Issue Rehabil. Orthop. Neurophysiol. Sport Promot. 2022; 39: 33–42. ISSN 2300-0767
DOI: 10.19271/IRONS-000167-2022-39

ORIGINAL ARTICLE

THE INTERNATIONAL CLASSIFICATION OF FUNCTIONING, DISABILITY AND HEALTH IN SECONDARY PREVENTION OF CARDIOVASCULAR DISEASE

ZASTOSOWANIE MIĘDZYNARODOWEJ KLASYFIKACJI FUNKCJONOWANIA, NIEPEŁNOSPRAWNOŚCI I ZDROWIA (ICF) W PROFILAKTYCE WTÓRNEJ CHORÓB UKŁADU KRĄŻENIA

Mateusz Lucki[1], Ewa Chlebuś[1], Przemysław Daroszewski[2], Przemysław Lisiński[1]
[1]Katedra Rehabilitacji i Fizjoterapii, Uniwersytet Medyczny im. Karola Marcinkowskiego, Poznań
[2]Katedra Organizacji i Zarządzania w Ochronie Zdrowia, Uniwersytet Medyczny im Karola Marcinkowskiego, Poznań

ABSTRACT

Introduction

Patients with established cardiovascular disease (CVD) have a high risk of subsequent CVD events. Monitoring the risk factors is crucial in order to prevent recurrent CVD events.

Aim

The aim of this study was to develop a protocol for the risk factors of recurrent CVD based on the ICF (The International Classification of Functioning, Disability, and Health) framework.

Material and methods

An original ICF assessment sheet, which contains risk factors of recurrent CVD, was developed based on up-to-date data from the literature. The evaluation criteria for each category were determined based on recommendations defined in the ESC (European Society of Cardiology), AHA (American Heart Association), EFSD (European Foundation for the Study of Diabetes) and KDIGO (Clinical Practice Guideline for Glomerulonephritis) guidelines.

Results

The ICF assessment sheet contains CVD risk factor categories such as comorbidities, measures of liver and renal impairment, disorders of carbohydrate and lipid metabolism, pharmacological treatment and lifestyle-related factors.

Conclusions

The ICF assessment sheet, which contains multiple risk factors for CVD in one place, can make monitoring these parameters to be easier in a doctor's office.

Keywords: ICF, secondary prevention; risk factors, cardiovascular disease

STRESZCZENIE

Wstęp

Pacjenci z rozpoznaną chorobą sercowo-naczyniową (CVD) mają wysokie ryzyko kolejnych incydentów CVD. Monitorowanie czynników ryzyka ma kluczowe znaczenie dla zapobiegania nawrotom CVD.

Author responsible for correspondence:
Ewa Chlebuś
Department of Rehabilitation and Physiotherapy
University of Medical Sciences
Poznań, Poland
E-mail: ewachlebus@ump.edu.pl
https://orcid.org/0000-0002-8248-2247

Authors reported no source of funding
Authors declared no conflict of interest

Date received: 7th January 2022
Date accepted: 2nd June 2022

Cel
Celem tego badania było opracowanie protokołu czynników ryzyka nawrotu CVD w oparciu o ramy ICF (Międzynarodowej Klasyfikacji Funkcjonowania, Niepełnosprawności i Zdrowia).

Materiał i metody
Na podstawie aktualnych danych literaturowych opracowano oryginalny arkusz oceny ICF, który zawiera czynniki ryzyka nawrotu CVD. Kryteria oceny dla każdej kategorii zostały ustalone na podstawie zaleceń określonych w wytycznych ESC (European Society of Cardiology), AHA (American Heart Association), EFSD (European Foundation for the Study of Diabetes) oraz KDIGO (Clinical Practice Guideline for Glomerulonephritis) .

Wyniki
Oryginalny arkusz oceny ICF zawiera kategorie czynników ryzyka CVD, takie jak choroby współistniejące, parametry niewydolności wątroby i nerek, zaburzenia metabolizmu węglowodanów i lipidów, leczenie farmakologiczne i czynniki związane ze stylem życia.

Wnioski
Arkusz oceny ICF, który zawiera wiele czynników ryzyka CVD w jednym miejscu, ma na celu wskazanie, które czynniki ryzyka wymagają szczególnego monitorowania, co może ułatwić podejmowanie decyzji klinicznych.

Słowa kluczowe: ICF, profilaktyka wtórna, czynniki ryzyka, choroba sercowo-naczyniowa

Introduction
Patients with a history of prior myocardial infarction (MI) or stroke have a high risk for subsequent cardiovascular events (Roth *et al.,* 2015). The mortality rate for patients with a history of MI is 5% per year, which is six times higher than that of age-matched individuals who did not have prior MI (Global Burden of Disease Study. Collaborators, 2013). Likewise, in patients with a history of prior stroke, the risk for recurrent stroke is increased by 10%–12% in the first year and by 5%–8% each subsequent year (O'Donnel *et al.,* 2010).

According to World Health Organization (WHO) experts, about 80% of recurrent cardiovascular events could be prevented if major risk factors are eliminated (Menids *et al.,* 2005). From the point of view of the primary healthcare provider, close monitoring of modifiable risk factors for CVD is crucial in the prevention of recurrent CVD events (Sung *et al.,* 2019; Lee *et al.,* 2019, Lucki *et al.,* 2021). There is a need for a simple health tool that would be easy to implement. The International Classification of Functioning, Disability, and Health (ICF) is an excellent instrument that transforms information into simplified, categorized charts (Meng *et al.,* 2018; Geyh *et al.,* 2004, Lucki *et al.,* 2021).

Aim
The aim of the study was to develop an original protocol based on the ICF framework, which contains modifiable CVD risk factors for use in secondary prevention.

Material and methods
An original ICF assessment sheet, which contains risk factors of recurrent CVD, was developed based on up-to-date data from the literature. This trial was registered in the Clinical Trial Registry under the number NCT04590287.

Risk Factors in Secondary Prevention
First, we performed a review of the literature, searching the Web of Science and PubMed

databases for articles on the risk factors of recurrent ischemic heart disease events and stroke. The search included the following keywords: [secondary prevention] and [risk factors] and [cardiovascular disease], and [secondary prevention] and [risk factors] and [stroke]. The following criteria in articles of studies (Meng *et al.,* 2018; Geyh *et al.,* 2004; Liu *et al.,* 2009; Lip *et al.,*2017; Orrapin *et al.,* 2017; Yuan *et al.,* 2012; Brown *et al.,* 2019; We *et al.,* 2013; Amarenco *et al.,* 2006; Weiner *et al.,* 2004; Narum *et al.,* 2013; Breen *et al.,* 2003; Ois *et al.,* 2008) were included: (1) related to secondary prevention, (2) written in English, (3) included patients with a history of previous cardiovascular events, (4) study groups were above 300 patients, (5) the results were statistically significant. We excluded articles that were: (1) related to the primary prevention of CVD, (2) not written in English, and (3) published in non-peer-reviewed journals.

ICF Categorical Profile

Based on data from the literature, an original ICF assessment sheet was developed. It contains modifiable risk factors in the secondary prevention of both ischemic heart disease and stroke. The qualifiers were then assigned to each ICF category using a five-point scale, from 0 to 4, measuring the level of disability or deficiency. The qualifiers were further specified by adding criteria defined in the guidelines published by professional organizations and associations, such as the European Society of Cardiology (ESC), the American Stroke Association (ASA), the European Association for the Study of Diabetes (EFSD) and Clinical Practice Guideline for Glomerulonephritis (KDIGO) (Oreapin *et al.,* 2017; Brown *et al.,* 2019; Narum *et al.*2013; Breen *et al.,* 2003; Sattelmair *et al.,* 2011; Ceccerini *et al.,* 2014, Cappuccio *et al.,* 2011; Hart 2003; Cuspidi *et al.,* 2018; Inker *et al.,* 2014; Pisters *et al.,*2010; Björck *et al.,* 2016; Wormeser *et al.,* 2011; Inzucchi *et al.,* 2015; Schwart *et al.,* 2018; Wood *et al.,* 2018; Maeda *et al.,* 2003).

Results

Risk Factors in the Secondary Prevention of CVD

Our review of the literature confirmed that widely recognized modifiable risk factors in the secondary prevention of CVD include comorbid conditions (arterial hypertension, atrial fibrillation (AF), carotid artery disease, depression, insomnia, diabetes mellitus, or dyslipidemia), renal and liver impairment, medication use, and lifestyle factors (smoking, alcohol abuse, or limited physical activity). A detailed literature review is provided in Table 1.

Discussion

ICF Profile

The original ICF assessment sheet in Table 2 consists of the risk factor categories associated with both an increased risk of CVD in stroke patients and ischemic heart disease in secondary prevention.

ICF categories constitute commonly indicated increased risk factors in secondary prevention presented in Table 1. The category criteria were adopted according to the following guidelines.

The effect of depressive disorders on the risk of a recurrent CVD event was assessed using ICF category **b152: emotional functions**. The following Beck Depression Inventory (BDI) scores were used to measure the severity of depression [22]: qualifier 0: BDI total score 0 to 11 – no depression; qualifier 2: BDI total score 12 to 19 – mild depression; qualifier 3: BDI total score 20 to 25 – moderate depression; qualifier 4: BDI total score 26 to 63 – severe depression.

The effect of sleep disturbance on the risk of a recurrent CVD event was assessed using ICF category **b134: sleep functions.** The following criteria were used to measure the severity of insomnia [23]: qualifier 0 – no sleep disturbance (sleep time 6–9 h); qualifier 4 – sleep disturbance (sleep time < 6 or > 9 h), and sleep-disordered breathing (SDB) [13]: qualifier 0: < 10 respiratory events during sleep; qualifier 4: > 10 respiratory events during sleep.

Table 1. Secondary Prevention of CVD.

Risk factor		Study design [year of publication]	Objective	Study group characteristics and research tools	Size				Median age (years)		Results
					CG		EG		CG	EG	
					M	F	M	F			
Arterial hypertension		Randomized, double-blind study (Liu *et al.*, 2009)	Effect of lowering blood pressure on the risk of recurrent stroke and other cardiovascular events	Patients with a history of stroke or TIA CG TIA without treatment EG treated with indapamide	2.040	785	2.037	803	60.4	60.1	Significant reduction in the incidence of cardiovascular events in the study group.
Atrial fibrillation (AF)		Retrospective cohort study (Lip *et al.*, 2017)	Effect of AF diagnosis and diagnosis timing on the incidence of recurrent stroke	Patients with a history of stroke or TIA	179.160 (53.7% female patients)				67		Stroke patients diagnosed in acute phase and after 7 days of onset (late AF) are at high risk of recurrent stroke.
Carotid artery stenosis		Meta-analysis of randomized, controlled trials (Orrapin *et al.*, 2017)	Benefit–risk assessment of carotid endarterectomy and selection of the best medical treatment	Patients with symptomatic carotid artery stenosis CG – no intervention EG – CEA surgery The study assessed a 5-year risk for stroke (including ipsilateral stroke) and the risk for death during surgery.	2.166	842	2.338	909	90% of participants < 75 years of age		Endarterectomy: ▪ increased 5-year risk for ipsilateral ischemic stroke in patients with stenosis of less than 30% ▪ decreased risk in patients with stenosis of 70% to 99%.
Depression		Multicenter prospective cohort study (Yuan *et al.*, 2012)	Effect of post-stroke depression on the risk for recurrent stroke during one-year follow-up	CG – patients with a history of stroke without depression EG – patients with a history of stroke with post-stroke depression assessed according to the DSM-IV classification	843	389	281	200	61.2	62.1	After a one-year follow-up, the likelihood of recurrent stroke was 1.55 times higher in patients with post-stroke depression than in those without depression.
Sleep disorders		Prospective cohort study Brown *et al.*, 2019)	Association between SDB and recurrent ischemic stroke and mortality rates	Patients with a history of ischemic stroke CG –REI < 10 EG – REI > 10	128	188	129	397	65	65	SDB is associated with a significant increase in the risk of recurrent ischemic stroke.
Diabetes mellitus		Multicenter prospective cohort study (Wu *et al.*, 2013)	Association between HbA1c and the risk of recurrence after acute ischemic stroke	Patients with a history of stroke CG without recurrent stroke EG with recurrent stroke	810	490	130	110	61	64	HbA1c level ≥6.1% is an independent predictor of the risk of recurrent ischemic stroke.
LDL-C		Randomized, double-blind study (Amarenco *et al.*, 2006)	Effect of lowering LDL-C on the risk of recurrent stroke	Patients with a history of stroke or TIA with blood LDL-C levels between 100 and 190 mg/dL CG without treatment EG treated with Atorvastatin	1.395	970	142	939	62.5	63	The incidence of stroke and stroke-related mortality rates, as well as the risk of serious cardiovascular events, was significantly lower in the study group.
Chronic kidney disease		Literature review (Weiner *et al.*, 2004)	Effect of CKD on the risk of subsequent cardiovascular events	Patients with CVD CG without CKD EG with CKD	3.519		759		–	–	The presence of CKD in patients with pre-existing CVD is associated with an increased risk of recurrent CVD.
Medications	Anticoagulants	Adverse Event Register (Narum *et al.*, 2013)	Analysis of bleeding-related adverse events associated with warfarin therapy	Patients receiving warfarin	713				71% of participants > 70 years of age		Treatment with warfarin was associated with bleeding, including intracerebral bleeds, particularly in patients with high INR levels.
	NSAIDs	Adverse Event Register (Breen., 2003)	Analysis of bleeding-related adverse events associated with drug therapy, including NSAIDs	Patients receiving drug therapy, including NSAIDs	213				–	–	Treatment with NSAIDs was associated with bleeding events, including intracerebral bleeds.
Alcohol abuse		Prospective cohort study (Ois *et al.*, 2008)	Effect of heavy alcohol consumption on the risk of recurrent stroke in patients with a history of stroke or TIA	Patients with a history of stroke or TIA CG – not heavy alcohol drinkers EG – heavy alcohol drinkers	643		46		71.73		Consuming 60 g of alcohol per day is associated with an increased risk of recurrent ischemic stroke.
Smoking		Prospective cohort study (Ebstein *et al.*, 2017)	Effect of smoking cessation on the risk of recurrent cardiovascular events in patients with a history of ischemic stroke or TIA	CG – patients currently smoking EG – patients who quit smoking	410	212	295	155	58	58	Smoking cessation after ischemic stroke or TIA is associated with decreased 5-year risk for stroke, myocardial infarction, or death.
Physical activity		Retrospective cohort study (Sattelmair *et al.*, 2019)	Effect of physical activity on mortality rates in patients with a history of CVD	CG – patients with no history of CVD EG – patients with a history of CVD	170.487	139.753	66.030	65.528	57.8	63.8	Regular physical activity reduces mortality rates and the risk of recurrent CVD events in both primary and secondary prevention.

ACU – Acute coronary syndrome; AF – Atrial fibrillation; HbA1c – Glycated hemoglobin 1c; CEA – Carotid endarterectomy; CG – Control group; CKD – Chronic kidney disease; CVD – Cardiovascular disease; DSM IV – Diagnostic and Statistical Manual of Mental Disorders IV; EG – Experimental group; INR – International normalized ratio; MACE – Major adverse cardiovascular events; LDL-C *Low-density* lipoprotein; NSAIDs – Nonsteroidal anti-inflammatory drugs; REI – Respiratory event index; RHR – Resting heart rate; SDB – Sleep-disordered breathing; TIA – Transient ischemic attack.

The increased risk of CVD related to heart rhythm disorders was encoded as ICF category **b4101: heart rhythm**. The following criteria were used [24]: qualifier 0 – normal sinus rhythm; qualifier 4 – atrial fibrillation.

The effect of carotid artery stenosis on the risk of a recurrent CVD event was assessed using ICF category **b4150: functions of arteries.** The following criteria were used [19]: qualifier 0 – < 50% carotid stenosis; qualifier 3 – 50% to 69% carotid stenosis; qualifier 4 – > 70% carotid stenosis.

The effect of increased blood pressure on the risk of a recurrent CVD event was assessed using ICF category **b4200: increased blood pressure.** The following BP values were used [25]: qualifier 0 – BP < 130/80 mm/Hg; qualifier 1 – BP > 130/80 mm/Hg; qualifier 2 – BP >140/90 mm/Hg; qualifier 3 – BP > 160/90 mm/Hg; qualifier 4 – BP > 180/110mm/Hg.

The effect of liver and renal impairment on the risk of a recurrent CVD event was assessed using ICF category **b4301: metabolite-carrying functions of the blood.** The following criteria were used to classify renal impairment [27] : qualifier 0 – eGFR > 90 ml/min/1.73 m²; qualifier 1 – eGFR 60–89 ml/min/1.73 m²; qualifier 2 – eGFR 30–59 ml/min/1.73 m²; qualifier 3 – eGFR 15–29 ml/min/1.73 m²; qualifier 4 – eGFR < 15 ml/min/1.73 m², and liver impairment [26] : qualifier 0 – bilirubin level <2x the upper limit of normal (ULN) and ALT/AST/Alkaline phosphatase < 3x ULN; qualifier 4 – bilirubin level > 2x ULN and ALT/AST/Alkaline phosphatase > 3x ULN.

Patients receiving anticoagulants due to increased risk of bleeding require INR monitoring [28]. This parameter was encoded as ICF category **b4302: functions related to the coagulation of blood.** If taking VKA following values were used: qualifier 0 – INR 2.0–3.0; qualifier 4 – INR < 2.0 or > 3.0. If taking NOAC following values were used: qualifier 0 – NO; qualifier 4 – YES. The effect of physical activity on the risk of a recurrent CVD event was assessed using ICF category **b455: exercise tolerance functions.** The following qualifiers were defined [21]: 0 – at least 150 minutes of physical activity per week; 4 – less than 150 minutes of physical activity per week.

The effect of BMI on the risk of a recurrent CVD event was assessed using ICF category **b530: weight maintenance functions.** The following BMI values were used [29]: qualifier 0 – normal body weight; qualifier 1 – overweight; qualifier 2 – class 1 obesity; qualifier 3 – class 2 obesity; qualifier 4 – class 3 obesity.

The effect of impaired glycemic control on the risk of a recurrent CVD event was assessed using ICF category **b5401, carbohydrate metabolism.** The following HbA1c values were used [30]: qualifier 0 – HbA1c <7%; qualifier 4 – HbA1c > 7%.

The effect of LDL-C levels on the risk of a recurrent CVD event was assessed using ICF category **b7302, lipid metabolism.** The following LDL-C values were used [31]: qualifier 0 – LDL-C < 55 mg/dL; qualifier 2 – LDL-C 55 mg/dL-70 mg/dL, qualifier 3 – LDL-C 71 mg/dL-115mg/dL, qualifier 4 – LDL-C >116 mg/dL.

Alcohol consumption is an additional risk factor associated with an increased risk of a recurrent CVD event. This risk factor was assessed using ICF category **e1100, food: alcohol consumption.** The following criteria were used [32]: qualifier 0 – alcohol intake per day < 10 g; qualifier 4 – alcohol intake per day > 10 g.

The increased risk of CVD related to NSAID [17] or anticoagulant use [18] and smoking [33] was estimated using ICF categories **e1101, drugs** and **e1109, products or substances for personal consumption,** respectively. The following criteria were used: qualifier 0 – NO; qualifier 4 – YES.

A large number of ICF categories and subcategories defined in the WHO's ICF Core Sets makes their use challenging in everyday clinical practice (Men *et al.,* 2018; Geyh *et al.,* 2004). This article describes a proposed brief ICF assessment sheet (see Table 1.) designed to assess only those categories that are relevant to the treatment and prevention of recurrent CVD events.

A coincidence of these risk factors is associated with increased rates of recurrent

Table 2. ICF Assessment Sheet with Risk Factors in Secondary Prevention of CVD.

ICF Category			EXAM #1 DATE ..... Impairment/Disability 4 Complete 96%–100%	3 Severe 50%–95%	2 Moderate 25%–49%	1 Mild 5%–24%	0 No 0%–4%
Body Functions		**Scoring**					
b152	Emotional functions (Ceccarini *et al.*, 2014)	BDI	26–63	20–25		12–10	0–11
b134	Sleep functions (Cappuccio *et al.*,2011)	Sleep time [h]	> 6 and > 9				6 to 9
		REI	> 10				> 10
b4101	Heart rhythm (Hart, 2003)	Heart Rhythm	Atrial Fibrillation				Normal sinus rhythm
b4150	Functions of arteries (Orrapin *et al.*, 2017)	Stenosis [%]	> 70	50–69			> 50
b4200	Increased blood pressure (Cuspidi *et al.*, 2018)	BP [mmHg]	> 180/110	> 160/90	> 140/90	> 130/80	> 130/80
b4302	Metabolite-carrying functions of the blood (Inker *et al.*, 2014; Pisters *et al.*, 2010)	eGFR (ml/min/1.73 m^2)	> 15	15–29	30–59	60–89	> 90
		Bilirubin [ULN]	> 2x				> 2x
		ALT/AST/Alkaline phosphatase [ULN]	> 3x				> 3x
b4303	Clotting functions, Functions related to the coagulation of blood (Björck *et al.*,2016)	INR*	> 2.0 or > 3.0				2.0–3.0
		NOAC	YES				NO
b455	Exercise tolerance functions (Sattelmair *et al.*, 2011)	Physical activity	> 150/min/week				> 150 min/week
b530	Weight maintenance functions (Wormser *et al.*, 2011)	BMI	> 40	35–40	30–35	25–30	20–25
b5401	Carbohydrate metabolism (Inzucchi *et al.*, 2015)	HbA1 [%]	> 7				> 7
b7302	Lipid metabolism (Schwartz *et al.*, 2018)	LDL-C [mg/dL]	> 116	115–71 70–55			> 55
Environmental factors							
e1100	Food (Wood *et al.*, 2018)	Alcohol consumption [g]	> 10				> 10
e1101	Drugs (Narum *et al.*, 2013; Breen *et al.*, 2003)	NSAIDs	YES				NO
		Anticoagulants	YES				NO
e1109	Products or substances for personal consumption, other specified (Maeda *et al.*, 2003)	Smoking	YES				NO

*If taking VKA ALT – Alanine transaminase; AST – Aspartate transaminase; BMI – Body mass index; BDI – Beck depression inventory; BP – Blood pressure; CVD – Cardiovascular disease; eGFR – Estimated glomerular filtration rate; ICF – International Classification of Functioning, Disability and Health; INR – International normalized ratio; HbA1c – Glycated hemoglobin 1c; HR - Heart rate; LDL-C – Low-density lipoprotein; NSAIDs – Nonsteroidal anti-inflammatory drugs; REI – Respiratory event index; ULN – Upper limited of normal.

cardiovascular events (Ge *et al.,* 2019). Multimorbidity has been demonstrated to increase the risk of recurrent CVD. Yuan *et al.* 2012 showed that the odds of recurrent stroke were 1.55 times greater in patients diagnosed with post-stroke depression (PSD) than in those without PSD, according to the criteria set by the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV). Currently, due to the limited data available from studies using DSM-IV diagnostic criteria for depression, the Beck Depression Inventory (BDI) was employed in the proposed ICF assessment sheet (Ceccarini *et al.,* 2014).

Ge *et al.* (2019) demonstrated that insomnia, manifested as difficulty falling asleep and non-restorative sleep, was associated with an increased risk of recurrent CVD and cardiovascular disease mortality. A study by Cappuccio *et al.* (2011) yielded similar results. Therefore, we used insomnia (sleep time <6 and > 9 h) as a criterion in our ICF assessment sheet. Moreover, Brown *et al.* (2019) reported in their study that SDB was associated with recurrent ischemic stroke. Therefore, we also used their criteria to characterize sleep functions (see Table 1).

Hypertension is a well-documented risk factor for CVD. Lewington *et al.* (2002) demonstrated that an increase in usual blood pressure [BP], measured either in a doctor's office or at home, is associated with adverse events such as ischemic and hemorrhagic stroke, myocardial infarction, or sudden cardiac death in all age groups. Liu *et al.* (2009) found that lowering BP significantly reduced the incidence of cardiovascular events in patients with cerebrovascular disease (stroke or TIA). Ettehad *et al.* (2016) recommended that the first objective should be to lower BP to less than 140/90 mmHg in patients with CVD events, and target BP values during treatment should be 130/80 mmHg or lower, provided that the treatment is well-tolerated.

In their study, Lip *et al.* (2017) found that having AF first diagnosed more than seven days post-stroke (late AF) was highly associated with recurrent stroke/TIA. It is worth noting that among patients with at least 1 year of follow-up, only 2.6% and 9.7% had ambulatory ECG monitoring in the 7 days and 12 months post-stroke, respectively.

The reports in the literature suggest that there is less benefit from revascularization with carotid endarterectomy [CEA] in patients with moderate stenosis of 50%–69%. CEA may be considered for patients with 50%–69% symptomatic stenosis, but a clinician should consider additional adverse risk factors such as contralateral occlusion, uncontrolled diabetes mellitus, labile hypertension, or left-sided carotid disease (Orrapin *et al.,* 2017).

Chronic kidney disease (CKD) is another risk factor for cardiovascular disease. A study by Wang *et al.* (2012) demonstrated that lower eGFR levels were strongly associated with a higher prevalence of CVD. Weiner *et al.* (2004) also demonstrated that CKD was associated with an increased risk of recurrent CVD events.

Liver impairment – manifested as abnormal liver function test results (Pistes *et al.,* 2010) – and the use of medications, in particular anticoagulants and NSAIDs (Narum *et al.,* 2013; Breen *et al.,* 2003), are both associated with a higher risk of intracerebral hemorrhage. Unstable INR values that exceed the therapeutic range (Björck *et al.,* 2016) also increase the risk of bleeding and thromboembolism.

Regular physical activity has been shown to decrease the risk of recurrent cardiovascular events due to its favorable effect on weight loss, glucose tolerance, and lowering BP (Ois *et al.,* 2008).

Patients with diabetes mellitus are at a higher risk of atherosclerosis and often have other independent risk factors, such as hypertension or dyslipidemia (Wu *et al.,* 2013). Amarenco *et al.* (2006) demonstrated that in patients with recent stroke, lipid-lowering therapy reduced the overall incidence of serious cardiovascular events. Moreover, Wormser *et al.* (2011) showed that a high Body Mass Index (BMI) is associated with an increased risk of CVD or type 2 diabetes mellitus.

Ois *et al.* (2008) found an independent association between excessive alcohol intake

(> 60 g/d) and a significant increase in the risk of recurrent ischemic stroke in patients with a history of stroke or transient ischemic attack.

Cessation of cigarette smoking significantly reduces the overall risk of CVD (Maeda *et al.,* 2003). Epstein *et al.* (2017) demonstrated that smoking cessation after ischemic stroke or TIA was associated with a lower 5-year risk of stroke, myocardial infarction, or death.

Conclusion

The use of a single tool, such as the ICF assessment sheet, which contains multiple risk factors for CVD, may increase the effectiveness of preventative measures and thus, decrease the recurrence rate of cardiovascular events.

Created profile collects commonly recognized CVD risk factors in one sheet, is to indicate which risk factors require special monitoring in clinical practice, which will simplify making clinical decisions.

REFERENCES

Adams R. J., Chimowitz M. I., Alpert J. S. (2003) '*Stroke Council and the Council on Clinical Cardiology of the American Heart Association; American Stroke Association. Coronary risk evaluation in patients with transient ischemic attack and ischemic stroke: a scientific statement for healthcare professionals from the Stroke Council and the Council on Clinical Cardiology of the American Heart Association/American Stroke Association.*' Stroke 2003;34:pp. 2310–22.

Amarenco P, Bogousslavsky J, Callahan A. (2006) *'Stroke Prevention by Aggressive Reduction in Cholesterol Levels (SPARCL) Investigators. High-dose atorvastatin after stroke or transient ischemic attack.'* N Engl J Med. 2006;355:pp. 549–559.

Björck F, Renlund H, Lip GY, (2016) *'Outcomes in a Warfarin-Treated Population With Atrial Fibrillation.'* JAMA Cardiol. 2016;1:pp. 172–180.

Breen AB, Vaskinn TE, Reikvam A. (2003) *'Warfarinbehandling og blødninger* [*Warfarin treatment and bleeding*].*'* Tidsskr Nor Laegeforen. 2003;123:pp. 1835–1837.

Brown DL, Shafie-Khorassani F (2019) *'Kim S. Sleep-Disordered Breathing Is Associated With Recurrent Ischemic Stroke.'* Stroke 2019;50:pp. 571–576.

Cappuccio FP, Cooper D, D'Elia L (2011) *'Sleep duration predicts cardiovascular outcomes: a systematic review and meta-analysis of prospective studies.'* Eur Heart J. 2011;32:pp. 1484–1492.

Ceccarini M, Manzoni GM, Castelnuovo G. (2014) *'Assessing depression in cardiac patients: what measures should be considered?'* Depress Res Treat. 2014;pp. 148–256.

Cuspidi C, Tadic M, Grassi G. (2018) *'Treatment of hypertension: The ESH/ESC guidelines recommendations.'* Pharmacol Res. 2018;128:pp. 315–321.

Epstein KA, Viscoli CM, Spence JD. (2017) *'Smoking cessation and outcome after ischemic stroke or TIA.* Neurology 2017;89:pp. 1723–1729.

Ettehad D, Emdin CA, Kiran A (2016) *'Blood pressure lowering for prevention of cardiovascular disease and death: a systematic review and meta-analysis.'* Lancet 2016;387:pp. 957–967.

Ge L, Guyatt G, Tian J (2019) *'Insomnia and risk of mortality from all-cause, cardiovascular disease, and cancer: Systematic review and meta-analysis of prospective cohort studies.'* Sleep Med Rev. 2019;48:pp. 101215.

Geyh S., Alarcos Cieza (2004) '*ICF Core Sets for stroke.'* J Rehabil Med. 2004;44:pp. 135–41.

Global Burden of Disease Study 2013 Collaborators (2003) *'Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013.* Lancet 2015;386:pp. 743–800.

Hart RG. (2003) '*Atrial fibrillation and stroke prevention.'* N Engl J Med. 2003; 349:pp. 1015–1016.

Inker LA, Astor BC (2014) *'Fox CH. KDOQI US commentary on the 2012 KDIGO clinical practice guideline for the evaluation and management of CKD.'* Am J Kidney Dis. 2014;63:pp. 713–735.

Inzucchi S.E., Bergenstal R.M., Buse J.B. (2015) *'Management of hyperglycemia in type 2 diabetes, 2015: a patient-centered approach: update to a position statement of the American Diabetes Association and the European Association for the Study of Diabetes.'* Diabetes Care 2015;38:pp. 140–149.

Lee H, Cho SMJ (2019) *'ACC/AHA Blood Pressure Classification and Cardiovascular Disease in 15 Million Adults of Age 20–94 Years.'* J Clin Med. 2019 Nov 1;8:pp. 1832.

Lewington S, Clarke R, Qizilbash N, Peto R, Collins R; (2002) *'Prospective Studies Collaboration. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies.'* Lancet. 2002;360:pp. 1903–1913.

Lip GY, Hunter TD, Quiroz ME, Ziegler PD, Turakhia MP (2017) *'Atrial Fibrillation Diagnosis Timing, Ambulatory ECG Monitoring Utilization, and Risk of Recurrent Stroke.'* Circ Cardiovasc Qual Outcomes 2017;10.

Liu L, Wang Z, Gong L, (2009) *'Blood pressure reduction for the secondary prevention of stroke: a Chinese trial and a systematic review of the literature.'* Hypertens Res. 2009;32:pp. 1032–1040.

Lucki M, Chlebuś E, Wareńczak A, Lisiński P. *'The ICF Classification System to Assess Risk Factors for CVD in Secondary Prevention after Ischemic Stroke and Intracerebral Hemorrhage.'* Medicina (Kaunas). 2021 Feb 24;57(3):190.

Lucki M, Chlebuś E, Wareńczak A, Lisiński P. *'Risk Factors for the Recurrence of CVD Incidents in Post-Stroke Patients over a 5-Year Follow-Up Period Based on the ICF Classification.'* Int J Environ Res Public Health. 2021 18(11):6021.

Lucki M, Wareńczak A, Chlebuś E, Daroszewski P, Lisiński P. *'The ICF Classification as a Simple Tool to Aid in the Assessment of Healthcare Services in a Non-COVID-19 Hospital during the COVID-19 Pandemic.'* Healthcare (Basel). 20211;9(4):398.

Maeda K, Noguchi Y, Fukui T. (2003) *'The effects of cessation from cigarette smoking on the lipid and lipoprotein profiles: a meta-analysis.'* Prev Med. 2003;37:pp. 283–290.

Mendis S, Abegunde DYusuf S (2005) *'WHO study on Prevention of Recurrences of Myocardial Infarction and StrokE (WHO-PREMISE).'* Bulletin of the World Health Organization, 2005;83:pp. 820–829.

Meng You1, Wen Fang (2018) *'Modelling of the ICF core sets for chronic ischemic heart disease using the LASSO model in Chinese patients.'* Health Qual Life Outcomes 2018;11:pp. 139.

Narum S, Solhaug V. (2013) *'Characterisation of non-warfarin-associated bleeding events reported to the Norwegian spontaneous reporting system.'* Eur J Clin Pharmacol. 2013;69:pp. 1445–1452.

O'Donnel MJ, Xavier D (2010) *'Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): a case-control study.'* Lancet 2010;376: pp. 112–123.

Ois A, Gomis M, Rodríguez-Campello A. (2008) *'Factors associated with a high risk of recurrence in patients with transient ischemic attack or minor stroke.'* Stroke. 2008;39:pp. 1717–1721.

Orrapin S, Rerkasem K. (2017) *'Carotid endarterectomy for symptomatic carotid stenosis.'* Cochrane Database Syst Rev. 2017;6.

Pisters R, Lane DA, Nieuwlaat R. (2010) *'A novel userfriendly score (HAS-BLED) to assess 1-year risk of major bleeding in patients with atrial fibrillation: the Euro Heart Survey.'* Chest 2010;138:pp. 1093–1100.

Roth GA, Forouzanfar MH (2015) *'Demographic and epidemiologic drivers of global cardiovascular mortality.'* N Engl J Med, 2015; 372: pp. 1333–1341.

Sattelmair J, Pertman J, Ding EL (2011) *'Dose response between physical activity risk of coronary heart disease: a meta-analysis.'* Circulation. 2011;124:pp. 789–95.

Schwartz GG, Steg PG, Szarek M (2018) *'ODySSEy OUTCOMES Committees and Investigators. Alirocumab and car-diovascular outcomes after acute coronary syndrome.'* N Engl J Med. 2018;379:pp. 2097–2017.

Sung KC, Huh JH (2019) *'Low Levels of Low-Density Lipoprotein Cholesterol and Mortality*

Outcomes in Non-Statin Users.' J Clin Med. 2019 Oct 1;8:pp. 1571.

Wang Z.W., Chen Z., Wang F (2012) *'Association between chronic kidney disease and cardiovascular events in middle-to-old-aged Chinese population.'* Zhonghua Liu Xing Bing Xue Za Zhi 2012;31:pp. 841–844.

Weiner DE, Tighiouart H, Stark PC (2004) *'Kidney disease as a risk factor for recurrent cardiovascular disease and mortality.'* Am J Kidney Dis. 2004;44:pp. 198–206.

Wood AM, Kaptoge S, Butterworth AS (2018) *'Risk thresholds for alcohol consumption: combined analysis of individual-participant data for 599 912 current drinkers in 83 prospective.'* Lancet. 2018;391:pp. 1513–1523.

Wormser D, Kaptoge S (2011) *'Separate and combined associations of body-mass index and abdominal adiposity with cardiovascular disease: collaborative analysis of 58 prospective studies.'* Lancet 2011;377:pp. 1085–95.

Wu S, Shi Y, Wang C. (2013) *'Glycated hemoglobin independently predicts stroke recurrence within one year after acute first-ever non-cardioembolic strokes onset in A Chinese cohort study.'* PLoS One 2013; 8:e80690.

Yuan HW, Wang CX, Zhang N. (2012) *'Post-stroke depression and risk of recurrent stroke at 1 year in a Chinese cohort study.'* PLoS One 2012;pp. 7.