Research Article

ISSN 3065-7059

Journal of Chronic Disease Prevention and Care

# A Comprehensive Vital Signs and Functional Status Assessment Panel

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**Received:** 01 Mar 2026; **Accepted:** 02 Apr 2026; **Published:** 13 Apr 2026

**Citation:** Richard R Love. A Comprehensive Vital Signs and Functional Status Assessment Panel. J Chronic Dis Prev Care. 2026; 3(2): 1-6.

## ABSTRACT

*The pillars of community-oriented primary care are community health workers and virtual care providers, anchored by ambulatory service facilities and staff. These pillars are coordinated by customized electronic medical record systems.*

*A core component of ambulatory care consultation visits has been the first part of physical examinations: determination of vital signs. Vital signs are indicators of the body's critical functions. The Global Burdens of Disease (GBD) studies of the commonest causes of DALYs (disability-years of life-lost) provide compelling data suggesting potential benefits from expanding current limited clinical practice to comprehensively assess routinely the functional status of multiple organ systems. This communication proposes such an expanded 24 test vital signs and 9 organ functional assessments panel grounded in the GBD populations data, and feasibility with test performance by trained paraprofessionals.*

## Keywords

Global burden of disease (GBD), Community-oriented primary care (COPC), Vital signs expansion, Functional status assessment, Ambulatory care, Primary healthcare delivery.

## Introduction

Community-oriented primary care is medical practice that undertakes responsibility for the health of a defined population. The pillars of community-oriented primary care are community health workers and virtual care providers, anchored by ambulatory service facilities and staff [1]. These pillars are coordinated by customized electronic medical record systems. Under a model proposing a broad scope, primary health physicians are human health biology psychology and education practitioners [2]. They are also technical and psychosocial ambulatory services health team coordinators.

In his rigorous exploration of probability in multiple parts of our lives, Nate Silver focuses on the central issue of distinguishing signals defining truth from noises that distract from recognition of the important facts [3]. In clinical medicine our challenges are quantitative, and as Silver suggests, we need to get the questions right. In physical examination investigations it is critical to develop accurate objective data, aka the signals, and not be distracted by subjective-call them fuzzy-data, aka noises. So, in thinking about "vital signs" applying Silver's concepts directs us to be thoughtful about the specific information we really want, and secondly in conducting our specific tests, we need to take care to do these correctly and precisely.

Defining the right routine vital signs examinations for populations can logically follow from comprehensive descriptive data on their health burdens. Over the last 30 years the Global Burden of Disease (GBD) studies have provided increasingly rich information on the most prevalent health conditions affecting populations and their causes [4]. The GBD studies use disability-adjusted life-years (DALYs) as the metric for ranking health conditions. DALYs account for both quantity and quality of life. Specific health conditions compromise functions, and causes are defined by probabilities of acquiring adverse health conditions and promoting those conditions already present. In summary then, for populations it is logical and reasonable to suggest that defining high-quality vital signs, meaning true signals to be determined routinely, should follow from and be grounded in specific GBD DALYs data.

One reaction to such a proposal is to assert that specific clinical practice activities, particularly physical examination components, have historically been based on patients' chief complaints. I would counter that we regularly fall considerably short in our recognition of patients' multiple dysfunctional health conditions, and their promoting causes. Further, optimal diagnosis and management of complex human health problems cannot be achieved without rigorous data on the full breadth of patients' health status. Operationally, there are several explanations for these shortcomings which are observed globally: 1.Time constraints with physicians as the chokepoint for greater numbers of assessments; 2. Limited health literacy with patients having poor command of their health status, and in some instances having hidden agendas, which again, with time constraints, prevent problem recognition; 3. Limited data from low- and middle-income countries on common complaints in clinical practice; and 4. Most critically, and the controlling factor globally, is the dominance of commercial models of practice.

The current communication is founded first on the concept that the goals of health services are to maximize human potential by improving population health and reducing capital costs [2,5]. A further premise is that we have GBD data and physical examination tools and data that allow us to define a comprehensive panel of vital signs and functional status assessments, the use of which can significantly improve the quality of routine health care and health literacy. As I have written, the triple aim definition of the Institute for Health Improvement –the goals presented in the first sentence of the paragraph- completely ignores a central challenge in meeting these aims: the need to improve providers' experience by better spelling out their time and tasks [2,5]. Finally, the implementation of this panel in clinical practice can be cost effectively achieved by having the tests performed by paraprofessional staff.

This communication is organized to consider first health condition and health risk factors data from the most recent GBD studies report [2]. A 24 item vital signs and functional status examinations panel proposal follows, with then detailed discussion and justification of each item. Finally, I offer a discussion of the benefits and challenges of general implementation of such an expanded vital signs and functional status panel.

## Most common burdens from adverse health conditions and the causes of these

Our currently dominant reactive health systems consider the challenges in improving health care by describing the most common conditions for which patients seek primary care. In a systematic review of data from 12 countries across 5 continents, Finley et al. reported data presented in (Table 1) [6].

What is most striking about these data is first the dominance of acute communicable disease conditions or symptoms. Second, the absence of ischemic heart disease symptoms, signs or major risk factor associated conditions (smoking, overweight measures, exercise, and LDL cholesterol) is surprising. Finally, the absence of patient-reported visits for several conditions and their symptoms is worrisome: hypertension, diabetes, COPD, falls, injuries, hearing loss and dementia.

**Table 1:** Clinician-reported and patient reported reasons for primary care consultations [6].

| Clinician reported | Patient reported |
|---|---|
| Upper respiratory infection | Cough |
| Hypertension | Back pain |
| Health maintenance | Abdominal symptoms |
| Arthritis | Pharyngitis |
| Diabetes | Dermatitis |
| Depression/anxiety | Fever |
| Pneumonia | Headache |
| Acute otitis media | Leg symptoms |
| Back pain | Upper respiratory symptoms |
| Dermatitis | Fatigue |

These consultation data need to be considered in the context of several tabulations of the major health burdens offered by the Global Burdens of Disease studies [4] (Tables 2-4).

**Table 2:** Top 12 causes of disability-adjusted life-years globally 2023 [4].

| |
|---|
| Ischemic heart disease |
| Neonatal disorders |
| Stroke |
| Lower respiratory infections |
| Diabetes |
| Road injuries |
| Chronic obstructive pulmonary disease (C.O.P.D.) |
| Falls |
| Low back pain |
| Diarrheal diseases |
| Depressive disorders |
| Anxiety disorders |

Hearing loss and headache are in the top 20 causes.

**Table 3:** Top 10 causes of disability-adjusted life-years in highest global socio-demographic index quintile [4].

| |
|---|
| Ischemic heart disease |
| Stroke |
| Falls |
| Low back pain |
| Pulmonary cancer |
| Diabetes |
| Dementia |
| COPD |
| Hearing loss |
| Depressive disorders |

Causes 4-10 all increased in frequency from 2010-23.

What do these GBD data suggest that should impact the components of primary care services? Together the data from (Table 1) and the GBD data describe a major disconnect between the common problems addressed in clinical primary care practice and the major

adverse health conditions found globally. Further, the clinical practice data strongly suggest that major conditions and their risk factors are not being identified or managed.

**Table 4:** Top 10 global disease burden risk factors 2023 [4].

| |
|---|
| High systolic blood pressure |
| Particulate matter pollution |
| Smoking |
| High fasting plasma glucose |
| Low birthweight short gestation |
| High BMI |
| Kidney dysfunctional |
| High LDL cholesterol |
| Child growth failure |
| Lead exposure |

## A constructive response to the compelling GBD data: An expanded vital signs and functional status assessment panel

I propose that the currently limited vital signs assessments which are done as part of any health problem evaluation be expanded to include additional vital signs and functional status measures (Table 5).

**Table 5:** A comprehensive vital signs and functional status assessment panel.

| | |
|---|---|
| Blood pressure | |
| Temperature | |
| Pulse | |
| Respiratory rate | |
| Weight and height→ auto calculated body mass index (B.M.I.) | |
| Blood oxygen saturation | |
| Waist and hip circumferences → auto calculated waist hip circumference ratio | |
| Pain scores backache: | Not a problem |
| | Usual daily |
| | Worst |
| Pain scores headache: | Not a problem |
| | Frequency |
| | Usual level when present |
| | Worst level when present |
| Pain scores from non-backache, non-headache conditions | Not a problem |
| | Usual daily |
| | Worst daily |
| Fatigue scores | Usual daily |
| | Worst daily |
| Speech capability: normal impaired | |
| Visual acuity assessment | |
| Color blindness assessment | |
| Hearing capacity | |
| Forced vital capacity (FVC), forced expiratory volume 1 second (FEV1) | |
| Heart auscultation with acoustically augmented stethoscope | |
| Hand grip strength | |
| Timed up & go test (TUG) mobility and balance test | |
| Dental and gum assessment | |
| Mental health impacts on functional status | |
| 6-minute walking test | |

## Justifications and critical details concerning the 24 above Table 5-proposed individual assessments

### Blood pressure

The updated 2025 report of the American College of Cardiology/ American Heart Association Joint Committee on Clinical Practice recommends use of a blood pressure (BP) monitoring device and critically and specifically "because individual BP measurements may vary in an unpredictable or random manner, a single reading is inadequate for clinical decision-making. Office BP should be based on the average of available readings, and an average of ≥2 BP measurements" [7]. This report provides an 8-item checklist for office blood pressure measurement [7].

### Temperature

While variations in body temperature regularly occur by time in the day, with exercise, by hormonal status, and of course with infections, normal human body temperature varies in individuals from 97-99 degrees Fahrenheit (36.1-37.2 degrees Celsius). In these circumstances, regular taking of temperature allows creation of a baseline for an individual in the absence of infection. In comfortable environmental temperatures, in adults, with placement 1-2 cm from the forehead, infrared sensor thermometers provide reasonable, perhaps slightly low body temperature estimates.

### Pulse

Three determinations should be made. 1. Rate with the blood pressure monitor reading. 2. Pattern for irregular irregularity from palpation of the radial pulse for at least 30 seconds. 3. Palpation of radial and femoral pulses simultaneously for recognition of synchrony and assessment of lower extremity arterial circulation.

### Respirations

The major purpose is to determine if tachypnea is present meaning 25 of more respiration per minute.

### Weight and height

Using a digital or analog scale, standard practice should be to measure patient's weight without shoes or jackets/coats. Similarly, height should be measured with a stadiometer in patients not wearing shoes. Body mass index (B.M.I.) is a proxy for amount of relative body fat [8].

### Oximetry

While the general recommendations for the use of blood oxygen level testing with oximetry are circumstances where cardiorespiratory compromise is otherwise diagnosed, air pollution and long-term lung and cardiovascular damage associated with Covid infections are contributing to increasing rates of unrecognized C.O.P.D. [9,10], (Tables 2,3,4). It is these factors which are leading to calls

for regular measurement of oxygen saturation as a 5th vital sign.

### Waist and hip circumference

Waist circumference measures the accumulation of visceral fat, the magnitude of which is associated with metabolic (insulin resistance) syndrome, cardiovascular disease, diabetes and all-cause mortality. Increasingly, there have been calls for designation of waist circumference as a vital sign [11,12]. B.M.I., waist circumference and waist-to-hip circumference ratio each independently contribute to increased risks for multiple medical conditions. With the significant increase in the GDB of diabetes and the associated increase in fasting plasma glucose levels, greater attention to these anthropometric measurements is justified (Tables 2 and 4).

### Pain and fatigue level scores

Longer than for regular assessments of oxygenation and waist circumference as vital signs, pain experts have called for determination of patient reported pain scores as a vital sign. Together, numeric and Wong-Baker FACES pain rating scales have been widely used despite concerns about their accuracy and reliability. Part of the hesitancy in accepting such patient reports as "hard" evidence of biological "truth", lies in a far-too-general perception that somehow health professional assessments provide more accurate data on patient distress, all-be they brief and at limited points in time. The extensive literature in cancer medicine and more recently with COVID, suggests that use of combined numeric and FACES symptom rating scale rulers, particularly in asking about usual and worst daily experiences, provides actionable data in clinical management. The commonalities of backache and headache justify regular assessments of their associated levels of distress [13,14] (Tables 2 and 3).

### Speech capability

A common sequel of stroke is speech impediment. As tables 2 and 3indicate, this affliction is a major GBD.

### Visual acuity and color blindness assessments

A contributor to the globally high rates of road injuries, which are increasing in low-income countries, and falls which are increasing in high-income countries with aging populations, is sub-optimal and uncorrected visual acuity (Tables 2 and 3). The operational separation of eye care and visual acuity assessment from general medical practice is unfortunate and dysfunctional. Other than regular assessment of visual acuity, the impacts of systemic medical conditions such as diabetes and inflammatory autoimmune disorders warrant greater practice of ophthalmologic function evaluations in usual clinical routines. Use of a Snellen chart is not complicated. The Snellen chart measures distance visual acuity by recording the smallest line of letters a patient can read at 20 feet, expressed as a fraction (e.g., 20/40), where the numerator is the testing distance and the denominator is the distance at which a person with normal vision could read that line.

Similarly, color blindness likely contributes to road injuries through inaccurate perception of road signs and traffic lights. Color blindness is an X-chromosome linked genetic disorder occurring dominantly therefore in men. Using an Ishihara book, color deficiency test results are interpreted based the numbers or shapes that the individual can see. The test results indicate the numbers seen by the individual on each plate, which can help identify the type and severity of color blindness. In populations of Northern European descent reports indicate some of the highest rates of red–green color blindness, with about 7 to 8% of men affected. In East Asian Groups rates of 4 to 6% are found, while in African populations rates are 2-3%.

### Hearing capacity

With aging populations, the occurrence of sensorineural hearing loss in higher-income countries is contributing to the top ten GBDs but in fact the greater burdens of hearing loss are in low- and middle-income countries [15] (Table 3). Urbanization and increased cell phone use worldwide may also be contributing to such hearing loss, which disability is underdiagnosed. A Whisper voice test done at a distance of 30-60 cm (1-2 feet) to the side/ behind the patient for both ears with one-two syllable words or numbers is a practical and sensitive (90%) assessment tool.

### Forced Vital Capacity (FVC), Forced Expiratory Volume 1 second (FEV1)

As for oximetry, the increasing rates of unrecognized C.O.P.D. justify these regular spirometric respiratory capacity assessments [9,10], (Tables 2 and 3).

### Heart auscultation with an acoustically augmented stethoscope

The development of an acoustically augmented stethoscope facilitates high-quality office assessments of the four heart sounds, regularity of the heartbeat, and the presence and details of cardiac murmurs [16]. The major GBD data on ischemic heart disease (in the face of increasing rates of diabetic small vessel disease), stroke (from atrial fibrillation or reduced cardiac ejection fraction), and hypertension all demand more detailed, focused and regular attention to recognizable acoustical signs of cardiac dysfunction (Tables 2,3, and 4).

### Hand grip strength

The assessment of hand grip strength with a dynameter is an easy proxy for measuring overall muscle strength. Falls and low back pain (with associated core body muscle weakness) are more frequent with poor muscle strength (Tables 2 and 3).

### Timed up & go test (TUG) mobility and balance test

The TUG test evaluates mobility, balance, walking ability and fall risk. In the face of GBDs of stroke, falls, high prevalence of overweight status, and compromised motor capacity after road injuries, this brief assessment is an efficient tool for identification of functional independence (Tables 2, 3, and 4).

### Dental and gum assessment

The contribution or oral to systemic health is way underappreciated; half of the world's citizens have poor oral health. Dental caries

contribute to increased levels of systemic C-reactive protein, an inflammatory marker. Inflammatory gum disease is associated with cardiovascular disease, stroke, dementia and diabetes [17].

### Mental health impact on functional status

The elevated global health burdens of mood disorders demand greater attention [4,18] (Tables 2 and 3). A practical approach to identifying functionally impactful levels of these disorders is asking about possible disruptions to home life activities and relationships, work outside of the home, and neighbor relationships.

### 6-minute walking test

Because a 6-minute walking test is a more time-consuming assessment, it is deserving of particular justification. This test is a functional submaximal exercise capacity assessment tool which is the gold standard for defining aerobic capacity and endurance [19]. It has been increasingly used for assessment of cardiac, post stroke and neurological and motor functional capacities and general exercise tolerance. It is a demonstrably safe and reliable test. In these contexts, then, reconsider the GBD data from (Tables 2 and 3). Ischemic heart disease is the top and COPD is the 7$^{th}$ top cause of DALYs globally. These conditions are most commonly diagnosed when they are in advanced stages producing major symptoms and signs of dysfunction. If we are to be more proactive in health services and seek to prevent or limit the development of these cardiopulmonary conditions, a test which allows definition of functional limitations of which patients are either unaware or inattentive to, might be significantly useful in our endeavors. It seems discordant to be regularly promoting increased physical activity as a preventive health measure, while not seeking to recognize and measure the presence of limited general cardiovascular, respiratory and motor functions.

## Major benefits and challenges of adoption of an expanded vital signs and functional assessments panel in clinical practice

In the introduction to this communication, I argued that the proposal I would make offers a credible approach to improving population health and reducing capital expenditures. I suggested that these benefits were possible because promoting the use of such an expanded regular assessments panel would lead to more comprehensive individual patient data and to associated better quality of care. I also suggested that the multiple activities would contribute to greater health literacy. Finally, I asserted that the entire panel of tests could be conducted cost-effectively by paraprofessional staff.

Regarding these potential benefits I want to expand considerations of two issues. First, I believe that serious exploration and discussion of the proposal here will entertain debates about the quality of data routinely sought and acquired in clinical practice. In the detailed sentences about each of the proposed panel assessments, I have touched on issues of rigorous performance. The usual conduct of two tests highlights needed debate: blood pressure measurement and cardiac auscultation. Personal experience, observations and reports from colleagues, collectively together with extensive research data, support conclusions that blood pressure measurements are generally poorly performed, and that cardiac auscultation with standard stethoscopes is but a token exercise.

Second, this proposal prompts consideration of how to most efficiently provide impactful medical care. The Communicable Disease Center in the United States defines personal health literacy as "the degree to which individuals have the ability to find, understand, and use information and services to inform health-related decisions and actions for themselves and others" [20]. Health professional-patient interactions offer major teachable moments, and I suggest that the explanations that can accompany the performance of the 24 assessments in the offered expanded panel, should be much more powerful, personally relevant and efficient teaching than usual verbal counselling. Consider again the performance of blood pressure measurement. Conduct of this test according to major guidelines as emphasized in the discussion above, models how patients themselves perform this test in their homes, which activity is regularly promoted [7]. Spirometric and 6-minute walk testing activities send strong messages about respiratory and cardiovascular exercise capacities, which forcefully complement standard recommendations for increased physical exercise.

The challenges to adoption of such a detailed vital signs and functional status panel seem, first, to be operational. Clinical practice globally is organized to be crisis/problem addressing. I contend, as I have suggested in the introduction, that in fact a comprehensive standard panel of assessment would facilitate higher quality care for usual patient chief complaint presentations. The time constraint restriction is more of a "this is what we do" perception. Worldwide, cataract surgery, ophthalmology, and other specialty medical care models demonstrate that such comprehensive assessments can be standard practice and of high quality when performed by paraprofessional health staff. I contend that the application of such panel assessments in specialty clinical practice (which is what primary care practice should also be defined as) can be the core visit activities [2].

Finally, it is reasonable to suggest that adopting such a total panel package should be preceded by demonstration experience data, and evidence of better patent outcomes. This position, of course, presumes evidence of benefits from current standard activities. The GBD data are a rich source of information to tailor model panels to local circumstances and age groups.

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