

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

TABLE OF CONTENTS

Pre- and Post-Procedure Management..... [Pages 2-4](#)

APPENDIX A: Procedure Bleeding Risk..... [Pages 5-10](#)

APPENDIX B: Procedure Bleeding Risk and Management of Antiplatelet Therapy for Interventional Spine and Pain Procedures..... [Pages 11-12](#)

APPENDIX C: Procedure Bleeding Risk and Management of Antiplatelet Therapy for Neurosurgery Procedures..... [Pages 13-14](#)

APPENDIX D: Management of Antiplatelet Therapy for Other Procedures..... [Pages 15-17](#)

APPENDIX E: Cangrelor (Kengreal®) Bridge for High-Risk Patients..... [Page 18](#)

Suggested Readings..... [Pages 19-20](#)

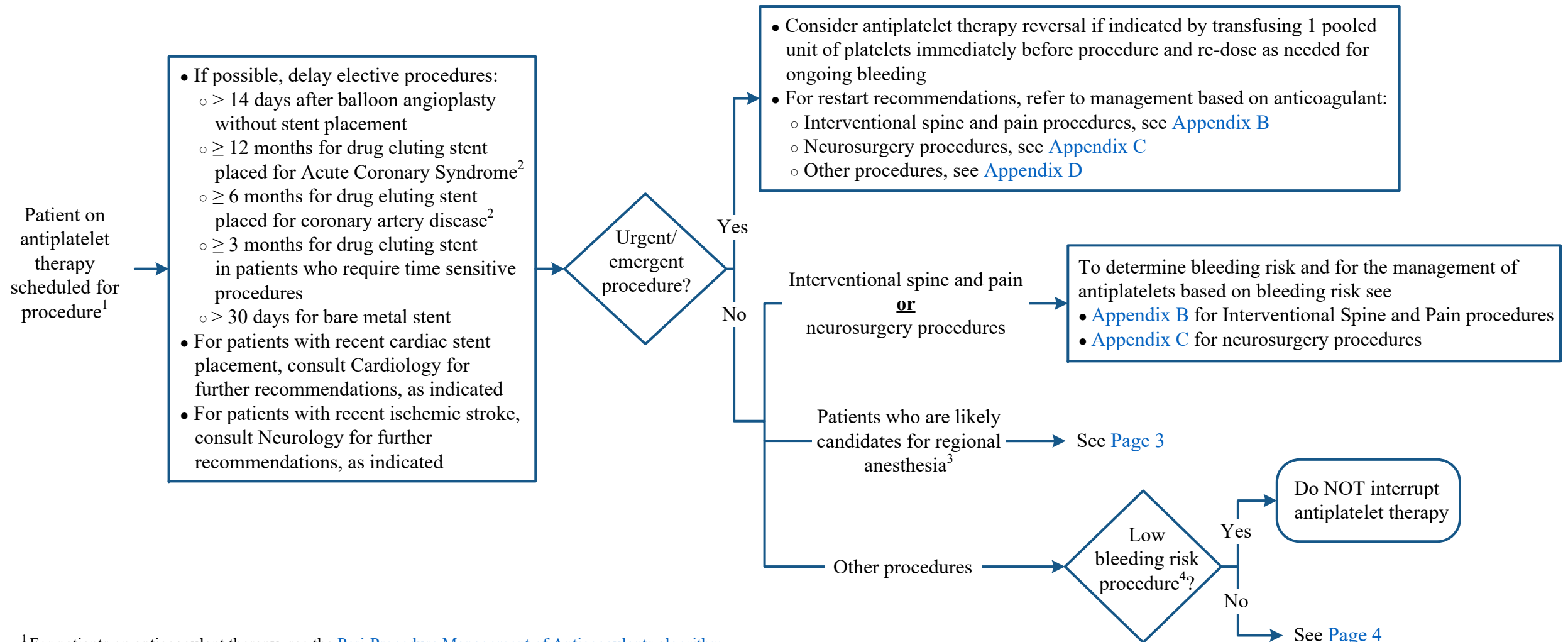
Development Credits..... [Page 21](#)

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson's specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care. This algorithm should not be used to treat pregnant women.

PRESENTATION (Inpatient or Outpatient)

EVALUATION

MANAGEMENT PRE- AND POST-PROCEDURE



¹ For patients on anticoagulant therapy, see the [Peri-Procedure Management of Anticoagulants algorithm](#)

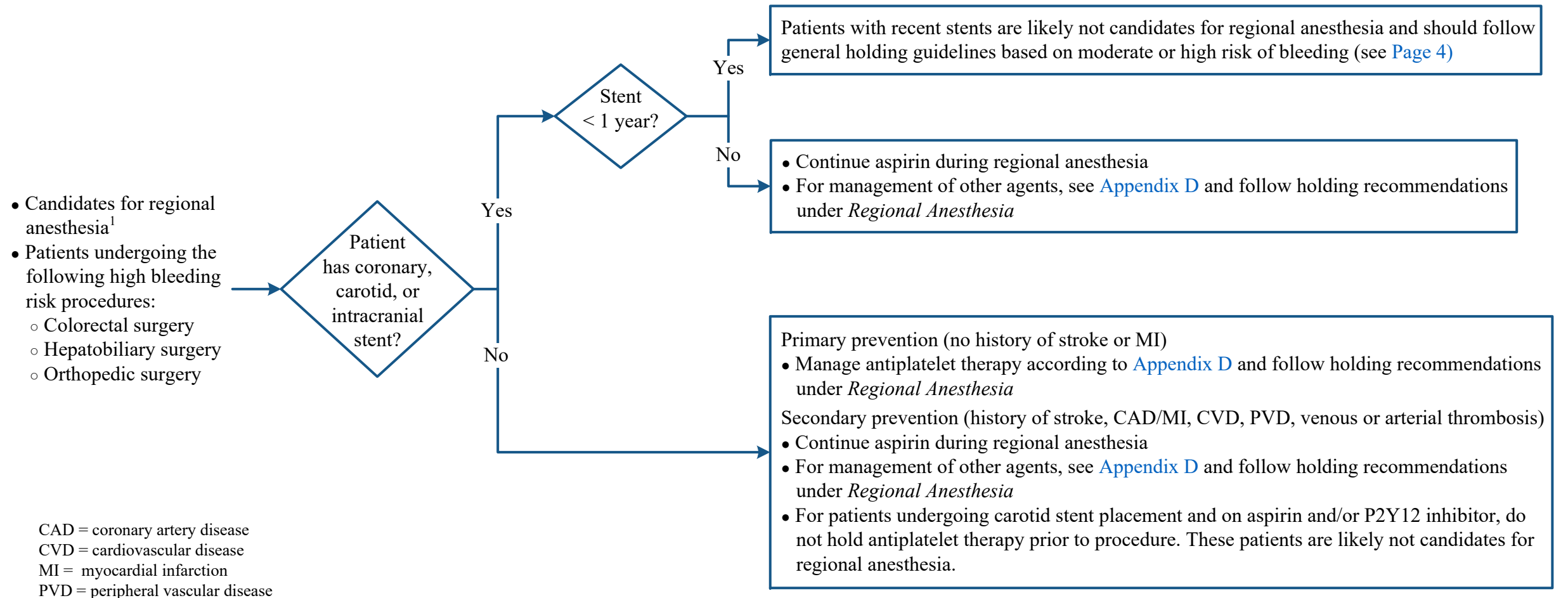
² For time sensitive procedures, delay greater than or equal to 3 months for drug eluting stents placed for any reason

³ Regional anesthesia includes epidural catheter and deep peripheral nerve catheter placement

⁴ See [Appendix A](#) for Procedural Bleeding Risks based on type of procedure

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson's specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care. This algorithm should not be used to treat pregnant women.

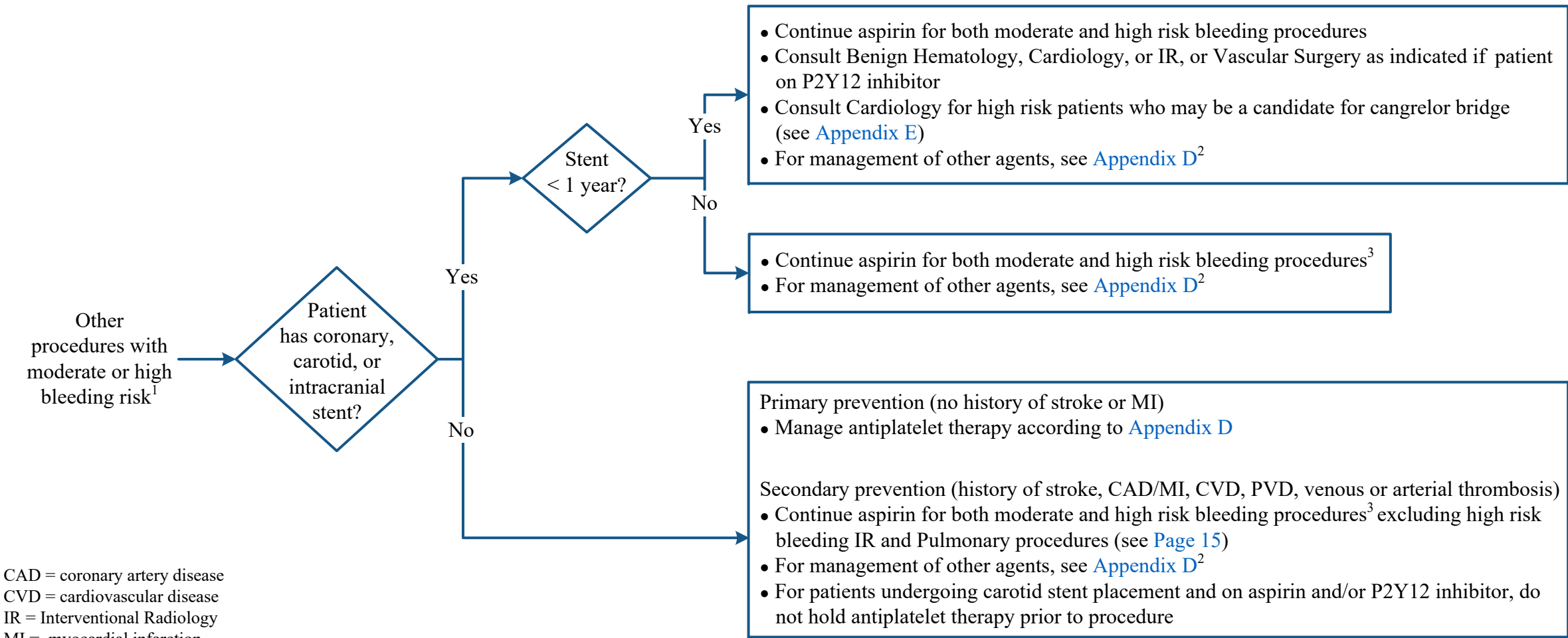
MANAGEMENT PRE- AND POST-PROCEDURE



¹ Regional anesthesia includes epidural catheter and deep peripheral nerve catheter placement

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

MANAGEMENT PRE- AND POST-PROCEDURE



CAD = coronary artery disease
 CVD = cardiovascular disease
 IR = Interventional Radiology
 MI = myocardial infarction
 PVD = peripheral vascular disease

¹ See [Appendix A](#) for Procedural Bleeding Risks based on type of procedure
² For Vascular Surgery or high bleeding risk Ophthalmology procedures, consult the respective team for peri-operative antiplatelet management
³ If patient on monotherapy with a P2Y12 inhibitor for secondary prevention or history of coronary/intracranial/carotid stent ≥ 1 year ago, consider holding P2Y12 inhibitor as recommended (see [Appendix D](#)) and initiating aspirin while the P2Y12 inhibitor is on hold. If needed, consult appropriate service depending on indication for P2Y12 inhibitor prior to holding.

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

APPENDIX A: Procedure Bleeding Risk

Note: For patients who have other risk factors for bleeding (e.g., recent bleeding event, thrombocytopenia) consider utilizing the management recommendations for high risk bleeding procedures.

High Bleeding Risk	Moderate Bleeding Risk	Low Bleeding Risk
General Procedures		
• Lumbar puncture with or without intrathecal chemotherapy	• Bone marrow aspiration and biopsy • Venous port placement	• Ommaya reservoir puncture • Venous port removal
Breast Surgical and Breast Radiology Procedures		
• All other Breast Surgical procedures	• Vacuum assisted breast biopsies (MRI/stereotactic)	• Core biopsy of breast and/or axillary level 1 nodal basin • Fine needle aspiration of breast, axillary nodal basins, internal mammary, and/or supraclavicular lymph nodes • Image guided pre-operative localization of the breast and axillary level 1 nodal basin • Breast skin punch biopsy in clinic
Cardiology Procedures		
• CardioMEMS™ placement • Coronary intervention • Endomyocardial biopsy • Implantable cardioverter-defibrillator/pacemaker lead extraction • Left atrial appendage occlusion device • Pericardiocentesis	• Diagnostic coronary angiography via femoral access • Electrophysiology testing and/or ablation • Pacemaker or defibrillator placement • Right heart catheterization • Supraventricular tachycardia ablation • Transvenous atrial fibrillation ablation	• Arterioventricular node ablation • Coronary artery angiography (radial approach) • Internal cardiac defibrillator implantation battery change • Permanent pacemaker implantation battery change
Dental Procedures		
• Alevolar surgery (bone removal) • Apicoectomy (root removal) • Complex dental procedure/multiple tooth extraction • Dental/endosseous implant procedures • Reconstructive dental procedures	• Endodontic (root canal) procedures • Peridontal surgery, abscess incision • Soft/hard tissue intraoral biopsy • Up to 2 tooth extractions	• Dental hygiene • Minor dental procedures

Continued on next page

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

APPENDIX A: Procedure Bleeding Risk - continued

Note: For patients who have other risk factors for bleeding (e.g., recent bleeding event, thrombocytopenia) consider utilizing the management recommendations for high risk bleeding procedures.

High Bleeding Risk	Moderate Bleeding Risk	Low Bleeding Risk
Dermatologic Procedures		
N/A	N/A	• Dermatologic procedures • Mohs Center procedures
Gastroenterology Procedures		
• Barrett’s esophagus ablation • Biliary or pancreatic sphincterotomy and/or dilation • Cystogastrostomy • Endoscopic hemostasis • Endoscopic submucosal dissection (ESD), endoscopic mucosal resection (EMR) or other polypectomy • Endoscopic ultrasound guided biliary drainage placement • Endoscopic ultrasound guided gastrojejunostomy placement • Endoscopic ultrasound with fine needle aspiration • Full thickness resection • Percutaneous endoscopic gastrostomy (PEG) placement • Pneumatic or bougie dilation • Therapeutic balloon-assisted enteroscopy • Treatment of varices • Tumor ablation by any technique	• Colonoscopy with biopsy • Diagnostic balloon-assisted enteroscopy • Endoscopic retrograde cholangiopancreatography (ERCP) with stent and/or biopsy • Esophageal or enteral stent • Gastroscopy with biopsy • Sigmoidoscopy with biopsy	• Capsule endoscopy • Colonoscopy without biopsy • Diagnostic esophagogastroduodenoscopy (EGD) • Endoscopic retrograde cholangiopancreatography (ERCP) diagnostic • Endoscopic ultrasound without fine needle aspiration • Push enteroscopy without biopsy • Sigmoidoscopy without biopsy
Gynecology Oncology Procedures		
• All other Gynecology Oncology procedures	• Cold knife conization (CKC)/loop electrosurgical excision procedure (LEEP) • Superficial wide local excisions • Brachytherapy	• Colposcopy • Dilatation and curettage • Endometrial biopsy • Exam under anesthesia • Hysteroscopy • Insertion/removal of intrauterine device (IUD) • Laser ablation of the cervix/vulva/vagina • Vulvar/vaginal/cervical biopsies

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

APPENDIX A: Procedure Bleeding Risk - continued

Note: For patients who have other risk factors for bleeding (e.g., recent bleeding event, thrombocytopenia) consider utilizing the management recommendations for high risk bleeding procedures.

High Bleeding Risk	Moderate Bleeding Risk	Low Bleeding Risk
Head and Neck Surgery Procedures		
• All other Head and Neck Surgery procedures	N/A	• Flexible nasopharyngeal laryngoscopy (when performed outside of the OR)
Interventional Radiology Procedures		
• Ablations: solid organs, bone, soft tissues, lung • Angiography with arterial intervention (e.g., angioplasty) with access size > 6 French • Aortic stent graft • Catheter directed thrombolysis (arterial and venous) • Gastrostomy, jejunostomy tube placement • Lung interventions: biopsy, fiducial placement, intratumoral injection, and drainage (parenchymal) • Percutaneous embolectomy, thrombectomy • Portal vein embolization and stenting • Solid organ biopsies, fiducial placement, and intratumoral injection (e.g., liver, prostate, cervical) • Solid organ drainage: nephrostomy, biliary, cholecystostomy • Spine procedures: vertebroplasty, kyphoplasty • Transjugular intrahepatic porto-systemic shunt (TIPS) • Venous interventions [intrathoracic, intracranial, intrahepatic, embolization, sclerotherapy, superior vena cava (SVC) stenting]	• Angiography with access size up to 6 French • Carotid stent placement • Catheter exchange < 6 weeks from initial placement (e.g., biliary, nephrostomy, abscess, gastrostomy, jejunostomy) • Deep, non-organ biopsy, fiducial placement, and intratumoral injection • Endovascular neurointerventional procedures • Non-organ drainage (e.g., abdominal or retroperitoneal abscess) • Trans-arterial embolotherapy • Transjugular liver biopsy • Tunneled central venous catheter placement • Tunneled drainage catheter placement or removal • Venous interventions (peripheral) • Venous port placement	• Catheter exchange > 6 weeks from initial placement (e.g., biliary, nephrostomy, abscess, gastrostomy, jejunostomy) • Diagnostic angiography (radial approach) • Intraperitoneal catheter placement • Inferior vena cava filter placement or retrieval • Joint aspirations/injections • Non-tunneled central line placement or removal • Non-tunneled chest tube placement (pleural space) • Paracentesis • Thoracentesis • Superficial (e.g., lymph nodes, thyroid) or palpable mass biopsies, fiducial placement, and intratumoral injection • Superficial abscess drainage • Tunneled central venous catheter removal • Venous port removal
Neuro-Oncology Procedures		
• Paraspinal, Diaphragm Electromyography (EMG) • Lumbar puncture with or without intrathecal chemotherapy (performed by Acute Procedure Team)	• Deep muscle (e.g., gastrocnemius, infraspinatus, supraspinatus) EMG	• Superficial muscle EMG

Continued on next page

APPENDIX A: Procedure Bleeding Risk – continued

Note: For patients who have other risk factors for bleeding (e.g., recent bleeding event, thrombocytopenia) consider utilizing the management recommendations for high risk bleeding procedures.

High Bleeding Risk	Moderate Bleeding Risk	Low Bleeding Risk
Neuroradiology Procedures		
• Flouroscopic lumbar puncture with or without intrathecal chemotherapy • Solid organ biopsies	• Deep, non-organ biopsy	• Superficial or palpable mass biopsies
Ophthalmic Procedures		
• Eye plaque brachytherapy • Orbital surgery/major eyelid surgery/lacrimal surgery/eye removal/orbital removal • Posterior eye surgery • Scleral buckle	• Conjunctival surgery • Descemet's stripping endothelial keratoplasty (DSEK) • Glaucoma procedures (<i>i.e.</i>, trabeculectomy) • Minor eyelid or pericular surgery • Penetrating keratoplasty	• Cataract surgery • Intravitreal injection of pharmacologic agent • Vitreoretinal surgery (except scleral buckle)
Orthopedic Procedures		
• Arthroplasty • Carpal tunnel repair • All other OR Oncologic Orthopedic procedures	• Arthroscopy • Shoulder, foot, and ankle tendon repair	• Joint or soft tissue injections
Plastic Surgery Procedures		
• All OR Plastic Surgery procedures • For non-OR procedures, consult Plastic Surgery for peri-operative antiplatelet management	N/A	N/A

Continued on next page

APPENDIX A: Procedure Bleeding Risk – continued

Note: For patients who have other risk factors for bleeding (e.g., recent bleeding event, thrombocytopenia) consider utilizing the management recommendations for high risk bleeding procedures.

High Bleeding Risk	Moderate Bleeding Risk	Low Bleeding Risk
Pulmonary Procedures		
• Diagnostic bronchoscopy with cryobiopsy • Diagnostic bronchoscopy with endobronchial biopsy • Diagnostic bronchoscopy with transbronchial biopsy • Pleuroscopy, pleural biopsy • Robotic bronchoscopy • Therapeutic bronchoscopy with endobronchial tumor destruction, stenosis relief, management of hemoptysis	• Bronchial or tracheal stent placement • Chemical pleurodesis • Diagnostic bronchoscopy with endobronchial ultrasound-guided transbronchial needle aspiration • Non-tunneled chest tube placement (pleural space) • Thoracentesis • Tracheostomy • Tunneled pleural catheter placement or removal	• Diagnostic bronchoscopy airway exam without biopsy • Diagnostic bronchoscopy with bronchoalveolar lavage without biopsy
Surgical Oncology		
• All other OR Surgical Oncology procedures	• Diagnostic laparoscopy (if any open procedures are planned or possible, procedure would be considered high risk) • Incision and drainage • Superficial wide local excision • Tunneled central venous catheter placement • Venous port placement	• Femoral vein vascular access device placement • Non-tunneled central venous catheter placement or removal • Tunneled central venous catheter removal • Venous port removal
Thoracic and Cardiovascular Surgery Procedures		
• All OR Thoracic and Cardiovascular Surgery Procedures • Endoscopic mucosal resection (EMR) • For other high bleeding risk procedures, see Pulmonary Procedures section on this page	• Pericardial window • For other moderate bleeding risk procedures, see Pulmonary Procedures section on this page	• Diagnostic esophagogastroduodenoscopy (EGD) • For other low bleeding risk procedures, see Pulmonary Procedures section on this page

Continued on next page

APPENDIX A: Procedure Bleeding Risk – continued

Note: For patients who have other risk factors for bleeding (e.g., recent bleeding event, thrombocytopenia) consider utilizing the management recommendations for high risk bleeding procedures.

High Bleeding Risk	Moderate Bleeding Risk	Low Bleeding Risk
Urology Procedures		
• All other OR Urology procedures • Prostate biopsy • Solid organ fiducial placement	• Circumcision • Endoscopic procedures for medium or large stones • Genital skin and endoscopic urinary system biopsies of small lesions • Incision and Drainage • Wide local excisions	• Cystoscopy with stent placement or exchange • Diagnostic cystoscopy or ureteroscopy • Endoscopic procedures for small stones
Vascular Access and Procedures Team		
• Lumbar puncture with or without intrathecal chemotherapy	N/A	• Femoral vein vascular access device placement • Non-tunneled central venous catheter placement or removal • Paracentesis • Peripherally inserted central catheter (PICC) placement • Tunneled central venous catheter removal • Venous port removal
Vascular Surgery Procedures		
• All open and hybrid Vascular Surgery procedures • Consult with Vascular Surgery for peri-operative antiplatelet management	N/A	N/A

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

APPENDIX B: Procedure Bleeding Risk and Management of Antiplatelet Therapy for Interventional Spine and Pain Procedures

Procedure Bleeding Risk

High Bleeding Risk: • Spinal cord stimulation trial and implant • Dorsal root ganglion stimulation • Intrathecal catheter and pump implant • Vertebral augmentation (vertebroplasty and kyphoplasty) • Percutaneous decompression laminotomy • Epiduroscopy and epidural decompression	Moderate Bleeding Risk¹: • Interlaminar and transforaminal epidural steroid injections • Cervical facet medial branch nerve blocks and radiofrequency ablations • Intradiscal procedures (cervical, thoracic, lumbar) • Sympathetic blocks (stellate, thoracic, splanchnic, celiac, lumbar, hypogastric) • Trigeminal and sphenopalatine ganglia blocks	Low Bleeding Risk¹: • Peripheral nerve blocks • Peripheral joints and musculoskeletal injections • Trigger point injections including piriformis injection • Sacroiliac joint injection and sacral lateral branch blocks • Thoracic and lumbar facet medial branch nerve block • Radiofrequency ablations of thoracic and lumbar facet joints • Peripheral nerve stimulator trial and implant (for locations not close to critical vessels and low-invasive procedures) • Pocket revision and implantable pulse generator/intrathecal pump replacement
--	--	---

¹ Patients with high risk of bleeding [e.g., old age, history of bleeding tendency, concurrent uses of other anticoagulants/antiplatelets, liver cirrhosis or advanced liver disease, advanced renal disease, and patients on vascular endothelial growth factor (VEGF) inhibitor therapy] undergoing low or moderate bleeding risk procedures should be treated as moderate or high bleeding risk, respectively

Continued on next page

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

APPENDIX B: Procedure Bleeding Risk and Management of Antiplatelet Therapy for Interventional Spine and Pain Procedures - continued

Note: Consult proceduralist if patient has recently (within the past 10 days) taken full dose thrombolytic medication (altepase). For patients on Vorapaxar (Zontivity®)¹, consult Cardiology for peri-procedure management.

	Low Bleeding Risk		Moderate Bleeding Risk		High Bleeding Risk	
	Hold Recommendations Prior to Procedure	Restart Recommendations After Procedure	Hold Recommendations Prior to Procedure	Restart Recommendations After Procedure	Hold Recommendations Prior to Procedure	Restart Recommendations After Procedure
Nonsteroidal anti-inflammatory drugs (NSAIDs)	No restrictions for any NSAID	No restrictions for any NSAID	No restrictions for any NSAID	No restrictions for any NSAID	Diclofenac 1 day	24 hours
					Etodolac 2 days	
					Ibuprofen 1 day	
					Indomethacin 2 days	
					Ketorolac 1 day	
					Meloxicam 4 days	
					Nabumetone 6 days	
					Naproxen 4 days	
					Oxaprozin 10 days	
					Piroxicam 10 days	
Aspirin Aspirin/Dipyridamole (Aggrenox®)	No restrictions	No restrictions	No restrictions ^{2,3}	24 hours if therapy is held	Primary prevention: 6 days Secondary prevention ³	24 hours
Clopidogrel (Plavix®)	No restrictions	No restrictions	7 days ³	24 hours for loading dose 12 hours for maintenance dose	7 days ³	24 hours for loading dose 12 hours for maintenance dose
Prasugrel (Effient®) ¹	No restrictions	No restrictions	7 days ³	24 hours for either loading or maintenance dose	7 days ³	24 hours for either loading or maintenance dose
Ticagrelor (Brilinta®)	No restrictions	No restrictions	5 days ³	24 hours for either loading or maintenance dose	5 days ³	24 hours for either loading or maintenance dose
Cilostazol	No restrictions	No restrictions	No restrictions	No restrictions	2 days	24 hours
Dipyridamole	No restrictions	No restrictions	No restrictions	No restrictions	2 days	24 hours
Eptifibatide (Integrilin) Tirofiban (Aggrastat®) ¹	8 hours	8-12 hours	24 hours	8-12 hours	24 hours	8-12 hours
Cangrelor (Kengreal®)	See Appendix E					

¹ Not on MD Anderson Cancer Center formulary
² Consideration should be given to the discontinuation of aspirin for certain moderate-risk procedures, including interlaminar cervical epidural steroid injections (ESIs) and stellate ganglion blocks, where specific anatomical configurations may increase the risk and consequences of procedural bleeding

³ If patient is on aspirin, aspirin/dipyridamole and/or P2Y12 inhibitor for **secondary prevention** or **any history of coronary/carotid/intracranial stent**, decision to hold antiplatelet therapy should be made after discussion with Benign Hematology, Cardiology, Interventional Radiology, Vascular Surgery or other appropriate service depending on indication for antiplatelet therapy

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

APPENDIX C: Procedure Bleeding Risk and Management of Antiplatelet Therapy for Neurosurgery Procedures

Procedure Bleeding Risk

High Bleeding Risk: • All other neurosurgery cranial and spinal procedures	Moderate Bleeding Risk: • Endovascular neurointerventional procedures • Extradural skull base procedures • Gamma knife procedures¹ • Intraventricular catheter (EVD) placement/removal • Laser Interstitial Thermal Therapy (LITT) • Lumbar drain placement/removal • Lumbar puncture with or without intrathecal chemotherapy • Ommaya reservoir placement/removal • Steriotactic biopsy • Ventriculoperitoneal (VP) shunt placement/removal	Low Bleeding Risk: • Ommaya reservoir tap • Ventriculoperitoneal (VP) shunt tap
---	---	--

¹ P2Y12 inhibitors may be continued especially for patients with a high risk for arterial thromboembolism. Consult with Neurosurgery prior to procedure.

Continued on next page

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

APPENDIX C: Procedure Bleeding Risk and Management of Antiplatelet Therapy for Neurosurgery Procedures - continued

Note: Consult proceduralist if patient has recently (within the past 10 days) taken full dose thrombolytic medication (altepase). Restart recommendations after neurosurgical procedures are based on hemostasis being established.

For patients on Vorapaxar (Zontivity®)¹, consult Cardiology for peri-procedure management.

	Low Bleeding Risk		Moderate Bleeding Risk		High Bleeding Risk	
	Hold Recommendations Prior to Procedure	Restart Recommendations After Procedure	Hold Recommendations Prior to Procedure	Restart Recommendations After Procedure	Hold Recommendations Prior to Procedure	Restart Recommendations After Procedure
Nonsteroidal anti-inflammatory drugs (NSAIDs)	No restrictions for any NSAID	No restrictions for any NSAID	No restrictions for any NSAID	No restrictions for any NSAID	Diclofenac 1 day Etodolac 2 days Ibuprofen 1 day Indomethacin 2 days Ketorolac 1 day Meloxicam 4 days Nabumetone 6 days Naproxen 4 days Oxaprozin 10 days Piroxicam 10 days	7 days
Aspirin Aspirin/Dipyridamole (Aggrenox®)	No restrictions	No restrictions	No restrictions	No restrictions	7 days ²	Primary prevention: 4-8 weeks Secondary prevention: 14 days
Clopidogrel (Plavix®)	No restrictions	No restrictions	7 days ^{2,3}	3-5 days	7 days ²	7 days
Prasugrel (Effient®) ¹	No restrictions	No restrictions	7 days ^{2,3}	3-5 days	7 days ²	7 days
Ticagrelor (Brilinta®)	No restrictions	No restrictions	5 days ^{2,3}	3-5 days	5 days ²	7 days
Cilostazol	No restrictions	No restrictions	No restrictions	No restrictions	2 days	7 days
Dipyridamole	No restrictions	No restrictions	No restrictions	No restrictions	2 days	7 days
Eptifibatide (Integrilin®) Tirofiban (Aggrastat®) ¹	8 hours	Consult Cardiology	24 hours	Consult Cardiology	24 hours	Consult Cardiology
Cangrelor (Kengreal®)	See Appendix E					

¹ Not on MD Anderson Cancer Center formulary
² If patient is on aspirin, aspirin/dipyridamole and/or P2Y12 inhibitor for **history of coronary/carotid/intracranial stent < 1 year ago**, decision to hold antiplatelet therapy should be made after discussion with Benign Hematology, Cardiology, Interventional Radiology, Vascular Surgery or other appropriate service depending on indication for antiplatelet therapy

³ If patient on monotherapy with a P2Y12 inhibitor for **secondary prevention** or **any history of coronary/intracranial/carotid stent ≥ 1 year ago**, consider holding P2Y12 inhibitor as recommended and initiating aspirin while the P2Y12 inhibitor is on hold. If needed, consult appropriate service depending on indication for P2Y12 inhibitor prior to holding.

APPENDIX D: Management of Antiplatelet Therapy for Other Procedures

• For Interventional Spine and Pain Procedures, see Appendix B • For Neurosurgery Procedures, see Appendix C

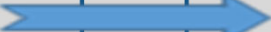
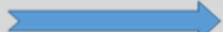
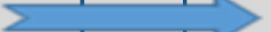
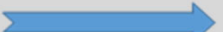
Note: For patients on Vorapaxar (Zontivity®)¹, consult Cardiology for peri-procedure management.

	Bleeding Risk	Day -8	Day -7	Day -6	Day -5	Day -4	Day -3	Day -2	Day -1		Day +1	Day +2	Day +3	
NSAIDs	Moderate/High	No hold needed prior to procedure Note: Hold 7 days prior to intra-hepatic melphalan infusion									Day of Procedure	No hold needed after procedure		
	Regional Anesthesia ²											• May be given while regional anesthesia catheter in place • May be given without time restrictions after regional anesthesia catheter removal		
Aspirin	Moderate	No hold needed prior to procedure										No hold needed after procedure		
	High		• Do not hold for patients with the following: ◦ History of coronary/carotid/intracranial stent placement ◦ On aspirin for secondary prevention excluding Interventional Radiology (IR) and Pulmonary procedures ◦ Undergoing carotid stent placement • If patient on aspirin for primary prevention, hold 7 days prior to procedure except for the following: ◦ For IR and Pulmonary procedures, hold for 5 days ◦ For biliary or pancreatic sphincterotomy, ESD, EMR or other polypectomy, endoscopic ultrasound guided biliary drainage, gastrojejunostomy or PEG placements, endoscopic ultrasound with fine needle aspiration, full thickness resection, or therapeutic balloon-assisted enteroscopy, only hold aspirin if dose > 81 mg • No hold needed for the following procedures: ◦ Lumbar puncture with or without intrathecal chemotherapy									Resume 24 hours after procedure		
	Regional Anesthesia ²	No hold needed for regional anesthesia. Hold based on recommendations for procedure.										• May be given while regional anesthesia catheter in place • May be given without time restrictions after regional anesthesia catheter removal		

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

APPENDIX D: Management of Antiplatelet Therapy for Other Procedures - continued

• For Interventional Spine and Pain Procedures, see Appendix B • For Neurosurgery Procedures, see Appendix C
Note: For patients on Vorapaxar (Zontivity®)¹, consult Cardiology for peri-procedure management.

	Bleeding Risk	Day -8	Day -7	Day -6	Day -5	Day -4	Day -3	Day -2	Day -1	Day of Procedure	Day +1	Day +2	Day +3	
Clopidogrel (Plavix®) ^{2,3,4}	Moderate/High				Hold 5 days prior to procedure						Resume 24-48 hours after procedure. For Interventional Radiology, resume 24 hours after procedure.			
	Regional Anesthesia ⁵										• May be given while regional anesthesia catheter in place. • May be given without time restrictions after regional anesthesia catheter removal for maintenance dose. Hold any loading doses for 6 hours after removal.			
Prasugrel (Effient®) ^{1,2,3,4}	Moderate/High		Hold 7 days prior to procedure								Resume 24-48 hours after procedure. For Interventional Radiology, resume 24 hours after procedure.			
	Regional Anesthesia ⁵										Regional anesthesia catheter in place: • Do not give unless approved by Acute Pain service • May be given without time restrictions after regional anesthesia catheter removal for maintenance dose. Hold any loading doses for 6 hours after removal.			
Ticagrelor (Brilinta®) ^{2,3,4}	Moderate/High				Hold 5 days prior to procedure						Resume 24-48 hours after procedure. For Interventional Radiology, resume 24 hours after procedure.			
	Regional Anesthesia ⁵										Regional anesthesia catheter in place: • Do not give unless approved by Acute Pain service • May be given without time restrictions after regional anesthesia catheter removal for maintenance dose. Hold any loading doses for 6 hours after removal.			

¹ Not on MD Anderson Cancer Center formulary
² If patient undergoing carotid stent placement, do NOT hold P2Y12 inhibitor prior to procedure
³ If patient is on P2Y12 inhibitor for **history of coronary/intracranial/carotid stent placed < 1 year ago**, decision to hold antiplatelet therapy should be made after discussion with Benign Hematology, Cardiology, Interventional Radiology, Vascular Surgery or other appropriate service depending on the indication for antiplatelet therapy prior to holding. For all other indications, hold P2Y12 inhibitor if patient also on aspirin.
⁴ If patient on monotherapy with a P2Y12 inhibitor for **secondary prevention or any history of coronary/intracranial/carotid stent ≥ 1 year ago**, consider holding P2Y12 inhibitor as recommended above and initiating aspirin while the P2Y12 inhibitor is on hold. If needed, consult appropriate service depending on indication for P2Y12 inhibitor prior to holding.
⁵ Regional anesthesia includes epidural catheter and deep peripheral nerve catheter placement. Common procedures for use of regional anesthesia include colorectal, hepatobiliary, and orthopedic. HIGH thrombotic risk patients are likely NOT candidates for regional anesthesia and should follow general holding guidelines based on moderate or high risk of bleeding.

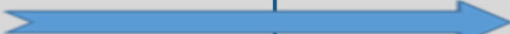
Continued on next page

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

APPENDIX D: Management of Antiplatelet Therapy for Other Procedures - continued

• For Interventional Spine and Pain Procedures, see Appendix B • For Neurosurgery Procedures, see Appendix C

Note: For patients on Vorapaxar (Zontivity®)¹, consult Cardiology for peri-procedure management.

	Bleeding Risk	Day -8	Day -7	Day -6	Day -5	Day -4	Day -3	Day -2	Day -1	Day of Procedure	Day +1	Day +2	Day +3			
Aspirin/Dipyridamole (Aggrenox®) ^{2,3}	Moderate	No hold needed prior to procedure										No hold needed after procedure				
	High		Hold 7 days prior to procedure. For Interventional Radiology procedures, hold for 5 days.										Resume 24 hours after procedure			
	Regional Anesthesia ⁴												<i>Regional anesthesia catheter in place:</i> • Do not give unless approved by Acute Pain service • Restart after regional anesthesia catheter removal: 6 hours			
Cilostazol	Moderate	No hold needed prior to procedure										No hold needed after procedure				
	High										Hold 1 day prior to procedure		Resume 24 hours after procedure			
	Regional Anesthesia ⁴								Hold 2 days prior to procedure			<i>Regional anesthesia catheter in place:</i> • Do not give unless approved by Acute Pain service • Restart after regional anesthesia catheter removal: 6 hours				
Dipyridamole	Moderate	No hold needed prior to procedure										No hold needed after procedure				
	High										Hold 1 day prior to procedure		Resume 24 hours after procedure			
	Regional Anesthesia ⁴										Hold 1 day prior to procedure		<i>Regional anesthesia catheter in place:</i> • Do not give unless approved by Acute Pain service • Restart after regional anesthesia catheter removal: 6 hours			
Eptifibatide (Integrilin) Tirofiban (Aggrastat®) ¹	Moderate/High									Hold 4-8 hours prior to procedure		Resume 4-6 hours after procedure				
	Regional Anesthesia ⁴											<i>Regional anesthesia catheter in place:</i> • Do not give unless approved by Acute Pain service • Restart after regional anesthesia catheter removal: Consult Cardiology and Acute Pain service				

¹ Not on MD Anderson Cancer Center formulary
² If patient is on aspirin for primary prevention, hold as recommended
³ If patient undergoing carotid stent placement, do NOT hold aspirin or P2Y12 inhibitor prior to procedure
⁴ Regional anesthesia includes epidural catheter and deep peripheral nerve catheter placement. Common procedures for use of regional anesthesia include colorectal, hepatobiliary, and orthopedic. HIGH thrombotic risk patients are likely NOT candidates for regional anesthesia and should follow general holding guidelines based on moderate or high risk of bleeding.

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

APPENDIX E: Cangrelor (Kengreal®) Bridge for High Thrombotic Risk Patients

- Patients with recent stents at increased risk of stent thrombosis who require interruption of dual antiplatelet therapy (DAPT) for any reason, such as an upcoming surgery/procedure, during which continuation of DAPT will contribute to an unacceptable increased risk in bleeding
- The following situations have been deemed by MD Anderson Cancer Center Cardiology Team to confer a high risk of stent thrombosis
 - PCI in the setting of a STEMI within 6 months
 - PCI in the setting of an NSTEMI/UA within 1 month
- Patients will be admitted to the hospital for cangrelor infusion (0.75 mcg/kg/minute with NO TITRATION). Cardiology consult required.
- Low dose aspirin should be continued throughout the peri-operative period
- Patients with regional anesthesia should have cangrelor held 3 hours prior to needle placement and cangrelor may be initiated 8 hours after removal of catheter

	Day -8	Day -7	Day -6	Day -5	Day -4	Day -3	Day -2	Day -1	Day of Procedure	+ 4-6 hours on Day +1	Day +2	
Clopidogrel (Plavix®)				STOP clopidogrel							• Resume cangrelor if unable to take oral therapy or at clinical risk for postoperative bleeding • Restart clopidogrel with loading dose after discontinuation of cangrelor	
					START cangrelor ¹	STOP cangrelor 1-6 hours prior to procedure						
Prasugrel (Effient®) ²		STOP prasugrel									• Resume cangrelor if unable to take oral therapy or at clinical risk for postoperative bleeding • Restart prasugrel with loading dose after discontinuation of cangrelor	
		START cangrelor ¹				STOP cangrelor 1-6 hours prior to procedure						
Ticagrelor (Brilinta®)				STOP ticagrelor							• Resume cangrelor if unable to take oral therapy or at clinical risk for postoperative bleeding • May administer ticagrelor with loading dose at any time during cangrelor infusion or immediately after discontinuation	
					START cangrelor ¹	STOP cangrelor 1-6 hours prior to procedure						

NSTEMI = Non-ST-elevation myocardial infarction
STEMI = ST-elevation myocardial infarction
UA = unstable angina

¹ Start cangrelor 12-36 hours (or per Cardiology) after discontinuation of P2Y12 inhibitor therapy
² Not on MD Anderson Cancer Center formulary

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson's specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care. This algorithm should not be used to treat pregnant women.

SUGGESTED READINGS

- Angiolillo, D. J., Firstenberg, M. S., Price, M. J., Tummala, P. E., Hutyra, M., Welsby, I. J., . . . Topol, E. J. (2012). Bridging antiplatelet therapy with cangrelor in patients undergoing cardiac surgery: A randomized controlled trial. *Journal of the American Medical Association*, 307(3), 265-274. <https://doi.org/10.1001/jama.2011.2002>
- Angiolillo, D. J., Rollini, F., Storey, R. F., Bhatt, D. L., James, S., Schneider, D. J., . . . Price, M. J. (2017). International expert consensus on switching platelet P2Y₁₂ receptor-inhibiting therapies. *Circulation*, 136(20), 1955-1975. <https://doi.org/10.1161/CIRCULATIONAHA.117.031164>
- Bhatt, D. L., Lincoff, A. M., Gibson, C. M., Stone, G. W., McNulty, S., Montalescot, G., . . . Harrington, R. A. (2009). Intravenous platelet blockade with cangrelor during PCI. *The New England Journal of Medicine*, 361(24), 2330-2341. <https://doi.org/10.1056/NEJMoa0908629>
- Douketis, J. D., & Spyropoulos, A. C. (2023). Perioperative management of anticoagulant and antiplatelet therapy. *New England Journal of Medicine Evidence*, 2(6), EVIDra2200322. <https://doi.org/10.1056/EVIDra2200322>
- Douketis, J. D., Spyropoulos, A. C., Murad, M. H., Arcelus, J. I., Dager, W. E., Dunn, A. S., . . . Moores, L. K. (2022). Perioperative management of antithrombotic therapy: An American College of Chest Physicians Clinical Practice Guideline. *Chest*, 162(5), e207-e243. <https://doi.org/10.1016/j.chest.2022.07.025>
- Halvorsen, S., Mehilli, J., Cassese, S., Hall, T. S., Abdelhamid, M., Barbato, E., . . . ESC Scientific Document Group. (2022). 2022 ESC guidelines on cardiovascular assessment and management of patients undergoing non-cardiac surgery. *European Heart Journal*, 43(39), 3826-3924. <https://doi.org/10.1093/eurheartj/ehac270>
- Horlocker, T., Vandermeulen, E., Kopp, S., Gogarten, W., Leffert, L., & Benzon, H. (2018). Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy: American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (Fourth Edition). *Regional Anesthesia and Pain Medicine*, 43(3), 263-309. <https://doi.org/10.1097/AAP.0000000000000763>
- Huang, P. H., Croce, K. J., Bhatt, D. L., & Resnic, F. S. (2012). Recommendations for management of antiplatelet therapy in patients undergoing elective noncardiac surgery after coronary stent implantation. *Critical Pathways in Cardiology*, 11(4), 177-185. <https://doi.org/10.1097/HPC.0b013e31826c53cd>
- Iliescu, C. A., Cilingiroglu, M., Giza, D. E., Rosales, O., Lebeau, J., Guerrero-Mantilla, I., . . . Marmagkiolis, K. (2017). "Bringing on the light" in a complex clinical scenario: Optical coherence tomography-guided discontinuation of antiplatelet therapy in cancer patients with coronary artery disease (PROTECT-OCT registry). *American Heart Journal*, 194, 83-91. <https://doi.org/10.1016/j.ahj.2017.08.015>
- Kopp, S. L., Vandermeulen, E., McBane, R. D., Perlas, A., Leffert, L., & Horlocker, T. (2025). Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy: American Society of Regional Anesthesia and Pain Medicine evidence-based guidelines (Fifth Edition). *Regional Anesthesia and Pain Medicine*. Advance online publication. <https://doi.org/10.1136/rapm-2024-105766>

Continued on next page

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson's specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care. This algorithm should not be used to treat pregnant women.

SUGGESTED READINGS - continued

- Narouze, S., Benzon, H., Provenzano, D., Buvanendran, A., De Andres, J., Deer, T., . . . Huntoon, M. (2018). Interventional spine and pain procedures in patients on antiplatelet and anticoagulant medications (Second Edition): Guidelines from the American Society of Regional Anesthesia and Pain Medicine, the European Society of Regional Anaesthesia and Pain Therapy, the American Academy of Pain Medicine, the International Neuromodulation Society, the North American Neuromodulation Society, and the World Institute of Pain. *Regional Anesthesia and Pain Medicine*, 43(3), 225-262. <https://doi.org/10.1097/AAP.0000000000000700>
- Patel, I., Rahim, S., Davidson, J., Hanks, S., Tam, A., Walker, T., . . . Weinberg, I. (2019). Society of Interventional Radiology Consensus Guidelines for the periprocedural management of thrombotic and bleeding risk in patients undergoing percutaneous image-guided interventions-part II: Recommendations. *Journal of Vascular and Interventional Radiology*, 30(8), 1168-1184. <https://doi.org/10.1016/j.jvir.2019.04.017>
- Sullivan, A. E., Nanna, M. G., Wang, T. Y., Bhatt, D. L., Angiolillo, D. J., Mehran, R., . . . Ohman, E. M. (2021). Bridging antiplatelet therapy after percutaneous coronary intervention: JACC review topic of the week. *Journal of the American College of Cardiology*, 78(15), 1550-1563. <https://doi.org/10.1016/j.jacc.2021.08.013>
- Thompson, A., Fleischmann, K. E., Smilowitz, N. R., de Las Fuentes, L., Mukherjee, D., Aggarwal, N. R., . . . Williams, K. A. (2024). 2024 AHA/ACC/ACS/ASNC/HRS/SCA/SCCT/SCMR/SVM Guideline for perioperative cardiovascular management for noncardiac surgery: A report of the American College of Cardiology/American Heart Association Joint Committee on clinical practice guidelines. *Circulation*, 150(19), e351-e442. <https://doi.org/10.1161/CIR.0000000000001285>
- Wang, T. F., Sanfilippo, K. M., Douketis, J., Falanga, A., Karageorgiou, J., Maraveyas, A., . . . Zwicker, J. I. (2022). Peri-procedure management of antithrombotic agents and thrombocytopenia for common procedures in oncology: Guidance from the SSC of the ISTH. *Journal of Thrombosis and Haemostasis*, 20(12), 3026-3038. <https://doi.org/10.1111/jth.15896>

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

DEVELOPMENT CREDITS

This practice consensus statement is based on majority opinion of the Management of Antiplatelet Therapy in Patients with Cardiac Stents Undergoing Procedures workgroup at the University of Texas MD Anderson Cancer Center for the patient population. These experts included:

Core Development Team Leads

Cezar Iliescu, MD (Cardiology)
Michael Kroll, MD (Benign Hematology)
Katy Toale, PharmD (Pharmacy Quality-Regulatory)
Ali Zalpour, PharmD (Pharmacy Clinical Programs)

Workgroup Members

Kamran Ahrar, MD (Interventional Radiology)
Lara Bashoura, MD (Pulmonary Medicine)
Wendy Carazo, MPAS (Interventional Radiology)
Melissa Mei Chen, MD (Neuroradiology)
Stephen Chen, MD (Interventional Radiology)
Ivy Cocuzzi, PA-C (Acute Care Procedure Team)
Sarah DeSnyder, MD (Breast Surgical Oncology)
Bitá Esmaeili, MD (Ophthalmic Plastic Surgery)
Wendy Garcia, BS♦
Dan Gombos, MD (Ophthalmology)
Amanda V. Hamlin, MS (Procedural Operations Administration)
Jobin John, MSN, RN (DI Academic Services)
Lakshmi Koyyalagunta, MD (Pain Medicine)
Valerae Lewis, MD (Orthopaedic Oncology)
Nazanin Majd, MD (Neuro-Oncology)
Angie McIntosh, MSPA, PA-C (PA Office)

Reza Mehran, MD (Thoracic and Cardiovascular Surgery)
Zeyad Metwalli, MD (Interventional Radiology)
Sarah Mitchell, MPAS (Interventional Radiology-West Houston)
Emily Nia, MD (Breast Imaging)
Elizabeth Ninan, MBA, PA-C (Procedural & Therapeutics Administration)
Keyuri Popat, MD (Anesthesiology & Perioperative Medicine)
Shannon Popovich, MD (Anesthesiology & Perioperative Medicine)
Kristen Pytynia, MD (Head and Neck Surgery)
William Ross, MD (Gastroenterology Hepatology & Nutrition)
Thomas Smith III, MD (Urology)
Jolyn Taylor, MD (Gynecologic Oncology and Reproductive Medicine)
Khanh Vu, MD (General Internal Medicine)
Justine Wang, PharmD (Pharmacy Clinical Programs)
Mary Lou Warren, DNP, APRN, CNS-CC♦
Roi Weiser, MD (Surgical Oncology)
Christopher Young, MBBCh, PhD (Neurosurgery)

♦ Clinical Effectiveness Development Team