Personalized outcomes forecasts in supervised exercise therapy for patients with intermittent claudication

CHAPTER 8

Impact Paragraph

AIM

The purpose of this thesis was to personalize the physical therapy treatment for patients with intermittent claudication. Intermittent claudication is caused by atherosclerotic narrowing of the arteries in the lower extremities, which limits the blood supply to the muscles during movement.[1,2] As a result, patients experience discomfort and pain in the leg or hip muscles during walking, which resolves after a brief period of rest. National guidelines recommend supervised exercise therapy (SET) in combination with lifestyle guidance, provided by a physical therapist, as the primary treatment for this patient population.[1,2] This conservative treatment is aimed at cardiovascular risk reduction and symptom relief.[1]

In the Netherlands, 87% of all patients with intermittent claudication are referred for SET as initial treatment.[3] This successful implementation of the evidence-based guideline recommendations could be considered as optimal care. However, this guideline-based practice it is at risk of eliminating patient-centered care.[4] So, to make SET patient-centered, we developed and implemented a decision support system, named KomPas (Dutch for compass). KomPas utilizes personalized outcomes forecasts to provide insight into the expected outcome of SET for individual patients. The personalized outcomes forecasts were inspired on the well-established 'growth' charts for monitoring infant growth. However, rather than plotting the growth of a child against growth of all similarly aged children in the database, van Buuren et al (2014)[5] suggested to plot the growth of a child against growth of infants who are similar based on multiple parameters (e.g., age, sex, length, weight and head circumference). Van Buuren showed that these personalized growth charts result in a more accurate prediction of a child's growth over time. We have adopted this technique to develop the personalized outcomes forecasts to accommodate physical therapists in their treatment of patients with intermittent claudication. Thus, for every new patient, similar patients are selected from a large database, based on specific patient characteristics. The actual outcome data of these similar patients are then used, anonymously, to create the individual outcomes forecast.

Results of this thesis showed that the personalized outcomes forecasts of KomPas provided an accurate insight into the expected outcome of therapy. Furthermore, the first use of KomPas by physical therapists in real world situations, showcased its different opportunities. KomPas was found to be useful to explain prognosed treatment outcomes, and to inform patients on the treatment plan, based on these outcomes. Furthermore,

using KomPas facilitated therapists in motivating patients and setting realistic treatment goals. Both real-world test sessions and scientific studies resulted in the improvement of KomPas. Currently, KomPas has been implemented nationally. As data about its effectiveness are still being gathered, we have not yet been able to examine its definitive impact nationwide. However, based on our experience with participating physical therapists, we believe that the implementation of KomPas in daily practice is a major step forwards towards personalized care for patients with intermittent claudication.

POPULATION

KomPas has been developed specifically to be used by physical therapist treating patients with intermittent claudication. SET for patients with intermittent claudication has already proven to be effective and has been successfully implemented as primary treatment in the Netherlands through the network of ClaudicatioNet.[3] ClaudicatioNet was a nationwide network of specialized physical therapist treating this patient population. This network provided the necessary elements to develop and implement KomPas. The first requirement for the development of KomPas was data of sufficient amount and quality. These data were gathered through the ClaudicatioNet Quality system: a data registry where routinely collected data from daily practice were gathered (e.g. patient characteristics, outcome results). As a result of the KomPas project, the existing ClaudicatioNet data infrastructure evolved into an infrastructure which adheres to the principles of a learning health system. A learning health system uses health data in cyclic processes.[6] These processes aim to convert data into knowledge, apply this knowledge into practice, and collect new data from the changed practice.

In the past decades, we learned that physical therapy is valuable in treating other chronic diseases besides intermittent claudication.[7] Physical activity and a healthy behavioral patterns are found to improve health in general and reduce the risk of morbidity and mortality. In the Netherlands, SET has been made available through the network of Chronic CareNet for all patients with chronic diseases for whom physical therapy is indicated. Chronic CareNet evolved from ClaudicatioNet. This is a network of physical therapists specialized in treating not only patients with intermittent claudication, but also patients with other chronic diseases (e.g. chronic obstructive pulmonary disease (COPD) and heart failure). Personalized physical therapy is relevant to all patients suffering from chronic conditions.[7,8] Therefore, the personalized outcomes forecasts methodology has great potential to be employed in the physical therapy of these other patient populations.

To achieve this, the used methods and lessons learned from the development and implementation of KomPas could serve as blueprint. The first steps – obtaining sufficient quality data – in the development of personalized outcomes forecasts for other chronic conditions, are already being taken. With ClaudicatioNet evolving into Chronic CareNet, the data registry expanded. In the Chronic CareNet Quality system data is gathered on all patients treated by Chronic CareNet physical therapists.

RELEVANCE

Intermittent claudication is the most common symptomatic presentation of peripheral arterial disease (PAD). PAD is a chronic disease caused by atherosclerotic narrowing of the arteries which affects over 200 million people worldwide. This number will increase as the population ages, and the presence of risk factors for PAD (e.g. diabetes mellitus, smoking, chronic kidney disease, hypertension, hyperlipidemia, positive family history) grows.[1,2] PAD, and consequently intermittent claudication, are growing problems worldwide, which warrants continuously optimizing SET.

SET is recommended in treatment guidelines that are based on population research. Population based research provides answers generalizable to the complete patient population. However, these answers are not necessarily applicable to the individual patient.[4] Furthermore, the current guidelines are based on a single condition, while multimorbidity is becoming increasingly common in patients with intermittent claudication. Ideally, guideline recommendations should be individualized and applied to the context of the patient. To make SET more patient-centered, several approaches have been proposed: 1) implementing shared decision-making[9], 2) integrating monitoring tools in daily practice[10,11], and 3) employing the principles of a learning health system.[6,12] We believe that our personalized outcomes forecasts could be valuable to support physical therapist in utilizing these three approaches to personalize physical therapy care. The outcomes forecasts could assist therapists to make individualized clinical decisions by closely monitoring therapy progression and comparing actual outcomes to predicted outcomes.[13]

IMPLEMENTATION/INNOVATION

To make the personalized outcomes forecasts generated by KomPas easily accessible and interpretable, they were embedded in an online tool. The reference charts produced by

KomPas include 1) the estimated outcome of the individual patient, 2) the actual outcome data from similar patients and 3) an uncertainty range. In the Netherlands, KomPas is implemented into daily practice through an interrupted time series study. This means that the KomPas was implemented over time in four clusters at equal intervals of one month. We defined implementation as the availability of KomPas for therapists to use in daily practice. Implementation was accompanied by various online trainings to support physical therapist in understanding and using KomPas. At the time of writing, more than 1200 therapists have used the personalized outcomes forecasts and almost 5700 individual outcomes estimates have been made. The implementation process has provided us with valuable lessons for future initiatives to develop and implement such personalized outcomes forecast for other patient populations.

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