



## Beneficial Cardiovascular Health and Lifestyle Evaluation by Life's Crucial 9 (LC9)

Bando H<sup>1,2,\*</sup>

<sup>1</sup>Tokushima University / Medical Research, Tokushima, Japan

<sup>2</sup>Japan Low Carbohydrate Diet Promotion Association, Kyoto, Japan

\*Corresponding author: Bando H, Tokushima University /Medical Research, Nakashowa 1-61, Tokushima 770-0943, Japan; E-mail: [pianomed@bronze.ocn.ne.jp](mailto:pianomed@bronze.ocn.ne.jp)

### Abstract

The bio-psycho-social model has been applied in primary care (PC), integrative medicine Japan (IMJ), and other fields. Health Japan 21 (HJ21) with 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> terms has started in 2000 and continued until now. HJ21-3<sup>rd</sup> started from 2024, in which specific numerical targets for individual health behavior are presented. For developing cardiovascular health (CVH), American Heart Association (AHA) has presented Life's simple 7 (LS7), Life's Essential 8 (LE8) and Life's Crucial 9 (LC9). LC9 has the characteristic aspect of psychological health status. LC9 will be useful for managing life style-related diseases and developing CVH in clinical practice and research.

**Keywords:** Cardiovascular Health (CVH); American Heart Association (AHA); Life's simple 7 (LS7); Life's Essential 8 (LE8); Life's Crucial 9 (LC9)

### Commentary Article

Clinical significance of the bio-psycho-social approach has been emphasized for long [1]. Especially, these perspectives become the fundamental concept for primary medical care, primary health care, and integrative medicine (IM) [2]. Authors et al. have managed medical societies of primary care (PC), integrative medicine Japan (IMJ), New Elderly Association (NEA) with Hinohara-ism and research group of low carbohydrate diet (LCD) for years [3-5]. In this article, recent trend of health policy development for related areas in Japan and US would be introduced.

In Japan, meaningful policy started in 2000, which was the first term of Health Japan 21 (1st-HJ21) project by the Bureau of Health, Ministry of Health, Labor and Welfare, Japan [6]. It presented adequate life style of 5 factors, which were meal, exercise, resting, alcohol and smoking. After general evaluation for HJ21, the second term of HJ21 (2nd-HJ21) were succeeded from 2013. It included 5 main themes as follows: 1) Extending healthy life expectancy and reducing health disparities [7], 2) Prevention of the onset and aggravation of lifestyle-related diseases, 3) Maintaining and improving the necessary functions for daily life, 4) Establishing a social cycle to support and protect

health, 5) Improvement of various lifestyle habits and the social environment [8]. The achievement of 2nd-HJ21 was finally evaluated in 2022, in which particular problems in 2nd-HJ21 and special tasks of 3rd term of HJ21 (3rd-HJ21) were presented (Table 1).

The third HJ21 started from 2024, in which specific numerical targets for individual health behavior were presented [9]. These target values are set based on scientific evidence with regular evaluation and review. It included 5 aspects in the following.

They are

1) The recommended BMI would be 20-25 kg/m<sup>2</sup> for those aged 65 and over. Its target value was set at 66%.

2) For dietary habits, the aim was to take vegetable to 350g per day. The actual intake was below the target, and then emphasizing the awareness through cafeterias and school lunches would be required.

3) As to exercise habits, the aim was to raise the ratio of people who has regular exercise to 40%. Exercise habits mean >2 times a week for >30 minutes, and continuing >1 year.

4) Specific goal was set for sleep. The target was to increase the ratio of people who has enough sleep to 60%, where 6-9 hours for < 60 years, and 6-8 hours for > 60 years old.

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5) Regarding smoking, the target was to reduce the smoking prevalence for people for > 20 years to 12%. To achieve this, to enhance support for quitting smoking and against passive smoking has been planned [10].

**Table 1:** Evaluation of 2nd-HJ21 and Future task of 3rd-HJ21.

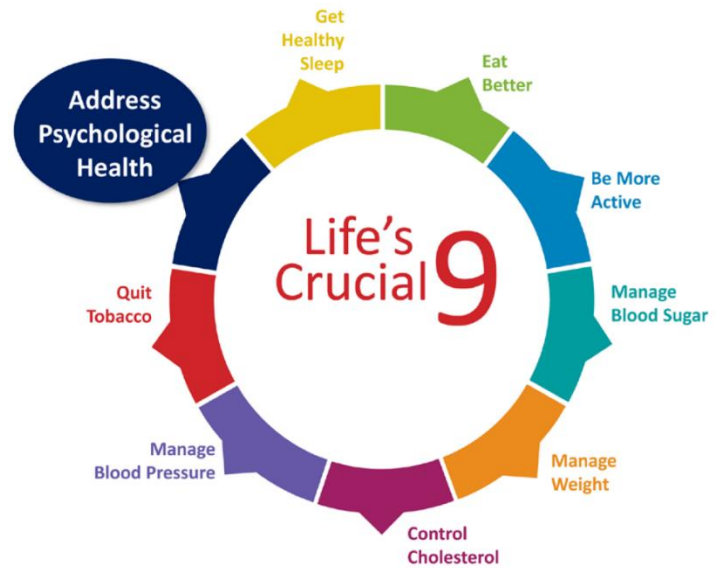
1	Evaluation of 2nd-HJ21		
	53 tasks were found and evaluated	(n)	(%)
	achieved	8	15%
	improvement	20	38%
	no changes	14	26%
	worse	4	8%
	not determined due to pandemic	7	13%
	Total	53	100%
2	Particular problems in 2nd-HJ21		
	Inadequate reduction of Metabolic syndrome in adults		
	Insufficient ratio of appropriate weight in children		
	Poor improvement of satisfactory rest and sleep states		
	Alcoholic problems leading to life-style related diseases		
3	Special Tasks of 3rd-HR21		
	Newly Added Targets for Women's Health problems		
	Reduce young thin female (<18.5 of BMI) to < 15%		
	Increase osteoporosis screening ratio to target 15%		
	support health guidance, education with life stage		

In the US, American Heart Association (AHA) has presented Life's simple 7 (LS7) and Life's Essential 8 (LE8) so far, which were for developing cardiovascular health (CVH) as a paradigm shift [11]. To the fundamental guideline of LE8, psychological factors were added, which was announced for Life's Crucial 9 (LC9). In comparison with LE8, the predictive value of LC9 remains unclear concerning the CV health risk associated with psychological health status (Figure 1). From 16290 applicants without CV disease of NHANES (National Health and Nutrition Examination Survey) for 12 years, cohort study was conducted [12]. The LC9 score consists of the mean of LE8 result and depression evaluation that represents the dimension of psychological health. As a result, almost predicted values were obtained between LE8 and LC9 about the CV score plus depression score.

Concerning severe abdominal aortic calcification (SAAC) as arteriosclerosis, the relationship with LC9 was studied [13]. The protocol included 2323 cases from NHANES data. Furthermore, systemic inflammatory response index (SIRI) was also investigated. As a result, increase score of 10 points in LC9 showed 26% reduction of SAAC prevalence ( $p < 0.001$ ). When LC9 scores increases, SAAC prevalence significantly decreased ( $p < 0.05$ ). From this research, robust inverse relationship was noted between increased LC9 scores and decreased SAAC incidence, associated with mediating role of SIRI.

As the latest report, the relationship among dietary intake of saturated fatty acids (SFAs), the risk of obstructive sleep apnea

(OSA) and mediating efficacy of LC9 was investigated [14]. Totally 13563 applicants of aged > 20 years attended, and odds ratios of LC9 and OSA was analyzed. As a result, dietary mixtures of SFAs would increase the risk of OSA. LC9 scores showed 71.50 vs 65.29 for non-OSA ( $n=9470$ ) vs OSA ( $n=4093$ ), respectively, which showed significant difference ( $p < 0.001$ ).



**Figure 1:** Scheme of Life's Crucial 9 (LC9).

Regarding reproductive issue, LC9 and infertility risk were studied from the data of NHANES for 6 years. A significant negative association was observed between LC9 values and infertility degree [15]. By adjustment of covariates, for every 10-



point increase in LC9 score, it showed 35% decrease in the ratio of infertility ( $p < 0.001$ ). The result suggests novel perspectives for the management of infertility, associated with potential relief and hope to infertile patients.

Previous research showed the potential relationships among overactive bladder (OAB), CV health and obesity. As a latest study, the connection of OAB and LC9 were investigated associated with the weight-adjusted waist index (WWI) for obesity value [16]. The data included 25319 cases, and among them 5038 had previous OAB. As a result, increase 10 units in LC9 brought 28% reduction incidence of OAB, an increase of one unit in WWI brought 40% increase incidence of OAB. From mentioned above, significant negative correlation was observed between LC9 and OAB, associated with WWI factor as partial mediator among these relationships.

From pathophysiological interrelationships of metabolic risk factors including diabetes, obesity, CKD, CVD, the novel conceptualization of cardiovascular-kidney-metabolic (CKM) syndrome has been proposed [17]. They presented the stages from 0 to 4. The general characteristic points are in the followings. They are stage 0: no CKM health risk factors, stage 1: excess and/or dysfunctional adiposity, stage 2: metabolic risk factors and CKD, stage 3: subclinical CVD in CKM, and stage 4: clinical CVD in CKM.

In summary, recent perspectives concerning total CVH have been introduced. They are Health Japan 21 (HJ21) in Japan and Life's Crucial 9 (LC9) in US. Some impressive guidelines have been found, which have brought large beneficial effect in the actual medical practice for preventing CV diseases. This article becomes hopefully useful reference for future managing atherosclerotic cardiovascular diseases (ASCVDs).

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