

# Lipid Management After First Diagnosis of Coronary Artery Disease: Contemporary Results From an Observational Cohort Study

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## ABSTRACT

**Purpose:** Although the efficacy of lipid-lowering medication (LLM) in patients with coronary artery disease (CAD) is well established, the majority of patients fail to achieve their LDL-C goals. The evidence for measurement of LDL-C to achieve these goals is limited. The goal of the present study, therefore, was to analyze ambulatory LLM management in relation to performance of LDL-C measurements and achieved LDL-C levels after the initial diagnosis of CAD.

**Methods:** The study followed up a subcohort of 200 patients with newly diagnosed CAD of the INTERCATH trial, an observational study including patients undergoing coronary angiography. In addition to baseline information, data were collected on LLM, performance of lipid measurements, and laboratory results at a minimum of 6 months' postdischarge.

**Findings:** The mean age of the sample was 67.9 years, and 36.0% were women. In 34.5% of all patients, no measurement of LDL-C levels was performed during follow-up. We found no differences in baseline characteristics between patients with and without LDL-C measurements during follow-up. In patients with measurement of LDL-C levels, the frequency of intensification of statin medication according to LDL-C reduction was higher compared with those patients without LDL-C measurement

(23.6% vs 4.3%;  $P < 0.001$ ); all other categories of intensity adjustment were comparable. In patients with 3 LDL-C measurements, achieved LDL-C levels were significantly lower (mean, 81 mg/dL), and a higher proportion reached an LDL-C level  $<70$  mg/dL (44.7%) compared with patients with 1 (95 mg/dL [ $P = 0.013$ ]; 21.8%) or 2 (91 mg/dL [ $P = 0.037$ ]; 28.9%) LDL-C measurements despite comparable LDL-C levels at baseline. Ezetimibe was used in 3.5% of the entire study cohort.

**Implications:** We found no differences in patient characteristics between patients with and without LDL-C measurements after being newly diagnosed with CAD. Performance and frequency of LDL-C measurements were clearly associated with better, higher frequency of intensification of statin medication, lower achieved LDL-C levels, and a higher proportion of patients achieving the LDL-C goal of  $<70$  mg/dL. These results suggest an important role of LDL-C measurements for secondary prevention after the initial diagnosis of CAD. (*Clin Ther.* 2017;■:■■■-■■■) © 2017 Elsevier HS Journals, Inc. All rights reserved.

**Key words:** coronary artery disease, LDL-C, lipid-lowering medication, secondary prevention, statin.

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## INTRODUCTION

During the past decades, numerous studies have reported the efficacy of statins in lowering mortality and morbidity in patients with coronary artery disease (CAD).<sup>1,2</sup> Despite increasing evidence for reduction of LDL-C by statins and the development of more potent drugs in this class, the vast majority of patients with CAD do not achieve the recommended LDL-C goal.<sup>3,4</sup> Considering the distribution of LDL-C levels in patients with CAD, the possible LDL-C reduction of modern statins, and the relatively low prevalence of nonresponders or intolerance to statins, one would expect a far higher rate of patients with CAD reaching an LDL-C goal of <70 mg/dL with statin therapy.<sup>5-8</sup> Reasons for this discrepancy are various and the focus of an ongoing debate. Although adherence to preventive medications, particularly statins, is suboptimal in a relevant proportion of patients with CAD, physicians might be reluctant or sometimes not diligent enough to up-titrate the statin intensity to a more effective level.<sup>9-11</sup>

Establishment of a powerful lipid-lowering medication (LLM) mainly follows 2 strategies. Although the American Heart Association/American College of Cardiology guidelines are based on the “fire-and-forget” approach recommending the most intensive tolerable statin medication irrespective of LDL-C targets, the European Society of Cardiology (ESC) guidelines follow the “treat-to-target” strategy with intensity up-titration of LLM aiming to achieve an LDL-C level <70 mg/dL in patients with an established diagnosis of CAD.<sup>12,13</sup> An important part of the latter strategy is the measurement of LDL-C levels with consecutive intensity adjustment, in particular in the first phase of statin treatment. However, evidence supporting such an algorithm is lacking, and the ESC guidelines assign a level of evidence C to measurement intervals of LDL-C levels.<sup>5,12</sup> Large-scale registry data focus on adjustment of statin medication and achievement of LDL-C goals but do not consider the performance of LDL-C measurements.<sup>3</sup> The goal of the present study, therefore, was to elucidate the following aspects of ambulatory LLM management in relation to measurement of LDL-C levels after newly diagnosed CAD: (1) Are there patient characteristics influencing the management of dyslipidemia in the setting of secondary prevention? (2) Is the performance or frequency of LDL-C measurements associated with a higher rate of

LLM intensification or better achievement of LDL-C levels?

## PATIENTS AND METHODS

The INTERCATH study is an ongoing observational study at the University Heart Center Hamburg. Since 2015, it has enrolled patients undergoing coronary angiography. The patients’ medical history, including comorbidities and medication, is assessed by self-report and patient charts. Lifestyle and socioeconomic information such as education are surveyed by using standardized questionnaires. The coronary angiogram is analyzed by experienced cardiologists.

The total INTERCATH cohort consists of 3 subcohorts: (1) patients with preexisting CAD; (2) patients without CAD according to the coronary angiogram; and (3) patients without previously known CAD but initial diagnosis of CAD at inclusion. For the present study, the first 200 consecutive patients of the latter subcohort with an initial diagnosis of CAD at enrollment according to the coronary angiogram were included.

The study protocol of the INTERCATH study was approved by the local ethics committee. Each patient provided written informed consent.

## Exclusion Criteria

All patients aged <18 years or physically or mentally incapable of providing written informed consent or patients without sufficient knowledge of the German language were not considered for inclusion. Furthermore, all patients with cardiogenic shock, life-threatening arrhythmias, or other hemodynamic instability were not included. All patients with known active malignancies were excluded from the present study.

## Cardiovascular Risk Factor Assessment

Patients taking antihypertensive medication or with arterial hypertension documented as a diagnosis in a written medical report were classified as having arterial hypertension. A patient was defined as having diabetes mellitus in the case of intake of oral blood glucose-lowering therapy, regular substitution of insulin, a glycosylated hemoglobin level >6.5%, or documented diabetes in a written medical report. Smoking was defined as current or former smoking. The body mass index was calculated as weight in

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