Costs of Real-Life Endovascular Treatment of Critical Limb Ischemia: Report from Poland—A European Union Country with a Low-Budget Health Care System

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Background: To analyze the costs of inhospital, percutaneous treatment of patients with critical limb ischemia (CLI) carried out in Poland, a European Union country with a low-budget national health system.
Methods: A retrospective analysis of prospectively collected data on all patients admitted to a tertiary care hospital for endovascular treatment of CLI over 1 year.
Setting: A single, large volume, tertiary angiology center located in Southern Poland.
Participants: CLI patients due to aortoiliac, femoropopliteal, or infrapopliteal arterial stenoses or occlusions with indications for first-line endovascular therapy or similar patients who refused open surgical procedure despite having primary indications for vascular surgery.
Interventions: Direct stenting using bare-metal stents was the primary mode of treatment for lesions located within the aortoiliac and femoropopliteal arterial segments. Plain old balloon angioplasty (POBA) was the second most commonly used technique. For below-the-knee arteries, POBA was the mainstay of treatment, which was occasionally supported by drug-eluting stent angioplasty. Directional atherectomy, scoring balloon angioplasty, or local fibrinolysis was used infrequently. Drug-eluting balloon percutaneous transluminal angioplasty was not used.
Main Outcome Measures: The main outcome measures were the mean reimbursement of costs provided by the Polish National Health Fund (NHF) for inhospital treatment of patients for whom endovascular procedures were performed as initial treatment for CLI and the inhospital costs of endovascular treatment calculated by the caregiver in the 2 years since the first procedure. The average total number of days spent in hospital, amputation-free survival (AFS), overall survival (OS), and limb salvage rate (LSR) according to a life-table method were also calculated for the 2 years.
Results: In the first year, there were 496 endovascular and 15 surgical hospitalizations for revascularization procedures to treat 340 limbs in 327 patients, with a further 53 revascularization procedures in the second year. There were an additional 90 hospitalizations over the first year and 38 over the second year for CLI-associated cardiovascular comorbidities. The mean reimbursement for hospitalizations of patients included into observation, provided by the NHF, was $4901.94 per patient for the first year and $833.57 per patient alive to the second year. The mean cost of hospitalization for percutaneous revascularization treatment was $3804.25 per patient for the first year and $3340.30 per patient requiring revascularization within the second year. All costs were calculated in constant 2011 USD. The average total number of days

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spent in hospital was 8.4 days for the first year and 1.97 days per patient alive to the second year. At 1 and 2 years, the AFS was 76.8% and 66.6%, the OS was 86.5% and 77.3%, and the LSR was 89.4% and 86%, respectively.

Conclusions: Endovascular therapy using the currently available techniques can be performed in almost all patients suffering from CLI at relatively low costs, and satisfactory results can be obtained. Physicians play a pivotal role in ensuring quality of treatment and the reduction of treatment cost in these patients.

INTRODUCTION

Peripheral arterial occlusive disease (PAOD) has become a global problem. An estimated 202 million people were living with PAOD in 2010. In the past decade, a 13.1% increase in the prevalence of PAOD in high-income countries and a 28.7% increase in other countries were also noted.[1] Critical limb ischemia, the most advanced form of PAOD, is defined according to the Trans-Atlantic Inter-Society Consensus (TASC) II as chronic ischemic rest pain or nonhealing ischemic lesions (wound or gangrene) of the lower extremity with symptoms lasting for more than 2 weeks and an ankle systolic blood pressure of $\leq$50 mm Hg and/or toe systolic blood pressure of $\leq$30 mm Hg.[2] Critical limb ischemia (CLI) is associated with a high risk of cardiovascular events including acute coronary syndrome, stroke, major amputation, and death. As a result, the treatments for these complications have significant economic consequences.

A dynamic rise of expenditure in the health care sector is a major concern for every country. For example, the Patient Protection and Affordable Care Act sanctioned in 2010 by the United States was in concert with the implementation of other initiatives to ''bend the curve'' of the rising health care costs in the country. Similar concerns regarding the issue and measures to address them are certainly greater in countries with moderate gross domestic product (GDP) such as Poland. With a total health expenditure per capita of 1391 US Dollar (USD or $), which is 7.4% of its GDP, Poland—a country that ranks 47th in the world statistics of health care expenditure by the World Health Organization[3]—struggles to maintain a high-quality care using fewer resources than other leading countries.

On the other hand, the optimal treatment of CLI is yet to be defined. There are many controversies concerning the most advantageous treatment method (revascularization or conservative treatment), the modality of revascularization, and the extent of revascularization in a patient.[4,5] Although open bypass surgery has traditionally been considered as the optimal treatment, percutaneous endovascular revascularization is becoming increasingly popular. It is gradually replacing the classic vascular surgery[6–9] and is emerging as the treatment of choice for CLI in many countries. Therefore, the estimation of risks and efficacy of these treatment modalities and the assessment of resource utilization to determine their cost effectiveness are of paramount importance for those in the health care planning sector.

The Aim of the Article

The aim of the article is to provide a single-center data on long-term expenditure related to inhospital treatment of patients admitted for percutaneous therapy as an initial intervention in CLI.

METHODS

Setting

The observation was conducted in the Department of Angiology of Jagiellonian University Medical College in Kraków, Poland. The department is a tertiary angiology center and the largest provider of peripheral arterial endovascular therapy in the Małopolska region of Poland, serving a population of approximately 3.3 million inhabitants. Annually, about 1300 peripheral endovascular procedures are performed in the department (which constitute over 60% of all similar procedures carried out in the region), mostly for the treatment of PAOD (stages 2–6 of the Rutherford symptom classification of lower extremity chronic ischemia[10]). The treatment details of patients admitted to the department have been entered prospectively throughout the study period into a specific database called the Małopolska Endovascular Registry.[11]

Data Collection, Costs of Care, and Use of Hospital Resources

Throughout this article, the financial payments from the Polish National Health Fund (NHF) for inhospital treatment of study patients are referred to as *reimbursements*, whereas the hospital expenditure for endovascular treatment of CLI among these patients are referred to as *costs*.