Supplemental Guide:

Thoracic Surgery – Independent

ACGME

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Milestones Supplemental Guide

This document provides additional guidance and examples for the Thoracic Surgery – Independent Milestones. This is not designed to indicate any specific requirements for each level, but to provide insight into the thinking of the Milestone Work Group.

Included in this document is the intent of each Milestone and examples of what a Clinical Competency Committee (CCC) might expect to be observed/assessed at each level. Also included are suggested assessment models and tools for each subcompetency, references, and other useful information.

Review this guide with the CCC and faculty members. As the program develops a shared mental model of the Milestones, consider creating an individualized guide (Supplemental Guide Template available) with institution/program-specific examples, assessment tools used by the program, and curricular components.

Additional tools and references, including the Milestones Guidebook, Clinical Competency Committee Guidebook, and Milestones Guidebook for Residents and Fellows, are available on the Resources page of the Milestones section of the ACGME website.

Patient Care 1: Ischemic Heart Disease **Overall Intent:** To manage patients with ischemic heart disease	
Milestones	**Examples**
Level 1 *Performs a disease specific history and physical and develops a diagnostic plan for a patient with ischemic heart disease*	● Identifies risk factors for coronary disease, performs physical exam including vascular exam, and knows the indications for ordering coronary angiography and echocardiogram
Assists in routine coronary procedures, including set-up and positioning	● Properly positions the patient for sternotomy and holds retraction of the heart, and lists steps of the procedure
Performs routine post-operative care and recognizes complications of coronary procedures	● Orders electrolyte replacement, interprets rhythm disturbances, removes chest tube, and recognizes a wound infection and bleeding
Level 2 *Interprets diagnostic testing and develops a treatment plan, including outpatient follow-up, for a patient with routine ischemic heart disease*	● Identifies stenosis and targets on coronary angiogram ● Identifies wall motion abnormalities on echocardiogram ● Knows the indications for a primary coronary artery bypass grafting (CABG) and can discuss conduit selection and targets for different patients
Performs components of coronary procedures	● Performs conduit preparation, cannulation, or proximal anastomosis
Manages simple post-operative complications of coronary procedures	● Manages atrial fibrillation, postoperative hypotension, bleeding
Level 3 *Develops a treatment plan, including outpatient follow-up, for a patient with complex ischemic heart disease*	● Identifies concomitant valvular disease on echocardiogram ● Suggests appropriate revascularization for a redo-CABG
Performs basic coronary procedures and recognizes intra-operative complications	● Performs primary CABG in a patient with preserved ventricular function ● Recognizes failure to wean off bypass or protamine reactions
Recognizes and creates a plan for complex complications of coronary	● Recognizes and develops management plan for graft occlusion or tamponade
Level 4 *Develops a treatment plan, including outpatient follow-up, for a patient with multiple comorbidities and complex ischemic heart disease*	● Develops a treatment plan for a patient with primary CABG with low ejection fraction

Performs complex coronary procedures and manages intra-operative complications *Manages complex complications of coronary procedures in critically ill patients*	● Performs repeat CABG, CABG for patients with low ejection fraction, primary valve-CABG, or primary CABG in patients with multiple prior stents ● Manages protamine reaction or failure to wean off bypass ● Manages graft occlusion or tamponade in patients who are hemodynamically unstable
Level 5 *Performs advanced coronary procedures* *Manages advanced intra-and post-operative complications of coronary procedures in critically ill patients*	● Performs left ventricular aneurysm repair (LVAR) or post-infarct ventricular septal defect (VSD) ● Manages iatrogenic type A dissection ● Manages air embolus
Assessment Models or Tools	● Direct observation ● End-of-rotation evaluation ● Medical record (chart) review ● Mock orals ● Simulation
Curriculum Mapping	●
Notes or Resources	● Thoracic Surgery Directors Association (TSDA). Cardiac Surgery Simulation Curriculum. https://tsda.org/. 2020. ● The Society of Thoracic Surgeons (STS). www.learnctsurgery.org. 2020.

Patient Care 2: Mechanical Circulatory Support **Overall Intent:** To manage and troubleshoot mechanical circulatory support	
Milestones	**Examples**
Level 1 *Identifies a patient in need of mechanical circulatory support* *Assists in routine procedures, including set-up and positioning*	● Identifies a patient who fails to wean from cardiopulmonary bypass or patient with cardiogenic shock after ST-segment-elevated myocardial infarction (STEMI) ● Properly positions patient for extracorporeal membrane oxygenation (ECMO) or intra-aortic balloon pump (IABP), can prepare equipment necessary prior procedure
Level 2 *Develops a diagnostic and treatment plan for a patient in need of mechanical circulatory support* *Assists in initiation of mechanical circulatory support*	● Determines appropriate support device for individual patient such as venous arterial versus veno-venous ECMO or need for balloon pump ● Obtains arterial and venous access, manages wires during IABP placement, chooses appropriate size and type of cannulas for ECMO
Level 3 *Develops a treatment plan for a patient in need of mechanical circulatory support with complex disease* *Performs components of mechanical circulatory support*	● Manages a patient with an IABP with aortic insufficiency, develops an ECMO plan for a patient pulmonary hypertension, develops a plan for a patient with biventricular failure ● Places cannulas for ECMO, positions IABP under imaging guidance, performs vascular cut down for access
Level 4 *Manages a patient on mechanical circulatory support and knows the principles of weaning a patient* *Initiates routine mechanical circulatory support, and manages routine complications*	● Adjusts timing of IABP and can troubleshoot waveform, appropriately weans flow on venous arterial ECMO ● Manages cold leg after placement of IABP, bleeding around cannula sites
Level 5 *Manages a patient who is able to be discontinued from mechanical circulatory support or in need of long-term strategy for end-stage failure*	● Places durable left ventricular assist device, total abdominal hysterectomy, performs transplant
Assessment Models or Tools	● Direct observation ● End-of-rotation evaluation ● Mock orals ● Simulation
Curriculum Mapping	●
Notes or Resources	● TSDA. Cardiac Surgery Simulation Curriculum. https://tsda.org/. 2020.

	● STS. www.learnctsurgery.org. 2020.

Patient Care 3: Valvular Disease **Overall Intent:** To manage patients with valvular heart disease	
Milestones	**Examples**
Level 1 *Performs a disease specific history and physical and develops a diagnostic plan for patients with valvular heart disease*	● Identifies murmurs of aortic stenosis, aortic insufficiency, mitral stenosis, and mitral insufficiency ● Identifies indications for echocardiogram in patients with suspected valvular disease
Assists in routine procedures, including set-up and positioning, for patients with valvular heart disease	● First-assists on the performance of aortic and mitral valve procedures
Performs routine post-operative care and recognizes complications related to heart valve surgery	● Identifies postoperative arrhythmias including atrial fibrillation ● Understands use of inotropes in routine post-operative patient
Level 2 *Interprets diagnostic testing and develops a treatment plan for a patient with routine valvular heart disease*	● Identifies aortic stenosis, aortic insufficiency, mitral stenosis, and mitral insufficiency on echocardiogram ● Identifies indications for valve surgery
Performs components of routine procedures for patients undergoing surgery for valvular heart disease	● Performs sternotomies, cannulation, and suture placement for valve procedures
Manages routine post-operative complications	● Manages post-operative arrhythmias and postoperative bleeding
Level 3 *Develops a treatment plan, including outpatient follow-up, for a patient with complex valvular heart disease*	● Identifies candidates for valve repair versus replacement versus percutaneous valve therapies
Performs basic procedures on patients with valvular heart disease and recognizes intra-operative complications	● Performs aortic valve replacement, mitral valve replacement, tricuspid valve repair ● Identifies and creates a plan for treatment of paravalvular leak or systolic anterior motion (SAM)
Recognizes and creates a plan for complex complications	● Identifies and creates a plan for treatment of post-operative tamponade, heart block, or hemolysis after valve surgery
Level 4 *Develops a treatment plan, including outpatient follow-up, for a patient with multiple*	● Develops a plan for patients with multivalvular disease ● Develops a plan for patients with valvular disease and low ejection fraction

comorbidities and advanced valvular heart disease *Performs complex procedures and manages intra-operative complications in patients undergoing surgery for valvular heart disease* *Manages complex complications*	 ● Performs mitral valve repair ● Performs multivalvular replacement ● Manages patient with small aortic root ● Performs transcatheter aortic valve replacement (TAVR) ● Manages systolic anterior motion ● Manages endocarditis of a prosthetic valve with systemic manifestations ● Manages patient with valve thrombosis
Level 5 *Performs advanced procedures for valvular heart disease* *Manages advanced intra- and post-operative complications*	● Performs redo-valvular surgery ● Manages aortic root abscess ● Manages complications of multi-valve surgery ● Manages atrioventricular groove disassociation
Assessment Models or Tools	● Direct observation ● End-of-rotation review ● Medical record (chart) review ● Mock oral ● Simulation
Curriculum Mapping	●
Notes or Resources	● TSDA. Cardiac Surgery Simulation Curriculum. https://tsda.org/. 2020. ● STS. www.learnctsurgery.org. 2020.

Patient Care 4: Great Vessel Disease **Overall Intent:** To manage patients with great vessel disease	
Milestones	**Examples**
Level 1 *Performs a disease-specific history and physical and develops a diagnostic plan for patients with disease of the great vessels*	● Identifies risk factors for great vessel disease, family history, connective tissue disorders, performs physical exam including vascular exam, and knows the indications for ordering coronary angiography, computerized tomography (CT) scan, and echocardiogram
Assists in routine procedures, including set-up and positioning for patients with disease of the great vessels	● Properly positions the patient for sternotomy, and follows suture; lists steps of the procedure
Performs routine post-operative care and recognizes complications in patients with disease of the great vessels	● Orders electrolyte replacement, interprets rhythm disturbances, removes chest tube, and recognizes a wound infection and bleeding
Level 2 *Interprets diagnostic testing and develops a treatment plan, including outpatient follow-up, for a patient with routine great vessel disease*	● Identifies extent of aneurysm and knows the indications for repair
Performs components of routine procedures on the great vessels	● Performs cannulation, resection, and mobilization of aneurysm/dissection
Manages simple post-operative complications in patients with disease of the great vessels	● Manages atrial fibrillation, postoperative hypotension, bleeding, and stroke
Level 3 *Develops a treatment plan, including outpatient follow-up, for a patient with complex disease of the great vessels*	● Identifies extent of dissection and concomitant wall motion and valvular abnormalities on echocardiogram, and knows the indications for concomitant valve replacement or CABG and can discuss cannulation strategies
Plans and performs basic procedures and recognizes intra-operative complications	● Identifies perfusion strategy, plan for hypothermia and cerebral protection, graft selection and placement; recognizes failure to wean off bypass, protamine reactions, and coagulopathy
Recognizes and creates a plan for complex complications	● Recognizes and develops management plan for tamponade, malperfusion, aortic pseudoaneuryms, residual dissection, or aneurysmal degeneration of native aorta
Level 4 *Develops a treatment plan, including outpatient follow-up, for a patient with multiple*	● Develops a treatment plan for a patient with aneurysm and aortic insufficiency, low ejection fraction, or coronary artery disease

comorbidities and complex disease of the great vessels *Plans and performs complex procedures and manages intra-operative complications* *Manages complex complications in critically ill patients*	● Performs extended aortic replacement, and manages protamine reaction or failure to wean off bypass ● Manages coronary artery ischemia, tamponade, or malperfusion in patients who are hemodynamically unstable
Level 5 *Performs advanced procedures* *Manages advanced intra- and post-operative complications*	● Performs reoperative aortic root replacement, thoracoabdominal aortic replacement, hybrid great vessel repair ● Manages iatrogenic type A dissection or air embolus
Assessment Models or Tools	● Chart review ● Direct observation ● End-of-rotation review ● Mock oral ● Simulation
Curriculum Mapping	●
Notes or Resources	● TSDA. Cardiac Surgery Simulation Curriculum. https://tsda.org/. 2020. ● STS. www.learnctsurgery.org. 2020.

Patient Care 5: Esophagus **Overall Intent:** To manage patients with benign or malignant esophageal disease	
Milestones	**Examples**
Level 1 *Performs a disease specific history and physical and develops a diagnostic plan*	● Identifies risk factors for benign and malignant esophageal disease, performs physical exam including degree of dysphagia, and knows the indications for ordering esophagram or endoscopy
Assists in routine procedures, including set-up and positioning	● Properly positions the patient for esophagectomy and proper exposure of the neck for a cervical anastomosis; lists steps of the procedure
Performs routine post-operative care and recognizes complications	● Orders electrolyte replacement, initiates tube feeds, identifies and manages aspiration, and recognizes chylothorax and a wound infection and bleeding
Level 2 *Develops a treatment plan, including outpatient follow-up, for patients with routine esophageal disease*	● Identifies the need for pre/post-chemoradiation, choice of surgical procedure, prehabilitation, or manometry for patients with routine esophageal disease
Performs components of procedures	● Performs mobilization of a gastric conduit, placement of a J-tube, or exposure of a cervical esophagus
Manages routine post-operative complications	● Manages aspiration pneumonia, ileus, or gastric outlet obstruction
Level 3 *Develops a treatment plan, including outpatient follow-up, for patients with complex esophageal disease*	● Develops a plan for patients with achalasia, locally advanced esophageal cancer, or giant paraesophageal hernia
Performs routine procedures and recognizes intra-operative complications	● Performs first time fundoplication, foreign body removal, or esophagogastroduodenoscopy (EGD) with dilation
Recognizes and creates a plan for complex complications	● Recognizes and develops a plan for leaks, chylothorax, or dehiscence
Level 4 *Develops a treatment plan, including outpatient follow-up, for a patient with multiple comorbidities and complex esophageal disease*	● Develops a treatment plan for patients needing salvage esophagectomy, esophagectomy with prior chest surgery, or for obesity
Performs complex procedures and manages intra-operative complications	● Performs minimally invasive esophagectomy, giant paraesophageal hernia, and Collis-Nissen

Manages complex complications in critically ill patients	● Manages ischemic conduit with sepsis, cervical leak with mediastinal extension, intraoperative airway injury, or intraoperative ischemic gastric conduit
Level 5 *Develops a treatment plan for a patient condition that does not have clear guidelines* *Performs advanced procedures and manages intra-operative complications* *Manages advanced complications without clear guidelines*	● Develops a management plan for patients with esophageal discontinuity ● Performs esophagectomy with non-gastric conduit, Redo fundoplication, or esophagectomy after prior fundoplication ● Manages aorto-enteric fistula, esophageal complication of thoracic endovascular aortic repair (TEVAR), or chylothorax post-duct ligation
Assessment Models or Tools	● Chart review ● Direct observation ● End-of-rotation review ● Mock oral ● Simulation
Curriculum Mapping	●
Notes or Resources	● STS. www.learnctsurgery.org. 2020.

Patient Care 6: Lung and Airway **Overall Intent:** To manage patients with benign or malignant lung and airway disease	
Milestones	**Examples**
Level 1 *Performs a disease specific history and physical and develops a diagnostic plan*	● Identifies risk factors for lung cancer, assesses functional status, and knows the indications for ordering pulmonary function tests, CT, positron emission tomography (PET) imaging
Assists in routine procedures, including set-up and positioning	● Assists in lateral decubitus positioning for thoracic procedures ● Drives a thoracoscope during video-assisted thoracic surgery (VATS) procedures
Performs routine post-operative care and recognizes complications	● Removes chest tubes ● Identifies air leak
Level 2 *Interprets diagnostic testing and develops a treatment plan, including outpatient follow-up, for a patient with routine disease*	● Identifies a treatment plan for solitary pulmonary nodules ● Identifies a diagnostic plan for patient with interstitial lung disease ● Develops a treatment plan for an early-stage lung cancer patient with normal pulmonary function tests
Performs bedside procedures and components of routine procedures	● Performs flexible bronchoscopy, VATS port placement, posterolateral thoracotomy, or division of individual structures during lobectomy (vein, artery)
Manages routine post-operative complications	● Manages hemothorax, pleural effusion, prolonged air leak, atrial fibrillation, or surgical site infection
Level 3 *Develops a treatment plan, including outpatient follow-up, for a patient with routine disease and multiple comorbidities or anatomic complexity*	● Develops a treatment plan for a patient with locally invasive lung cancer ● Develops a treatment plan for a patient with early-stage lung cancer and limited pulmonary reserve
Performs routine procedures and recognizes intra-operative complications	● Performs lung biopsy, wedge resection, open lobectomy, or tracheostomy
Recognizes and creates a plan for complex complications	● Recognizes and creates a plan for management of bronchopleural fistula, empyema, respiratory failure, vascular injury, or chylothorax
Level 4 *Develops a treatment plan, including outpatient follow-up, for a patient with complex disease*	● Develops a treatment plan for a patient with tracheal tumors, including anesthetic management

Performs complex procedures and manages intra-operative complications *Manages complex complications in critically ill patients*	● Performs segmentectomy, pneumonectomy, extended pulmonary resections, or minimally invasive lobectomy ● Manages bronchopleural fistula, empyema, respiratory failure, vascular injury, and chylothorax
Level 5 *Develops a treatment plan for a condition that does not have clear guidelines* *Performs advanced procedures and manages intra-operative complications* *Manages advanced complications without clear guidelines*	● Develops a treatment plan for immunosuppressed patients with pulmonary complications ● Performs completion pneumonectomy, sleeve/ bronchoplasty, tracheal resection and reconstruction or resection of pancoast tumors ● Manages tracheo-innominate fistula
Assessment Models or Tools	● Chart review ● Direct observation ● End-of-rotation review ● Mock oral
Curriculum Mapping	●
Notes or Resources	● STS. www.learnctsurgery.org. 2020.

Patient Care 7: Chest Wall/Pleura/Mediastinum/Diaphragm **Overall Intent:** To manage patients with chest wall, pleural, mediastinal, and diaphragmatic disease	
Milestones	**Examples**
Level 1 *Performs a disease-specific history and physical and develops a diagnostic plan*	● Identifies risk factors, performs physical exam including assessing for lymphadenopathy, and knows the indications for ordering CT scan or tumor markers
Assists in routine procedures, including set-up and positioning	● Properly positions the patient for the procedure, holds retraction, and follow suture; lists steps of the procedure
Performs routine post-operative care and recognizes complications	● Orders electrolyte replacement, interprets rhythm disturbances, removes chest tube, and recognizes a wound infection or bleeding
Level 2 *Interprets diagnostic testing and develops a treatment plan, including outpatient follow-up, for a patient with routine disease*	● Uses imaging to identify the location and extent of chest pathology including mediastinal mass, and pleural versus parenchymal disease; develops treatment plans for pneumothorax, malignant effusion, or chest wall infections
Performs bedside procedures and components of routine procedures	● Performs tube thoracostomy or intrapleural lytic therapy
Manages routine post-operative complications	● Manages atrial fibrillation, postoperative hypotension, or bleeding
Level 3 *Develops a treatment plan, including outpatient follow-up, for a patient with complex disease*	● Develops a treatment plan for a patient with thoracic outlet syndromes, mediastinal tumors, and bronchopleural fistula
Performs routine procedures and recognizes intra-operative complications	● Performs pleurodesis, sympathectomy, or pericardial window
Recognizes and creates a plan for complex complications	● Recognizes and creates a plan for empyema, vascular injury, diaphragmatic disruption, or chylothorax
Level 4 *Develops a treatment plan, including outpatient follow-up, for a patient with multiple comorbidities and complex disease*	● Develops a treatment plan for an immunosupressed or malnourished patient with thoracic outlet syndrome, mediastinal tumors, or bronchopleural fistula
Performs complex procedures and manages intra-operative complications	● Performs decortication, diaphragm plication, or mediastinal mass resection

Manages complex complications in critically ill patients	● Manages empyema, vascular injury, diaphragmatic disruption, or chylothorax
Level 5 *Performs advanced procedures* *Manages advanced intra- and post-operative complications*	● Performs pancoast tumor resection, extra pleural pneumonectomy, or pericardiectomy ● Manages cardiac herniation or injuries
Assessment Models or Tools	● Direct observation ● End-of-rotation evaluation ● Medical record (chart) review ● Mock orals
Curriculum Mapping	●
Notes or Resources	● STS. www.learnctsurgery.org. 2020.

Patient Care 8: Critical Care **Overall Intent:** To manage patients with critical illness	
Milestones	**Examples**
Level 1 *Interprets diagnostic data for a critically ill patient* *Performs routine critical care-related procedures*	● Determine type of shock, interprets pulmonary artery catheter, interprets ventilator data, uses intensive care unit (ICU) flowsheet, determines volume status, etc. ● Places a radial/femoral arterial line, central lines, percutaneous chest drain, or Swan-Ganz catheter
Level 2 *Implements a treatment plan for peri-operative patients with routine procedures* *Recognizes need for complex procedures*	● Writes order for ventilator settings, manages inotropic support, determines nutrition needs relative to disease or procedure, and implements appropriate diet/tube feeds, and so on ● Recognizes when to implement veno-venous ECMO, place a balloon pump, or re-open the chest
Level 3 *Implements a treatment plan for peri-operative patients with complex procedures* *Performs complex bedside procedures*	● Creates a treatment plan for patient post-op from esophagectomy, type A dissection repair, or repaired ischemic VSD ● Performs bedside sternal opening, places veno-venous ECMO, places a balloon pump, performs a tracheostomy, or performs a percutaneous endoscopic gastrostomy
Level 4 *Implements a treatment plan for a patient with multiple comorbidities and complex disease* *Performs complex bedside procedures during an emergency situation*	● Implements a treatment plan for ventricular dysfunction following coronary surgery, or manages cardiac ischemia/minimally invasive post-esophagectomy or major lung resection ● Performs intubation with hemoptysis, placement of arterial lines during hypotension, or opens chest during active chest compressions to relieve tamponade
Level 5 *Implements a treatment plan for a patient condition that does not have clear guidelines* *Performs advanced bedside procedures*	● Implements a treatment plan for patient on ECMO with no clear endpoint, and manages failure to wean from ventricular assist devices ● Performs a bedside laparotomy or thoracotomy, revision coronary anastomosis, or placement of temporary mechanical support (e.g., Impella®, percutaneous left ventricular assist device)
Assessment Models or Tools	● Direct observation ● End-of-rotation evaluation ● Medical record (chart) review ● Mock orals ● Simulation

Curriculum Mapping	●
Notes or Resources	● TSDA. Cardiac Surgery Simulation Curriculum. https://tsda.org/. 2020. ● STS. www.learnctsurgery.org. 2020.

Medical Knowledge 1: Cardiovascular Surgical Knowledge **Overall Intent:** To demonstrate comprehensive knowledge of anatomy, physiology, and pathophysiology related to cardiovascular surgery	
Milestones	**Examples**
Level 1 *Identifies normal cardiovascular anatomy*	● Identifies coronary anatomy, valve relationships, and location of conduction system
Identifies normal cardiovascular physiology	● Identifies determinates of cardiac output, analyzing swan waveform
Lists components of cardiopulmonary bypass apparatus	● Lists oxygenator, pump heads, heat exchanger, low level alarm, and in-line monitoring
Level 2 *Identifies variants of cardiovascular anatomy*	● Identifies abnormal coronary anatomy (e.g., stenotic vessel, intramyocardial segment) and bicuspid aortic valve
Identifies cardiovascular pathophysiology	● Evaluates electrocardiogram (EKG) for ST-elevation myocardial infarction (STEMI) and diagnoses atrial fibrillation
Demonstrates knowledge of cardioplegia solutions, delivery modes, and complications of bypass	● Understands difference in crystalloid and blood cardioplegia, describes antegrade and retrograde, and coagulopathy
Level 3 *Integrates knowledge of anatomy with diagnostic testing*	● Identifies coronary anatomy on various angiographic views, and valvular anatomy on echo
Integrates knowledge of pathophysiology with diagnostic testing	● Identifies systolic anterior motion on echocardiogram, and appropriately describes regurgitant jets in valvular insufficiency
Discusses cannulation techniques and options for cardiopulmonary bypass	● Explains single venous versus bicaval, central versus peripheral arteries, and cold versus full or partial
Level 4 *Integrates knowledge of anatomical changes after prior surgery with diagnostic testing*	● Recognizes bypass grafts on angiogram, type of valve replacement on imaging, and proximity of cardiac anatomy to sternum prior to redo-sternotomy
Integrates knowledge of pathophysiologic changes after prior surgery with diagnostic testing	● Recognizes paravalvular leak on echo, cardiac tamponade on imaging, and hemodynamic data

Explains management strategies of complex complications related to cardiopulmonary bypass	● Can list the steps required to manage iatrogenic aortic dissection or air embolism
Level 5 *Uses advanced imaging techniques to help identify anatomic variability for operative planning* *Contributes to medical literature*	● Uses 3D modeling and/or reconstruction for planning ● Participates in writing a book chapter or review article
Assessment Models or Tools	● Direct observation ● End-of-rotation evaluation ● Learn CT Surgery Benchmark quizzes ● Mock orals ● Simulation ● TSDA in-service exam
Curriculum Mapping	●
Notes or Resources	● STS. www.learnctsurgery.org. 2020. ● Self Education Self Assessment in Thoracic Surgery (SESATS). http://www.sesats.org/. 2020.

Medical Knowledge 2: General Thoracic Surgical Knowledge **Overall Intent:** To demonstrate comprehensive knowledge of anatomy, physiology, and pathophysiology related to general thoracic surgery	
Milestones	**Examples**
Level 1 *Identifies normal general thoracic anatomy* *Identifies normal general thoracic physiology*	● Lists the bronchopulmonary segments of the lung ● Identifies the compartments of the mediastinum and its components ● Identifies normal location of recurrent and phrenic nerves ● Describes the blood supply of the foregut ● Describes the physiology of gas exchange in the lung ● Describes normal esophageal motility
Level 2 *Identifies variants of general thoracic anatomy* *Identifies general thoracic pathophysiology and staging of thoracic malignancies*	● Describes the variations of left upper lobe pulmonary artery anatomy ● Identifies bronchial suis ● Describes esophageal motility disorders ● Describes the physiology of chronic obstructive pulmonary disease (COPD) and physiology of pulmonary fibrosis ● Explains the TNM (Tumor, Nodes, Metasteases) staging of lung cancer and esophageal cancer
Level 3 *Integrates knowledge of anatomy with diagnostic testing* *Integrates knowledge of pathophysiology with diagnostic testing*	● Identifies mediastinal lymph node stations on CT imaging ● Identifies segments and lobes of the lung on CT imaging ● Identifies abnormal patterns on esophageal manometry ● Identifies high-risk patients for pulmonary resection based on pulmonary function tests
Level 4 *Integrates knowledge of anatomical changes after prior surgery with diagnostic testing* *Integrates knowledge of pathophysiologic changes after prior surgery with diagnostic testing*	● Identifies previous pulmonary resections on CT imaging ● Identifies prior Nissen fundoplication on esophagram ● Identifies failed Nissen on barium studies ● Interprets pulmonary function tests in the setting of prior pulmonary resection
Level 5 *Uses advanced imaging techniques to help identify anatomic variability for operative planning* *Contributes to medical literature*	● Uses 3D reconstruction imaging to plan for surgery (tracheal resection, chest wall surgery, Pancoast tumors)
Assessment Models or Tools	● Chart review ● Direct observation

	● Learn CT Surgery Benchmark quizzes ● Mock orals ● TSDA in-service exam
Curriculum Mapping	●
Notes or Resources	● STS. www.learnctsurgery.org. 2020. ● SESATS. http://www.sesats.org/. 2020.

Medical Knowledge 3: Congenital Heart Disease **Overall Intent:** To demonstrate understanding and knowledge of congenital heart disease	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of embryology, anatomy, and physiology related to routine forms of congenital heart disease*	● Demonstrates knowledge of embryology, anatomy, and physiology of atrial septal defect (ASD), VSD, patent ductus arteriosus (PDA), or coarctation
Level 2 *Demonstrates knowledge of embryology, anatomy, and physiology related to complex forms of congenital heart disease*	● Demonstrates knowledge of embryology, anatomy, and physiology of truncus arteriosus, transposition of the great vessels, tetralogy of Fallot, hypoplastic left heart syndrome, atrioventricular canal defects, total anomalous pulmonary venous return (TAPVR), or partial anomalous pulmonary venous return (PAPVR)
Level 3 *Demonstrates knowledge of operative principles and non-operative options for routine forms of congenital heart disease*	● Demonstrates knowledge of operative principles and non-operative options for ASD, VSD, PDA, or coarctation
Level 4 *Demonstrates knowledge of operative principles and non-operative options for complex forms of congenital heart disease*	● Demonstrates knowledge of operative principles and non-operative options for Tetralogy of Fallot, AV canal defects, TAPVR, or PAPVR
Level 5 *Demonstrates knowledge of operative principles and non-operative options for advanced forms of congenital heart disease*	● Demonstrates knowledge of operative principles and non-operative options for re-operative congenital heart surgery, tetralogy of Fallot with pulmonary atresia, truncus, hypoplastic left heart syndrome, transposition, interrupted aortic arch, or heart transplant in a patient with single ventricle physiology
Assessment Models or Tools	● Direct observation ● Mock orals ● TSDA in-service exam
Curriculum Mapping	●
Notes or Resources	● STS. www.learnctsurgery.org. 2020.

Systems-Based Practice 1: Patient Safety and Quality Improvement (QI) **Overall Intent:** To engage in the analysis and management of patient safety events, including relevant communication with patients, families, and health care professionals; to conduct a QI project	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of common patient safety events*	● Lists patient misidentification or medication errors as common patient safety events
Demonstrates knowledge of how to report patient safety events	● Describes how to report errors in your environment
Demonstrates knowledge of basic quality improvement methodologies and metrics	● Describes Society of Thoracic Surgeons (STS) database, National Surgery Quality Improvement Program, and root cause analysis ● Participates in a morbidity and mortality (M and M) conference
Level 2 *Identifies system factors that lead to patient safety events*	● Identifies that lack of hand sanitizer dispenser at each clinical exam room may lead to increased infection rates; identifies that outpatient medications are not reconciled to inpatient medications
Reports patient safety events to superiors/ faculty members	● Reports lack of hand sanitizer dispenser at each clinical exam room to appropriate supervisor
Describes local quality improvement initiatives	● Summarizes protocols resulting in decreased spread of hospital acquired *C. diff*
Level 3 *Participates in analysis of patient safety events (simulated or actual)*	● Preparing for M and M presentations or participates in data entry for quality assurance (QA) database
Reports patient safety events through institutional reporting systems (actual or simulated)	● Through simulation, communicates with patients/families about a medication administration error
Participates in local quality improvement initiatives	● Participates in project identifying root cause of operating room turnover inefficiency, leads M and M case, or participates on a quality committee
Level 4 *Conducts analysis of patient safety events and offers error prevention strategies (simulated or actual)*	● Collaborates with a team to conduct the analysis of a medication administration errors and effectively communicates with patients/families about those events
Participates in disclosure of patient safety events to patients and families (simulated or actual)	● Participates in the completion of a QI project, including assessing the problem, articulating a broad goal, developing a SMART (Specific, Measurable, Attainable, Realistic, Time-Based) objective plan, and monitoring progress and challenges

Demonstrates the skills required to identify, develop, implement, and analyze a quality improvement project	
Level 5 *Actively engages teams and processes to modify systems to prevent patient safety events* *Role models or mentors others in the reporting/disclosure of patient safety events to superiors/organization* *Creates, implements, and assesses quality improvement initiatives at the institutional or community level*	● Assumes a leadership role at the departmental or institutional level for patient safety ● Conducts a simulation for disclosing patient safety events ● Initiates and completes a QI project at hospital, county, or state level
Assessment Models or Tools	● Direct observation ● E-module multiple choice tests ● Medical record (chart) audit ● Multisource feedback ● Portfolio ● Reflection ● Simulation
Curriculum Mapping	●
Notes or Resources	● Institute of Healthcare Improvement. http://www.ihi.org/Pages/default.aspx. 2020. ● STS Database. www.sts.org. 2020. ● Gallagher T, Studdert D, Levinson W. Disclosing harmful medical errors to patients. *N Engl J* Med. 2007;356(26):2713-2719. https://www.nejm.org/doi/full/10.1056/NEJMra070568?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%3dpubmed. 2020. ● Gallagher TH, Etchegaray JM, Bergstedt B, et al. Improving communication and resolution following adverse events using a patient-created simulation exercise. *Health Serv Res*. 2016;51(6):2537-2549. https://onlinelibrary.wiley.com/doi/abs/10.1111/1475-6773.12601. 2020.

Systems-Based Practice 2: System Navigation for Patient-Centered Care **Overall Intent:** To effectively navigate the health care system, including the interdisciplinary team and other care providers, to adapt care to a specific patient population to ensure high-quality patient outcomes	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of care coordination* *Identifies key elements for safe and effective transitions of care and hand-offs* *Demonstrates knowledge of population and community health needs and disparities*	● For a patient with lung cancer requiring adjuvant therapy, identifies need for communication with medical oncologist and/or radiation oncologist ● Lists the essential components of a structured sign-out tool during care transitions and hand-offs ● Identifies information a medical oncologist may need to determine care and methods of delivering that information ● Identifies that patients in rural areas may have different needs and access to a medical oncologist/radiation oncologist than urban patients
Level 2 *Coordinates care of patients in routine clinical/social situations effectively using the roles of the interprofessional teams* *Performs safe and effective transitions of care/hand-offs in routine clinical situations* *Identifies specific population and community health needs and inequities for their local population*	● Coordinates care with the heart failure clinic at the time of discharge from the hospital ● Routinely uses a structured sign-out tool for a stable patient during night float sign-out ● Identifies that limited transportation options may be a factor in rural patients getting to multiple chemotherapy appointments
Level 3 *Coordinates care of patients in complex clinical/social situations effectively using the roles of the interprofessional teams* *Performs safe and effective transitions of care/hand-offs in complex clinical situations* *Uses local resources effectively to meet the needs of a patient population and community*	● Works with the social worker to coordinate care for a homeless patient that will ensure follow-up to a heart failure clinic after discharge from the hospital ● Routinely uses a structured sign-out tool when transferring a patient to the ICU ● Makes appropriate referral for patients who cannot afford post discharge medication
Level 4 *Role models effective coordination of patient-centered care among different disciplines and specialties*	● Leads team members in approaching interdisciplinary approach to patient care

Role models and advocates for safe and effective transitions of care/hand-offs within and across health care delivery systems *Adapts personal practice to provide for the needs of specific populations*	● Prior to going on vacation, proactively informs the covering resident about a plan of care for a patient with a complex wound ● Adapts pain management plan in the context of substance use disorder
Level 5 *Analyzes the process of care coordination and leads in the design and implementation of improvements* *Improves quality of transitions of care within and across health care delivery systems to optimize patient outcomes* *Leads innovations and advocates for populations and communities with health care inequities*	● Leads a program to streamline the process for discharge with home oxygen ● Develops a protocol to improve transitions to long-term care facilities ● Leads development of telehealth diagnostic services for a rural site
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Multisource feedback ● Quality metrics and goals mined from electronic health records (EHRs) ● Review of sign-out tools, use and review of checklists
Curriculum Mapping	●
Notes or Resources	● CDC. Population Health Training in Place Program (PH-TIPP). https://www.cdc.gov/pophealthtraining/whatis.html. 2020. ● Kaplan KJ. In pursuit of patient-centered care. http://tissuepathology.com/2016/03/29/in-pursuit-of-patient-centered-care/#axzz5e7nSsAns. 2020. ● Skochelak SE, Hawkins RE, Lawson LE, Starr SR, Borkan JM, Gonzalo JD. *AMA Education Consortium: Health Systems Science*. Philadelphia, PA: Elsevier; 2016. https://commerce.ama-assn.org/store/ui/catalog/productDetail?product_id=prod2780003. 2020.

Systems-Based Practice 3: Physician Role in Health Care Systems **Overall Intent:** To understand the physician's role in the complex health care system and how to optimize the system to improve patient care and the health system's performance	
Milestones	**Examples**
Level 1 *Identifies key components of the complex health care system*	● Articulates differences between skilled nursing and long-term care facilities
Describes basic health payment systems, including practice models	● Understands the impact of health plan coverage on prescription drugs for individual patients
Identifies basic knowledge domains for effective transition to practice	● Identifies that notes must meet coding requirements
Level 2 *Describes how components of a complex health care system are interrelated, and how this impacts patient care*	● Explains that improving patient satisfaction impacts patient adherence and payment to the health system
Delivers care with consideration of each patient's payment model	● Takes into consideration patient's prescription drug coverage when choosing a statin for treatment of hyperlipidemia
Demonstrates use of information technology required for medical practice	● Recognizes that appropriate documentation can influence the severity of illness determination upon discharge
Level 3 *Discusses how individual practice affects the broader system*	● Ensures that patient with COPD has a scheduled follow up appointment at discharge within seven days to reduce risk of readmission
Engages with patients in shared decision making, informed by each patient's payment models	● Discusses costs and benefits of the location of surveillance imaging post-cancer resection
Describes core administrative knowledge needed for transition to practice	● Understands the core elements of employment contract negotiation
Level 4 *Manages and adapts personal practice to provide efficient and effective patient care and transition of care*	● Ensures proper documentation of three-day qualifying hospital stay prior to discharging a patient to a skilled nursing facility for physical therapy
Advocates for patient care needs with consideration of the limitations of each patient's payment model	● Works collaboratively to improve patient assistance resources for a patient with a recent amputation and limited resources

Analyzes practice patterns and professional requirements in preparation for practice	● Proactively compiles procedure log in anticipation of applying for hospital privileges
Level 5 *Advocates for or leads systems change that enhances efficient and effective patient care and transition of care* *Participates in health policy advocacy activities* *Educates others to prepare them for transition to practice*	● Works with community or professional organizations to advocate for no smoking ordinances ● Improves informed consent process for non-English-speaking patients requiring interpreter services
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Multisource feedback
Curriculum Mapping	●
Notes or Resources	● Agency for Healthcare Research and Quality (AHRQ). Measuring the Quality of Physician Care. https://www.ahrq.gov/professionals/quality-patient-safety/talkingquality/create/physician/challenges.html. 2020. ● AHRQ. Major physician performance sets. https://www.ahrq.gov/professionals/quality-patient-safety/talkingquality/create/physician/measurementsets.html. 2020. ● The Kaiser Family Foundation. www.kff.org. 2020. ● The Kaiser Family Foundation: Topic: health reform. https://www.kff.org/topic/health-reform/. 2020. ● Dzau VJ, McClellan M, Burke S, et al. Vital directions for health and health care: priorities from a National Academy of Medicine Initiative. *NAM Perspectives*. Discussion Paper, National Academy of Medicine, Washington, DC. https://nam.edu/vital-directions-for-health-health-care-priorities-from-a-national-academy-of-medicine-initiative/. 2020. ● The Commonwealth Fund. Health System Data Center. http://datacenter.commonwealthfund.org/?_ga=2.110888517.1505146611.1495417431-1811932185.1495417431#ind=1/sc=1. 2020. ● The Commonwealth Fund. Health Reform Resource Center. http://www.commonwealthfund.org/interactives-and-data/health-reform-resource-center#/f:@facasubcategoriesfacet63677=[Individual%20and%20Employer%20Responsibility. 2020.

Practice-Based Learning and Improvement 1: Evidence-Based and Informed Practice **Overall Intent:** To incorporate evidence and patient values into clinical practice	
Milestones	**Examples**
Level 1 *Demonstrates how to access and use available evidence to take care of a routine patient*	● Looks up disease-specific STS guidelines
Level 2 *Articulates clinical questions and elicits patient preferences and values in order to guide evidence-based care*	● Discusses role of bioprosthetic versus mechanical valve replacement with patients ● Discusses role of stereotactic body radiation therapy (SBRT) versus surgery for early stage lung cancer with patients
Level 3 *Locates and applies the best available evidence, integrated with patient preference, to the care of complex patients*	● Discusses National Comprehensive Cancer Network guidelines for N2 positive lung cancer ● Discusses role of adjuvant therapy after lung cancer resection
Level 4 *Critically appraises and applies evidence even in the face of uncertainty and conflicting evidence to guide care, tailored to the individual patient*	● Discusses anticoagulation indications after valve replacement ● Discusses treatment options for Stage 3A lung cancer
Level 5 *Coaches others to critically appraise and apply evidence for complex patients; and/or participates in the development of guidelines*	● Leads local development of enhanced recovery from surgery protocols
Assessment Models or Tools	● Conference presentations ● Direct observation ● M and M ● Oral or written examinations
Curriculum Mapping	●
Notes or Resources	● National Institutes of Health. U.S. National Library of Medicine. Write Your Application. https://grants.nih.gov/grants/how-to-apply-application-guide/format-and-write/write-your-application.htm. 2020. ● National Institutes of Health. U.S. National Library of Medicine. PubMed Tutorial. https://www.nlm.nih.gov/bsd/disted/pubmedtutorial/cover.html. 2020. ● Institutional IRB guidelines ● National Comprehensive Cancer Network Guidelines. www.nccn.org. 2020. ● American College of Cardiology Guidelines. https://www.acc.org/guidelines. 2020. ● STS Guidelines. https://www.sts.org/resources/clinical-practice-credentialing-and-reporting-guidelines. 2020.

Practice-Based Learning and Improvement 2: Reflective Practice and Commitment to Personal Growth **Overall Intent:** To seek clinical performance information with the intent to improve care; reflects on all domains of practice, personal interactions, and behaviors, and their impact on colleagues and patients (reflective mindfulness); develop clear objectives and goals for improvement in some form of a learning plan	
Milestones	**Examples**
Level 1 *Accepts responsibility for personal and professional development by establishing goals and actively seeking opportunities to improve*	● Sets a personal practice goal of improving suture management ● Identifies gaps in knowledge of ischemic heart disease ● Asks for feedback from patients, families, and patient care team members
Level 2 *When prompted, uses performance data to identify gaps, design, and implement a learning plan*	● When prompted, uses in-training exam results to identify areas for improvement ● When prompted, develops reading plan based on identified areas for improvement
Level 3 *Independently uses performance data to identify gaps, design, and implement a learning plan*	● Uses in-training exam and multisource feedback results to identify areas for improvement ● Implements reading plan based on identified areas for improvement
Level 4 *Independently uses performance data to measure the effectiveness of the learning plan and adapt the plan as needed*	● Evaluates performance on subsequent in-training exams and adjusts study plan appropriately
Level 5 *Facilitates the design and implementing learning plans for others*	● Assists first-year residents in developing their individualized learning plans
Assessment Models or Tools	● Direct observation ● Review of learning plan
Curriculum Mapping	●
Notes or Resources	● Hojat M, Veloski JJ, Gonnella JS. Measurement and correlates of physicians' lifelong learning. *Acad Med.* 2009;84(8):1066-74. https://journals.lww.com/academicmedicine/fulltext/2009/08000/Measurement_and_Correlates_of_Physicians__Lifelong.21.aspx. 2020. ● Burke AE, Benson B, Englander R, Carraccio C, Hicks PJ. Domain of competence: practice-based learning and improvement. *Acad Pediatr.* 2014;14: S38-S54. https://www.academicpedsjnl.net/article/S1876-2859(13)00333-1/pdf. 2020. ● Lockspeiser TM, Schmitter PA, Lane JL et al. Assessing residents' written learning goals and goal writing skill: validity evidence for the learning goal scoring rubric. *Acad Med.* 2013;88(10)1558-63. https://journals.lww.com/academicmedicine/fulltext/2013/10000/Assessing_Residents__Written_Learning_Goals_and.39.aspx. 2020. ● STS. www.learnctsurgery.org. 2020. ● SESATS. http://www.sesats.org/. 2020. ● TSDA. TSDA In-Training Exam. https://tsda.org/in-training-exam/. 2020.

Professionalism 1: Ethical Principles **Overall Intent:** To recognize and address lapses in ethical and professional behavior, demonstrates ethical and professional behaviors, and use appropriate resources for managing ethical and professional dilemmas	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of the ethical principles underlying informed consent, surrogate decision making, advance directives, confidentiality, error disclosure, stewardship of limited resources, and related topics*	● Discusses the basic principles of beneficence, nonmaleficence, justice, autonomy ● Discusses professional values and commitments and how they apply to informed consent process ● Lists elements of informed consent for procedures
Level 2 *Applies ethical principles during patient care*	● Identifies surrogate for impaired patients ● Maintains patient confidentiality in public situations
Level 3 *Recognizes need to seek help in managing and resolving ethical situations*	● Obtains institutional guidance on obtaining consent for blood transfusion in pediatric Jehovah's Witness patient ● Analyzes difficult real or hypothetical ethics case scenarios or situations, recognizes own limitations
Level 4 *Uses appropriate resources for managing and resolving ethical dilemmas as needed*	● Manages a near miss or sentinel event by contacting risk management ● Identifies ethical dilemmas of performing procedures in patients who are potential organ donors ● Recognizes and manages situations of medical futility
Level 5 *Identifies and seeks to address system-level factors that induce or exacerbate ethical problems or impede their resolution*	● Identifies and seeks to address system-wide factors or barriers to promoting a culture of ethical behavior through participation in a work group, committee, or task force
Assessment Models or Tools	● Direct observation ● Global evaluation ● Multisource feedback ● Oral or written self-reflection ● Simulation
Curriculum Mapping	●
Notes or Resources	● American Medical Association. Ethics. https://www.ama-assn.org/delivering-care/ama-code-medical-ethics. 2020. ● Byyny RL, Papadakis MA, Paauw DS. *Medical Professionalism Best Practices*. Menlo Park, CA: Alpha Omega Alpha Medical Society; 2015. https://alphaomegaalpha.org/pdfs/2015MedicalProfessionalism.pdf. 2020. ● Levinson W, Ginsburg S, Hafferty FW, Lucey CR. *Understanding Medical Professionalism*. 1st ed. New York, NY: McGraw-Hill Education; 2014.

	● Bynny RL, Paauw DS, Papadakis MA, Pfeil S. *Medical Professionalism. Best Practices: Professionalism in the Modern Era*. Menlo Park, CA: Alpha Omega Alpha Medical Society; 2017. http://alphaomegaalpha.org/pdfs/Monograph2018.pdf. 2020. ● STS. Code of Ethics. https://www.sts.org/about-sts/policies/code-ethics. 2020. ● American Association for Thoracic Surgery (AATS). Code of Ethics. https://www.aats.org/aatsimis/AATSWeb/Association/About/Governance/By-Laws_and_Policies/Code_of_Ethics.aspx. 2020.

Professionalism 2: Professional Behavior and Accountability **Overall Intent:** To take responsibility for their actions and the impact on patients and other members of the health care team and recognize limits of one's own knowledge and skill	
Milestones	**Examples**
Level 1 *Completes patient care tasks and responsibilities, identifies potential barriers, and describes strategies for ensuring timely task completion*	● Completes routine discharge process ● Sees transfer patient and completes admit orders in a timely manner
Describes when and how to appropriately report lapses in professional behavior	● Knows how to report unprofessional behavior at their institution
Accepts feedback highlighting gaps	● Acknowledges gaps in skill during a case debriefing and spends additional time in the simulation lab
Level 2 *Performs patient care tasks and responsibilities in a timely manner with appropriate attention to detail in routine situations*	● Consents patient and schedules lobectomy
Takes responsibility for his or her own professional behavior and reports lapses in self and others	● Apologizes to team member(s) for unprofessional behavior without prompting
Episodically seeks feedback	● Recognizes difficulty placing chest tube and requests feedback before next procedure
Level 3 *Performs patient care tasks and responsibilities in a timely manner with appropriate attention to detail in complex or stressful situations*	● Counsels angry patient with complaints about care team while having multiple other clinical responsibilities
Demonstrates professional behavior in complex or stressful situations	● Asks for help after attempting central line twice without success ● Asks for help when unable to identify critical pulmonary anatomy
Intentionally seeks and integrates multisource feedback into practice	● Asks for help leading family meeting where withdrawal of life-sustaining treatment will be discussed ● Consistently integrates intra-operative feedback into performance improvement

Level 4 *Recognizes situations that may impact others' ability to complete patient-care tasks and responsibilities in a timely manner* *Intervenes to prevent and correct lapses in professional behavior in self and others* *Provides constructive feedback to others*	● Adjusts junior resident schedule to allow work hour compliance ● Encourages junior residents to use well-being days ● Asks another team member to perform tasks when fatigued ● Reports student harassment to appropriate institutional official
Level 5 *Develops systems to enhance other's ability to efficiently complete patient-care tasks and responsibilities* *Coaches others when their behavior fails to meet professional expectations*	● Sets up a meeting with the nurse manager to streamline patient discharges ● Shares templates for documentation ● Coaches others on how to avoid conflict with team members
Assessment Models or Tools	● Compliance with deadlines and timelines ● Direct observation ● Multisource feedback ● Self-evaluations ● Simulation
Curriculum Mapping	●
Notes or Resources	● American College of Surgeons. Code of Professional Conduct https://www.facs.org/about-acs/statements/stonprin#code. 2020. ● Code of conduct from institutional manual ● STS. Code of Ethics. https://www.sts.org/about-sts/policies/code-ethics. 2020. ● AATS. Code of Ethics. https://www.aats.org/aatsimis/AATSWeb/Association/About/Governance/By-Laws_and_Policies/Code_of_Ethics.aspx. 2020.

Professionalism 3: Administrative Tasks **Overall Intent:** To ensure the resident develops the skills and behaviors required to complete the administrative duties of being a surgeon, such as clinical work and education hours, Case Logs, evaluations, discharge summaries, operative reports, daily progress notes, and conference/meeting attendance	
Milestones	**Examples**
Level 1 *Takes responsibility for failure to complete administrative tasks and responsibilities*	● When a program director confronts a resident who has failed to concurrently log cases, the resident acknowledges failure to allocate time specifically for this administrative duty ● Creates a plan to log all cases at the end of every day
Level 2 *Performs administrative tasks and responsibilities in a timely manner with appropriate attention to detail in routine situations*	● Logs clinical and educational work hours and Case Logs regularly ● Completes operative report or discharge summary dictation promptly ● Responds to pages, texts, and emails
Level 3 *Performs administrative tasks and responsibilities in a timely manner with appropriate attention to detail in complex or stressful situations*	● When on a busy service, continues to log clinical and educational work hours and cases without interruption ● Completes timely evaluations while having multiple clinical responsibilities
Level 4 *Recognizes situations that may impact others' ability to complete administrative tasks and responsibilities in a timely manner*	● A resident who has planned to attend a wedding in the family makes the appropriate changes in the call schedule to avoid service interruptions ● A senior resident anticipates junior resident rotation changes and ensures that patient documentation is completed
Level 5 *Develops systems to enhance other's ability to efficiently complete administrative tasks and responsibilities*	● Works with the hospital information technology department to develop a resident shared file directory to facilitate resident completion of administrative requirements such as call schedule distribution, transition of patient care documents, etc.
Assessment Models or Tools	● Case Logs ● Clinical and educational work hours logs ● Conference attendance logs ● Evaluation compliance ● Medical chart review ● Multisource feedback ● Program director's reports documenting compliance with administrative requirements
Curriculum Mapping	●
Notes or Resources	● ACGME Program Requirements for Graduate Medical Education in Thoracic Surgery ● Institutional guidelines

Professionalism 4: Well-Being **Overall Intent:** To identify, use, manage, improve, and seek help for personal and professional well-being for self and others	
Milestones	**Examples**
Level 1 *With assistance, recognizes status of personal and professional well-being*	● Acknowledges own response to patient's death
Level 2 *Independently recognizes status of personal and professional well-being*	● Independently identifies and communicates impact of a personal family tragedy ● Identifies the impact of lack of sleep on performance ● States symptoms of burnout
Level 3 *Proposes a plan to optimize personal and professional well-being*	● With the multidisciplinary team, develops a reflective response to deal with personal impact of difficult patient encounters and disclosures ● Does self-reflection to identify symptoms of burnout
Level 4 *Executes a plan to optimize personal and professional well-being*	● Independently identifies ways to manage personal stress ● Engages in activities to build resilience and well-being
Level 5 *Coaches others when emotional responses or limitations in knowledge/skills do not meet professional expectations*	● Assists in organizational efforts to address clinician well-being after patient diagnosis/prognosis/death
Assessment Models or Tools	● Direct observation ● Group interview or discussions for team activities ● Individual interview ● Institutional online training modules ● Self-assessment and personal learning plan
Curriculum Mapping	●
Notes or Resources	● Local resources, including Employee Assistance ● ACGME. Tools and Resources on Physician Well-Being. https://www.acgme.org/What-We-Do/Initiatives/Physician-Well-Being/Resources. 2020.

Interpersonal and Communication Skills 1: Patient and Family-Centered Communication **Overall Intent:** To deliberately use language and behaviors to form a therapeutic relationship with patients and their families; to identify communication barriers, including self-reflection on personal biases, and minimize them in the doctor-patient relationship; organize and lead communication around shared decision making	
Milestones	**Examples**
Level 1 *Introduces themselves and explains their role to the patient and family*	● Self-monitors and controls tone, non-verbal responses, and language and asks questions to invite the patient's participation ● Accurately communicates their role in the health care system to patients and families, and identifies loss of hearing, language, aphasia as common communication barriers in patient and family encounters
Provides timely updates to patients and families	● Communicates with patients and patients' families on changing conditions ● Provides patients with routine information, such as chest x-ray obtained earlier in the day is normal or that the hematocrit is stable
Identifies common barriers to effective communication	● Identifies need for trained interpreter with non-English-speaking patients
Level 2 *Delivers routine information to patients and families and confirms understanding*	● Shares information and verifies patient understanding
Actively listens to patients and families to elicit patient preferences and expectations	● Leads a discussion about acute pain management with the patient and the family, reassessing the patient's and family's understanding and anxiety
Identifies complex barriers to effective communication	● Identifies culture, religious beliefs, health literacy as complex communication barriers in patient and family encounters
Level 3 *Delivers complex and difficult information to patients and families and confirms understanding*	● Establishes and maintains a therapeutic relationship with angry, non-compliant, substance seeking, and mentally challenged patients ● Attempts to mitigate preconceived ideas about patients of certain race or weight through reflection on implicit biases, when prompted
Uses shared decision making to make a personalized care plan	● When speaking to a patient, acknowledges uncertainty in a patient's medical complexity and prognosis ● Independently engages in shared decision making with the patient and family, including a recommended acute pain management plan to align a patient's unique goals with treatment options
When prompted, reflects on personal biases while attempting to minimize communication barriers	● In a discussion with the faculty member, acknowledges discomfort in caring for a patient with lung cancer who continues to smoke

Level 4 *Facilitates interdisciplinary patient and family conferences* *Effectively negotiates and manages conflict among patients, families, and the health care team* *Manages communication barriers and biases*	● Facilitates family conference when family members disagree about the goals of care ● Negotiates care management plan when interventions will be medically ineffective ● Reflects on personal bias related to lung cancer death of resident's father and solicits input from faculty about mitigation of communication barriers when counseling patients around smoking cessation
Level 5 *Coaches others in the facilitation of difficult conversations* *Coaches others in conflict resolution*	● Mentors/coaches and supports colleagues in self-awareness and reflection to improve therapeutic relationships with patients ● Creates a curriculum to teach conflict resolution in family conferences
Assessment Models or Tools	● Direct observation ● Kalamazoo Essential Elements Communication Checklist (Adapted) ● Mini-clinical evaluation exercise ● Multisource feedback ● Self-assessment including self-reflection exercises ● Standardized patients or structured case discussions
Curriculum Mapping	●
Notes or Resources	● Laidlaw A, Hart J. Communication skills: an essential component of medical curricula. Part I: Assessment of clinical communication: AMEE Guide No. 51. *Med Teach*. 2011;33(1):6-8. https://www.tandfonline.com/doi/abs/10.3109/0142159X.2011.531170?journalCode=imte20. 2020. ● Makoul G. Essential elements of communication in medical encounters: the Kalamazoo consensus statement. *Acad Med.* 2001;76:390-393. https://insights.ovid.com/crossref?an=00001888-200104000-00021. 2020. ● Makoul G. The SEGUE Framework for teaching and assessing communication skills. *Patient Educ Couns.* 2001;45(1):23-34. https://www.sciencedirect.com/science/article/abs/pii/S0738399101001367?via%3Dihub. 2020. ● Symons AB, Swanson A, McGuigan D, Orrange S, Akl EA. A tool for self-assessment of communication skills and professionalism in fellows. *BMC Med Educ*. 2009;9:1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2631014/. 2020.

	● American College of Surgeons (ACS). Communicating with Patients about Surgical Errors and Adverse Outcomes. https://web4.facs.org/ebusiness/ProductCatalog/product.aspx?ID=229. 2020. ● ACS. Disclosing Surgical Error: Vignettes for Discussion. https://web4.facs.org/ebusiness/ProductCatalog/product.aspx?ID=157. 2020. ● Baile WF, Buckman R, Lenzi R, et al. SPIKES - a six-step protocol for delivering bad news: application to the patient with cancer. *Oncologist*. 2000;5:302-311. https://theoncologist.onlinelibrary.wiley.com/doi/full/10.1634/theoncologist.5-4-302. 2020. ● Gallagher T, Studdert D, Levinson W. Disclosing harmful medical errors to patients. *N Engl J Med*. 2007;356(26):2713-2719. https://www.nejm.org/doi/full/10.1056/NEJMra070568?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%3dpubmed. 2020. ● Gallagher T, Etchegaray JM, Bergstedt B, et al. Improving communication and resolution following adverse events using a patient-created simulation exercise. *HSR*. 2016;51(6):2537-2549. https://onlinelibrary.wiley.com/doi/abs/10.1111/1475-6773.12601. 2020.

Interpersonal and Communication Skills 2: Interprofessional and Team Communication **Overall Intent:** To effectively communicate with the health care team, including consultants, in both straightforward and complex situations	
Milestones	**Examples**
Level 1 *Respectfully requests a consultation*	● Politely ask for a cardiology consultation for a patient with post-operative myocardial infarction
Respectfully receives a consultation request	● Receives consult request for a patient with metastatic lung cancer, asks clarifying questions politely, and expresses gratitude for the consult
Uses language that values all members of the health care team	● Acknowledges the contribution of each member of the surgical team to the patient
Level 2 *Clearly and concisely requests a consultation*	● When asking for a cardiology consultation for a patient with post-operative myocardial infarction, respectfully relays the clinical course and need for angiography
Clearly and concisely responds to a consultation request	● Responds in a timely manner to primary team regarding lack of surgical options for a patient with metastatic lung cancer
Communicates information effectively with all health care team members	● Sends a message in EHR to the dietician of an esophagectomy patient to increase the protein intake
Level 3 *Verifies own understanding of consultant recommendations*	● When receiving treatment recommendations from an attending physician, repeats back the plan to ensure understanding
Verifies understanding of recommendations when providing consultation	● After a consultation from infectious disease has been completed, confirms understanding of the antibiotic course and who will place the order
Uses active listening to adapt communication style to fit team needs	● Summarizes a consultant recommendation in the progress notes
Level 4 *Coordinates recommendations from different members of the health care team to optimize patient care*	● Initiates a multidisciplinary meeting to developed shared care plan for a patient with multi-organ system failure
Navigates and resolves disagreements with interprofessional team	● Explains surgical rationale for contraindications of ECMO in a heart failure patient with the critical care and cardiology physicians
Mediates conflict within the team	● Speaks directly to a consultant to avoid miscommunication in the medical record

Level 5 *Models flexible communication strategies that value input from all health care team members, resolving conflict when needed*	● Creates a curriculum for team communication and resolving conflict ● Participates in a course on difficult conversations
Assessment Models or Tools	● Direct observation ● Global assessment ● Medical record (chart) audit ● Multisource feedback ● Simulation
Curriculum Mapping	●
Notes or Resources	● Roth CG, Eldin KW, Padmanabhan V, Freidman EM. Twelve tips for the introduction of emotional intelligence in medical education. *Med Teach*. 2019;41(7):1-4. https://www.tandfonline.com/doi/full/10.1080/0142159X.2018.1481499. 2020. ● Green M, Parrott T, Cook G., Improving your communication skills. *BMJ*. 2012;344:e357. https://www.bmj.com/content/344/bmj.e357. 2020. ● Henry SG, Holmboe ES, Frankel RM. Evidence-based competencies for improving communication skills in graduate medical education: a review with suggestions for implementation. *Med Teach*. 2013;35(5):395-403. https://www.tandfonline.com/doi/full/10.3109/0142159X.2013.769677. 2020. ● Dehon E, Simpson K, Fowler D, Jones A. Development of the faculty 360. *MedEdPORTAL*. 2015;11:10174. https://www.mededportal.org/publication/10174/. 2020. ● Lane JL, Gottlieb RP. Structured clinical observations: a method to teach clinical skills with limited time and financial resources. *Pediatrics*. 2000;105(4):973-977. https://pdfs.semanticscholar.org/8a78/600986dc5cffcab89146df67fe81aebeaecc.pdf. 2020. ● Braddock CH, Edwards KA, Hasenberg NM, Laidley TL, Levinson W. Informed decision making in outpatient practice: time to get back to basics. *JAMA*. 1999;282(24):2313-2320. https://jamanetwork.com/journals/jama/fullarticle/192233. 2020.

Interpersonal and Communication Skills 3: Communication within Health Care Systems **Overall Intent:** To effectively communicate using a variety of methods	
Milestones	**Examples**
Level 1 *Accurately and timely documents information in the patient record*	● Documentation is accurate but may include extraneous information
Safeguards patient personal health information	● Shreds patient list after rounds; avoids talking about patients in the elevator
Communicates through appropriate channels as required by institutional policy	● Identifies institutional and departmental communication hierarchy for concerns and safety issues
Level 2 *Completes documentation thoroughly and communicates diagnostic and therapeutic reasoning in an organized fashion*	● Organized and accurate documentation outlines clinical reasoning that supports the treatment plan
Documents required data in formats specified by institutional policy	● Uses documentation templates
Respectfully communicates concerns about the system	● Recognizes that a communication breakdown has happened and respectfully brings the breakdown to the attention of the chief resident or faculty member
Level 3 *Completes documentation accurately, concisely, and completely*	● Complex clinical thinking is documented concisely but may not contain anticipatory guidance
Appropriately selects direct and indirect forms of communication	● Calls patient immediately about potentially critical test result
Uses appropriate channels to offer clear and constructive suggestions to improve the system	● Uses institutional reporting system after a medication error
Level 4 *Communicates in a clearly organized, concise, and timely manner, and includes anticipatory guidance*	● Creates documentation that is consistently accurate, organized, and concise, and frequently incorporates anticipatory guidance
Uses written and verbal communication (e.g., patient notes, email) in a professional manner	● Notes are exemplary and used to teach others
Initiates difficult conversations with appropriate stakeholders to improve the system	● Respectfully closes the loop with an emergency room physician about breakdowns in communication in order to prevent recurrence

Level 5 *Models feedback to improve others' written communication* *Guides departmental or institutional communication around policies and procedures* *Facilitates dialogue regarding systems issues among larger community stakeholders (institution, health care system, field)*	● Leads a task force established by the hospital QI committee to develop a plan to improve house staff hand-offs ● Meaningfully participates in a committee following a patient safety event in the ICU such as inadvertent removal of ECMO cannula ● Participates on a task force generated by a root cause analysis
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Multisource feedback
Curriculum Mapping	●
Notes or Resources	● Bierman JA, Hufmeyer KK, Liss DT, Weaver AC, Heiman HL. Promoting responsible electronic documentation: validity evidence for a checklist to assess progress notes in the electronic health record. *Teach Learn Med.* 2017;29(4):420-432. https://www.tandfonline.com/doi/full/10.1080/10401334.2017.1303385. 2020. ● Haig KM, Sutton S, Whittington J. SBAR: a shares mental model for improving communications between clinicians. *Jt Comm J Qual Patient Saf*. 2006;32(3):167-75. https://www.jointcommissionjournal.com/article/S1553-7250(06)32022-3/fulltext. 2020.

In an effort to aid programs in the transition to using the new version of the Milestones, the original Milestones 1.0 have been mapped to the new Milestones 2.0. Also indicated below are where the subcompetencies are similar between versions. These are not necessarily exact matches but are areas that include some of the same elements. Note that not all subcompetencies map between versions. Inclusion or exclusion of any subcompetency does not change the educational value or impact on curriculum or assessment.

Milestones 1.0	Milestones 2.0
PC1: Ischemic Heart Disease	PC1: Ischemic Heart Disease
PC2: Cardiopulmonary Bypass, Myocardial Protection and Temporary Circulatory Support	PC2: Mechanical Circulatory Support
PC3: Valvular Disease	PC3: Valvular Disease
PC4: Great Vessel Disease	PC4: Great Vessel Disease
PC5: Esophagus	PC5: Esophagus
PC6: Lung and Airway	PC6: Lung and Airway
PC7: Chest Wall/Pleura/Mediastinum/Diaphragm	PC7: Chest Wall/Pleura/Mediastinum/Diaphragm
PC8: Critical Care	PC8: Critical Care
MK1: Ischemic Heart Disease	MK1: Cardiovascular Surgical Knowledge
MK2: Cardiopulmonary Bypass, Myocardial Protection and Temporary Circulatory Support	
MK3: Valvular Disease	
MK4: Great Vessel Disease	
MK5: Congenital Heart Disease	MK3: Congenital Heart Disease
MK6: End Stage Cardiopulmonary Disease	No match
MK7: Esophagus	MK2: General Thoracic Surgical Knowledge
MK8: Lung and Airway	
MK9: Chest Wall/Pleura/Mediastinum/Diaphragm	
MK10: Critical Care	No match
SBP1: Patient Safety	SBP1: Patient Safety and Quality Improvement
SBP2: Resource Allocation	SBP3: Physician Role in Health Care Systems
SBP3: Practice Management	SBP3: Physician Role in Health Care Systems
PBLI1: he ability to investigate and evaluate the care of patients, to appraise and assimilate scientific evidence, and to continuously improve patient care based on constant self-evaluation, evidence based guidelines and life-long learning	PBLI1: Evidence-Based and Informed Practice PBLI2: Reflective Practice and Commitment to Personal Growth
PBLI2: Research and Teaching	PBLI1: Evidence-Based and Informed Practice
PROF1: Ethics and Values	PROF1: Professional Behavior and Ethical Principles

PROF2: Personal Accountability	PROF2: Accountability/ Conscientiousness
No match	PROF3: Self-Awareness and Well-Being
ICS1: Interpersonal and Communication Skills	ICS1: Patient and Family-Centered Communication ICS2: Interprofessional and Team Communication SBP2: System Navigation for Patient-Centered Care
No match	ICS3: Communication within Health Care Systems

Available Milestones Resources

Clinical Competency Committee Guidebook, updated 2020 - https://www.acgme.org/Portals/0/ACGMEClinicalCompetencyCommitteeGuidebook.pdf?ver=2020-04-16-121941-380

Clinical Competency Committee Guidebook Executive Summaries, New 2020 - https://www.acgme.org/What-We-Do/Accreditation/Milestones/Resources - Guidebooks - Clinical Competency Committee Guidebook Executive Summaries

Milestones Guidebook, updated 2020 - https://www.acgme.org/Portals/0/MilestonesGuidebook.pdf?ver=2020-06-11-100958-330

Milestones Guidebook for Residents and Fellows, updated 2020 - https://www.acgme.org/Portals/0/PDFs/Milestones/MilestonesGuidebookforResidentsFellows.pdf?ver=2020-05-08-150234-750

Milestones for Residents and Fellows PowerPoint, new 2020 -https://www.acgme.org/Residents-and-Fellows/The-ACGME-for-Residents-and-Fellows

Milestones for Residents and Fellows Flyer, new 2020 https://www.acgme.org/Portals/0/PDFs/Milestones/ResidentFlyer.pdf

Implementation Guidebook, new 2020 - https://www.acgme.org/Portals/0/Milestones%20Implementation%202020.pdf?ver=2020-05-20-152402-013

Assessment Guidebook, new 2020 - https://www.acgme.org/Portals/0/PDFs/Milestones/Guidebooks/AssessmentGuidebook.pdf?ver=2020-11-18-155141-527

Milestones National Report, updated each Fall - https://www.acgme.org/Portals/0/PDFs/Milestones/2019MilestonesNationalReportFinal.pdf?ver=2019-09-30-110837-587 (2019)

Milestones Bibliography, updated twice each year - https://www.acgme.org/Portals/0/PDFs/Milestones/MilestonesBibliography.pdf?ver=2020-08-19-153536-447

Developing Faculty Competencies in Assessment courses - https://www.acgme.org/Meetings-and-Educational-Activities/Other-Educational-Activities/Courses-and-Workshops/Developing-Faculty-Competencies-in-Assessment

Assessment Tool: Direct Observation of Clinical Care (DOCC) - https://dl.acgme.org/pages/assessment

Assessment Tool: Teamwork Effectiveness Assessment Module **(TEAM) -** https://dl.acgme.org/pages/assessment

Learn at ACGME has several courses on Assessment and Milestones - https://dl.acgme.org/