

Medication Administration Recommendations Following Gastric Bypass Surgery

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Introduction

Recently gastric bypass surgeries in the United States have been increasing at a dramatic rate. The American Bariatric Society Reports that there are on average 103,000 procedures performed annually¹. Despite this spike, there has been very little research investigating how surgery affects a daily medication regimen¹.

For oral medications to work consistently and correctly, it is essential that our body absorbs as much of the medication as possible. Most medications are absorbed directly in the stomach or in a nearby portion of the small intestine called the duodenum.¹ There are many factors that influence how medications are absorbed. Four keys to absorption are: how well the drug dissolves, how much of the GI tract is available to absorb the drug, where the majority of drug is preferentially absorbed, and how much blood flow is supplied to the GI tract to allow distribution throughout the body.^{1,5}

How well a drug dissolves is primarily impacted by how much gastric acid is present. Most medications dissolve better in acidic environments.¹ Following surgery most patients produce less gastric acid, and as a result medications do not dissolve as easily.¹ Gastric bypass surgery also reduces the amount of GI tract which is available for medication absorption.¹ Decreased surface area results in a direct decline in how much drug a patient can absorb. As a result, the therapeutic benefits of most medications also decline.

Recently, a literature review found 26 studies investigating the effects of bypass surgery on medication absorption³. 16 of these studies showed that surgery did indeed decrease the amount of drug absorbed³. The following is a discussion about how to best avoid these interactions, choose the right medication, and make sure medications continue to be beneficial following surgery.

Pain Medication

Many patients on a day to day basis have minor aches and pains for which they choose over-the-counter products such as Tylenol® and Aleve®. It is important that patients who have undergone gastric bypass avoid a class of medications called NSAIDs (ex. ibuprofen, naproxen, ketorolac, aspirin, etc.)¹. It has been shown that bypass patients are at an increased risk of stomach ulceration and bleeding while taking these medications¹. Patients who take a daily baby aspirin for heart protection should ask their physician before stopping therapy. If patients are unsure if the medications, they take are NSAIDs they should speak with their pharmacist. Alternative pain medications for bypass patients include acetaminophen, tramadol, and opioids¹.

Topical NSAIDs have been gaining popularity because of their reduced systemic side effects. It is important to avoid these as well because there is still a risk of absorption which may increase your risk of stomach ulcers. Diclofenac topical gel, patch, and solution are the topical NSAIDs currently available in the U.S. Alternatives include lidocaine patch (Rx only) and topical capsaicin (available OTC).

Anti-Osteoporosis Medications

Medications including Fosamax, Actonel, and Boniva are in a class referred to as the bisphosphonates. Absorption of these drugs requires extensive amounts of gastric acid and contact time with the GI tract. This is something that can not be provided in bypass patients and it is recommended that these medications be avoided^{1,5}. Alternatives include: calcitonin nasal spray, teriparatide, and raloxifene.¹ Patients should discuss with their physician which medication may be right for them.

Coumadin

There are currently no official studies looking at the effects of gastric bypass surgery on Coumadin (warfarin).⁴ However, many cases have been reported in which bypass patients require large doses of Coumadin to achieve a therapeutic effect.⁴ It is important to discuss concerns about altered Coumadin therapy post-operatively with your physician. More frequent INR monitoring may be required.

Extended Release Medications

Many medications come in the form of extended release capsules or tablets. This means that the medications dissolve and take effect over a period that can range from 8-24 hours. Most extended release medications are labeled as ER, SR, LA, or CD. These medications require extended periods of time in the GI tract to work correctly¹. With a shortened GI tract from bypass surgery these medications are usually not viable options for bypass patients.¹ Patients should be switched from extended release to immediate release formulations after surgery.¹ Liquid medications are also often absorbed better than tablets, and may be an alternative.¹ If you are unsure if your medication is extended release, please consult your pharmacist.

Oral Contraceptives

Drug absorption can not be guaranteed following gastric bypass, it is important that female patients not rely solely on oral contraceptives to prevent pregnancy.⁵ The period following surgery has also been shown to be a time of increased fertility in most female patients.⁵ Barrier contraception is recommended for these patients.¹

Oral Antibiotics

Many oral antibiotics are also affected by the results of bypass surgery. Penicillins and cephalosporins have extensively varied absorption depending on how much acid and food is present in the stomach.² These properties can limit their effectiveness in the gastric bypass patient.

Nitrofurantoin comes in two dosage forms, an immediate and extended release. It is important that bypass patient not utilize the extended release formulation.²

Macrolide antibiotics like erythromycin, clarithromycin, and azithromycin also show varied absorption, with clarithromycin being the most reliable.²

Bactrim with its direct absorption from the stomach and small intestine also exhibits decreased absorption following bypass.²

Quinolone antibiotics like levofloxacin, ciprofloxacin, and moxifloxacin dissolve very well in environments with minimal acid.² These are often good choices for patients following bypass surgery.²

When starting patients on oral antibiotics it is important to monitor signs and symptoms of infection closely. If it appears that the signs and symptoms of infection are not resolving a follow-up appointment should be scheduled. IM or IV antibiotic administration may be beneficial in these patients when possible.²

Psychiatric Medications

Psychiatric medications were a focus of study for one group in 2005. Researchers recreated the environment produced by gastric bypass surgery in a laboratory and tested how drug absorption was affected⁶. Some medications changed dramatically while others were minimally affected⁶. Please review the following table of their results comparing pre-op and post-op drug absorption. Medications which have * were shown to have clinically significant differences in absorption pre-op vs. post-op. It would be prudent to closely monitor * medications that were extensively affected by bypass surgery. It is important to remember that these numbers are only an estimation of the effects of bypass surgery⁶.

Medication	Pre-Op Absorption	Post-Op Absorption
Amitriptyline*	28%	21%
Fluoxetine*	30%	11%
Paroxetine*	9%	3%
Sertraline*	16%	10%
Bupropion*	52%	73%
Venlafaxine	59%	59%

Citalopram	27%	31%
Clonazepam*	57%	52%
Buspirone	59%	59%
Diazepam	6%	6%
Lorazepam	8%	0%
Trazodone	59%	59%
Zolpidem	82%	74%
Clozapine*	54%	43%
Olanzapine*	45%	38%
Quetiapine*	53%	23%
Risperidone*	64%	49%
Ziprasidone*	77%	27%
Lithium Carbonate*	35%	75%
Haloperidol	7%	7%
Methylphenidate	48%	54%
Oxcarbazepine	5%	2%

Supplements

Nutrient deficiencies are often present in patients undergoing gastric bypass surgery. The most common deficiencies are vitamins A, D, E, K, and Calcium⁵. Many bypass patients are also at risk for anemia.⁵ The easiest way to prevent these deficits is for bypass patients to take daily nutrient supplementation.

Nutrient supplementation for gastric bypass patients should start with a daily multivitamin.¹ In addition, a daily calcium supplement should be considered.¹ Due to a lack of stomach acid, bypass patients should choose calcium citrate products over the less soluble calcium carbonate.¹

Many bypass patients will also need supplementation to prevent anemia. These patients should be started on an iron supplement.⁵ Newer polysaccharide iron complexes are now available and are easily dissolved making them good candidates for bypass patients.¹ However, they can be expensive and difficult for some patients to manage. In that instance combining regular ferrous sulfate tablets with vitamin C can increase the amount of acid in the stomach to allow better absorption of the iron complex.¹

Another contributing factor to the development of anemia is the inability of the surgical GI tract to make enough intrinsic factor to allow for vitamin B12 absorption.⁵ The best way for bypass patients to circumvent this problem is to receive monthly intramuscular injections of vitamin B12.¹ Folate and thiamine may also be key additions to this regimen.⁵ Before taking action, patients should speak with their physician about their risk of nutrient deficiency and anemia.

Conclusion

As one can see, there are many considerations to take into account when managing day to day medication therapy for the gastric bypass patient. It is important to ensure the maximum possible benefit from each medication. Understanding the changes undertaken by gastric bypass surgery, and the principles of drug dissolution can give providers an edge in determining the effects of surgery on medication absorption for virtually all medications. These recommendations come in light of the currently limited but available medical research on this topic.

Attached below is a table listing medications which have not been discussed above, and how they are affected by bypass surgery¹. As always, if you have further questions please discuss any medication concerns with your physician or pharmacist.

Table 1. Selected Agents with Potential for Decreased Absorption in Patients Who Have Undergone Bariatric Surgery		
Drug	Possible Site(s) of Absorption	Management
Enalapril	Hydrolyzed to active form, enalaprilat, in stomach; absorbed in small intestine ^a	May exhibit decreased activity; consider other angiotensin-converting-enzyme inhibitors
Ketoconazole	Likely absorbed in stomach because acidic medium required for absorption ^b	Absorption likely to be negligible; consider alternative agents ^c
Lamotrigine	Likely stomach and proximal small intestine due to rapid and complete absorption ^d	Monitor for and advise patients of decreased efficacy
Metformin	Slowly and incompletely absorbed in duodenum ^e	Increased monitoring of blood glucose; drug requirements can decrease as weight loss occurs
Metoprolol tartrate	Absorbed rapidly and completely, indicating stomach and duodenum ^a	Monitor blood pressure; medication requirements may decrease as weight loss occurs
Niacin	Primarily absorbed in duodenum ^f	Administer with low-fat snack to maximize absorption
Olanzapine	Stomach ^g	Monitor for decreased efficacy; switching to orally disintegrating tablet will not increase absorption (still absorbed in stomach)
Quetiapine fumarate	Exact location unknown, but likely stomach and duodenum due to rapid absorption ^h	Monitor for decreased efficacy
Ramipril	Unknown; decreased absorption documented in patients with steatorrhea and malabsorption ⁱ	Consider other agents; monitor blood pressure in the postoperative period; need for antihypertensives may decrease as weight loss occurs
Simvastatin	Absorption site unknown, but must be hydrolyzed to the active form in stomach ^j	Consider other agents; monitor serum lipids
Zolpidem	Absorbed rapidly and completely; absorption affected by food ^k	Absorption time may increase, resulting in delay to effect; take on an empty stomach

^aVasotec (enalapril) package insert. Morrisville, NC: Biovail Pharmaceuticals; 2002 Aug.

^bData on file. Janssen Pharmaceutica, Titusville, NJ.

^cLamictal (lamotrigine) package insert. Research Triangle Park, NC: GlaxoSmithKline; 2005 Aug.

^dVidon N, Chaussade S, Noel M et al. Metformin in the digestive tract. *Diabetes Res Clin Pract.* 1988; 4:223-9.

^eLopressor (metoprolol tartrate) package insert. Suffern, NY: Novartis; 2004 Nov.

^fData on file. Kos Pharmaceuticals, Cranbury, NJ; 2005 Aug.

^gData on file. Eli Lilly Pharmaceuticals, Indianapolis; 2005 Oct.

^hSeroquel (quetiapine fumarate) package insert. Wilmington, DE: AstraZeneca; 2005 Dec.

ⁱData on file. King Pharmaceuticals, Bristol, TN; 2004 Feb.

^jVickers S, Duncan CA, Chen W et al. Metabolic disposition studies on simvastatin, a cholesterol lowering prodrug. *Drug Metab Dispos.* 1900; 18:138-45.

^kAmbien (zolpidem) package insert. New York: Sanofi-Synthelabo; 2004 Mar.

References

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MEDICATIONS AFTER WEIGHT LOSS SURGERY

Most medications are absorbed primarily in the small intestine through the intestine's membrane. This process is influenced by the amount of time it takes for the stomach to empty. Weight loss surgery (WLS) may slow down medication absorption due to this process.

Some points to consider:

- The formulation of the med may affect how well it is absorbed. For example, some meds require high levels of fluid to facilitate their action. Taking large amounts of liquid quickly after WLS may be a challenge.
- Extended-release preparations should be avoided since the release system will be impacted, resulting in either a large amount of medication released into your system all at once or very little medication released at all.
- Drugs that are corrosive to the stomach lining are not recommended. These include Aspirin, Non-Steroidal anti-inflammatory drugs (NSAIDS) like ibuprofen and naproxen, as well as potassium supplements to name a few... See the more extensive list on the next page.
- Protect yourself. When being prescribed a new medication—ask questions. Make sure the physician is aware of your prior WLS. Utilize the pharmacist who is an expert in medication action and usage. And read the label of all over-the-counter products.

Advil	Mobic
Aggrenox	Motrin
Aleve	Nabumetone
Alka-Seltzer (avoid ones with aspirin)	Nalfon
Anacin	Naprosyn
Anaprox	Naproxen
Ansaid	Norgesic
Arthrotec	Norwich Tablets
Ascriptin	Novasal
Aspirin	Nuprin
Bayer	Orudis
Bufferin	Oxaprozin
Cataflam	P-A-C Tablets
Celebrex	Pennsaid
Celecoxib	Pepto Bismol
Clinoril	Percodan
CMTrisalicylate	Piroxicam
Daypro	Pravigard
Diclofenac	Relafen
Diclofenac/Misoprostal	Robaxidal
Diflunisal	Rufen
Disalcid	Salsalate
Doan's pills	Sine-Aid IB
Dolobid	Synalgos-DC
Dristan Sinus Caplets	Sulindac
Ecotrin	Synalgoz-DC
Empirin	Tolectin
Etodolac	Tolmetin Sodium
Excedrin (avoid ones with aspirin)	Toradol
Feldene	Trilisate
Fenoprofen	Vanquish
Flector patch	Voltaren
Fiorinol	Voltaren gel
Flurbiprofen	Voltaren patch
Ibuprofen	Voltaren solution
Indocin	Voltaren XR
Indomethacin	Vioxx
Ketoprofen	
Ketorolac	
Lodine	
Magnesium Salicylate	
Meclofenamate	
Meclomen	
Midol (avoid ones with naproxen)	

This list includes NSAID's to avoid with Gastric Bypass

Medications to avoid*

Brand	Generic
Advil, Motrin, Nuprin	Ibuprofen
Ascriptin, Bayer aspirin, Bufferin, Ecotrin, Empirin, Norwich, many others	Aspirin
Alka-seltzer	Some formulations contain aspirin
Aggrenox	Aspirin + diclofenac
Aleve, Anaprox, Naprosyn	Naproxen
Anacin, Excedrin, Vanquish	Acetaminophen, aspirin, caffeine
Ansaid	flurbiprofen
Arthrotec	Diclofenac + misoprostol
Cataflam, Flector patch, Pennsaid solution, Voltaren, Voltaren gel, Voltaren XR, Zipsor, Zorvolex	Diclofenac (oral and topical)
Celebrex	celecoxib
Clinoril	Sulindac
Choline magnesium trisalicylate, Tricosal, Trilisate	Choline magnesium trisalicylate
Daypro	Oxaprozin
Disalcid	Salicylate
Doans pills, Doans Extra Strength, MST 600, Novasal	Magnesium salicylate
Dolobid	Diflunisal
Feldene	Piroxicam
Fiorinal	Butalbital, aspirin, caffeine
Indocin	Indomethacin
Lodine	Etodolac
Midol Cramps and Body Aches, Midol Extended Relief	Ibuprofen or naproxen
Meclomen	Meclomenamate
Mobic	Meloxicam
Nalfon	Fenoprofen
Norgesic	Orphenadrine, aspirin, caffeine
Orudis, Oruvail	Ketoprofen
Pepto-Bismol, Bismatrol, Stomach Relief, others	Bismuth subsalicylate
Percodan	Oxycodone, aspirin
Potassium tablets and capsules	
Relafen	Nabumetone
Synalgos-DC	Aspirin, caffeine, dihydrocodeine
Tolectin	Tolmetin
Toradol	Ketorolac flurbiprofen

Mediations that are ok to take*

Brand	Generic
Benadryl	Diphenhydramine
Chlor-trimeton	Chlorpheniramine
Claritin, Alavert	Loratidine
Colace	Docusate
Coricidin	Many different formulations
Delsym	Dextromethorphan
Dimetapp	Diphenhydramine + phenylephrine
Dulcolax suppositories	Bisacodyl
Fleet enemas	
Gas-X, Phazyme	Simethicone
Glycerin suppositories	
Imodium A-D	Loperamide
Pepcid AC	Famotidine
Robitussin	Guaifenesin
Senokot	Sennosides
Sudafed, Sudafed PE, Sudogest PE	Pseudoephedrine (from the pharmacy), phenylephrine (on the store shelves)
Tums	Calcium carbonate
Tylenol	Acetaminophen
Tylenol cold products	Acetaminophen + many different drugs
Triaminic	Dextromethorphan + phenylephrine
Zantac	Ranitidine
Zyrtec	Cetirizine

***This list is not all-inclusive, if you do not see a drug on this list ask your doctor or pharmacist if it is ok to take**

Check the label

- Many cold and flu products have 2 or more medications in them.
- Products can be sold under the same brand name but have different medications in them.
 - Example: NyQuil Cold and Flu, Nyquil Cough and NyQuil Severe Cold and Flu all have different medications in them
- It's important to read the label every time you buy a product

Surgery Preparation: Acid Reducers

- Purchase over-the-counter acid reducers (H2 blockers or proton pump inhibitors) in preparation for your potential gastric bypass surgery. Examples include Prilosec, Pepcid, Nexium, Zantac, Tagamet
- They can be purchased for as little as 4\$/month at pharmacies like Wal-Mart, Hannaford or even Marden's. You should stockpile 3-6 months of acid reducers before surgery.
- Sleeve and band patients may not need this

