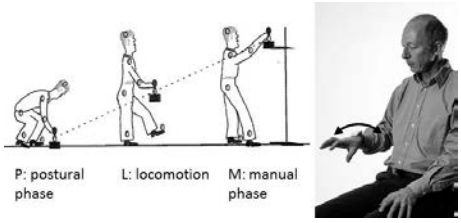
Initialt är testpersonen omedicinerad och han ombeds utföra teströrelsen ca 10 gånger med en kort vila mellan varje gång. Därefter ges testpersonen duodopa och han ombeds utföra teströrelsen med tre framåtrörelser 2 gånger med en kort vila mellan, var tionde minuten under ca 2 timmar. Totalt tar hela testningen ca 2,5 timmar att genomföra.

Om personen reagerar positivt på duodopa-medicineringen, dvs utför teströrelse snabbare och jämnare, är detta en tydlig indikation på L-DOPA responsiv parkinsonism.

1.3. Handteströrelse

Vi har använt en teströrelse, diadochokinesi, som används rutinmässigt för klinisk värdering av parkinsonism. Patienten sitter i en stol med överarmen utefter kroppen och armbågen i 90 graders vinkel och underarmen rakt fram. Hans ombeds därefter att vrida

handen fram och tillbaka så snabbt han kan och med så stort utslag som möjligt. En succesiv minskning av amplitud och frekvens utgör ett dopaminberoende kardinalsymptom vid Parkinsons sjukdom. Patienten ombeds göra denna rörelse i 20 sekunder, och både med höger och vänster arm.



Figur 2. PLM-teströrelsen.

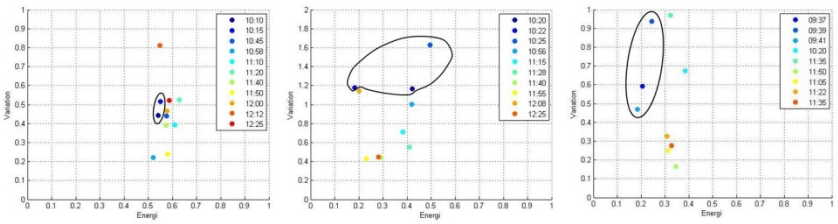
1.4. Filmning och skattning enligt Unified Parkinson Disease Rating Scale (UPDRS)

Precis före medicinering och ca 60 minuter efter har patienterna filmats när de utför items 6, 7 och 8 i UPDRS III. Dessa items utgörs dels av den teströrelse som vi använder för mätning, dels ”fingertappning”, dels handknytning som sker upprepat under 20 s. Utförandet av rörelserna har skattats enligt UPDRS skalan baserat på filmerna.

2. Resultat

Sammanlagt har 13 st mätningar i samband med PLM-tester genomförts. Under hösten 2012 och våren 2013 7 st med hjälp av IDM21 och under vintern 2013/2014 6 st med hjälp av Shimmer3.

Signalbehandlingsalgoritmerna har utvecklats i syfte att presentera en tydlig och relevant bild av testpersonens grad av parkinsonism och som visar förändring av personens tillstånd beroende bland annat av medicineringen. Figur 3 visar diagram från tre av de senaste mätningar. Axlarna i diagrammen representerar energin respektive variationen i teströrelsen. Idealtillståndet är det nedre högra hörnet, dvs punkten (1,0). De inringade punkterna representerat mätningar före medicinering, medan övriga punkter är mätningar efter medicinering. Även om det finns en relativt stor variation i mätvärdena är generellt värdena för dessa tre patienter bättre efter medicinering är än värdena före, dvs energin är högre eller variationen lägre.



Figur 3. Resultat från patientmätningar nr 3, 5 och 6.

Tabell 1 sammanfattar resultatet från de sex senast utförda mätningarna. PLM-testet, som utöver hand testar bål och gångfunktion, visade läkemedelsrelaterade förbättringar hos 4/6 patienter och 3 av dessa visade också förbättringar i handrörelsemätningen. Överensstämmelsen med UPDRS-skattningar av handfunktion var sämre med 3 överensstämmande resultat och två motsatta. Vid jämförelse med skattning av endast samma handrörelse som den uppmätta var överensstämmelse mellan mätvariablerna och den skattade förändringen enbart 2/6.

Tabell 1. Sammanfattning av resultaten från de sex utförda mätningarna under december 2013/januari1014.

Pat	Handrörelse	PLM-test	UPDRS hand item 6-8	UPDRS hand item 8
1	Svagt bättre	Bättre	1 p bättre	2 p bättre
2	Oförändrat	Bättre	3 p bättre	1 p bättre
3	Svagt bättre	Bättre	1 p bättre	Oförändrat
4	Oförändrat	Oförändrat	2 p bättre	Oförändrat
5	Bättre	Oförändrat	Oförändrat	Oförändrat
6	Bättre	Bättre	2 p bättre	1 p sämre

3. Slutsats

Vi har visat att vårt koncept kan fånga läkemedelsberoende förändringar i en parkinsonpatients rörelseförmåga. Mätningarna ger utfall som i stort överensstämmer med PLM-testet, men diskrepansen med UPDRS-skattningarna indikerar att de valda variablerna inte helt speglar den kliniska bedömningen och de bör kunna optimeras ytterligare. Vår mätning är enkel att utföra och kräver inte en dedikerad testplats. Objektiva mätningar som kan upprepas i hemmet vid valda tillfällen kan om de avspeglar sjukdomskaraktäristisk rörelsestörning vägleda den symptomlindrande behandlingen av Parkinsons sjukdom. Detta kan leda till bättre kvalitet på medicinutvärderingar och kan möjliggöra större förbättring av livskvalitet hos patienter med Parkinsons sjukdom.

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