

Clearing the path – how to improve clinical pathways in a cost-efficient manner

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***Abstract:* This paper explains how an innovative Finnish Holter ECG consultation service is organized and describes a research project that will examine the benefits of the service model compared to the traditional procedure. The differences and costs between a conventional clinical pathway to secondary care and a modified pathway where a telemedicine consultation service is in use at a primary care facility will be analyzed and compared. Also, differences in the time it takes to complete the pathways as well as other benefits will be studied.**

Introduction

In continuous ambulatory monitoring of a person's electrocardiogram, or Holter ECG, the electrical activity of the heart is recorded for a relatively long period of time, most often 24 hours. Electrodes that connect to the Holter monitoring device via lead cables are attached to the patient's chest and a recording device is carried around the waist. The device records the patient's electrocardiogram into a digital memory. The patient is encouraged to act and work normally during the monitoring period and to keep a diary of any symptoms and activities.

The Holter ECG method is useful in detecting rhythm disturbances, or arrhythmias, that are associated with a wide variety of symptoms¹. Individuals suffering from arrhythmias may experience palpitations such as skipped heartbeats or fluttering. Arrhythmias may also cause dizziness or fainting. Arrhythmias cover a variety of irregularities in the heartbeat ranging from non-symptomatic and harmless irregularities to life-threatening ones. A normal rest ECG is not always an effective way to examine certain arrhythmias, in particular those that are paroxysmal in nature because the arrhythmia might not manifest itself during the often quite short time the rest ECG is recorded for. Also, since Holter ECG allows for the patient to work

and act normally during the registration period of 24 hours it is possible to link the resulting ECG recording to activities and symptoms to compare their time of occurrence with possible events in the ECG curve.

In Finland, municipalities are required to finance and arrange for healthcare for their inhabitants. Primary care is provided by municipality health centers employing mainly general practitioners and nurses, and seldom any specialists. Therefore, when a general practitioner decides that a patient needs specialized care, he or she is usually referred to a larger secondary care sector hospital. Unfortunately, both the waiting times for referrals in the secondary care and the distances between municipalities and secondary care facilities can be very long.

In the telemedicine service concept featured in this study, a service operator equips a healthcare center with as many Holter ECG monitoring devices as they require without any investments from the center's part. A nurse sets the patient up with the monitoring device and sends the patient home. The next day the patient returns with the device. The nurse then uses a private internet portal to upload the monitoring data from the device along with anonymous patient information onto a remote server over a secure connection. The data is checked for accuracy by technicians and then put forward for specialist (a cardiologist specialized in arrhythmias) analysis. The specialist writes a report complete with treatment recommendations, which is then made available for download at the internet portal.

The service charges are based on the number of delivered reports. The service model provides hospital-level specialist consultations to primary care facilities and makes it possible to refer only the patients who actually need secondary care treatment. Furthermore, with this model the specialists making the consultation reports can put their expertise to a much wider use than normally.

In addition to Holter ECG the system includes ambulatory blood pressure monitoring and sleep apnea monitoring services. The service model is in use in 160 locations in Finland, Sweden and the United Kingdom. During 2011 12834 consultation reports were delivered, of which 7988 were Holter ECG reports.

Objectives

The purpose of this research project is to compare the overall costs of a traditional clinical pathway where patients are referred to secondary care for Holter ECG examinations with a modified pathway where a telemedicine

consultation service is in use at a primary care facility. The costs include for example patient's travelling costs, cost of nurse's work and costs of doctor's work. Also, the time it takes the patient to travel through the pathway will be analyzed.

Methodology

This study will be principally implemented by Laurea University of Applied Sciences. The study will be limited to the public sector municipality healthcare centers and hospitals.

The bulk of the research will be carried out using the quantitative descriptive analysis method. Also, qualitative interviews will be used to verify the presuppositions associated with the study and to support the quantitative analysis. Three different patient types were identified and selected as examples to illustrate the types of clinical pathways that are examined in this study:

Patient A: A history of fainting, no findings in auscultation or rest ECG.

Patient B: Subjectively difficult recurrent palpitations, no findings in auscultation or rest ECG.

Patient C: An elderly patient, history of episodic dizziness and slow heart rate.

The usual clinical pathways for these patient types as well as the modified pathways utilizing the telemedicine service will be carefully mapped and analyzed. The pathways will be followed from the moment the patients first come into contact with the healthcare system to the successful delivery of the specialist doctor's diagnosis based on a Holter ECG monitoring. The pathways will not be systematically followed after the Holter ECG monitoring in order to contain the study and to ensure applicability between different healthcare systems. The findings related to the two different types of pathways will then be compared to determine which is the most cost-effective and advantageous alternative.

A sample of several thousand patient cases from Remote Analysis Ltd's archives will be investigated and utilized in order to determine the average

distance a patient has to travel in Finland going through the traditional clinical pathway. This information will then be compared with statistics about the modified pathway. Also, for example the percentage of patients who do not have to be referred to secondary care will be examined.

Predicted results

The telemedicine service model is expected to offer significant cost savings compared to the traditional method of referring arrhythmia patients to the secondary care sector for Holter ECG and diagnosis. These savings will most likely be related to lower prices for Holter ECG and personnel costs in the primary care sector, as well as shorter travelling distances for the patients.

The preliminary results of this study will be presented at the 2012 Med-e-Tel conference in Luxembourg.

References

- [1] M. Crawford et al. American College of Cardiology/American Heart Association guidelines for ambulatory electrocardiography. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Revise the Guidelines for Ambulatory Electrocardiography), p. 888, 1999.

About the authors

Tuomas Harju, BBA, is the International Sales Manager of RemoteA Ltd, an export-oriented spinoff company of Remote Analysis Ltd. He has several years of experience in the practical applications of telemedicine consultation systems. He has collaborated with Remote Analysis Ltd since 2007.

Professor Lauri Toivonen works as Chief Physician in the Cardiac Arrhythmia Division of the Department of Cardiology in University Hospital, Helsinki, Finland. His scientific interest is focused on cardiac risk assessment, inherited cardiac arrhythmias and cardiac pharmacology. He has been the leading cardiologist in collaborative research program in Biomedical Engineering Laboratory in Helsinki University of Technology. Toivonen is the author of more than 200 original scientific articles. He has collaborated with Remote Analysis Ltd since 2005.