



Complete Summary

GUIDELINE TITLE

Vitamins in pre-dialysis patients.

BIBLIOGRAPHIC SOURCE(S)

Voss D. Vitamins in pre-dialysis patients. Westmead NSW (Australia): CARI - Caring for Australians with Renal Impairment; 2005 Dec. 7 p. [11 references]

Voss D. Vitamins in predialysis patients. Nephrology 2005 Dec;10(S5):S198-200.

GUIDELINE STATUS

This is the current release of the guideline.

COMPLETE SUMMARY CONTENT

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SCOPE

DISEASE/CONDITION(S)

Chronic kidney disease (CKD)

GUIDELINE CATEGORY

Assessment of Therapeutic Effectiveness
Management
Treatment

CLINICAL SPECIALTY

Family Practice
Internal Medicine

Nephrology
Nutrition

INTENDED USERS

Dietitians
Physicians

GUIDELINE OBJECTIVE(S)

- To outline the recommended daily intake and dietary requirements of vitamins: A, B₁, B₂, B₃, B₆, B₁₂, folic acid, biotin, niacin, pantothenic acid, C, D, E and K
- To assess any evidence of an association between mortality/morbidity and abnormal levels of these vitamins; these include blood test/plasma, serum levels and dietary intake levels

TARGET POPULATION

Patients with chronic kidney disease

INTERVENTIONS AND PRACTICES CONSIDERED

Supplementation with fat- and water-soluble vitamins

MAJOR OUTCOMES CONSIDERED

- Morbidity
- Mortality
- Abnormal vitamin levels

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Databases searched: Medical Subject Heading (MeSH) terms and text words for kidney disease were combined with MeSH terms and text words for vitamins then combined with the Cochrane highly sensitive search strategy for randomised controlled trials and search filters for identifying prognosis and aetiology studies. The search was carried out in Medline (1996–November Week 2 2003). The Cochrane Renal Group Trials Register was also searched for trials not indexed in Medline.

Date of searches: 27 November 2003.

NUMBER OF SOURCE DOCUMENTS

2 of 10

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

Level I: Evidence obtained from a systematic review of all relevant randomized controlled trials (RCTs)

Level II: Evidence obtained from at least one properly designed RCT

Level III: Evidence obtained from well-designed pseudo-randomized controlled trials (alternate allocation or some other method); comparative studies with concurrent controls and allocation not randomized, cohort studies, case-control studies, interrupted time series with a control group; comparative studies with historical control, two or more single arm studies, interrupted time series without a parallel control group

Level IV: Evidence obtained from case series, either post-test or pretest/post-test

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Comparison with Guidelines from Other Groups
Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Recommendations of Others. Recommendations regarding the safety of vitamin supplementation in patients with chronic kidney disease and end-stage kidney disease from the following groups were discussed: Kidney Disease Outcomes Quality Initiative, British Renal Association, Canadian Society of Nephrology, and European Dialysis & Transplant Nurses Association/European Renal Care Association.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Definitions for the levels of evidence (I–IV) can be found at the end of the "Major Recommendations" field.

Guidelines

No recommendations possible based on Level I or II evidence

Suggestions for Clinical Care

(Suggestions are based on Level III and IV sources)

- Chronic kidney disease (CKD) patients following a protein-restricted diet should receive supplementation with thiamine (>1 mg/day), B₂ (1 to 2 mg/day) and B₆ (1.5 to 2.0 mg/day). (*Level IV evidence and Opinion*)
- CKD patients with a glomerular filtration rate (GFR) below 50 mL/min and with an elevated parathyroid hormone (PTH) level or histological evidence of osteodystrophy should receive vitamin D supplementation. (*Level II evidence and Opinion*)

(See the Appendix in the original guideline document for recommended daily intake of selected vitamins).

A. Water Soluble Vitamins

Most B vitamins are supplied in a combined tablet form of 3 to 6 different vitamins. As they are water soluble, and when in excess easily cleared from the body, even in severe renal failure, supplementation is a safe way of ensuring deficiency of this group of vitamins is avoided.

Vitamin B₁ (Thiamine)

Dietary sources of thiamine include fresh green vegetables, whole-meal grains and some meats. Potassium-restricted or protein-restricted diets may result in thiamine deficiency. It may take 12 months or more for the deficiency to develop.

For patients following a prolonged protein-restricted diet, supplementary thiamine (1.0 to 1.5 mg/day is adequate maintenance) should be added to their medication profile.

Vitamin B₂ (Riboflavin)

Vitamin B₂ is plentiful in meat. As it is common (up to 40% of patients) for patients to become vitamin B₂ deficient on a protein-restricted diet, CKD patients following a prolonged protein-restricted diet should have their diet supplemented with vitamin B₂ by 1.0 to 2.0 mg/day.

Vitamin B₆ (Pyridoxine)

Meat is a natural dietary source rich in pyridoxine. Pre-dialysis patients on erythropoietin and patients on protein-restricted diets can develop pyridoxine deficiency. Such at-risk patients should have supplementary pyridoxine (5 mg/day is adequate maintenance) added to their medication profile.

The relevance of reports of mega-dosing with vitamin B₆ (300 mg/day) being associated with a lowering of serum cholesterol is unknown in CKD patients.

Vitamin B₁₂ (Cobalamin)

Vitamin B₁₂ is only plentiful in meat and meat product foodstuffs. B₁₂ requirements are low and deficiency is rare, and can take several years to develop after the introduction of a diet deficient in B₁₂. Annual serum B₁₂ levels can be monitored in high-risk patients, especially vegans.

Folic Acid

Dietary sources of folic acid include fresh green vegetables but prolonged cooking destroys folic acid. Folic acid deficiency results in megaloblastic anaemia. There is no conclusive evidence for routine folic acid supplementation in pre-dialysis CKD patients. Only intra-cellular red corpuscle folic acid levels should be measured, as serum levels are not indicative of body stores. Pre-dialysis patients on supplementary erythropoietin may need folic acid supplementation with 200 micrograms per day, due to increased use of folate.

Other B Vitamins (Biotin, Niacin, Pantothenic Acid)

Levels of these vitamins are elevated in CKD. The risk of deficiency is therefore low. There is no evidence for routine supplementation in the predialysis CKD population.

Vitamin C (ascorbic acid)

Low potassium diets are also low in vitamin C. Patients on low potassium diets can become vitamin C deficient. Serum ascorbic acid levels are low in most pre-dialysis patients. Supplementary vitamin C of >60 mg per day may increase the risk of hyperoxalosis and associated nephrolithiasis (Kopple et al., 1981).

A high intake of vitamin C is associated with hyperoxalosis, which may contribute to the vascular disease of renal failure patients or obstructive uropathy. Care should be taken not to exacerbate the CKD with oxalosis/urine crystal formation from the excessive administration of supplementary vitamin C.

Vitamin C supplementation may be given to assist the absorption of oral iron.

B. Fat-Soluble Vitamins

Vitamin A (Retinol)

Chronic kidney disease results in a rise in vitamin A levels by up to 20% above baseline. Retinol-binding protein (RBP) rises in renal failure and is associated with this vitamin A rise. Toxicity does not usually occur, as vitamin A is well bound to the RBP. Supplementation is not required and regular monitoring of blood vitamin A level is also not required.

Vitamin D (Cholecalciferol)

Care must be taken not to allow hypercalcaemia to ensue with vitamin D supplementation. Administration of vitamin D and dose adjustment should be prescribed initially at low doses with careful monitoring of serum calcium, phosphorus, and PTH (Ando, 2004). Vitamin D is potentially valuable for patients at high risk of developing secondary hyperparathyroidism (Sanchez, Goodman, & Salusky, 1999).

Vitamin E (Tocopherol)

Levels of vitamin E in platelets drop with CKD and correct with supplementation. Serum levels have been documented to be low, normal and high in patients with CKD, with both normal and restricted-protein diets (Gilmour, Hartley, & Goodship, 1998).

Erythropoietin therapy has been noted to raise vitamin E levels. At present, no recommendation with regards to vitamin E supplementation in CKD patients can be made.

Vitamin K

There is no information on vitamin K in relation to CKD. At present, no recommendation with regards to vitamin K supplementation in CKD patients can be made.

Definitions:**Levels of Evidence**

Level I: Evidence obtained from a systematic review of all relevant randomized controlled trials (RCTs)

Level II: Evidence obtained from at least one properly designed RCT

Level III: Evidence obtained from well-designed pseudo-randomized controlled trials (alternate allocation or some other method); comparative studies with concurrent controls and allocation not randomized, cohort studies, case-control studies, interrupted time series with a control group; comparative studies with historical control, two or more single arm studies, interrupted time series without a parallel control group

Level IV: Evidence obtained from case series, either post-test or pretest/post-test

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS**REFERENCES SUPPORTING THE RECOMMENDATIONS**

[References open in a new window](#)

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS**POTENTIAL BENEFITS**

Appropriate vitamin supplementation in patients with chronic kidney disease

POTENTIAL HARMS

Not stated

IMPLEMENTATION OF THE GUIDELINE**DESCRIPTION OF IMPLEMENTATION STRATEGY****Implementation and Audit**

1. All pre-dialysis patients who are following a protein-restricted diet should have B vitamin supplementation. Most proprietary formulations have an adequate amount of the required vitamins. One or two B vitamin complex tablets daily is usually adequate. The prescribing physician should ensure that the prescribed medication contains the recommended content.
2. The diet could be supplemented with at least 1 mg of folate per day. Higher doses may be required in cases of erythropoietin administration. If available, therapy efficacy and compliance could be followed by regularly taking blood homocysteine levels.
3. Vitamin C supplementation may be appropriate to assist supplementary oral iron absorption (see separate iron and erythropoietin guidelines). Mega-dosing of vitamin C (e.g., prevention of common cold) must be avoided.
4. Parathyroid hormone level should be measured once glomerular filtration rate (GFR) is below 60 mL/min. Regular monitoring of parathyroid hormone (PTH) levels (3–6 monthly) should be performed, and oral vitamin D dose should be adjusted to maintain near-normal PTH levels. Pulse oral dosing (two or three days per week) has a greater effect in lowering PTH levels, with less provocation of hypercalcaemia. Care must be taken not to induce hypercalcaemia with supplementary vitamin D therapy, which may result in nephrolithiasis, and exacerbate renal failure. Regular review of the patient's diet by a renal dietician must also occur, as the calcium content of foods in the diet may vary (e.g., calcium-supplemented foods, milks and juices).

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Living with Illness

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

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ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2005 Dec

GUIDELINE DEVELOPER(S)

Caring for Australasians with Renal Impairment - Disease Specific Society

SOURCE(S) OF FUNDING

Industry-sponsored funding administered through Kidney Health Australia

GUIDELINE COMMITTEE

Not stated

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Author: David Voss

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

All guideline writers are required to fill out a declaration of conflict of interest.

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the [Caring for Australasians with Renal Impairment Web site](#).

Print copies: Available from Caring for Australasians with Renal Impairment, Locked Bag 4001, Centre for Kidney Research, Westmead NSW, Australia 2145

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- The CARI guidelines. A guide for writers. Caring for Australasians with Renal Impairment. 2006 May. 6 p.

Electronic copies: Available from the [Caring for Australasians with Renal Impairment \(CARI\) Web site](#).

PATIENT RESOURCES

None available

NGC STATUS

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