

# The Establishment of National Standards for Health Checks in China and a comparison with American EHE Standards

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## Research article

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# Abstract

**Objective** Different institutes utilize different test standards for routine health checks in China. It is necessary and urgent to establish unified standards for health checks to conserve medical resources and reduce the social burden in China. The purpose of this study is to determine standards of health items and evaluate the advantage and disadvantage by comparing with the American executive health exam (EHE) standards.

**Methods** We collected health check items used in 60 top hospitals within mainland China. We excluded items that occurred in less than 80%. We compared the selected items with those used in the American EHE standards.

**Results** China's health check included physical examination, non-infectious disease screening, malignancy screening, laboratory screening, and imaging examinations. China's health checks included more items than those used in the American EHE standards.

**Conclusion** Our findings showed that China's health check protocols could be simplified, except for the items currently used in the basic physical examination and malignancy screening.

## Background

The health check is a thorough check-up of a patient physical condition through a variety of tests. The check will cover most of the basic systems of the body, including the heart system, lung system, gut system, nerve system, and genitourinary system. It can tell us whether we are at higher risk of getting certain health problems, such as heart disease, cancer, diabetes, stroke, etc. Regular health check can help to find problems before they start. They can also help to find problems early, when your chances for treatment and cure are better. A health check generally involves a medical history, a brief or complete physical examination, and laboratory tests. More advanced tests include ultrasound and mammography. Generally, the routine health checks are not meant to include newborn checks, pap smears (screens for cervical cancer), or regular follow-ups for chronic medical disorders.

As society develops and standards of living increase, the concept of health in the population is rapidly changing. According to population statistics, 5 million health checks per year have been recorded in Beijing Metropolitan area. The institutes available for health checks, including general hospitals, public health institutes, privately operated medical institutes, disease control institutes, and sanatoria, have recently reached over 5000.<sup>2</sup>

At the meantime, China government is transiting the medical care mode from centering on the treatments of disease to centering on the promotions of health. The health check systems have developed rapidly in China; thus, different institutes have developed their own distinct items and standards. No national guideline for "health check" standards has been released by now.

We found that the American Executive Health Exam, founded in 1913, has been devoted to developing and establishing the health check paradigm. The EHE has pioneered the fields of employee health and lifestyle management, and is thoroughly devoted to safeguarding future health by disease prevention. The EHE's mission is to protect the health of company employees. It also endeavors to manage health costs by establishing early detection of preventable diseases and by managing risk factors and lifestyle behaviors that drive diseases.

In summary, it is the top priority to set up unified health check standards in China by analyzing the health items within Mainland China by comparison with the American EHE standards.

## Methods

We collected the health items used in health checks in 60 top hospitals within Mainland China. Then, we calculated the occurrence rate of every item. We excluded items that occurred in less than 80%. The selected items were collected in a list to form China's health check standards. Finally, we compared these standards with the American EHE standards.

## Results

The items used in health checks in China's top hospitals included a basic physical examination, non-infectious disease screening, malignancy screening, laboratory tests, and imaging examinations.

The basic physical examination items are shown in Table 1. In the questionnaire section, the American EHE standards included only a personal history; in contrast, China's health checks questionnaire included personal history, family history, life style, surgical history, medication history, menstruation history (for female), and marriage history. In the ordinary examination section, China's health checks included the pulse pressure difference, waist hip ratio, and vital capacity; the American EHE standards included the vital capacity, ABO blood type, and tetanus status.

Table 1  
Comparison of basic physical examination items used in China and America

	Examination items	China	America
Questionnaire	Personal history	✓	✓
Physical examination	Family history	✓	✓
Ordinary examination	Life style	✓	✓
Audiometric test	Surgical history	✓	✓
Ophthalmology	Medication history	✓	✓
	Menstrual history	✓	✓
	Marriage history	✓	✓
	Height	✓	✓
	Weight	✓	✓
	Waistline	✓	✓
	Hipline	✓	✓
	SBP	✓	✓
	DBP	✓	✓
	Pulse	✓	✓
	BMI	✓	✓
	Pulse pressure difference	✓	
	Waist hip ratio	✓	
	Vital capacity	✓	
	ABO blood type	✓	
	Tetanus status	✓	
	Hearing assessment	✓	
	Vision assessment		
	Intraocular pressure		

Abbreviations: SBP: systolic blood pressure; DBP: diastolic blood pressure; BMI: body mass index.

Totally, compared with the American EHE standards, China's basic physical examination was more detailed than America EHE standards. However, all identified standard items were inexpensive to perform. Therefore, for this part of the basic physical examination, China's standards were superior to the American EHE standards.

Non-infectious diseases include some common diseases, such as cardiovascular diseases and diabetes. A comparison of non-infectious screening items used in China and America is shown in Table 2. Compared with China's health check, American EHE standards included only the latent risk factors for cardiovascular diseases and diabetes.

Table 2

Comparison of non-infectious disease screening items used in China and America

	Examination items	China	America
Major factors	Family history	✓	✓
Potential risk factors	Smoking history	✓	✓
	Serum total cholesterol	✓	✓
	Serum LDC-C	✓	✓
	Serum HDL-C	✓	
	Overweight/obesity	✓	
	Serum total glycerin	✓	
	Serum total cholesterol	✓	
	Education level	✓	
	Plasma homocysteine	✓	
	HsCRP	✓	
	Occupation	✓	
	Physical exercise	✓	
	Alcohol history	✓	
	Systolic blood pressure	✓	
	Diastolic blood pressure	✓	
	Static electrocardiogram	✓	
	Blood sugar level: fasting		
	Blood sugar: postprandial		

Abbreviations: LDL-C: low density lipoprotein cholesterol; HDL-C: high density lipoprotein cholesterol; HsCRP: hypersensitive C-reactive protein.

The most frequently occurring malignancies include lung cancer, breast cancer, cervical cancer, prostatic cancer, and colon cancer. A comparison of malignancy screening items used in China and America is shown in Table 3. The malignancy screening items included common risk factors and specific risk factors. The American EHE standards included fewer screening items for the specific risk factors compared with China's health check.

Table 3  
Comparison of malignancy screening items used in China and America

Examination items		China	America
Common risk factors	Questionnaire	✓	✓
Breast cancer	Tumor maker CEA	✓	✓
Cervical cancer	Breast examination	✓	✓
Lung cancer	Breast ultrasound	✓	✓
Prostate cancer	Breast X-ray examination	✓	✓
Colon and rectal cancer	Breast molybdenum target	✓	✓
	Tumor markers CA15-3, CA125	✓	✓
	Cervical scraping smear	✓	
	Thinprep cytologic test	✓	
	Human papillomavirus	✓	
	Chest X-ray	✓	
	Sputum cytology	✓	
	Tumor maker neuron specific enolase	✓	
	Prostate ultrasound	✓	
	Prostate specific antigen	✓	
	Alpha fetoprotein	✓	
	Free prostate specific antigen		
	Fecal occult blood		
	Colonoscopy test		

Abbreviations: CEA: carcinoembryonic antigen; CA15-3: cancer antigen 15 - 3; CA125: cancer antigen 125; NSE: neuron specific enolase.

Laboratory screening tests consisted of a routine laboratory test and a laboratory biochemical test. The routine laboratory test included routine blood, urine, and stool analysis. The laboratory biochemical test included analyses of liver function, renal function, blood lipids, and blood sugar. The American EHE standards included a general blood biochemistry test, a routine urine analysis, blood cholesterol, a cardiovascular blood profile, homocysteine, and glycosylated hemoglobin.

A comparison of laboratory screening tests used in China and America is shown in Table 4. In this section, China's health check included much more items than those used in the American EHE standards. Imaging examinations included ultrasonography, X-ray, mammograms, etc. Both China's health check and the American EHE standards included a resting ECG and a chest X-ray. China's health check also included the transabdominal ultrasound, breast ultrasound, and prostate ultrasound. The American EHE standards included a carotid artery ultrasound and a mammogram. A comparison of imaging examinations used in China and America is shown in Table 5.

Table 4

## Comparison of laboratory screening items used in China and America

	Examination items	China	America
Routine blood analysis	General blood biochemistry test	✓	✓
Routine urine analysis	Red blood cell	✓	✓
Stool routine analysis	Hemoglobin	✓	✓
Liver function	Hematocrit	✓	✓
Renal function	Granulocyte	✓	✓
Blood lipids	White blood cell	✓	✓
Blood sugar	Polymorphonuclear leukocytes	✓	✓
	Lymphocyte	✓	✓
	Monocyte	✓	✓
	Eosinophil	✓	✓
	Basophil	✓	✓
	Platelet	✓	
	Hematuria marker	✓	
	Red blood cell urine test	✓	
	White blood cell urine test	✓	
	Urine protein	✓	
	Urine specific gravity	✓	
	Urine pH value	✓	
	Ketone body	✓	
	Stool abnormal appearance	✓	
	Occult blood positive marker	✓	
	Total protein	✓	
	Albumin	✓	
	globulin	✓	
	Alanine transaminase	✓	
	Aspartate aminotransferase	✓	
	Gamma glytaryl transpeptidase	✓	
	Alkaline phosphatase	✓	
	Total bilirubin	✓	
	Blood urea nitrogen	✓	
	Creatine	✓	
	Cholesterol	✓	
	Cardiovascular blood profile	✓	
	TC	✓	
	Triglycerides	✓	
	LDL-C	✓	
	HDL-C	✓	
	TC/HDL-C	✓	
	Homocysteine	✓	
	Fasting blood glucose	✓	
	Blood sugar post prandial		
	Glycosylated hemoglobin		

Abbreviations: TC: total cholesterol; LDL-C: low density lipoprotein cholesterol; HDL-C: high density lipoprotein cholesterol.

Table 5  
Comparison of image examination used in China  
and America

Examination items	China	America
Resting electrocardiogram	√	√
Chest X-ray	√	√
Transabdominal ultrasound	√	√
Carotid artery ultrasound	√	√
Breast ultrasound	√	
Mammogram		
Prostate ultrasound		

## Discussion

The health check is a common form of preventive medicine performed during regular visits to medical professionals. In general, individuals should obtain health checks yearly or even less frequently. It is not entirely clear when health checks were initiated, but they have been advocated since the 1920s. Some authors called for initiatives from the 19th and early 20th century for the early detection of diseases, like tuberculosis, and for periodic health checks in schools. The health check is considered a screening that comprises medical tests for the early detection of diseases and occult risk factors for chronic diseases, including lung diseases, cardiovascular diseases, metabolic syndrome, and malignancies.” Due to the large number of institutes that utilize different terminologies and standards in performing these screens, we urgently need to establish a standardized health check. Here, we analyzed the health items used in 60 top hospitals in Mainland China, by excluding items that occurred in less than 80%. The selected items were collected to form a list of China’s health check standards, which were compared with the American EHE standards.

Compared with the American EHE standards, we found that China’s health check items included more comprehensive, more expensive, and more advanced techniques, even after we excluded items that occurred in less than 80%. In the basic examination, China’s questionnaire was finely elaborated, and all the items could be determined inexpensively. For the basic physical examination, China’s standards were better than the American EHE standards because it has more detailed questionnaires, which was reported to be very useful in predicting or screening for diseases.””

In screening for non-infectious diseases, China’s health items included 17 laboratory items, American EHE standards included only 4 basic items. However, China’s health standards missed one of the most important items: the hypersensitive C reactive protein.

In screening for malignancies, the American EHE standards focused on the questionnaire, a breast X-ray examination, a cervical scraping smear, and the prostatic specific antigen (PSA), for detecting early tumor formation. In comparison, China’s health standards tested more items, which provided more reliable screenings.

In the laboratory analyses, compared with China's health check, the American EHE standards was more refined. The analyses included in China's health check were highly complex and expensive.

In the imaging examinations, items used in China's health check are similar to those used in the America EHE standards.

## **Conclusion**

The purpose of health management is to provide early detection and early diagnosis of serious diseases. However, in the absence of standards, medical institutes may aim to make profit in the name of early detection by providing essentially all-inclusive examinations. By referring to the American EHE standards, we found that China's health check could be simplified, except for the items used in the basic physical examination and malignancy screening.

## **Abbreviations**

SBP

systolic blood pressure; DBP:diastolic blood pressure; BMI:body mass index; LDL-C:low density lipoprotein cholesterol; HDL-C:high density lipoprotein cholesterol; HsCRP:hypersensitive C-reactive protein; CEA:carcinoembryonic antigen; CA15-3:cancer antigen 15 – 3; CA125:cancer antigen 125; NSE:neuron specific enolase; TC:total cholesterol; LDL-C:low density lipoprotein cholesterol; HDL-C:high density lipoprotein cholesterol.

## **Declarations**

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Not applicable.

### **Authors' contributions**

YZ was involved in drafting and revising this manuscript for important intellectual content. JL were involved in the design planning of this project. All authors read and approved the final manuscript.

### **Authors' information**

Dr. Yanhui Zhu is a clinician scientist, with expertise in clinical informatics. Dr. Jianbo Lei is a clinician scientist and computer expert.

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## **Availability of data and materials**

The datasets used during the current study are available from the corresponding author on reasonable request.

## **Ethics approval and consent to participate**

The study meets the Ethics Standard of Peking University. Data was collected as part of routine management processes. No personal identifying information is revealed.

## **Consent for publication**

Not applicable.

## **Competing interests**

The authors declare that they have no competing interests.

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