

# MEDICAL UPDATES: OPTIMIZING VITAMIN D FOR SURGICAL SUCCESS

Brennan Reardon, DPM, AACFAS

November 20, 2025



IN PARTNERSHIP WITH



COLLABORATIVE MEDICAL CONTENT  
AN EDUCATIONAL NONPROFIT



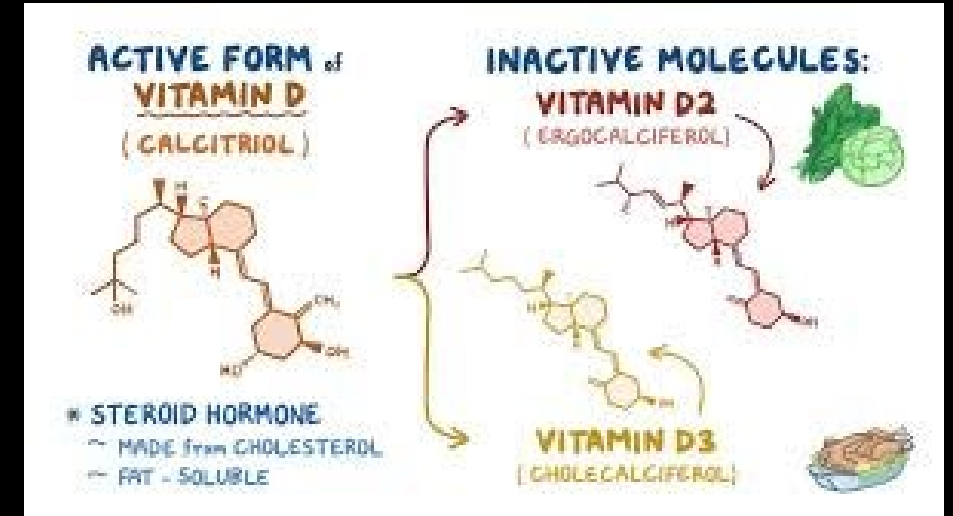
# Background:

- Bachelors of Science from The Ohio State University
- Doctorate of Podiatric Medicine from Kent State University
- 3 year surgical residency at Wake Forest Baptist Health
- 1 year advanced surgical fellowship at Silicon Valley Comprehensive Foot and Ankle Surgical Fellowship
- Current Associate at Upstate Podiatry Group
- President of STEPS

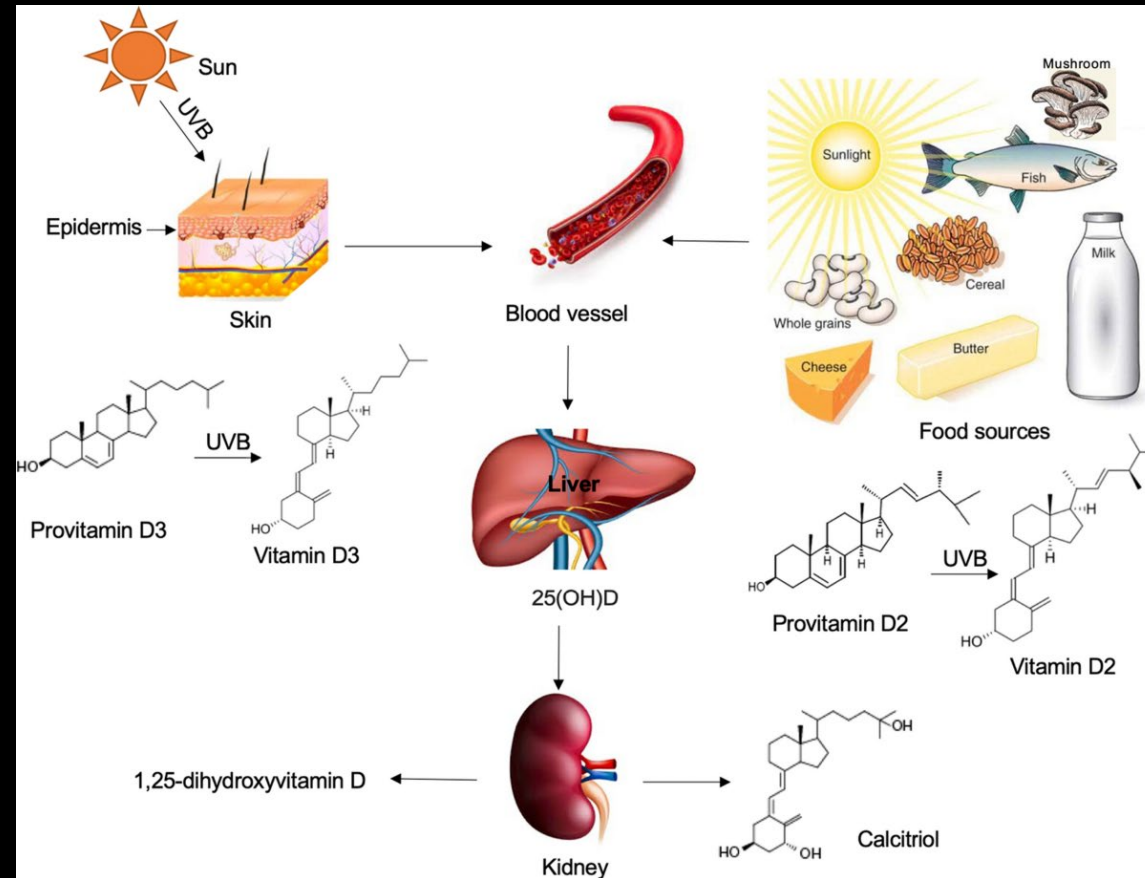


# Vitamin D

- Fat soluble
- Obtained via diet or through ultraviolet radiation
- Essential for bone development and maintenance
- Main action is to increase gut absorption of calcium and phosphorus



# Mechanism of Action:



# Etiology

Range	SI Units	Conventional
Deficiency	< 50 nmol/l	< 20 ng/ml
Insufficiency	52-72 nmol/l	21-29 ng/ml
Sufficient	> 75-150 nmol/l	> 30-60 ng/ml
Toxicity	> 374 nmol/l	> 150 ng/ml

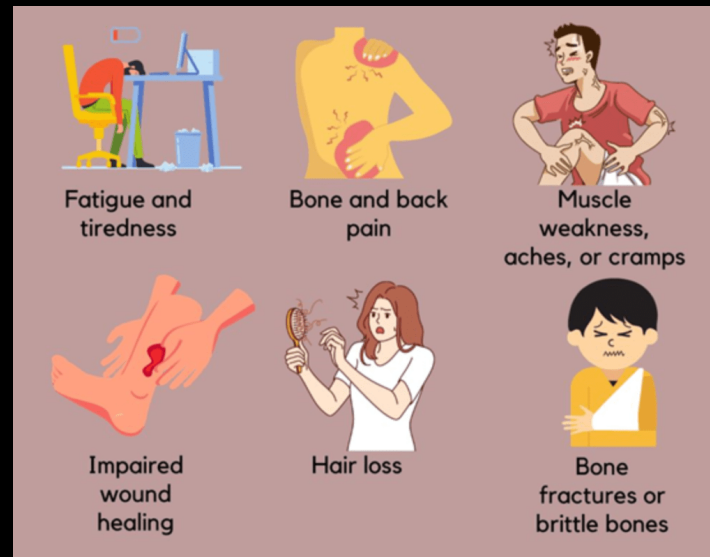
- Estimated 23% of people aged 19-64 years and 21% over 65 years have a Vitamin D deficiency
- From January-March increase to 40% and 50% respectively
- Affects an estimated 1 billion
- In orthopedic surgery it is believed that 30-47% of patients have insufficient Vitamin D levels

## VITAMIN D DEFICIENCY: Risk Factors



# Vitamin D Deficiency:

- Best marker: Serum 25(OH) D
- Range of below 75 nmol/L (30ng/mL) is considered deficient



# Vitamin D Replacement:

- Sunlight exposure and dietary intake are often insufficient alone
- Recommended intake is 400-2000 IU daily
- **25µg** of vitamin D<sub>3</sub> raises 25-hydroxyvitamin D serum levels by 15-25 nmol/L on average
- Endocrine Society Recommends a maximum limit of 10,000 IU daily



## Vitamin D status and surgical outcomes: a systematic review

Paul J Iglar<sup>1</sup> and Kirk J Hogan<sup>2\*</sup>

- Systematic review to assess the association between perioperative vitamin D status and outcomes after surgery
- 31 studies were eligible for inclusion. Fifteen studies employed prospective observational designs, 3 used prospective randomized protocols, and 13 report retrospective database interrogations.
- 26 of 31 studies (84%) report at least one statistically significant worse outcome in patients with low vitamin D status.
- 5 of 31 studies (16%) found no association.

# Incidence of Vitamin D Deficiency in Foot and Ankle Arthrodesis Nonunions

Victor Anciano<sup>1</sup>, Sterling K. Tran<sup>2</sup>, James B. Carr<sup>3</sup>, Campbell Edwards<sup>1</sup>, Dylan Russell<sup>4</sup>, Risa T. Reid<sup>4</sup>, Joseph Park<sup>4</sup>

1. Orthopaedics, University of Louisville Hospital, Louisville, USA 2. Orthopaedic Surgery, University of Alabama at Birmingham, Birmingham, USA 3. Orthopaedic Surgery, Hospital for Special Surgery Florida, West Palm Beach, USA 4. Orthopaedic Surgery, University of Virginia, Charlottesville, USA

Corresponding author: Victor Anciano, victor.anciano@uoflhealth.org

Patient number	Surgery	Follow-up (months)	Union vs. nonunion	Broken hardware	Vitamin D level (ng/mL)	Revision surgery
1	Ankle arthrodesis	22.3	Nonunion	No	15	No
2	Left TTC fusion	29.2	Nonunion	Yes	12	Yes
3	Ankle arthrodesis	35.0	Nonunion	No	14	No
4	Triple arthrodesis	22.5	Nonunion	Yes	21	Yes
5	TTC fusion	44.6	Nonunion	No	10	No
6	TMT arthrodeses	26.7	Nonunion	No	24	No
7	Triple arthrodesis	27.3	Nonunion	Yes	14	Yes
8	Subtalar arthrodesis	31.7	Nonunion of the TN joint only	No	9	Yes
9	TTC arthrodesis	10.9	Nonunion	No	16	No
10	TMT arthrodeses	24.2	Nonunion	No	16	No
11	Triple arthrodesis	22.3	Nonunion	Yes	28	No
12	Ankle arthrodesis	29.2	Nonunion	Yes	10	Yes
13	TTC fusion	35.0	Nonunion	Yes	34	Yes

TABLE 2: Vitamin D levels, associated arthrodesis procedures, follow-up duration, and the presence of nonunion for each patient.

TTC = tibiototalcaneal; TMT = tarsometatarsal; TN = talonavicular

Patient number	Gender (F/M)	Age	BMI	Smoking Hx (Yes/No/Former)	DM (Yes/No)	CAD/PVD (Yes/No)
1	M	76	24.4	No	No	No
2	F	57	39.5	Former	Yes	No
3	F	35	49.4	Former	No	No
4	F	49	25.5	No	No	Yes
5	M	50	45.2	No	No	No
6	F	41	31.9	Former	No	No
7	F	35	37.1	No	No	No
8	F	55	43	Yes	No	No
9	F	56	45.8	Former	Yes	No
10	F	40	46.8	No	No	No
11	M	67	31.1	Former	No	No
12	F	40	43.9	Yes	No	No
13	M	62	26.1	Former	No	No

TABLE 1: Demographics of the patient population.

F = female; M = male; Hx = history; BMI = body mass index; DM = diabetes mellitus; CAD = coronary artery disease; PVD = peripheral vascular disease

- **13** patients met the inclusion criteria: 4 (31%) patients were male, and 9 (69%) patients were female
- The average vitamin D level was **17.1 ng/mL**
- 5 patients underwent revision arthrodesis after normalization of vitamin D levels, and **4/5** patients went on to successful union



## Vitamin D levels in 577 consecutive elective foot & ankle surgery patients

Randeep S. Aujla <sup>a</sup>, Patricia E. Allen <sup>a</sup>, William J. Ribbans <sup>b</sup>  

- Vitamin D levels were obtained prospectively in 577 consecutive elective patients undergoing elective foot and ankle surgery between October 2014 and March 2017
- 62.0% were female. Mean age was 53.2
- 21.7% were grossly deficient, 31.9% deficient, 28.9% insufficient and 17.5% within normal range
- 1 in 5.7 patients had a normal Vitamin D level and 1 in 4.6 were grossly deficient

- Each patient was tested within 2 months prior to surgery and optimized to at least 20ng/mL
- 44 operative extremities were included
- Nonunion rate of 2.3%
- No statistically significant difference in time to fusion based on varying levels of vitamin D of at least 20 ng/mL or in patients who used a bone stimulator.
- No increased risk of delayed or nonunion in patients with a history of deficiency.

**Patients With a History of Vitamin D Deficiency Are Not at Increased Risk of Delayed Union Following First Metatarsophalangeal Joint Arthrodesis After Preoperative Optimization**

Bryanna D. Vesely, DPM, MPH\*  
Jennifer Kipp, DPM\*  
Gregory Russell, MS\*  
Paula Gangopadhyay, DPM\*  
Ashleigh W. Medda, DPM†



# What should we do?

- Optimize Vitamin D levels prior to major foot/ankle surgery?
- Testing prior to surgery?
- What are we optimizing with?



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THANK YOU

Brennan Reardon, DPM, AACFAS

Email: [brennan.reardon@gmail.com](mailto:brennan.reardon@gmail.com)