Drug Effects		
System	**Effect**	**Test**
CV	Tachycardia, palpitations, Htn with other cardiac stimulants, edema	HR, BP
HEME	Decreases effectiveness of warfarin, inhibits coagulation cascade	INR, PT, PTT
NEURO	Excessive use: Somnolence, hypertonia, nervousness, and excitability mania in pts on phenelzine Reduces analgesic effect of morphine	
ENDO	Hypoglycemia	Blood glucose
GYN	Mastalgia, postmenopausal bleeding	Hct

Key References: Volger BK, Pittler MH, Ernst E: The efficacy of ginseng. a systematic review of randomized clinical trials, *Eur J Clin Pharmacol* 55(8):567–575, 1999; Tokuyama S, Takahashi M: Pharmacological and physiological effects of ginseng on actions induced by opioids and psychostimulants, *Japan J Pharm* 117(3):195–201, 2001.

Perioperative Implications

Preoperative Concerns
- Check coagulation studies; monitor blood glucose.

Monitoring
- Standard

Induction
- Increased amounts of opioids may be required to blunt adrenergic response to intubation.

Airway
- No specific concerns

Postoperative Concerns
- Monitor blood glucose level, monitor for signs of excessive postop bleeding.
- Increased amounts of opioids may be required to manage postop pain.

Acknowledgment

The authors would like to acknowledge the contributions of Dr. Devi Mahendran and Dr. Swaminathan Karthik to the previous edition.

Glucosamine Sulfate

Bridget Perrin Pulos

Uses
- For pain associated with OA, particularly of the knee
- IBD
- Other inflammatory disorders, such as rheumatoid arthritis, psoriasis
- Possible benefits for wound healing and prevention of migraines

Perioperative Risks
- No convincing evidence of increased periop risk owing to glucosamine therapy
- No known significant interactions with commonly administered anesthetic drugs

Worry About
- Potential increase in INR in pts on warfarin who initiate glucosamine therapy, or increase glucosamine dose

Overview
- Available without a prescription in North America.
- Classified as a food additive, not regulated by the USA FDA, made from crustacean skeletons.
- As monotherapy, little consistent evidence of therapeutic effect.
- Often used in combination with other drug supplements, such as chondroitin.
- In combination with chondroitin, may prolong the time to total knee replacement in those with severe OA.
- Side-effect profile is indistinguishable from placebo and better than that of NSAIDs.
- High oral bioavailability with substantial first-pass metabolism, freely diffusable with a 28- to 58-h half-life.

Drug Class/Mechanism of Action/Usual Dose
- Glucosamine is a component of the extracellular matrix of articular cartilage, found naturally in the body.
- Recommended oral dose is 1500 mg/d or 500 mg 3 times per d.
- Precise mechanism of action of glucosamine is unknown; thought to aid in cartilage repair, normalize cartilage metab, and have mild anti-inflammatory properties.

Assessment Points		
System	**Effect**	**Test**
HEME	May potentiate warfarin or increase risk of bleeding when taken with other drugs that increase risk of bleeding	PT/INR if pt is on warfarin
ENDO	No consistent effect	Glucose if otherwise indicated

Key References: Fransen M, Agaliotis M, Nairn L, et al.: Glucosamine and chondroitin for knee osteoarthritis: a double blind randomized placebo-controlled clinical trial evaluating single and combination regimens, *Ann Rheum Dis* 74(5):851–858, 2015; Altman RD: Glucosamine therapy for knee osteoarthritis: pharmacokinetic considerations, *Expert Rev Clin Pharmacol* 2(4):359–371, 2009.

Perioperative Implications
- Glucosamine therapy has no significant periop or anesthetic implications. No need to interrupt therapy for a surgical procedure, no reason to modify an anesthetic plan due to glucosamine, and there is no urgency with regard to restarting therapy postop.

Glycine

Alan David Kaye | Rachel J. Kaye | Mark R. Jones

Uses
- Inhibitory neurotransmitter in the brain stem and spinal cord.
- Glycine and GABA receptors may mediate the effects of inhaled anesthetics.
- A nonessential amino acid sold as a natural sugar substitute, a sedative, and an antacid; used to promote muscle growth and decrease Sx of BPH; also as a polyphenol and an antipsychotic.
- Glycine 1.5% used as a nonhemolytic irrigation solution during TURP.
- Antagonists of glycine binding to NMDA receptor complex are used as anticonvulsants.
- Attempts to use glycine and other NMDA agonists in schizophrenia have had little success.
- Intrathecal glycine is not different from placebo in the treatment of complex regional pain syndrome.