Vitamins for Chronic Disease Prevention in Adults
Clinical Applications

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In the absence of specific predisposing conditions, a usual North American diet is sufficient to prevent overt vitamin deficiency diseases such as scurvy, pellagra, and beriberi. However, insufficient vitamin intake is apparently a cause of chronic diseases. Recent evidence has shown that suboptimal levels of vitamins, even well above those causing deficiency syndromes, are risk factors for chronic diseases such as cardiovascular disease, cancer, and osteoporosis. A large proportion of the general population is apparently at increased risk for this reason.

Suboptimal Amounts of Vitamins
Suboptimal levels of a vitamin can be defined as those associated with abnormalities of metabolism that can be corrected by supplementation with that vitamin. For example, many people in the general population have serum homocysteine levels from 1.62 to 2.03 mg/L (12-15 µmol/L), which fall to baseline levels of 1.08 to 1.35 mg/L (8-10 µmol/L) after a few weeks of supplementation with folate, along with vitamins B6 and B12. Similarly, in many elderly people, methylmalonic acid levels fall with vitamin B12 supplementation, and elevated levels of parathyroid hormone fall with vitamin D supplementation. Measurements of vitamin levels in blood, serum, or red blood cells, at least with current reference points for abnormality, are not a reliable guide to this form of deficiency; in one study, supplementation substantially reduced serum homocysteine levels in elderly patients with normal serum folate concentrations.

For some vitamins, the concept of suboptimal levels is also supported by randomized trial evidence that supplementation reduces the rate of clinical deficiency syndromes such as scurvy and beriberi are uncommon in Western societies. However, suboptimal intake of some vitamins, above levels causing classic vitamin deficiency, is a risk factor for chronic diseases and common in the general population, especially the elderly. Suboptimal folic acid levels, along with suboptimal levels of vitamins B6 and B12, are a risk factor for cardiovascular disease, neural tube defects, and colon and breast cancer; low levels of vitamin D contribute to osteopenia and fractures; and low levels of the antioxidant vitamins (vitamins A, E, and C) may increase risk for several chronic diseases. Most people do not consume an optimal amount of all vitamins by diet alone. Pending strong evidence of effectiveness from randomized trials, it appears prudent for all adults to take vitamin supplements. The evidence base for tailoring the contents of multivitamins to specific characteristics of patients such as age, sex, and physical activity and for testing vitamin levels to guide specific supplementation practices is limited. Physicians should make specific efforts to learn about their patients’ use of vitamins to ensure that they are taking vitamins they should, such as folate supplementation for women in the childbearing years, and avoiding dangerous practices such as high doses of vitamin A during pregnancy or massive doses of fat-soluble vitamins at any age.

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See also p 3116 and Patient Page.
VITAMINS FOR CHRONIC DISEASE PREVENTION

longer than 2 hours results in a more
vitamins; for example, keeping food hot
ration may decrease the activity for some
reduces the risk of fractures in elderly
supplementation, along with calcium,
tion of some vitamins such as B12.
Alcohol consumption in-
creases folate requirements,11 and ag-
makes it difficult to get
individual patients to change their di-
seled individually, and it is difficult to get
special formulations may cost a great deal more. However, one can
easily buy large quantities (eg, 250-
500 pills) of generic multivitamins for
around $10 annually. We are aware of
no evidence that the various multivita-
mains differ in bioavailability because of
the way they are formulated. Patients can
buy individual vitamins at an even lower
price, which may make sense for women
in the childbearing years, for whom fol-
late supplementation might cost only $5
to $10 annually.

Special multivitamins are sold for
subgroups of the population such as ac-
tive men, perimenopausal women, and
the elderly. The Internet and health-
food stores are filled with promotions
for these special-purpose multivita-
mains, which are often costly. The only
evidence-based arguments for taking
more than a common multivitamin
once a day pertain to the elderly and
women who might become pregnant.
The recommended intake for vitam-
ins B12 and D in the elderly is closer
to 2 times the dietary reference intake.
For women who might become preg-
nant, folate at 800 µg/d is appropriate.

Some vitamins, such as thiamin, ri-
boflavin, and niacin, have received little
mention in this review. Although by
definition severe deficiency of these vi-
tamins is associated with disease, they
have so far not been associated with
chronic diseases. The absence of evi-
dence that these vitamins are associ-
ated with chronic diseases might be
because those associations do not ex-
ist, ordinary diets provide sufficient
amounts to prevent chronic disease, or
the research has not yet been done to
discover these relationships.

Testing
Tests for vitamin levels in blood, se-
rum, or red blood cells are now offered
by commercial laboratories, as are tests
for substances such as homocysteine that
mark abnormal vitamin-related metabo-
lism.14 The availability of these tests raises
these questions: Would this additional
information lead to better preventive or
therapeutic interventions than might be
offered without the test? If so, what kind
of patients would benefit?

It is certainly possible that some in-
dividuals, because of their diets or ge-
genetic polymorphisms, have unusual vi-
tamin needs. Many of these people can
be detected by a simple review of their
medical problems, including alcohol-
ism. The MTHFR polymorphism, which
is associated with low folate levels and
perhaps increased rates of cardiovascu-
lar disease, is the best studied. The ab-
normal MTHFR gene occurs in 5% to
15% of the population and might have
effects on diseases related to folate de-
iciency. The MTHFR gene would be de-
tected only by specific testing not yet
commercially available. However, re-
search into the metabolic and clinical ef-
fects of these disorders is in its infancy
and not strong enough to confidently
guide tailored supplementation pro-
grams. Therefore, we believe that test-
ing individuals who do not have a well-
recognized indication is premature.

Recommendations

We recommend that all adults take one
multivitamin daily. This practice is jus-
tified mainly by the known and sus-
pected benefits of supplemental folate
and vitamins B12, B6, and D in prevent-
ning cardiovascular disease, cancer, and
osteoporosis and because multivita-
mins that at dose are safe and inexpen-

tive.16 It is reasonable to consider a dose
of 2 ordinary multivitamins daily in the
elderly, specifically because of the high
prevalence of suboptimal vitamin B12 and
D intake. However, it might be safer to
supplement 1 multivitamin with addi-
tional vitamins B12 and D, taken sepa-
rately, given the possibility that in-
creased vitamin A intake might increase
the risk of hip fracture27 and that the iron
in most multivitamins may increase the
risk of hemochromatosis in some people.

The increased folate requirement in
people with high alcohol intake can be
met with 1 multivitamin daily or folic
acid supplementation alone. For women
attempts to conceive, a multivitamin
plus folate at 400 µg/d is appropriate,
given evidence of additional benefit with
higher folate levels.18 We recommend
multivitamins, rather than individual vi-
tamins, because multivitamins are sim-
pler to take and cheaper than the indi-

dividual vitamins taken separately and
because a large proportion of the popu-
lation needs supplements of more than
one vitamin.

Physicians often do not ask about vi-
tamin use. Patients may not volunteer
information about their vitamin use, fear-
ing that the physician would disapprove
of unconventional use of vitamins. 
Therefore, physicians should specifi-
cally ask about vitamin use with 2 goals
in mind. First, they should be sure that
patients know about the vitamin supple-
ments they clearly should be taking, such
as folate during the childbearing years.
Second, physicians should be sure the pa-

tient is not taking vitamins in harmful
doses, such as very large doses of vita-
min D or even moderate doses of vita-

min A during the first trimester of preg-
nancy. Within these rather broad limits,
we believe that physicians should be in-
terested and not directive, even when it
seems the patient has unfounded be-
liefs or apparently unhelpful practices.

In this way, physicians can avoid in-
curring a substantial chance of losing ac-
cess to important information about pa-

tients’ vitamin use.

Additional Information

About Vitamins

The evidence base for the clinical ef-

cfects of vitamins is increasing rapidly.

For physicians to keep up with new de-

developments, there is no good alterna-
tive to electronic sources. The World
Wide Web includes a vast array of in-
formation on vitamins, most of it pro-
motional and self-serving. Physicians
can find the most updated and credi-
table information at the National Insti-
tutes of Health Web site (http://www
.cc.nih.gov/ccc/supplements). In addi-
tion, Tufts University maintains an


excellent nutrition Web site, as well as


a Nutrition Navigator that provides
quality ratings for other nutrition Web
sites (http://www.navigator.
tufts.edu). This site includes appro-
riate information for patients and
health care professionals. Some text-
books and Web publications are con-


tinuously updated as new research find-
ings are published. The Institute of
Medicine has published a series of
books on this subject as well, with ex-
tensive review of the existing litera-
ture at the date of publication.19-23

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