Nutrition and Wound Healing: Vitamins

NURS 2217: Inquiry: Evidence Informed Practice

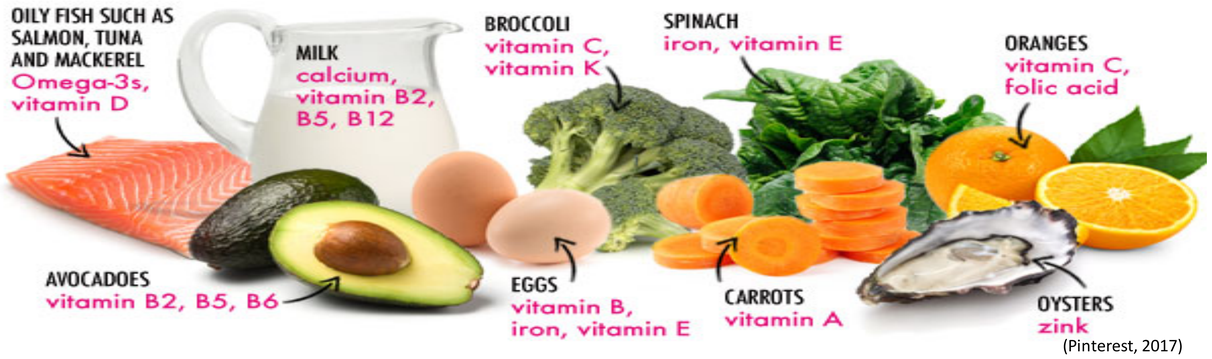
Presented By: Rina Ho, Mahsa A., Ellison Fernandez Jeannie Zhou

DOUGLAS COLLEGE

INTRODUCTION

- Sufficient nutrition is important for all medical surgical patients
- In the clinical setting, many patients postoperative receive multivitamin and minerals to maintain adequate nutrition
- This poster presentation will address the importance of supplementary vitamins to wound healing
- Complications of delay wound healing includes adhesions contractures, dehiscence, evisceration, granulation tissue, fistula formation, Infection, hemorrhage, formation of hypertrophic scars and keloids

(Lewis, Dirksen, Heitkemper, Bucher, & Camera, 2014)



(Pinterest, 2017)

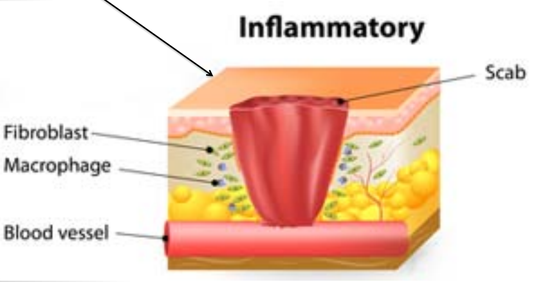
Vitamins	Symptoms and Signs (of Deficiency)	Function in Wound Healing	Effects of Deficiency on wound healing	Replacement Doses	Toxic Levels
Vitamin A	Xeropthalamia; xerosis of the cornea; keratomalacia; night blindness; poor bone growth	Maintains integrity of epithelial and mucosal surfaces Enhances fibroplasia that increases collagen synthesis and epithelialization Antagonizes inhibitory effects of glucocorticoids	Widespread alterations in immune function Impaired collagen synthesis and cross-linking, decreased epithelialization	RDA: 900 mcg daily (3000 IU) for men and 700 mcg daily (2300 IU) for women Vitamin A-rich foods: liver, beef, carrots, orange and mangos. Five servings of fruit and vegetables per day.	>150 000 mcg → acute toxicity >10 000 mcg → chronic toxicity
Vitamin E	Nerve dysfunction (ataxia; hyporeflexia, and peripheral neuropathy); bone weakness	No clear role in healing surgical wounds or pressure ulcers Antioxidant Supplementation inhibits collagen synthesis and decreases tensile strength of wounds		RDA: 15 mg	800 mg/day → depressed coagulation with bleeding risk; impaired WBC function
Vitamin C	Scurvy: petechial, bleeding gums, bruising, fatigue, hyperkeratosis and arthralgias	Required for fibroblast maturation; a cofactor in the hydroxylation of proline and lysine in collagen synthesis Required for angiogenesis Affects immune function	Defective collagen cross-linking, reduced wound tensile strength, and increased wound dehiscence Increased capillary fragility, diminished angiogenesis Old wounds may break down in severe vitamin C deficiency	100 – 200 mg/day, equivalent to five servings of fruit and vegetables.	≥ 500 mg/day → nausea and diarrhea >1g/day → risk for oxalate kidney stones
Vitamin K	Easy bruisability and bleeding Dermatitis Diarrhea	Cofactor for synthesis of prothrombin and clotting factors II, VII, IX, and X	Excessive bleeding can occur in wounds and predispose to wound infection		

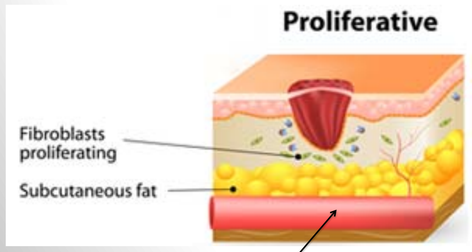
(Little, M. O., 2013) (Thompson, C., & Fuhrman, M., 2005)

PREOPERATIVE + POSTOPERATIVE TEACHING

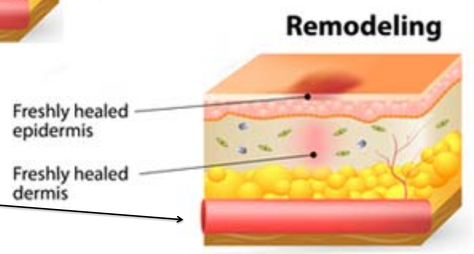
Stages of Wound Healing:
Vitamins associated at each stage

Vitamin A
Vitamin C
Vitamin K





Vitamin A
Vitamin C



Maynard, 2016

SUMMARY OF STUDY

Vitamin C

Two cited studies found results from the use of pharmacological doses of vitamin C for wound healing.

- 20 surgical patients with pressure ulcers were randomized to receive 1000mg of Vitamin C (500mg BID) Vs. placebo
- subjects receiving supplementation had significantly higher leukocyte ascorbic acid concentrations and reduced pressure ulcer surface area
- authors reported 84% reduction in surface area at 30 days in the supplemented group compared with a 42.7% reduction for those receiving placebo
- 6 patients receiving supplementation were treated completely, whereas only 3 healed completely from the placebo group

Vitamin D

- researchers believe that vitamin D can play a role in regulating the effects of keratinocytes, which are predominate cells of the skin's outermost layer, and vitamin D plays a significant role in the growth and differentiation of these cells
- researchers recruited 26 patients with chronic leg ulcers and 26 patients without leg ulcers as controls for comparison. Vitamin D in ulcer patients was 17.1ng/ml COMPARED TO 22.8ng/mL in control group
- after screening the 26 patients, 4 did not meet inclusion criteria, 13 received vitamin D 50,000IU/week and 9 received placebo treatment
- researchers found a significant difference in wound size between the two study groups:
  - those receiving vitamin D had decreased wound size by 0.75cm^2
  - the placebo group had a median increase in wound size of 4cm^2

CONCLUSION

- Through this project we have learned that malnutrition contributes to delayed wound healing
- Each vitamin we have discussed plays an important role in each stage of the healing process: inflammatory, proliferative and remodeling phase.
- Based on our literature review, patients who were receiving nutritional supplementation displayed a significant decrease in wound size as compared to those who did not.
- We now have a better understanding of supplemental nutrition (vitamins) on post surgical patients in our clinical setting and will further promote these findings through patient teaching.

REFERENCES

Burkiewicz, C. J. C. C., Guadagnin, F. A., Skare, T. L., Nascimento, M. M., Servin, S. C. N., &Souza, G. D. (2012). Vitamin D and skin repair: a prospective, double-blind and placebo controlled study in the healing of leg ulcers. *Revista do Colégio Brasileiro de Cirurgiões*, *39*(5), 401-407. doi:10.1590/S0100-69912012000500011

Lewis, S. L., Dirksen, S. R., Heitkemper, M. M., Bucher, L., & Camera, I. M. (Eds.). (2014). *Medical-surgical nursing in Canada: Assessment and management of clinical problems* (3rd Cdn. ed.) (M. A. Barry, S. Goldsworthy & D. Goodridge, Cdn. Adapt.). Toronto: Elsevier Canada.

Little, M. O. (2013). Nutrition and skin ulcers. *Current Opinion In Clinical Nutrition And Metabolic Care*, *16*(1), 39-49. doi:10.1097/MCO.0b013e32835bc0a1

Maynard, J. (2016, November 03). How Wounds Heal: The 4 Main Phases of Wound Healing. Retrieved February 15, 2017, from http://www.shieldhealthcare.com/community/wound/2015/12/18/how-wounds-heal-the-4-main-phases-of-wound-healing/

Pinterest. (2017). Vitamins. Retrieved Februrary 16 2017, from https://www.pinterest.com/pin/425097652300904836/

Salah, D. (2016). Perioperative nutrition to enhance recovery after surgery. *Ain Shams Journal Of Anesthesiology*, *9*(4), 469-477. doi:10.4103/1687-7934.198247

Stechmiller, J. K. (2010). Understanding the role of nutrition and wound healing. *Nutrition In Clinical Practice: Official Publication Of The American Society For Parenteral And Enteral Nutrition*, *25*(1), 61-68. doi:10.1177/0884533609358997

Thompson, C., & Fuhrman, M. (2005). Nutrients and wound healing: still searching for the magic bullet. *Nutrition In Clinical Practice*, *20*(3), 331-366.