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Retrospective Analysis of Lipid-Lowering and Antiplatelet Therapy Regimen by Clinical Decision Support Service Based on Real-World Data from Electronic Medical Records "Intellect 3 Study"

Aim	To evaluate prescription of lipid-lowering and antithrombotic therapy in clinical practice and to compare differences in recommendations using the clinical decision support service (CDSS).
Material and methods	Electronic medical records (EMR) of 300 patients from the Chazov National Medical Research Center of Cardiology, as well as from medical organizations controlled by the Department of Health of the Lipetsk Region and the Ministry of Health of the Voronezh Region, were analyzed for the period of August – December 2022, during the pilot implementation of CDSS. Retrospective information about the prescription of lipid-lowering and antithrombotic therapy from the EMR was compared with the CDSS guidelines under the expert supervision based on digitized clinical and laboratory profiles of patients. The study primary endpoint was a change in the initially prescribed lipid-lowering and/or antithrombotic therapy as per CDSS guidelines.
Results	Overall 292 patients were included in the final analysis; 46 (15.7%) were from the primary prevention group and 246 (84.3%) from the secondary prevention group. In group 1, the lipid-lowering therapy recommended by the CDSS differed by 50% ($p<0.001$) from the baseline therapy recorded in the EMR. In the secondary prevention group, 78.9% ($p<0.001$) differences were found in the lipid-lowering therapy recommended in the CDSS guidelines compared to the prescriptions in the EMR. In 76.8% ($p<0.001$) of patients, antithrombotic therapy was significantly different from the baseline therapy in the EMR.
Conclusion	The use of CDSS may improve the practice of choosing lipid-lowering and antithrombotic therapy for prevention of cardiovascular complications.

Keywords	Cinical decision support service; antithrombotic therapy; lipid-lowering therapy; clinical guidelines; ischemic heart disease; secondary prevention; low-density lipoprotein cholesterol
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Introduction

Mortality from circulatory diseases accounts to almost 50% of the total mortality in our country; 83% of circulatory disease mortality is associated with atherosclerosis [1]. More than 50% of the adult Russian population have elevated total cholesterol levels [2], one in every four individuals has hypertriglyceridemia [3], one in every five people has elevated lipoprotein levels (a) [4]. Moreover, lipid-lowering therapy (LLT) is ineffective, including in secondary prevention, as evidenced by the extremely low

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percentage of achieving the target levels of LDL cholesterol during therapy [5].

Antithrombotic therapy (ATT) is an integral part of CAD patients management aimed at improving prognosis and preventing cardiovascular complications. Determining the best-possible treatment strategy, especially during brief patient visits to cardiologists or internists, is challenging due to numerous recommendations and theses regarding the combinations and duration of ATT combined with a number of possible ischemic and hemorrhagic profiles [6–8]. This problem is aggravated by the availability of a large number of various ischemic/hemorrhagic complication risk calculators, which in some cases are used specifically within the framework of a certain clinical recommendation [9]. Various tools are being actively developed to assist in making the best-possible decisions in compliance with the clinical guidelines. These include clinical decision support services (CDSS), which allow assessing epidemiological and other analytical patient data in clinical setting in addition to providing personalized recommendations for treatment and further examination. Such databases may contain such a number of parameters that can be classified as big data. In Russia, CDSSs are being developed and actively implemented in clinical practice in various fields of medicine, which make it possible to improve the quality of medical care for the population and reduce health expenditure [10]. Modern decision-making systems have been proven effective in several Russian and foreign studies [11–14].

Objective

Compare the compliance with the clinical guidelines of decisions made regarding ordering LLT and ATT by the CDSS based on the analysis of electronic medical records (EMRs) of patients with cardiovascular diseases or corresponding risk factors, and decisions made by physicians in the clinical setting.

Material and methods

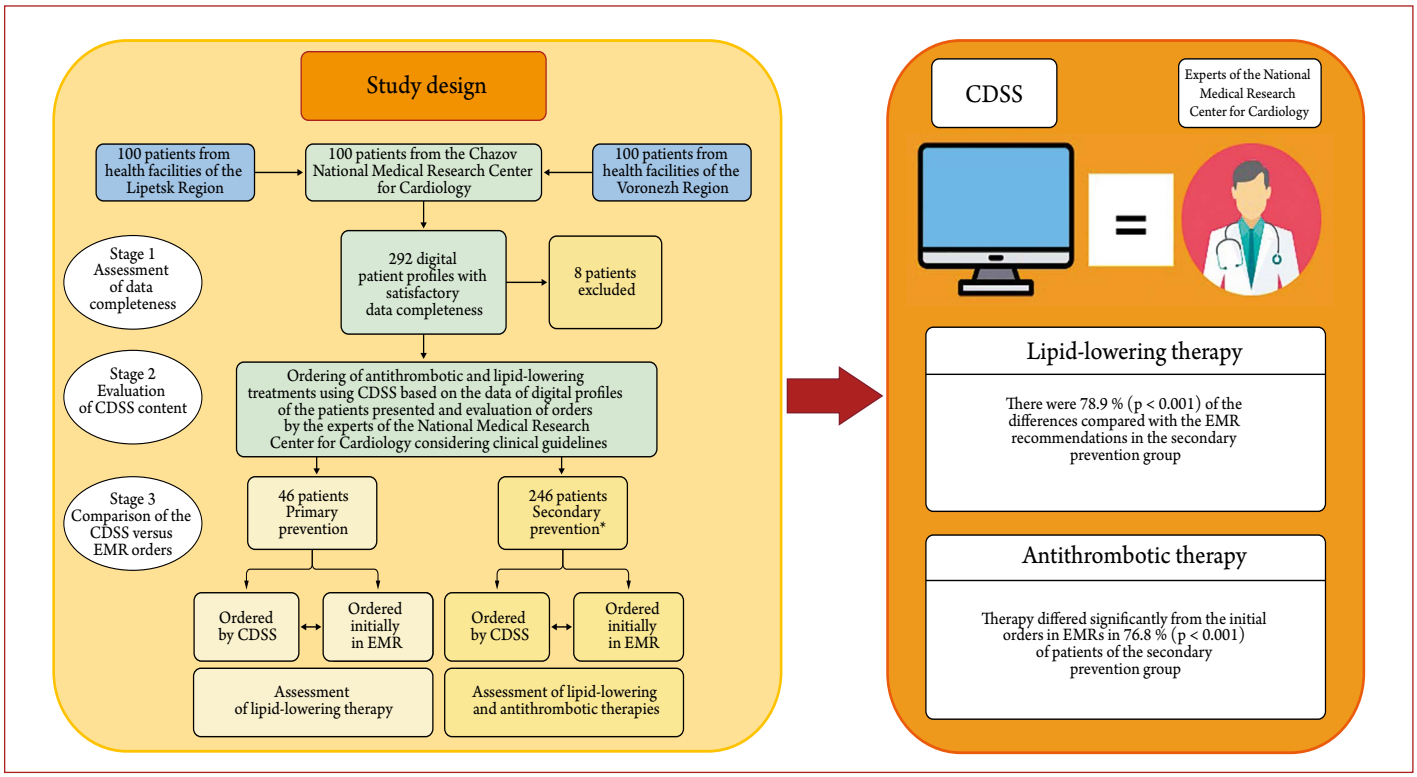
In the INTELLECT-3 study, a retrospective analysis of EMR data obtained within the pilot implementation of CDSS (https://medicbk.com/ru, version 3.1.0, OOO Medikbuk) in the Chazov National Medical Research Center for Cardiology and medical facilities of the Lipetsk and Voronezh regions from August to December 2022. The CDSS functions have been described in detail in previous publications and the manufacturer's website [14, 15]. A total of 265,789 electronic medical documents (medical examinations, discharge summaries, results of laboratory tests and clinical examinations, etc.) were analyzed using the CDSS during the integration period, which corresponded to 63,886 patients with circulatory diseases, including outpatient and inpatient medical care. The final sample randomly included 300 EMRs from the totality of all uploaded data: 100 EMRs from each of the specified medical facilities. The EMR sample inclusion criteria were the presence of diagnoses according to the 10th revision of the International Classification of Diseases (ICD) I20, I21, I22, I25 and the presence of diagnoses of the ICD codes I10, I11, I12, I13, I48, E78 with an assessment of the risk of cardiovascular complications following the clinical guidelines for the management of patients with lipid metabolism disorders and ATT of stable CAD and acute coronary syndrome (ACS) [6, 16–18].

The first step was to create digital patient profiles using the CDSS based on the EMR analysis and provide access in the CDSS to expert cardiologists in order to assess the quality of the original clinical data for making decisions on ordering LLT and ATT. After the assessment of the data completeness for decision-making, 8 patients were excluded from the analysis due to the lack of biochemical test results that could affect the strategy of choosing treatment and did not allow properly assessing the quality of the CDSS decision (no creatinine and LDL cholesterol values in the EMR).

As the second step, LLT and ATT were ordered using the CDSS based on the impersonal digital patient profiles from the EMR data, with blinding of the data on the originally ordered therapy. To validate the content, digital profiles, and conclusions for 292 patients with the results if clinical examinations and laboratory tests were provided to ten expert cardiologists of the Chazov National Medical Research Center for Cardiology. The CDSS automatically formulated recommendations for ordering treatment for each patient using an integrated algorithm based on clinical guidelines [6, 16–18]. The experts accepted or rejected the CDSS recommendations to fit the particular clinical situation. Cases of discrepancies between the CDSS recommendations and treatments recommended by the experts were subjected to further analysis.

As the third step, 292 patients were divided into groups of primary prevention (n=46; 15.7%) and secondary prevention (n=246; 84%) based on the absence or presence of cardiovascular complications (myocardial infarction (MI), acute coronary syndrome (ACS), cerebrovascular accident (CVA), percutaneous intervention (PCI), and CABG (coronary artery bypass surgery), respectively. LLT was evaluated in both groups, and ATT ordered for the secondary prevention of cardiovascular complications was evaluated in Group 2, followed by a comparative analysis of differences in drugs, combinations, and dosages ordered using the CDSS and initially in EMR. The study design is shown in Central figure.

Central illustration. Retrospective Analysis of Lipid-Lowering and Antiplatelet Therapy Regimen by Clinical Decision Support Service Based on Real-World Data from Electronic Medical Records "Intellect 3 Study"



CDSS, clinical decision support service; EMR, electronic medical record.
* Criteria for signs of secondary prevention, the presence of MI, ACS, CVA, PCI, CABG.

Statistical analysis

The estimated sample size was at least 300 patients given the expected change of therapy in more than 50% of patients at 80% power [14]. This number of EMRs of the unique patients was included in the study. The critical significance level was p=0.05. The Student's t-test, Fisher's z-test, and Pearson's chi-squared test were used for the comparisons in the primary and secondary prevention groups. A single proportion Z-test was used to compare the proportions of patients receiving different treatments ordered initially in EMRs and using the CDSS. The main patient characteristics are described using standard indicators-means, standard deviations, absolute numbers, percentages. Statistical software R 4.3.0 (tidyverse 2.0.0 library) was used for the calculations.

Results

Analysis of the main EMR characteristics

The study included 292 patients, of whom 46 (16.3%) patients without history of cardiovascular complications were included in the primary prevention group, and 246 (83.7%) patients with history of cardiovascular complications made up the secondary prevention group. Detailed characteristics of patients are provided by groups in Table 1.

Analysis of the assessment of the CDSS recommendations by the experts

The first step before comparing the CDSS recommendations with initially ordered therapy in the EMR was the assessment of the CDSS recommended for LLT and ATT by the experts of the National Medical Research Center for Cardiology. LLT recommended by the CDSS coincided with the expert opinion in 268 cases of 277 orders made using the CDSS (p=0.14). In 9 cases, different expert opinions were due to the absence of an increase in LDL cholesterol levels of more than 1.4 mmol/L and no LLT ordered, especially in older patients. In those situations, the CDSS recommended low-intensity statin therapy, which does not contradict current clinical guidelines and confirms the physician's role in making the final decision on treatment strategy. The experts agreed in 5 cases with the identified contraindications to LLT in patients with liver malfunction. ATT recommended by the CDSS in 245 cases was confirmed by experts in 239 patients (p=0.6). Due to unknown date of the index event, the experts proposed in 6 cases to extend the dual therapy in contrast to the CDSS recommendations. Thus, due to the coincidence of the expert opinions with the CDSS recommendations in more than 90% of cases and the lack of statistical significance in the proportion of treatment orders made by the experts and according to the CDSS

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recommendations, further analysis was carried out taking into account the CDSS recommendations confirmed by the expert opinion.

Analysis of lipid-lowering therapy in the primary prevention group

In the primary prevention group, the EMRs of 43 (93%) of 46 patients contained data on LDL cholesterol levels. LDL cholesterol less than 1.8 mmol/L was registered in 4 (80%) patients at high risk, and the target range of LDL cholesterol less than 1.4 mmol/L was registered in 10 (28.5%) patients at very high risk. Statin therapy was found in the EMRs of 37 (80.4%) patients, and the CDSS recommendation to order statins was found for 36 (78.2%) patients to whom therapy was indicated, and among them, 7 patients had not previously received the treatment. Ten patients had no indications for ordering the therapy due to normal LDL cholesterol levels and recommendations for lifestyle correction. Generally, the significant differences in choosing therapy using the CDSS versus initial orders in EMRs accounted to 50% (p<0.001). When assessing the differences between the recommendations for statin monotherapy and the ezetimibe/fenofibrate combination, statin therapy was identified in 36 patients and the ezetimibe/statin combination-in one patient. At the same time, the CDSS recommended statin monotherapy for 28 patients and combination therapy with ezetimibe or fenofibrate for 7 patients, which differed from the initial orders in the EMR. There were no statistically significant differences in the number of drug changes (Table 2).

The comparison of the differences in statin dosages showed a trend to higher doses of lipid-lowering therapy with atorvastatin (p=0.083; Figure 1).

Analysis of lipid-lowering therapy in the secondary prevention group

In the secondary prevention group, 234 (95%) of the 246 patients with history of cardiovascular complications documented in the EMRs had data on the LDL cholesterol levels. LDL cholesterol above the target value (1.4 mmol/L) was found in 190 (81.1%) patients. No therapy was found in 100 (41%) EMRs, and those cases were considered as a lack of treatment order. In the secondary prevention group, there were 78.9% (p<0.001) differences in the recommendations for lipid-lowering therapy made by the CDSS compared with the EMR orders. At the same time, statins were discontinued by the CDSS in 5 cases due to the presence of absolute and relative contraindications, and statin therapy was ordered for the first time in 83 cases. The CDSS recommended a combination of drugs for

Table 1. Main characteristics of the examined patients depending on the presence or absence of cardiovascular complications

Parameter	Total (n=292)	Primary prevention (n=46)	Secondary prevention (n=246)	p
Age, years	63.6±10.5	67.6±10.1	62.8±10.5	<0.001
Sex (male), n (%)	198 (68)	17 (37)	181 (74)	<0.001
Height, cm	171.0±9.0	166.8±9.5	171.8±8.7	<0.001
Weight, kg	85.5±15.6	89.5±20.6	84.8±14.5	0.3
Cardiovascular risk, n (%)				
• Low	2 (0.7)	2 (4.4)	-	<0.001
• Moderate	4 (1.4)	4 (8.7)	-	–
• High	5 (1.7)	5 (10.9)	-	–
• Very high	281 (96.2)	35 (76.1)	246 (100)	–
History of MI, n (%)	200 (68)	-	200 (81)	–
History of CVA, n (%)	61 (21)	-	61 (24)	–
NSTE-ACS, n (%)	28 (10)	-	28 (11)	–
STE-ACS, n (%)	22 (8)	-	22 (9)	–
ACS unspecified, n (%)	11 (4)	-	13 (5)	–
PCI, n (%)	193 (66)	-	193 (78)	–
CABG, n (%)	38 (13)	-	38 (15)	–
Ischemic stroke, n (%)	36 (12)	-	36 (15)	–
Diabetes mellitus type 2, n (%)	74 (25)	12 (26)	62 (25)	0.9
Atrial fibrillation, n (%)	68 (23)	12 (26)	56 (23)	0.6
CKD (GFR <60 mL/min/1.73 m^2), n (%)	110 (38)	16 (35)	94 (38)	0.7
EF less than 40 %, n (%)	37 (13)	1 (2)	36 (15)	0.027
Total cholesterol, mmol/L	4.4±1.3	5.2±1.3	4.3±1.2	<0.001
LDL cholesterol, mmol/L	2.4±1.2	2.6±1.5	2.4±1.2	0.8
Triglycerides, mmol/L	1.6±1.1	1.7±1.4	1.6±1.0	0.6

Table 2. Comparison of lipid-lowering treatments identified in EMRs and ordered using CDSS in patients in the primary prevention group

Parameter	Ordered using CDSS	Ordered initially in EMR	p	Matching CDSS/EMR orders
Monotherapy. Statin	28	36	0.07	21
Statin + ezetimibe	6	1	< 0.05	0
Statin + fenofibrate	1	0	0.3	0
Monotherapy. Ezetimibe	1	0	0.3	0

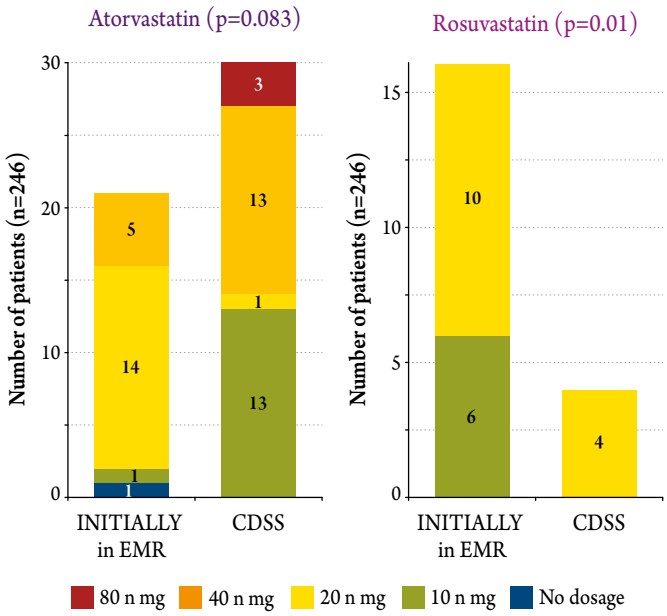
EMR, electronic medical record; CDSS, clinical decision support service.

Table 3. Secondary prevention. Lipid-lowering therapy

Parameter	Ordered using CDSS	Ordered initially in EMR	p	Matching CDSS/EMR orders
Monotherapy. Statin	179	134	< 0.001	96
Statin + ezetimibe	45	10	< 0.001	2
Fenofibrate + statin	3	1	0.3	0
Monotherapy. Fenofibrate	2	1	0.6	0
Monotherapy. Ezetimibe	2	0	0.2	0

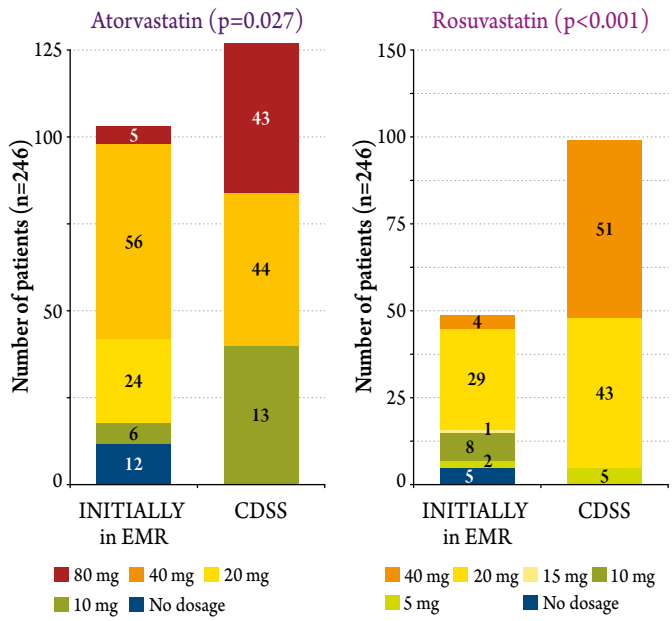
EMR, electronic medical record; CDSS, clinical decision support service.

Figure 1. Comparison of atorvastatin and rosuvastatin dosages in EMR and CDSS in the primary prevention arm



EMR, electronic medical record; CDSS, clinical decision support service.

Figure 2. Comparison of atorvastatin and rosuvastatin dosages in EMR and CDSS in the secondary prevention arm



EMR, electronic medical record; CDSS, clinical decision support service.

48 patients, in contrast to the 11 orders in the initial EMRs (Table 3).

The number of differences in statin dosages also differed significantly from the trend in the CDSS recommendations for high doses when ordering both rosuvastatin (p<0.001) and atorvastatin (p=0.027) compared to the initial EMR data (Figure 2).

Analysis of antithrombotic therapy in the secondary prevention group

In the secondary prevention group, the data of 246 patients with history of cardiovascular complications documented in the EMRs were analyzed. The CDSS did not detect ATT in 87 (37%) patients, which was considered a lack of orders. When comparing the ATT

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Table 4. Secondary prevention. Antithrombotic therapy

Parameter	Ordered using CDSS	Ordered initially in EMR	p	Matching CDSS/EMR orders
ASA	189	117	< 0.001	106
Ticagrelor 90 mg	40	62	< 0.05	23
OACs	56	23	< 0.001	16
Clopidogrel	12	39	< 0.001	4
Ticagrelor 60 mg	22	5	< 0.001	3
Rivaroxaban 2.5 mg	15	0	< 0.001	0

ASA, acetylsalicylic acid; OAC, oral anticoagulant; EMR, electronic medical record; CDSS, clinical decision support system.

Table 5. Secondary prevention. Antithrombotic therapy in acute coronary syndrome

Parameter	Ordered using CDSS	Ordered initially in EMR	p	Matching CDSS/EMR orders
ASA	50	39	< 0.05	33
Ticagrelor	40	29	< 0.05	23
OACs	11	7	< 0.001	7
Clopidogrel	12	16	0.4	4

ASA, acetylsalicylic acid; OAC, oral anticoagulant; EMR, electronic medical record; CDSS, clinical decision support system.

detected initially in the EMRs and recommended by the CDSS, therapy differed significantly in 76% (p<0.001) of patients and was prescribed in 86 cases for the first time.

Recommendations for P2Y12 inhibitors also differed from the initial therapy in EMRs, but unlike the recommendations for ASA and OACs, which the CDSS recommended more often, clopidogrel was prescribed 3 times less often than in the CDSS, and ticagrelor was recommended 4 times more often than initially in the EMRs (Table 4). This difference is due to the excessive ordering of dual ATT in patients one year after the event.

Less than one-year history of ACS was registered in 61 patients in the secondary prevention group. In this group of patients, P2Y12 inhibitors were ordered as follows: clopidogrel orders coincided in 4 patients, the CDSS recommended ticagrelor instead of clopidogrel in 10 cases, and therapy that had not been previously identified was recommended in 2 cases, clopidogrel was recommended in combination with an OAC for the first time for 8 patients. Orders of ticagrelor coincided in 23 patients, and the drug was recommended by the CDSS once again or instead of clopidogrel in 17 cases (Table 5).

The CDSS identified 37 patients with medium and high risk of ischemic complications in the secondary prevention group, for whom long-term dual ATT was recommended. Only 3 patients were treated with ticagrelor 60 mg initially according to the EMRs, which coincided with the CDSS recommendations; ticagrelor 60 mg and rivaroxaban 2.5 mg in combination with ASA was recommended by the CDSS in 22 and 15 cases, respectively (Table 4).

Discussion

This study demonstrates the relevance of using the CDSS in the routine clinical practice when prescribing the best-possible strategy of LLT and ATT for the primary and secondary prevention of cardiovascular complications. The comparison of the initial orders in the EMRs with the therapy recommended by the CDSS revealed differences in the strategy as a whole and higher number of patients with combination and high-dose LLT in the secondary prevention group. The use of CDSS is comparable to the expert-level selection of treatment strategy, which is confirmed by the coincidence of opinions in more than 90% of decision-making cases.

Lipid-lowering therapy

The analysis of the prescribed LLT structure showed a beneficial extra effect of the CDSS: the use of a personalized approach with the analysis of the benefit/risk ratio was characterized by the preferred administration of atorvastatin [19]. At the same time, atorvastatin and rosuvastatin were ordered in the EMRs approximately equally often in the clinical setting. Thus, the CDSS tends to recommend combination therapy and atorvastatin more often, which can lead to the achievement of target LDL cholesterol levels in more patients than in the real-world clinical setting.

The use of CDSS in the group of secondary prevention of cardiovascular complications also showed clear differences in approaches to the treatment of lipid metabolism disorders.

The CDSS prescribed lipid-lowering therapy for 83 (33.6%) patients for the first time, which may be bene-

ficial for reducing the risk of recurrent cardiovascular complications. Schubert et al. [20] showed that a more than 50% decrease in the LDL cholesterol levels is associated in patients with history of MI with a significant reduction in the risk of recurrent acute MI, stroke, and cardiovascular mortality.

Thus, this study demonstrates the expert level of prescribing lipid-lowering therapy according to the current clinical guidelines for the treatment of patients with lipid metabolism disorders when using the CDSS [16]. However, this is somewhat different from the data obtained by McKie et al. [21] in the United States. The authors of this study showed that the use of the CDSS is characterized by increased adherence to the clinical guidelines in the treatment of CHF, but not atrial fibrillation and lipid metabolism disorders. This may be due to more common use of highly structured EMRs in the United States, which facilitates the construction of personalized lipid-lowering therapy.

Antithrombotic therapy

According to the clinical guidelines, patients with NSTE-ACS and patients with STE-ACS should be treated with ASA and a P2Y12 inhibitor for 12 months if there are no contraindications and a high risk of bleeding. Moreover, clopidogrel should be administered for patients with ACS only they have contraindications or intolerance to prasugrel or ticagrelor and patients with atrial fibrillation if OACs are indicated for them [6]. Thus, ticagrelor should be the treatment of choice for patients with ACS.

The assessment of ATT orders showed higher frequency of the administration of ticagrelor recommended by the CDSS for patients with ACS then in the real-world clinical setting. The population-based study by Ozaki et al. [22] confirms that the frequency of ticagrelor administration in patients with ACS varies widely and mainly depends on the medical facility rather than the patient's clinical characteristics or clinical guidelines. In this study, when a patient was admitted to the district hospital, the odds of the administration of ticagrelor decreased 2-fold, and the patient's management by a cardiologist increased 2.8-fold this probability [22]. This aspect is of particular clinical importance: Using the CDSS in district medical facilities may increase the number of cases of reasonable administration of ticagrelor in ACS patients, which will reduce mortality and recurrence of cardiovascular complications.

Compared with the real-world clinical data, the use of CDSS allowed increasing the number of orders of long-term ATT: ticagrelor 60 mg in 22 more patients and rivaroxaban 2.5 mg in 15 patients with high and very high risk of ischemic complications.

The PEGASUS-TIMI 54 study demonstrated that the administration of ASA + ticagrelor 60 mg one year after acute MI is more effective than placebo for the prevention of cardiovascular death, MI, or ischemic stroke [23]. Similar results were demonstrated by the Swedish Register: the administration of long-term therapy with ticagrelor in patients with history of ACS reduced the incidence of ischemic stroke by 21% [24]. Similar results were also obtained in the COMPASS study, which showed that the addition of rivaroxaban 2.5 mg 2 times a day to ASA reduced the likelihood of stroke and cardiovascular death, with a greater effect during a longer follow-up period [25]. Despite the proven efficacy in reducing the risk of ischemic complications during long-term ATT, it is underused in the clinical setting. There are the following limitations to the more frequent administration of long-term ATT:

Challenges in assessing the high risk of ischemic complications by outpatient physicians (due to lack of time);

Outpatient physicians do not witness the effects of the prevention of ischemic complications, they rather see side effects of drugs (including bleeding);

Physicians rarely extrapolate the results of randomized clinical trials to their clinical practice [26].

The CDSS includes an automatic assessment of the risk of ischemic and hemorrhagic complications, which can significantly increase physician's adherence to the administration of long-term ATT, which explains the high frequency of ordering these drugs when the CDSS is used in the study.

Efficacy of using CDSS in the clinical setting

The analysis of big data collected from the EMRs in the clinical setting can help in planning clinical trials, defining clinical endpoints, qualitative results, and decision-making processes, and contribute to the treatment target control [27]. The BETTER CARE-HF study demonstrated that if a physician is warned that a patient has heart failure, therapy is prescribed according to clinical guidelines more often, and, as a result, the frequency of hospitalizations decreases, unlike in routine clinical practice [28]. In another study evaluating real-world clinical data, the prescription of therapy not in line with the clinical guidelines increased the incidence of clinically significant cardiovascular complications in the secondary prevention arm [29]. There were also cases in this study when adequate therapy was not ordered in the secondary prevention group. Digital tools integrated into medical information systems can help

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Показания к применению. Артериальная гипертензия I-II степени у взрослых пациентов.
Способ применения и дозы. Внутрь по 10 мг (1 таблетка препарата Леркамен® 10 или 1/2 таблетки препарата Леркамен® 20) 1 раз в сутки не менее чем за 15 минут до еды, предпочтительно утром, не разжевывая, запивая достаточным количеством воды. В зависимости от индивидуальной переносимости препарата пациентом, доза может быть увеличена до 20 мг (2 таблетки препарата Леркамен® 10 или 1 таблетка препарата Леркамен® 20). Терапевтическая доза подбирается постепенно, так как максимальное антигипертензивное действие развивается приблизительно через 2 недели после начала приема препарата. Препарат содержит менее 1 ммоля натрия (23 мг) на 1 таблетку, то есть практически не содержит натрия.
Противопоказания. Повышенная чувствительность к лерканидипину, другим производным дигидропиридинового ряда или любому компоненту препарата; застойная сердечная недостаточность без лечения; нестабильная стенокардия; обструкция выносящего тракта левого желудочка; острый инфаркт миокарда и в течение 1 месяца после перенесенного инфаркта миокарда; тяжелая печеночная недостаточность; тяжелая почечная недостаточность (СКФ <30 мл/мин) включая пациентов, находящихся на диализе; непереносимость лактозы, дефицит лактазы, синдром глюкозо-галактозной мальабсорбции; беременность и период грудного вскармливания; применение у женщин детородного возраста, не пользующихся надежными методами контрацепции; возраст до 18 лет (эффективность и безопасность не изучены); одновременное применение с мощными ингибиторами CYP3A4 (кетоконазол, итраконазол, эритромицин, ритонавир, тролеандомицин); с циклоспорином; одновременное применение с грейпфрутом или грейпфрутовым соком.
С осторожностью. Синдром слабости синусового узла (без электрокардиостимулятора); дисфункция левого желудочка сердца; ишемическая болезнь сердца; нарушения функции печени средней степени тяжести; нарушения функции почек легкой и средней степени тяжести; перитонеальный диализ; одновременное применение с индукторами/субстратами изофермента CYP3A4, мидазоламом, метопрололом, дигоксином; хроническая сердечная недостаточность (до начала применения препарата необходимо достичь компенсации хронической сердечной недостаточности); пожилой возраст.
Побочное действие. Наиболее частыми нежелательными реакциями в клинических исследованиях и при обобщении данных постмаркетингового опыта применения являются следующие: периферические отеки, головная боль, приливы, тахикардия и сердцебиение.
Подробная информация содержится в инструкции по медицинскому применению лекарственного препарата Леркамен® 10 ЛСР-007057/09-250822 от 25.08.2022 г. и Леркамен® 20 ЛСР-006976/08-230822 от 23.08.2022 г.

1. *Barrios V., et all. ELYPSE STUDY. Blood Pressure, 2002; 11: 95-100.*

Антигипертензивная эффективность и переносимость лерканидипина в повседневной клинической практике: исследование ELYPSE. В исследовании ELYPSE оценивали эффективность и переносимость лерканидипина у пациентов с артериальной гипертензией (АГ) 1 или 2 степени. Это было открытое, наблюдательное, многоцентровое исследование в реальной клинической практике. Главная цель исследования была оценить антигипертензивную эффективность и переносимость препарата. Вторичная цель состояла в оценке комплаенса пациента. Лерканидипин 10 мг в сутки назначали пациентам (n=9059), которым было показано применение дигидропиридиновых антагонистов кальция. Длительность наблюдения 3 месяца. Средний возраст пациентов 63 года. Результаты: исходное АД 160±10/96±7 мм рт ст, ЧСС 77±9 уд в мин. Через 3 месяца наблюдения АД составило 141±11/83±7 мм рт. ст. и ЧСС 75± 8 уд в мин (p <0.001). Общая частота нежелательных явлений (НЯ) составила 6,5%, среди которых наиболее часто наблюдались головная боль (2,9%), отек ног (1.2%), приливы (1,1%) и сердцебиение (0,6%). Отмена терапии из-за НЯ составила менее 1%. В этом исследовании лерканидипин продемонстрировал хорошую эффективность и переносимость в повседневной клинической практике.

2. *Leonetti G. et al. COHORT Study. Am J Hypertens. 2002 Nov;15(11):932-40.*

Переносимость длительного лечения лерканидипином по сравнению с амлодипином и лацидипином у пожилых пациентов с артериальной гипертензией. В исследовании COHORT изучали профиль переносимости лерканидипина по сравнению с двумя другими антагонистами кальция (амлодипин и лацидипин) у пожилых пациентов с артериальной гипертензией. Это многоцентровое, двойное слепое, в параллельных группах исследование, с участием 828 пожилых пациентов, ≥60 лет, рандомизированных в группы лерканидипина 10 мг/день (n=420), амлодипина 5 мг/день (n=200) или лацидипина 2 мг/день (N=208). При неудовлетворительном контроле АД дозу препарата удваивали, далее к терапии добавляли эналаприл или атенолол (при необходимости - диуретики). Пациентов наблюдали в среднем 12 месяцев. Первичной конечной точкой исследования была оценка частоты развития периферического отека в трех группах лечения. Также безопасность препаратов оценивалась на основании частоты развития других нежелательных явлений, симптомах, изменениях самочувствия пациента, частоте сердечных сокращений, лабораторных тестах и ЭКГ. Результаты: У пациентов, получавших амлодипин, значительно чаще наблюдались отеки ног (19%; p<0.001) и чаще встречались случаи раннего отказа от терапии из-за отека (8,5%); по сравнению с лерканидипином (9% и 2.1%) и лацидипином (4% и 1.4%). Также симптомы, связанные с отеком (отек и тяжесть в нижних конечностях), значительно чаще (P <0,01) возникали при применении амлодипина (50% и 45% соответственно), чем при применении лерканидипина (35% и 33%) и лацидипина (34% и 31%). Большинство случаев отеков ног возникало в течение первых 6 месяцев, при этом разница между видами лечения была очевидна с момента начала лечения. Другие побочные эффекты, связанные с приемом препарата, не различались между видами лечения. Артериальное давление было одинаково эффективно снижено в трех группах. В группе лерканидипина в течение 6 месяцев АД, измеренное стоя, достоверно снизилось с 169 ± 11/ 98 ± 7 до 140 ± 15/84 ± 9 mm Hg (P<0.01). Случаев ортостатической гипотензии во время исследования не зарегистрировано. Два липофильных дигидропиридиновых антагониста кальция, лерканидипин и лацидипин, обладают антигипертензивным действием, сравнимым с таковым амлодипина, но имеют лучший профиль переносимости.

avoid prescription errors. In general, the use of big data and advanced analytics can revolutionize the approach to managing patients with cardiovascular complications and improve treatment outcomes.

Limitations

Firstly, there was no subanalyses depending on the medical facilities, which matters in decision-making. Secondly, despite the fact that the experts followed the recommendations when using the CDSS, some discrepancies in the treatment strategies could be due to the expert's opinion. Thirdly, the lack of information on the treatment orders in the EMR could be due to a human element-a physician could have failed to enter information about the therapy in the electronic form.

Conclusion

Administration of lipid-lowering therapy for the primary prevention in the clinical setting differ significantly from the CDSS recommendations. The CDSS revealed significant differences in the group of secondary prevention in the recommendations for lipid-lowering therapy compared with the initial data in favor of higher statin dosages and the use of combined lipid-lowering therapy. Significant differences were also shown by the CDSS in recommendations for ATT in the secondary prevention group. Using the CDSS can improve the practice of choosing lipid-lowering and antithrombotic therapy for the prevention of cardiovascular complications. It is necessary to conduct a prospective randomized trial to confirm the effect of the CDSS on reducing the incidence of cardiovascular complications in the clinical setting.

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