JOINT COUNCIL ON
THORACIC SURGERY
EDUCATION

Thoracic Surgery Milestones Resource Manual

JOINT COUNCIL ON THORACIC SURGERY EDUCATION

TABLE OF CONTENTS

A. ACGME TS Milestones Overview

As the ACGME began to move toward continuous accreditation, specialty groups developed outcomes-based **milestones** as a framework for determining resident and fellow performance within the six ACGME Core Competencies.

What are Milestones?
Simply defined, a milestone is a significant point in development. For accreditation purposes, the Milestones are competency-based developmental outcomes (e.g., knowledge, skills, attitudes, and performance) that can be demonstrated progressively by residents and fellows from the beginning of their education through graduation to the unsupervised practice of their specialties.

Who developed the Milestones?
Each specialty's Milestone Working Group was co-convened by the ACGME and relevant American Board of Medical Specialties (ABMS) specialty board(s), and was composed of ABMS specialty board representatives, program director association members, specialty college members, ACGME Review Committee members, residents, fellows, and others.

What are the Milestones Supplemental Materials?
The Milestones Supplemental Materials consist of a variety of educational information, references, frequently asked questions (FAQs), and assessment methods and tools developed to aid in the understanding and use of the Milestones in each specialty. These materials were developed by the Working Groups, Advisory Groups, and other members of the GME community. These materials are listed on their corresponding specialty pages. The Milestones group will continue to add helpful materials over time as they are developed. We welcome any suggestions.

Why Milestones?
First and foremost, the Milestones are designed to help all residencies and fellowships produce highly competent physicians to meet the health and health care needs of the public. To this end, the

Milestones serve important purposes in program accreditation:

- Allow for continuous monitoring of programs and lengthening of site visit cycles
- Public Accountability – report at a national level on aggregate competency outcomes by specialty
- Community of practice for evaluation and research, with focus on continuous improvement of graduate medical education

www.acgme.org/acgmeweb/tabid/430/ProgramandInstitutionalAccreditation/NextAccreditationSystem/Milestones.aspx

Return to Table of Contents

For educational (residency/fellowship) programs, the Milestones will:

- Provide a rich descriptive, developmental framework for clinical competency committees
- Guide curriculum development of the residency or fellowship
- Support better assessment practices
- Enhance opportunities for early identification of struggling residents and fellows

And for residents and fellows, the Milestones will:

- Provide more explicit and transparent expectations of performance
- Support better self-directed assessment and learning
- Facilitate better feedback for professional development

How will the Milestones be used by the ACGME?

Residents'/fellows' performance on the Milestones will become a source of specialty-specific data for the specialty Review Committees to use in assessing the quality of residency and fellowship programs and for facilitating improvements to program curricula and resident performance if and when needed. The Milestones will also be used by the ACGME to demonstrate accountability of the effectiveness of graduate medical education within ACGME-accredited programs in meeting the needs of the public.

Feedback and Questions

We welcome your feedback and encourage you to check this website periodically as we update information and provide additional resources to help programs with their Milestones implementation.
Questions regarding milestone development should be directed to milestones@acgme.org and someone from the Milestones Department will respond as soon as possible.

Milestones Staff

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B. TS Milestones Reporting Dates and Frequently Asked Questions (FAQ)

Milestones by Reporting Date

Milestone use and reporting has begun for some specialties and will become effective for all other specialties by December 2015. All subspecialties that are linked to Next Accreditation System Phase I core specialties and some associated with Phase II specialties will report on the Milestones in December 2014. All other subspecialties will formally begin to use the Milestones in 2015. As subspecialty Milestone development is completed, the documents will be posted on the ACGME website. ACGME strongly encourages subspecialty programs to begin working with the Milestones as soon as they become available. A comprehensive table will be updated on the ACGME web site with hyperlinks to documents as they are posted.

Below is the TS Milestone Reporting dates as of October 8, 2014 reported on the following ACGME web site:
http://www.acgme.org/acgmeweb/Portals/0/PDFs/Milestones/MilestonesByReportingDate.pdf

Effective July 2014 – First Reporting November 3, 2014 through January 9, 2015

☐Thoracic Surgery

Please e-mail any questions to milestones@acgme.org, and someone from the Milestones Team will respond as soon as possible.

Milestones: Frequently Asked Questions (FAQ)

More information about the Milestones can be found on the ACGME website.

What are Milestones?
Simply defined, a milestone is a significant point in development. For accreditation purposes, the Milestones are competency-based developmental outcomes (e.g., knowledge, skills, attitudes, and performance) that can be demonstrated progressively by residents and fellows from the beginning of their education through graduation to the unsupervised practice of their specialties.

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Return to Table of Contents

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Why Milestones?
First and foremost, the Milestones are designed to help all residencies and fellowships produce highly competent physicians to meet the 21st century health and health care needs of the public. To this end, the following describes the purposes of the Milestones:

For educational (residency/fellowship) programs, the Milestones will:
☐ Provide a rich descriptive, developmental framework for Clinical Competency Committees
☐ Guide curriculum development of the residency or fellowship
☐ Support better assessment practices
☐ Enhance opportunities for early identification of struggling residents and fellows[1]

For residents and fellows, the Milestones will:
☐ Provide more explicit and transparent expectations of performance
☐ Support better self-directed assessment and learning
☐ Facilitate better feedback for professional development

For accreditation, Milestones will:
• Allow for continuous monitoring of programs and lengthening of site visit cycles
• Enhance Public Accountability – report at a national level on aggregate competency outcomes by specialty
• Provide a community of practice for evaluation and research, with focus on continuous improvement of graduate medical education

Return to Table of Contents

What is the difference between reporting milestones, curricular milestones, and EPAs?
Reporting milestones are those posted on the ACGME website that each program must use to judge the developmental progress of its residents and fellows twice per year and on which each program must submit reports through ADS.

Curricular milestones are designed in conjunction with the reporting milestones – these milestones are typically very descriptive (granular) and are not required by the ACGME. Primarily, they are utilized by internal medicine and pediatrics, and their related subspecialties, to guide curriculum development and specific assessments.

"EPA" stands for Entrustable Professional Activities, and was originally conceptualized by Olle ten Cate in the Netherlands. ten Cate recently updated his definition in a JGME publication: "*EPAs are units of professional practice, defined as tasks or responsibilities that trainees are entrusted to perform unsupervised once they have attained sufficient specific competence. EPAs are independently executable, observable, and measurable in their process and outcome, and, therefore, suitable for entrustment decisions.*" In other words, what is it we expect a particular specialist to be able to do without supervision upon graduation from residency and fellowship?

Where are the milestones found on the web?
The Milestones can be found on each specialty web page as well as on the Milestones web page, at: http://www.acgme.org/acgmeweb/tabid/430/ProgramandInstitutionalAccreditation/NextAccreditationSystem/Milestones.aspx.

When will the specialties start reporting?
Initial reporting dates for the Milestones vary by specialty. For the most current reporting dates, please review the *Milestones by Reporting Date* document on the Milestones web page: http://www.acgme.org/acgmeweb/Portals/0/PDFs/MilestonesByReportingDate.pdf.

How will the Milestones be used by the ACGME? Residents'/fellows' performance on the Milestones will become a source of specialty-specific data for the specialty Review Committees to use for continuous quality improvement in assessing programs and for facilitating improvements to program curricula and resident assessment. In this early phase, the Milestone data will be used as formative assessment of the quality of residency and fellowship programs. The Milestones will also be used by the ACGME to demonstrate accountability of the effectiveness of graduate medical education within ACGME-accredited programs in meeting the needs of the public over time.

How do we know the CCCs are judging accurately and appropriately?
The ACGME will closely study and monitor the Milestone data. Using various statistical models we will monitor overall progression of milestones in a given specialty, as well as within individual programs. We encourage every CCC to accurately report the Milestone evaluations as the data will also be used to identify individual milestones that need to be edited or removed.

In addition, professional self-regulation, exemplified by the work of the ACGME and the certification boards, requires a high degree of professionalism from program directors and faculty members. This includes honest assessment and reporting of residents' and fellows' progress on the Milestones. It would be a disservice to its residents or fellows for a program to be less than candid about their performance on the Milestones, and will also undermine the goal of continuous improvement of the NAS.

When and how will the Milestones be changed?
We will collect feedback through several mechanisms, including through our own research and evaluation activities, the Milestones web page, and ongoing outreach. We will also work with the ABMS to plan a second summit, tentatively scheduled for May-June 2015. The exact date of when "version 2.0" of the Milestones might roll out is yet to be determined, but it will be at least several years of learning and planning before the next version would be implemented.

Being that individual data is being reported, how is resident privacy being protected?
The ACGME is dedicated to protecting the data collected from programs and residents. There are four key components to this discussion:

1. From a legal standpoint, the ACGME is subject to the Illinois state peer review statutes. We track these very carefully and have successfully blocked discoverability of ACGME data because of the protections afforded under these statutes.
2. The Review Committees will not review any identified individual Milestone data, but will instead view the data in aggregate, using the program as the unit of analysis.
3. We plan to convert the resident and fellow identifier to the National Provider identifier (NPI) to discontinue use of SSNs. Currently we have NPIs for about 40% of residents and fellows.
4. The ACGME also uses state-of-the-art data security methods, including 256-bit encryption of sensitive data (e.g., SSNs, etc.)

How do combined programs report Milestones?
Residents in combined programs will have access to and will report on the Milestones for both specialties. For example, a resident in a Medical Genetics-Pediatrics program will have Milestones reports submitted for both medical genetics and pediatrics.

How does a program facilitate evaluation of an off-cycle resident?
Residents and fellows who are "off-cycle" will be reported at the same time as their peers. If the resident (or fellow) graduates prior to the reporting date, and ADS has been updated prior to the start of the reporting period, there will not be a final report. Programs must ensure that the resident's record is updated appropriately as a report is required for all residents with an "active" status.
It is understood that the evaluation of these residents will differ from those of their peers. Should the applicable Review Committee have a concern, it will be able to determine whether an off-cycle resident is indeed enrolled in the program.

How should a resident doing a six-month research rotation be evaluated?
Residents performing research for a duration of six months will still need to be evaluated. It is recognized that many of the subcompetencies will not have been evaluated during this period, and as such, the Milestone evaluation would remain as it was during the previous assessment period.

How should a resident who is learning in a different department be evaluated?
Residents must be evaluated against their specialty Milestones every six months. Evaluations from another department must be reviewed and used in determining the resident's Milestone level. If this is a regular occurrence, a member from the other department should become a member of the Clinical Competency Committee to facilitate the review.

If transitional year residents must score at least a "3" in the Milestones, what is the minimum evaluation for a resident in a preliminary or categorical program?
This has been a misinterpretation by many programs. **The ACGME has listed no required minimums on Milestone reporting**. Level 4 is a target for graduation (except for TY in which Level 3 is the target) but readiness for graduation is at the discretion of the program director.

Why do some specialties use "Level 4" as the target for graduation and others use "Ready for Unsupervised Practice"? How can a graduating resident not receive "Ready for Unsupervised Practice" and still be eligible to take the ABMS board exam?
The original Milestones were started by multiple groups at the same time. The ACGME made a strategic decision that to try and maximize buy-in by the various specialty communities that flexibility would be permitted in developing the Milestones. In addition, some Milestone groups, most notably Internal Medicine, initiated their Milestone development process before the formal ACGME process began. Moving forward we will learn from the current experience and discuss with the community whether and what level of harmonization among the Milestones across specialties would be advisable.

How is the validity and reliability of the Milestones being established?
The Milestones were written by a Working Group of ABMS board members, Review Committee members, program directors, and residents, and represent a broad range of specific areas of expertise that a resident or fellow in a given clinical specialty is expected to develop.
Similarly, establishing the reliability of the Milestones will require data from their use in resident/fellow assessments. Several specialties are currently conducting pilot studies to gather information about the clarity, feasibility, acceptability, and performance characteristics of the Milestones. One advantage of the Milestones, compared to the evaluation tools currently used by individual programs, is that assessment data will be collected on thousands of residents and fellows, producing a sample that, over time, will make it possible to establish their reliability and validity. We will use the validity frameworks of Kane and Messick to guide the validity work. Kane approaches validity as an "argument" – in other words one always has to build the case for validity. The Messick framework is provided below as an example of the "elements" of the argument:

Content: do instrument items completely represent the construct?
Response process: the relationship between the intended construct and the thought processes of subjects or observers (e.g., have the observers been trained?)
Internal structure: acceptable reliability and factor structure
Relations to other variables: correlation with scores from another instrument assessing the same construct
Consequences (intended uses): do scores really make a difference?

If indicated by performance on the Milestones, can a resident or fellow finish his or her educational program early and be considered "board-eligible"?
The decision to allow an "early graduation" that would render a resident or fellow board-eligible would always and only be made by the relevant ABMS certifying board. While such a decision would likely be aided by the use of the Milestones, accelerating resident and fellow education is not the intent of the Milestones.

Return to Table of Contents

Will the use of the Milestones cause a shift of focus toward these areas at the expense of other important knowledge and skills necessary for competent practice?
The Milestones were developed by members of the specialty community to encompass the core aspects of the specialty in which the growth of an individual during residency/fellowship is most important to preparedness for unsupervised practice. Milestones do not define the totality of competence or of a discipline. Judgment on the part of faculty members and the programs is and will remain essential in producing the "whole physician." The ACGME will use the Milestones to promote better curriculum and assessment, and as one method of assessing whether programs are adequately preparing individuals for the unsupervised practice of the specialty. Programs should continue to maintain their curricula in all areas of knowledge, skills, and attitudes necessary for the practice of the specialty. In addition, the ABMS member boards will continue to assess individuals for their acquisition of the knowledge, skills, and attitudes necessary for the unsupervised practice of the specialty.

What does the report that the programs can print and put into the residents' files look like?
After the program submits the Milestone data through ADS, a report is prepared (pdf) for each individual resident/fellow. The report includes all of the milestones the resident achieved during the previous reporting cycle. The program director can choose to print this report and use it as part of the semiannual evaluation with the resident/fellow. There is a space for signatures, should the program choose to use it. It is not required that programs print these reports; the ACGME does not require any further action after the Milestone data is submitted.

When will the "resident report" be available?
The individual detailed PDF documents will be posted 10-14 days after the close of the reporting window. The reports will be permanently available in ADS.

Can a resident's Milestone reports/assessments be shared with potential fellowship programs for which the resident is interviewing?
Currently, this data is not available for programs the resident is not enrolled in. The following is in the Common Program Requirements that take effect July 1, 2016. The mechanism of how this is done has not been determined.
CPR III.A.1. Eligibility Requirements – Residency Programs
III.A.1.a) All prerequisite post-graduate clinical education required for initial entry or transfer into ACGME-accredited residency programs must be completed in ACGME-accredited residency programs, or in Royal College of Physicians and Surgeons of Canada (RCPSC)-accredited or College of Family Physicians of Canada (CFPC)-accredited residency programs located in Canada. Residency programs must receive verification of each applicant's level of competency in the required clinical field using ACGME or CanMEDS Milestones assessments from the prior training program. (Core)
III.A.2.a) Fellowship programs must receive verification of each entering fellow's level of competency in the required field using ACGME or CanMEDS Milestones assessments from the core residency program. (Core)

Return to Table of Contents

Can the programs use the Milestone tables as assessment tools?
The Milestone tables were not designed to be used as evaluation forms for specific rotations or experiences. The reporting Milestones are designed to guide a synthetic judgment of progress roughly twice a year. Utilizing language from the Milestones may be helpful as part of a mapping exercise to determine what competencies are best covered in specific rotation and curricular experiences. The reporting Milestones can also be used for self-assessment by the resident/fellow in preparation for feedback sessions and in creating individual learning plans. Residents and fellows should use the Milestones for self-assessment with input and feedback from a faculty advisor, mentor, or program director. It is imperative that programs remember that the Milestones are not inclusive of the broader curriculum, and limiting assessments to the Milestones could leave many topics without proper and essential assessment and evaluation.

Who can and cannot be on the Clinical Competency Committee (CCC)?
Revisions to the Common Program Requirements regarding who can serve on the CCC are currently out for public comment, so the information below is subject to change. The members of a CCC have responsibility for:

1) determining residents' or fellows' progression on the educational Milestones;
2) making recommendations on promotion and graduation decisions; and
3) recommending remediation or disciplinary actions to the program director.

Members of the CCC can include physician faculty members and members from other health professions (i.e., inter-professional) who serve on the faculty or have extensive contact and experience with residents/fellows in patient care and other health care settings.

Chief residents may attend CCC meetings is if they have completed a core residency program in their specialty discipline, possess a faculty appointment from the program, and are eligible for specialty board certification. They cannot be members of the CCC.

Exclusion of residents from the CCC is meant to ensure that the residents' peers are not providing promotion and graduation decisions, and to ensure they are not involved in recommendations for remediation or disciplinary actions. However, the chair(s) of the CCC and/or program director should receive input from program residents outside the context of CCC meetings through the evaluation system.

Program coordinators may attend CCC meetings to provide administrative support and to help document CCC deliberations and decisions. However, coordinators may not serve as members of the CCC.

Can the program director serve on the CCC? Can he/she chair it?
The requirements regarding the CCC do not preclude or limit a program director's participation on the CCC. The intent is to leave flexibility for each program to decide the best structure for its own circumstances, but a program should consider: its program director's other roles as resident advocate, advisor, and confidante; the impact of the program director's presence on the CCC members' discussions and decisions; the size of the program faculty; and other program-relevant factors. The program director has final responsibility for the program's evaluation and promotion.

Please e-mail any questions to milestones@acgme.org, and someone from the Milestones Team will respond as soon as possible.

Return to Table of Contents

The Thoracic Surgery Milestone Project: Assessment Tools

A Joint Initiative of
The Accreditation Council for Graduate Medical Education
and
The American Board of Thoracic Surgery

Return to Table of Contents

Milestone evaluation is completed by the Clinical Competency Committee using resident assessments completed throughout resident education. These assessments are completed by faculty members, other care providers, and patients. The Thoracic Surgery Milestone Working Group altered exiting assessment tools to simplify evaluating the Milestones. These assessment tools are not required.

Return to Table of Contents

Table of Contents

Return to Table of Contents

Chart Audit of Patient Encounter

Resident: _____ Date: _____

Evaluator: _____

Topic: IHD Valve Great Vessel Congenital End-Stage Disease Esophagus Lung/Airway
Chest Wall/Mediastinum Critical Care Other _____

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1. Medical History

0	1	2	3	4
Fails to document major elements of history		Documents major elements of history		Documents all relevant elements of history

2. Physical Exam

0	1	2	3	4
Fails to document major findings		Documents major findings		Documents major and subtle findings

3. Test Results

0	1	2	3	4
Documentation of major test results is missing or inaccurately documented		Major test results documented but not all relevant findings documented		All test results documented appropriately and all relevant findings documented

4. Plan of Care

0	1	2	3	4
Incomplete or irrelevant plan provided		Basic elements of an appropriate are documented		Complex plan with appropriate contingencies documented

5. Organization

0	1	2	3	4
Poorly organized Major elements missing Incomplete		Major elements organized properly but inefficient or grammatically incorrect		Well-organized documentation Efficient documentation

6. Timeliness

0	1	2	3	4
Late and required reminders to effect completion		Late but still completed without reminders		On time completion

7. Overall Level of Competence

No Knowledge Beginner Advanced Beginner Intermediate Competent

Suggestions for improvement:

Reviewed with Resident: Yes No

Date reviewed: _____ Reviewer: _____

Resident Signature: _____

Presentation Evaluation

Resident: _____ Date: _____

Presentation Title: _____ Evaluator: _____

Topic: IHD Valve Great Vessel Congenital End-Stage Disease Esophagus Lung/Airway
Chest Wall/Mediastinum Critical Care Other _____

1. Organization					
0 Disorganized	1	2 Partially organized No clear flow of topic	3	4 Concise, logical, integrated	
2. Objectives					
0 Not stated	1	2 Some, but not all objectives covered	3	4 Objectives completed and covered Relevant disclosures made	NA
3. Verbal Communication					
0 Ineffective	1	2 Monotonous tone Unclear jargon Flow is halting	3	4 Facile, engaging Excellent flow Effective	
4. Non-verbal Communication					
0 No eye contact Lacks confidence	1	2 Somewhat comfortable Some eye contact	3	4 Confident Good eye contact and body language	
5. AV Materials					
0 Visually unclear, illegible, ineffective	1	2 Mostly relevant and legible Distracts from content	3	4 Organized, concise, readable Effective Enhances presentation	
6. Content					
0 Not relevant Misleading	1	2 Some lack of relevance or accuracy Superficial	3	4 Relevant, accurate, up-to-date, evidence-based	
7. Audience Engagement					
0 Unengaged	1	2 Some participation, asks for questions	3	4 Elicits participation Able to expand presentation in response to questions	NA

8. Overall Effectiveness of Presentation

No Knowledge Novice Advanced Beginner Intermediate Competent

Suggestions for improvement:

Reviewed with Resident: Yes No

Date reviewed: _____ Reviewer: _____

OBSERVATION OF PATIENT ENCOUNTER IN CARDIOTHORACIC SURGERY

Resident Signature: _____

Resident: _____ Evaluator: _____ Date: _____
Diagnosis: _____ Setting: Ambulatory Inpatient Emergency Department Other ____
Milestone Topic: IHD Valve Great Vessel Congenital End-Stage Disease Esophagus Lung/Airway Chest Wall/Mediastinum Critical Care Other _____

	None		Advanced Beginner		Competent	NO*
History	0	1	2	3	4	
Obtains history in organized/focused way	Misses multiple elements of history		Notes majority of major elements of history		Accurate, thorough, complete history	
Attentive, good eye contact	Inattentive with infrequent eye contact		Intermittent eye contact		Attentive, with good eye contact	
Introduces self, addresses patient by name	Does not introduce self Does not address patient by name		Partial explanation of role Uses improper salutation		Fully explains role/ relationship to care team Respectfully addresses patient	
Responds appropriately to affect/non-verbal cues	Does not notice affect/non-verbal clues		Partially aware and responsive		Fully aware of affect/non-verbal clues and responds appropriately	
Physical Exam	0	1	2	3	4	
Obtains physical in organized way	Disorganized, incomplete exam		Organized exam, includes most major elements		Thorough and complete exam	
Humanistic qualities/professionalism	0	1	2	3	4	
Shows respect, compassion, empathy, confidentiality	Unkind, rough, or hurried encounter		Does not respect personal or cultural differences		Shows respect, compassion, empathy, confidentiality	
Works effectively with ancillary staff members	Rude to ancillary staff members		Does not actively engage ancillary staff members		Works effectively with ancillary staff members	
Decision making	0	1	2	3	4	
Communicates possible diagnosis	Does not communicate with patient		Uses medical terminology patient does not understand		Demonstrates effective communication; discusses diagnosis, risks and benefits, and options	
Allows further questions/elicits patient preference	Avoids answering patient questions		Responds to patient questions		Actively elicits patient questions Communicates what to expect to patient	
Encounter is timely and succinct	Rushes encounter, inadequate time for questions		Encounter ends without completion of forms, consent, etc.		Encounter is timely, succinct, effective, complete	
Considers cost-effectiveness of testing and treatment	Does not select appropriate diagnostic tests or selects excessive tests		Selects some appropriate tests but requires guidance to prioritize appropriate testing		Practices in cost-conscious manner	
Record Keeping	0	1	2	3	4	
Note is timely, concise, and complete	Note omits major elements of encounter/plan, etc.		Major elements are documented, but incomplete		Documentation is complete, accurate, timely	
Coding is accurate and supported by documentation	Limited understanding of importance of coding		Understands importance of coding Minor coding inaccuracies		Coding of routine diagnoses is accurate and supported by documentation	
Overall Clinical Competence	Beginner		Advanced Beginner	Intermediate	Competent	

*NO = Not Observed

Suggestions for improvement:

Reviewed with Resident: Yes No

Date reviewed: _____ Reviewer: _____

Resident Signature: _____

QUALITY IMPROVEMENT REVIEW (M&M) IN THORACIC SURGERY

RESIDENT NAME_____YR IN PROGRAM_____ DATE_____EVALUATOR_____
Complication(s)/Session Addressed: _____

Milestone Topic: IHD Valve Great Vessel Congenital End-Stage Disease Esophagus Lung/Airway
Chest Wall/Mediastinum Critical Care Other _____

Medical Knowledge Understands root cause of the M&M; understands the management options of original patient issue and reasoning of resulting complication(s)	0 No understanding	1	2 Some understanding	3	4 Objectives covered	N/A
Patient Care Managed original patient issue and appropriately recognized/managed complication	0 Did not understand complication	1	2 Limited understanding of complication	3	4 Clearly understood complication Recognized opportunity for improvement	N/A
Practice-based Learning and Improvement Effectively reviewed the literature and scientific evidence relative to complication; suggests appropriate practice modifications to prevent future occurrences	0 Did no review	1	2 Missed key references and modifications	3	4 Presented key evidence and appropriate modifications	N/A
Interpersonal and Communication Skills Presented in a succinct and engaging manner with the appropriate AV enhancements; information was appropriate to the range of learners	0 Ineffective	1	2 Some lack in organization, engagement with audience	3	4 Organized, concise, engaging	N/A
Professionalism Disclosed information to appropriate parties/patient; appropriate medicolegal documentation; discussed complications with colleagues and family	0 Disclosed no information or failed to engage colleagues/family	1	2 Disclosed some information; poor communication; some family discussion	3	4 Fulfilled objectives	N/A
Systems-based Practice Demonstrated an understanding of resources available to provide optimal patient care; demonstrated cost-conscious, evidence-based	0 No demonstration	1	2 Demonstrated some understanding of resources	3	4 Fulfilled objectives	N/A

treatment strategies; report to QI committees to improve practices			and cost-related issues		
Overall Level of Review:	None	Beginner	Advanced Beginner	Intermediate	Competent

Suggestions for Improvement:

Reviewed with Resident: **Yes** **No**

Date Reviewed: _____ **Reviewer: _____**

Resident: _____

Residents as Educators in Thoracic Surgery

Instructions: Please use the scale to rate the resident on his or her teaching skills during the clinical rotation. The results of this evaluation will be shared with the resident, the residency program director, as well as the clerkship director. Your comments will remain anonymous.

Resident: _____ Clinical Rotation: _____ Date: _____

Extent of contact with resident during rotation: __ Minimal (<1 day) __Moderate (<1 week) __Extensive (>1 week)

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1. Communication of learning goals; Ability of resident to provide a collaborative learning environment

0	1	2	3	4
No communication		The resident communicates information accurately at appropriate level for the learner.		The resident recognizes teachable moments and respectfully engages the learner. The resident teaches junior team members about presentation skills.

2. Knowledge about team member role and responsibilities; Leadership skills

0	1	2	3	4
No knowledge		The resident exhibits behaviors (e.g., respect, approachability, listens) that invite information sharing with health care team members.		The resident assumes overall leadership of a health care team responsible for his/her patients, while at the same time seeking and valuing input from members of the team.

3. Attitude towards teaching and learning

0	1	2	3	4
Undesirable behaviors, including acting impolitely and disrespectful, not respecting patient privacy, demonstrating lack of integrity, or failing to take responsibility for educational activities. Unaware of their role as a teacher.		The resident anticipates logistical issues regarding surgical care and communicates with the patient and hospital staff, engaging members of the team to solve problems.		The resident positively influences the learning environment by assertively modeling professional behaviors.

4. Identification of learning resources for educational sessions

0	1	2	3	4
The resident does not engage in directed learning activities or utilize available resources.		The resident independently reads the literature and uses CT surgery resources including library databases and on-line materials to answer questions.		The resident demonstrates use of system or process for keeping up with changes in the literature and initiates assignments for other learners.

5. Effective content delivery

0	1	2	3	4
The resident delivers inaccurate or inappropriate information.		The resident delivers accurate information ineffectively; does not embrace teaching opportunity.		The resident delivers content effectively and engages the learner.

6. Overall Level of Competence

No Knowledge	Novice	Advanced Beginner	Intermediate	Competent

Suggestions for improvement:

Reviewed with Resident: Yes No

Date reviewed: _____ Reviewer: _____

Resident Signature: _____

For Program Director Use: The 5 areas of review may aid in the evaluation of the four general competencies.
Q1 – Interpersonal and Communication Skills, Practice Based Learning and Improvement and Systems Based Practice
Q2 – Interpersonal and Communication Skills, Professionalism and Systems Based Practice
Q3 – Professionalism
Q4 – Practice Based Learning and Improvement
Q5 – Interpersonal and Communication Skills

Mock Oral Examination Assessment

Resident: _____ Date: _____

Evaluator: _____

Topic: IHD Valve Great Vessel Congenital End-Stage Disease Esophagus Lung/Airway
Chest Wall/Mediastinum Critical Care Other _____

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1. Understand General Scenario

0	1	2	3	4
No understanding Generic questions Stalling		Some understanding Some appropriate questions for clarification Some hesitation		Full understanding Appropriate questions for clarification No hesitation

2. Anatomy/Pathophysiology

0	1	2	3	4	NA
No basic knowledge		Integrates anatomy and pathophysiology		Understands complex variations	

3. Diagnostic Tests

0	1	2	3	4
Unclear, generic Unable to interpret Incorrect follow-up tests		Understands advantages and disadvantages Mostly appropriate interpretation Mostly appropriate follow-up		Interprets and integrates results Avoids unnecessary tests Appropriate follow-up

4. Formulate Differential Diagnosis

0	1	2	3	4
Unable to formulate Unclear path		Moderate list of differential diagnoses Somewhat logical path		Distinguishes complex clinical manifestations/complications Logical path

5. Diagnosis

0	1	2	3	4
No diagnosis		Mostly correct		Correct diagnosis

6. Treatment Plan

0	1	2	3	4
No/inappropriate plan Does not seek assistance		Understands advantages and disadvantages of options Seeks qualified assistance		Appropriate plan or approach Accounts for complex patient

7. Management of Complications

0	1	2	3	4
Fails to recognize complication		Recognizes complication Incomplete understanding of treatment		Correctly identifies complication and appropriate treatment

8. Overall Level of Competence

No Knowledge Beginner Advanced Beginner Intermediate Competent

Suggestions for improvement:

Reviewed with Resident: Yes No

Date reviewed: _____ Reviewer: _____

Resident Signature: _____

Patient Evaluation Form

It is important to the Department of Cardiothoracic Surgery to know how our residents interact with patients. We would like them to be aware of what they do well and what they need to improve. Thank you!

Resident Name: _____ Date: _____

1. The resident introduced him/herself to me clearly explaining his/her role in my care.

Strongly disagree Disagree Neutral Agree Strongly agree

2. The resident behaved in a professional manner and was respectful of me.

Strongly disagree Disagree Neutral Agree Strongly agree

3. The resident explained my problem and care plan in terms I understood.

Strongly disagree Disagree Neutral Agree Strongly agree

4. The resident answered my questions clearly.

Strongly disagree Disagree Neutral Agree Strongly agree

D. Milestones in Cardiothoracic Surgery

1. ISHD: Ischemic Heart Disease - Medical Knowledge
2. ISHD 2: Ischemic Heart Disease Patient Care & Technical Skills
3. CPB: Cardiopulmonary Bypass, Myocardial Protection, Temporary Circulatory Support - Medical Knowledge
4. CPB: Cardiopulmonary Bypass, Myocardial Protection , Temporary Circulatory Support – Patient Care and Technical Skills
5. VHD: Valvular Heart Disease - Medical Knowledge
6. VHD: Valvular Heart Disease - Patient Care and Technical Skills
7. AoD: Great Vessel Disease- Medical Knowledge
8. AoD: Great Vessel Disease - Patient Care and Technical Skills
9. CHD: Congenital Heart Disease - Medical Knowledge
10. ESHD: End Stage Cardiopulmonary Disease – Medical Knowledge
11. Eso: Esophagus – Medical Knowledge
12. Eso: Esophagus – Patient Care and Technical Skills
13. Lung: Lung and Airway - Medical Knowledge
14. Lung: Lung & Airway - Patient care & Technical Skills
15. Med: Chest Wall /Pleura / Mediastinum – Medical Knowledge
16. Med: Chest wall, Pleura, Mediastinum - Patient Care and Technical Skills
17. CC: Critical Care – Medical Knowledge
18. CC: Critical Care – Patient care and Technical Skills
19. Professionalism: Ethics and Values
20. Professionalism: Personal Accountability
21. Interpersonal and Communication Skills
22. Systems Based Practice - Patient safety
23. Systems Based Practice - Resource Allocation
24. Systems Based Practice- Practice Management
25. Practice Based Learning and Improvement
26. Practice Based Learning and Improvement – Research & Teaching

Return to Table of Contents

The Thoracic Surgery Milestone Project

January 2014

Return to Table of Contents

The Thoracic Surgery Milestone Project

The milestones are designed only for use in evaluation of resident physicians in the context of their participation in ACGME-accredited residency or fellowship programs. The milestones provide a framework for the assessment of the development of the resident physician in key dimensions of the elements of physician competency in a specialty or subspecialty. They neither represent the entirety of the dimensions of the six domains of physician competency, nor are they designed to be relevant in any other context.

Thoracic Surgery Milestones

Chair: Walter Merrill, MD

Working Group

Andrea J. Carpenter, MD, PhD
Laura Edgar, EdD, CAE
James Fann, MD
Robert Higgins, MD
Richard Lee, MD
Tom C. Nguyen, MD
Carolyn Reed, MD*
Peggy Simpson, EdD
Ara Vaporciyan, MD, FACS, MHPE
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Cameron Wright, MD
Stephen Yang, MD

Advisory Group

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John Calhoon, MD
David Fullerton, MD
John Potts, MD
Douglas Wood, MD

*Acknowledgements: The Working Group and ACGME would like to honor Dr. Carolyn Reed for her significant contribution to the milestones as former chair of the Working Group, she will be greatly missed.

Milestone Reporting

This document presents milestones designed for programs to use in semi-annual review of resident performance and reporting to the ACGME. Milestones are knowledge, skills, attitudes, and other attributes for each of the ACGME competencies organized in a developmental framework from less to more advanced. They are descriptors and targets for resident performance as a resident moves from entry into residency through graduation. In the initial years of implementation, the Review Committee will examine milestone performance data for each program's residents as one element in the Next Accreditation System (NAS) to determine whether residents overall are progressing.

For each period, review and reporting will involve selecting milestone levels that best describe a resident's current performance and attributes. Milestones are arranged into numbered levels. Tracking from Level 1 to Level 5 is synonymous with moving from novice to expert. These levels do not correspond with post-graduate year of education. Please note that residents in a traditional program may start at a higher level for many of the milestones due to their previous experience within the general surgery program.

Selection of a level implies that the resident substantially demonstrates the milestones in that level, as well as those in lower levels (see the diagram on page v).

Level 1: The resident demonstrates milestones expected of an incoming resident.

Level 2: The resident is advancing and demonstrates additional milestones, but is not yet performing at a mid-residency level.

Level 3: The resident continues to advance and demonstrate additional milestones, consistently including the majority of milestones targeted for residency.

Level 4: The resident has advanced so that he or she now substantially demonstrates the milestones targeted for residency. This level is designed as the graduation target.

Level 5: The resident has advanced beyond performance targets set for residency and is demonstrating "aspirational" goals which might describe the performance of someone who has been in practice for several years. It is expected that only a few exceptional residents will reach this level.

Additional Notes

Level 4 is designed as the graduation *target* and does not represent a graduation *requirement*. Making decisions about readiness for graduation is the purview of the residency program director. Study of milestone performance data will be required before the ACGME and its partners will be able to determine whether milestones in the first four levels appropriately represent the developmental framework, and whether milestone data are of sufficient quality to be used for high-stakes decisions.

Some milestone descriptions include statements about performing independently. These activities must conform to ACGME supervision guidelines, as well as institutional and program policies. For example, a resident who performs a procedure independently must, at a minimum, be supervised through oversight.

Examples are provided with some milestones. Please note that the examples are not the required element or outcome; they are provided as a way to share the intent of the element.

Answers to Frequently Asked Questions about the Next Accreditation System and Milestones are posted on the Next Accreditation System section of the ACGME website.

The diagram below presents an example set of milestones for one sub-competency in the same format as the milestone report worksheet. For each reporting period, a resident's performance on the milestones for each sub-competency will be indicated by:

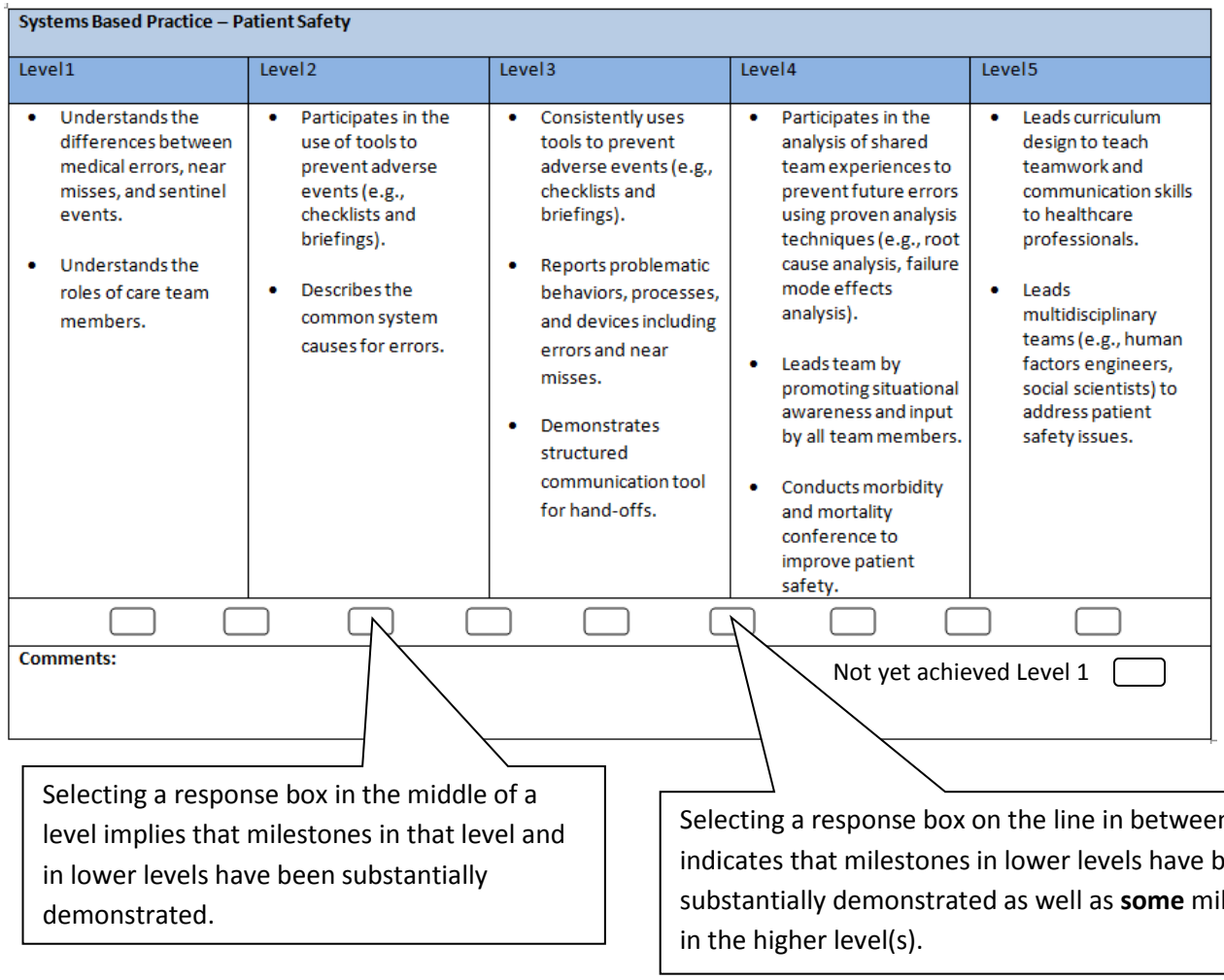
- selecting the level of milestones that best describes that resident's performance in relation to the milestones

or

- for Patient Care and Medical Knowledge milestones, selecting the option that says the resident has "Not yet rotated"

or

- for Interpersonal and Communication Skills, Practice-based Learning and Improvement. Professionalism, and Systems-based Practice milestones, selecting the option that says the resident has "Not yet achieved Level 1"



Return to Table of Contents

Ischemic Heart Disease — Medical Knowledge				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic anatomy and pathology (identifies coronary anatomy on angiogram) • Knows basic cellular and vascular physiology • Lists clinical manifestations of ischemic heart disease (e.g., angina, myocardial infarction) • Lists diagnostic tools available for evaluation of ischemic heart disease • Lists treatment options for ischemic heart disease (e.g., coronary artery bypass graft [CABG], percutaneous coronary intervention [PCI]) • Knows basic complications for ischemic heart disease	• Understands common variations in anatomy and pathology (e.g., left dominant system) • Understands physiologic changes accompanying ischemic heart disease (e.g., ischemia, ischemia reperfusion injury, infarction, recovering myocardium) • Generates differential diagnosis of disease with similar manifestations (e.g., esophageal and aortic problems, pleurisy) • Understands advantages and disadvantages of diagnostic tools in evaluating ischemic heart disease (e.g., electrocardiogram [EKG] vs. echocardiogram vs. angiogram) • Understands advantages and disadvantages of various treatment options for ischemic heart disease • Understands risks, benefits and complications of treatment modalities	• Understands complex integrations between anatomy and pathology (e.g., anomalous coronary artery) • Understands the role of treatment on physiology of ischemic heart disease • Identifies the common variants of the clinical manifestations of ischemic heart disease (e.g., unstable angina, acute myocardial infarction, silent ischemia) • Interprets normal and common abnormalities associated with ischemic heart disease (e.g., reads coronary angiogram, complex EKG) • Identifies appropriate treatment for routine patient with ischemic heart disease. • Familiar with American College of Cardiology [ACC]/Society for Thoracic Surgery [STS]/Association of American Thoracic Surgeons [AATS] guidelines • Knows basic outcome literature for ischemic heart disease (e.g., SYNTAX Trial)	• Understands complex variations in anatomy and pathology, including congenital (e.g., able to identify coronary anatomy in reoperative surgery) • Adapts therapeutic management based on understanding of physiology of complications of ischemic heart disease (e.g., post infarct ventricular septal defect [VSD], ischemic mitral regurgitation) • Distinguishes the complex clinical manifestations and complications of ischemic heart disease • Interprets and integrates complex abnormalities associated with ischemic heart disease • Identifies appropriate treatment for complex patient with ischemic heart disease (e.g., hybrid CABG) • Knows outcomes for all treatment modalities and complications, including databases and clinical trials (e.g., STS Database)	• Understands implications of SYNTAX score • Presents on outcomes of ischemic heart disease at local, regional, or national meeting
☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments:

Not yet rotated ☐

Ischemic Heart Disease — Patient Care and Technical Skills				
Level 1	Level 2	Level 3	Level 4	Level 5
• Orders basic diagnostic and pre-operative assessment tests for ischemic heart disease (e.g., cardiac cath, stress test) • Lists basic treatment options for routine ischemic heart disease (e.g., medical management, PCI vs. CABG) • Demonstrates basic surgical skills (simulation vs. operation room [OR])	• Interprets and prioritizes diagnostic and physiologic assessment tests for routine patient with ischemic heart disease • Recognizes routine post-operative complications (e.g., cerebral vascular accident [CVA], shock, tamponade, interprets abnormal EKG) • Suggests treatment plan for patient with routine ischemic heart disease • Assesses and harvests conduits (e.g., vein mapping) • Performs surgical opening and closing • Provides basic intra-operative assisting • Performs proximal coronary anastomosis	• Establishes a diagnostic and assessment plan for patients with routine ischemic heart disease (e.g., role of functional testing in ischemic heart disease) • Manages routine post-operative complications (e.g., return to the OR vs. return to cath lab) • Selects ideal treatment option for patient with routine ischemic heart disease (e.g., institutes treatment per ACC/STS/AATS guidelines) • Institutes and weans patient from cardiopulmonary bypass • Performs routine CABG	• Establishes a diagnostic and assessment plan for complex patients with ischemic heart disease • Manages complex post-operative complications (e.g., need for ventricular assist) • Selects ideal treatment option for patient with complex ischemic heart disease (e.g., combined coronary and carotid disease) • Manages complex coronary disease (e.g., redo CABG, VSD, ischemic mitral regurgitation [MR], off pump)	• Independently performs reoperative coronary bypass grafting • Independently performs coronary endarterectomy
☐	☐	☐	☐	☐	☐	☐	☐	☐
Comments:				**Not yet rotated** ☐

Cardiopulmonary Bypass, Myocardial Protection and Temporary Circulatory Support — Medical Knowledge				
Level 1	Level 2	Level 3	Level 4	Level 5
• Lists basic components of cardiopulmonary bypass apparatus (e.g., oxygenator, pump heads, heat exchanger, low level alarm, in line monitoring) • Understands pulsatile vs. non-pulsatile pump physiology • Understands basic myocardial protection. (e.g., oxygen requirement, oxygen delivery, myocardial relaxation) • Understands coagulation cascade (e.g., intrinsic and extrinsic pathways) • Lists complications of cardiopulmonary bypass (e.g., bleeding, renal failure, pulmonary dysfunction)	• Discusses options for myocardial protection (e.g., cardioplegia vs. beating heart) • Discusses cannulation techniques and options for cardiopulmonary bypass (e.g., single venous, bicaval, aortic, peripheral arteries, cold, full or partial) • Understands intra-aortic balloon pump physiology (e.g., diastolic augmentation and presystolic dip) • Understands coagulation cascade inhibitors (e.g., heparin, argatroban) • Understands complications of cardiopulmonary bypass • Lists treatment strategies for cardiac injury without cardiac bypass, including trauma	• Demonstrates knowledge of cardioplegia solutions and delivery modes (e.g., crystalloid, blood, antegrade, retrograde) • Demonstrates knowledge of acid-base and anticoagulation management on cardiopulmonary bypass (e.g., pH stat, alpha stat, activated clotting time [ACT]) • Demonstrates knowledge of pharmacologic management of postcardiotomy hemodynamics (e.g., inotropes, vasodilators) • Discusses advantages and disadvantages of different myocardial protection strategies • Lists management strategies of routine complications related to cardiopulmonary bypass (e.g., air in the heart, inadequate drainage, incomplete arrest) • Demonstrates knowledge of post-operative sequelae from cardiopulmonary bypass (e.g., low cardiac output syndrome, coagulopathies, arrhythmias, heparin-induced thrombocytopenia [HIT])	• Explains advanced cardiopulmonary support (e.g., circulatory arrest or extracorporeal membrane oxygenation [ECMO]) • Explains the management of postcardiotomy shock syndrome (e.g., inotropes, intra-aortic balloon pump [IABP], mechanical support) • Explains management strategies of complex complications related to cardiopulmonary bypass (e.g., aortic dissection, air embolism) • Explains treatment strategies for post-operative sequelae from cardiopulmonary bypass (e.g., low cardiac output syndrome, coagulopathies, arrhythmias, HIT)	• Develops simulation scenarios for complications related to cardiopulmonary bypass
☐	☐	☐	☐	☐	☐	☐	☐	☐
Comments:				**Not yet rotated** ☐

Cardiopulmonary Bypass, Myocardial Protection and Temporary Circulatory Support — Patient Care and Technical Skills				
Level 1	Level 2	Level 3	Level 4	Level 5
• Demonstrates basic surgical skills (simulation vs. OR)	• Performs axillary, femoral, arterial, or venous cannulation • Performs peripheral vascular access • Performs surgical opening and closing • Assists perfusionist with cardiopulmonary bypass setup and pump run	• Cannulates and institutes cardiopulmonary bypass, including myocardial protection in routine cases • Manages cardiopulmonary bypass and myocardial protection in routine cases • Weans and decannulates from cardiopulmonary bypass for routine cases • Recognizes and manages common acute complications (e.g., coagulopathy, pump failure)	• Cannulates and institutes cardiopulmonary bypass, including myocardial protection in complex cases • Manages cardiopulmonary bypass and myocardial protection in complex cases • Weans and decannulates from cardiopulmonary bypass for complex cases • Institutes temporary circulatory support for cardiogenic shock (e.g., intraaortic balloon pump, ECMO, short term left ventricular [LV] assist) • Recognizes and manages unusual acute complications (e.g., aortic dissection)	• Operates in a hostile chest (e.g., radiation, porcelain aorta, use of epiaortic probe, patent grafts) • Performs left ventricular assist device procedures or transplant
☐	☐	☐	☐	☐	☐	☐	☐	☐
Comments:				**Not yet rotated** ☐

Valvular Disease — Medical Knowledge				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic anatomy and pathology of valvular heart disease • Knows basic normal valve physiology • Lists clinical manifestations of isolated valvular heart disease (e.g., dyspnea, angina, edema, syncope) • Lists diagnostic tools available for evaluation of valvular heart disease • Lists treatment options for valvular heart disease • Knows basic complications for valvular heart disease (e.g., peri-operative complications for aortic valve replacement)	• Knows common variations in anatomy and pathology of valvular heart disease (e.g., Mitral Regurgitation, Types II and III) • Explains physiologic changes accompanying valvular heart disease (e.g., pulmonary hypertension) • Generates differential diagnosis of diseases with similar manifestations (e.g., coronary artery disease, emphysema) • Explains advantages and disadvantages of diagnostic tools in evaluating valvular heart disease (e.g., surface vs. transesophageal echo) • Recites advantages and disadvantages of various treatment options for valvular heart disease (e.g., repair vs. replacement) • Recites risks, benefits and complications of treatment modalities (e.g., cites frequency of common complications)	• Explains complex integrations between anatomy and pathology of valvular heart disease (e.g., bicuspid aortic valve and stenosis, functional mitral and tricuspid regurgitation) • Explains the role of treatment on physiology of valvular heart disease, including arrhythmia management, (e.g., the mechanism of surgical atrial fibrillation treatment) • Identifies the common variants of the clinical manifestations of valvular heart disease (e.g., fatigue, exercise intolerance) • Interprets normal and common abnormalities associated with valvular heart disease, including intra-operative transesophageal echocardiography • Identifies appropriate treatment for routine patient with valvular heart disease • Familiar with ACC/STS/AATS guidelines • Explains basic outcome literature for valvular heart disease (e.g., durability of	• Explains complex variations in anatomy and pathology, including congenital (e.g., contribution of coronary disease to mitral regurgitation, bicuspid aortic valve and ascending aneurysm) • Adapts therapeutic management based on understanding of physiology (e.g., explains when to correct mitral or tricuspid regurgitation in setting of aortic stenosis or coronary artery disease) • Distinguishes the complex clinical manifestations and complications of valvular heart disease (e.g., staging of congestive heart failure) • Interprets and integrates complex abnormalities associated with valvular heart disease (e.g., hypertrophic obstructive cardiomyopathy) • Identifies appropriate treatment for complex patient with valvular heart disease (e.g., combined coronary artery disease, aortic aneurysm, or aortic root enlargement) • Explains outcomes for all	• Presents on outcomes valvular heart disease at local, regional, or national meeting

		mitral valve repair)	treatment modalities and complications, including databases and clinical trials (e.g., outcome after minimally invasive valves, success of sinus restoration in surgery for atrial fibrillation)	
☐	☐	☐	☐	☐ ☐ ☐ ☐ ☐
Comments:				**Not yet rotated** ☐

Valvular Disease — Patient Care and Technical Skills				
Level 1	Level 2	Level 3	Level 4	Level 5
• Orders basic diagnostic and pre-operative assessment tests for valvular heart disease • Lists basic treatment options for routine valvular heart disease • Demonstrates basic surgical skills (simulation vs. OR)	• Interprets and prioritizes diagnostic and physiologic assessment tests for routine patient with valvular heart disease (e.g., echocardiogram, cardiac cath) • Suggests treatment plan for patient with routine single valvular heart disease (e.g., single valve replacement in a symptomatic patient with aortic stenosis) • Recognizes routine post-operative complications (e.g., identifies surgically significant bleeding) • Identifies surgical approach for each valve • Performs surgical opening and closing • Performs basic Intra-operative assisting	• Provides a diagnostic and assessment plan for patients with routine valvular heart disease (e.g., intra-operative transesophageal echocardiogram) • Selects ideal treatment option for patient with acquired valvular heart disease (e.g., double valve replacement) • Manages routine post-operative complications (e.g., decides to return to operating room, management of heart block) • Institutes and weans patient from cardiopulmonary bypass • Performs optimal myocardial protection strategy • Performs routine valvular replacement	• Forms a diagnostic and assessment plan for complex patients with valvular heart disease (e.g., intra-operative mitral regurgitation on a patient scheduled for isolated coronary artery bypass) • Selects ideal treatment option for patient with complex valvular heart disease (e.g., valvular repair, congenital valve repair) • Manages complex post-operative complications, including arrhythmias (e.g., management of paravalvular leak or systolic anterior motion [SAM]) • Performs complex valvular replacement • Performs valvular repair	• Selects ideal plan for a patient with prior transcatheter valve, minimally invasive valve • Performs minimally invasive, percutaneous, or robotic approaches to valvular heart disease • Performs atrial and ventricular arrhythmia surgery • Performs reconstruction of fibrous trigone in patient with endocarditis of mitral and aortic valves
☐	☐	☐	☐	☐	☐	☐	☐	☐
Comments:				**Not yet rotated** ☐

Great Vessel Disease — Medical Knowledge				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic anatomy and pathology of great vessels (e.g., aortic dissection classification, including spinal cord and cerebral perfusion) • Lists clinical manifestations of great vessel disease, acquired and traumatic (e.g., chest pain syndromes, Marfan's syndrome) • Lists diagnostic tools available for evaluation of great vessel disease • Lists treatment options for great vessel disease • Knows basic complications for great vessel disease (e.g., natural history treated and untreated)	• Understands common variations in anatomy and pathology of adult great vessel disease, acquired and traumatic (e.g., descending aortic tear from blunt trauma) • Generates differential diagnosis of diseases with similar manifestations (e.g., myocardial infarction, esophageal spasm) • Understands advantages and disadvantages of diagnostic tools in evaluating great vessel disease (e.g., computerized tomography [CT] scan vs. magnetic resonance imaging [MRI] vs. echocardiography vs. angiography) • Understands advantages and disadvantages of various treatment options for great vessel disease (endovascular vs. open) • Understands risks, benefits and complications of treatment modalities	• Understands integrations between anatomy and pathology of great vessel disease, acquired, congenital, and traumatic (e.g., atherosclerosis, penetrating ulcer, aortic dissection) • Identifies the common variants of the clinical manifestations of great vessel disease, acquired, congenital, and traumatic (e.g., bowel ischemia, renal insufficiency) • Interprets normal and common abnormalities associated with great vessel disease (e.g., sensitivity, specificity, accuracy of aortic imaging techniques) • Identifies appropriate and/or adjunct treatment for routine patient with great vessel disease (neuroprotection, spinal cord protection, renal) • Knows basic outcome literature for great vessel disease	• Understands complex variations in anatomy and pathology of great vessel disease, acquired, congenital, and traumatic (e.g., congenital arch anomalies leading to tracheal or esophageal compression) • Distinguishes the complex clinical manifestations and complications of great vessel disease, acquired, congenital, and traumatic (e.g., myocardial infarction vs. acute aortic dissection) • Interprets and integrates complex abnormalities associated with great vessel disease (e.g., aneurysm, dissection, pseudo-aneurysm, penetrating ulcer) • Identifies appropriate treatment for complex patient with great vessel disease (e.g., cardiopulmonary bypass [CPB] techniques) • Knows outcomes for all treatment modalities and complications, including databases and clinical trials	• Surgically manages acute and chronic pulmonary thromboembolic disease
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Comments: **Not yet rotated** ☐				

Great Vessel Disease — Patient Care and Technical Skills				
Level 1	Level 2	Level 3	Level 4	Level 5
• Orders basic diagnostic and pre-operative assessment tests for great vessel disease (e.g., CT, echo, need for cath) • Lists basic treatment options for routine great vessel disease (e.g., Type A vs. Type B dissections; timing of intervention) • Demonstrates basic surgical skills (simulation vs. OR) • Obtains advanced trauma life support (ATLS) certification	• Interprets and prioritizes diagnostic assessment tests for routine patient with great vessel disease (e.g., risk/benefit options) • Suggests treatment plan for patient with routine great vessel disease (e.g., endovascular vs. open repair) • Recognizes routine post-operative complications • Identifies surgical approach • Performs surgical opening, closing, and vascular access • Provides basic intra-operative assisting	• Establishes a diagnostic and assessment plan for patients with routine great vessel disease (e.g., blunt aortic injury) • Selects ideal treatment option for patient with routine great vessel disease, including peri-operative monitoring, perfusion, and neuroprotective strategies • Manages routine post-operative complications • Institutes and weans patient from cardiopulmonary bypass • Provides optimal perfusion and myocardial/neuroprotection • Performs routine aortic valvular replacement • Performs simple vascular anastomosis	• Establishes a diagnostic and assessment plan for complex patients with great vessel disease (e.g., great vessel interventions in the elderly or patients with collagen vascular disease) • Selects ideal treatment option for patient with complex great vessel disease, including peri-operative monitoring, perfusion and neuroprotective strategies (e.g., thoracoabdominal disease, chronic aortic dissections) • Manages complex post-operative complications (e.g., multisystem organ failure) • Performs complex great vessel replacement • Performs aortic repair • Participates in endovascular aortic surgery	• Performs endovascular aortic surgery • Performs pulmonary thromboendarterectomy • Performs hybrid approaches to complex aortic disease (e.g., debranching followed by endovascular procedure)
☐	☐	☐	☐	☐	☐	☐	☐	☐
Comments:				**Not yet rotated** ☐

Congenital Heart Disease — Medical Knowledge				
Level 1	Level 2	Level 3	Level 4	Level 5
• Lists clinical manifestations of common congenital heart diseases (e.g., cyanosis, tachypnea, mottling, failure to thrive) • Lists diagnostic tools available for evaluating congenital heart disease (e.g., EKG, chest x-ray, echocardiogram, cardiac cath)	• Lists basic congenital cardiac abnormalities (e.g., atrial septal defect [ASD], VSD, tetralogy of Fallot, transposition of great arteries) • Lists physiologic changes accompanying congenital heart disease (e.g., right to left and left to right shunt, excessive or insufficient pulmonary blood flow) • Discusses possible diagnostic modalities for various conditions • Lists basic treatment options for congenital heart disease (e.g., diuretics, digoxin, palliative vs. definitive operations)	• Knows basic anatomy and pathology of congenital heart disease • Understands physiologic changes accompanying congenital heart disease (e.g., Eisenmenger syndrome) • Generates a differential diagnosis of diseases with similar manifestations (e.g., tachypnea due to increased pulmonary blood flow caused by ASD or VSD) • Understands the advantages and disadvantages of diagnostic tools in evaluating congenital heart disease • Understands advantages and disadvantages of various treatment options in congenital heart disease (e.g., pulmonary artery [PA] band vs. primary closure VSD) • Knows basic complications of congenital heart disease (e.g., residual VSD, heart block)	• Understands common variations in anatomy and pathology (e.g., partial and complete atrioventricular [AV] septal defect, types of VSD) • Understands the basics of the single ventricle pathway (e.g., Truncus, Norwood, transposition of the great arteries [TGA]) • Understands the role of treatment on physiology of congenital heart disease (e.g., role of pulmonary artery banding, acid-base balance benefits of pH stat or alpha stat) • Understands the role of physiology of congenital heart disease on treatment modality options (e.g., patent foramen ovale [PFO], increased pulmonary vascular resistance in newborns) • Identifies clinical manifestations of elective vs. emergent vs. urgent scenarios. • Recognizes simple vs. complex disease • Interprets normal and	• Understands complex integrations between anatomy and pathology (e.g., right ventricular [RV] dependent coronary sinusoids)

			common abnormalities associated with congenital heart disease, including echocardiography (e.g., identifies valve stenosis and regurgitation) • Identifies appropriate treatment for common patient with congenital heart disease (e.g., selection of palliative vs. definitive, identifies for urgent vs. elective procedures) • Understands strategies for complex reoperative surgery • Understands risks, benefits and complications of various treatment modalities	
☐	☐	☐	☐	☐ ☐ ☐ ☐ ☐

Comments:

Not yet rotated ☐

End Stage Cardiopulmonary Disease — Medical Knowledge				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic cardiothoracic normal anatomy • Knows basic normal respiratory and cardiovascular physiology • Lists clinical manifestations of cardiac and pulmonary failure (e.g., dyspnea, fatigue, exercise intolerance, peripheral edema, pulmonary edema) • Lists diagnostic tools available for evaluation of cardiac and pulmonary failure (e.g., arterial blood gas [ABG], CXR, PA line, echo) • Understands the natural history of cardiac and pulmonary failure (e.g., end-stage emphysema)	• Knows basic pathology as it relates to cardiac and pulmonary failure (e.g., lung-pneumonia, ARDS, pathology of end-stage lung disease; heart-myocardial infarction, types of cardiomyopathy) • Understands physiologic changes accompanying cardiac and pulmonary failure (e.g., increased work of breathing hypoxemia, hypercarbia, elevated lactate, tachycardia, hypotension, reduced cardiac output [CO]) • Generates differential diagnosis of causes of heart and pulmonary failure (e.g., heart-cardiomyopathy, coronary artery disease; pulmonary—interstitial lung disease, trauma) • Understands advantages and disadvantages of diagnostic tools in evaluating cardiac and pulmonary failure (e.g., cardiac-PA catheter measurements, echo vs. cath, MRI pulmonary-transbronchial biopsy vs.	• Understands common variations in anatomy and pathology (e.g., advanced valvular disease, pulmonary fibrosis, sarcoidosis) • Understands the role of treatment on physiology of cardiac and pulmonary failure (e.g., cardiac—medical management vs. IABP vs. mechanical support; pulmonary-medical treatment vs. need for mechanical ventilation) • Identifies the common variants of the clinical manifestations of cardiac and pulmonary failure (e.g., cardiac—ischemic, post viral, postpartum, idiopathic; pulmonary—acute lung injury/ARDS, infectious) • Interprets normal and common abnormalities associated with cardiac and pulmonary failure (e.g., cardiac—distinguishes various types of shock; pulmonary—surgical biopsy; acute vs. chronic cardiopulmonary failure) • Understands advantages	• Understands complex integrations between anatomy and pathology (e.g., adult with congenital heart disease) • Adapts therapeutic management based on understanding of physiology of cardiac and pulmonary failure (cardiac—need for mechanical support such as VAD; pulmonary—need for advanced mechanical ventilation) • Distinguishes the complex clinical manifestations and complications of cardiac and pulmonary failure (e.g., adult congenital disease manifestations, mechanical complications of myocardial infarction) • Interprets and integrates complex abnormalities associated with cardiac and pulmonary failure (e.g., distinguishes RV vs. LV vs. biventricular failure) • Identifies appropriate treatment for patients with cardiac and	• Understands complex variations in anatomy and pathology as related to cardiac and pulmonary failure (e.g., Eisenmenger's complex) • Understands the immunologic mechanisms in cardiac and pulmonary transplantation • Understands non-pulsatile ventricular assist physiology • Understands clinical manifestations of allograft rejection (e.g., hyperacute, acute, and chronic rejection) • Understands clinical manifestations of complications of mechanical cardiopulmonary support (e.g., bleeding, line infection, sepsis, stroke, tamponade) • Diagnoses complications of transplant and mechanical cardiopulmonary support (e.g., heart failure due to pulmonary hypertension, acute and chronic rejection, assist device failure,

	open biopsy, advanced pulmonary stress test) • Lists treatment options for cardiac and pulmonary failure (e.g., medical vs. surgical management) • Understands signs of decompensation and need for intervention for cardiac and pulmonary failure	and disadvantages of various treatment options for cardiac and pulmonary failure • Understands risks, benefits and complications of treatment modalities (e.g., risk-benefit ratio)	pulmonary failure, and indications for transplantation or mechanical cardiopulmonary support (e.g., selection criteria for transplantation) • Knows basic outcome literature for cardiac and pulmonary failure • Understands limitations of mechanical support (e.g., recognizes when risks exceed benefits)	endomyocardial biopsy) • Identifies appropriate treatment for complex patient with cardiac and pulmonary failure • Understands how to treat acute and chronic transplant rejection (e.g., need for single vs. bi-VAD assist, cardiac vs. cardiopulmonary support, ECMO) • Knows outcomes for all treatment modalities and complications, including databases and clinical trials
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Esophagus — Medical Knowledge				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic anatomy and pathology (e.g., identifies gastrointestinal anatomy innervation and blood supply, endoscopic landmarks) • Knows basic foregut physiology (e.g., basic esophageal motility) • Lists clinical manifestations of benign and malignant disorders (e.g., heart burn, chest pain, dysphagia, odynophagia • Lists diagnostic and/or staging tools available for the evaluation of benign and malignant disorders (e.g., manometry, pH testing, EUS) • Lists treatment options for benign and malignant disorders (e.g., surgery vs. chemo/RT vs. chemo/RT alone for malignancy) • Knows basic complications for benign and malignant disorders (e.g., perforation, recurrent reflux, pulmonary aspiration)	• Understands common variations in anatomy and pathology (e.g., lymphatic drainage) • Understands physiologic changes accompanying malignancy and motility disorders (e.g., achalasia, reflux, esophageal spasm) • Generates differential diagnosis of disease with similar manifestations (e.g., achalasia vs. pseudoachalasia; coronary syndrome vs. esophageal spasm) • Understands advantages and disadvantages of diagnostic tools in evaluating benign and malignant disorders (e.g., endoscopy vs. EUS vs. barium swallow) • Understands advantages and disadvantages of various treatment options for benign and malignant disorders, including the impact of staging (e.g., pluses and minus of treatment options for esophageal cancer; dilation vs. myotomy for achalasia) • Understands risks, benefits and	• Understands complex integrations between anatomy and pathology (e.g., fascial planes in descending mediastinitis) • Understands the role of treatment on physiology of malignancy and motility disorders (e.g., post-operation esophagectomy complications: dumping syndrome) • Identifies the common variants of the clinical manifestations of benign and malignant disorders (e.g., benign vs. malignant stricture) • Interprets normal and common abnormalities associated with benign and malignant disorders (e.g., interprets EUS, common motility tracings) • Identifies appropriate treatment for routine patient with benign and malignant disorders (e.g., treatment options for high grade dysplasia – EMR vs. esophagectomy) • Knows basic outcome	• Understands complex variations in anatomy and pathology, including congenital (e.g., esophageal atresia) • Adapts therapeutic management based on understanding of physiology for various disease states (e.g., partial vs. total fundoplication) • Distinguishes the complex clinical manifestations and complications of benign and malignant disorders (e.g., Type IV hernias, tracheoesophageal fistula [TEF]) • Interprets and integrates complex abnormalities associated with benign and malignant disorders (e.g., short esophagus, achalasia with sigmoid esophagus) • Identifies appropriate treatment for complex patient with benign and malignant disorders (e.g., primary vs. redo Nissen, redo myotomy vs. esophagectomy) • Knows outcomes for all treatment modalities	• Understands imaging for colon interposition • Understands need for colon interposition • Presents on outcomes of benign or malignant disorders at local, regional, or national meetings

	complications of treatment modalities (e.g., slipped Nissen, anastomotic leak)	literature for benign and malignant disorders	and complications, including databases and clinical trials	
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Esophagus — Patient Care and Technical Skills				
Level 1	Level 2	Level 3	Level 4	Level 5
• Performs pre-operative assessment • Orders basic diagnostic/assessment tests for routine benign and malignant esophageal disease (e.g., endoscopic ultrasound [EUS], CT/ positron emission tomography [PET], pH testing, manometry) • Demonstrates basic surgical skills (simulation vs. OR)	• Interprets hemodynamics and suggests appropriate diagnostic imaging • Recognizes routine post-operative complications • Prioritizes diagnostic/assessment tests for routine benign and malignant esophageal disease (e.g., Barium swallow vs. EUS vs. endoscopy) • Lists basic treatment options for routine benign and malignant esophageal disease (e.g., Nissen fundoplication, esophageal resection, Toupet) • Recognizes common post-operative complications (e.g., leak, slipped Nissen, cardiac arrhythmia) • Demonstrates basic endoscopic skills • Demonstrates basic minimally invasive skills (Fundamentals of Laparoscopic Surgery [FLS]) • Provides basic intra-operative assistance • Performs basic hand sewn and stapled anastomosis	• Develops a treatment plan for routine patient with benign and malignant disorders • Manages routine post-operative complications • Interprets diagnostic/assessment tests for routine benign and malignant esophageal disease (e.g., basic manometry tracings, EUS, and PET/CT scan results) • Selects ideal treatment option after assessment of diagnostic test results for routine benign and malignant esophageal disease • Manages common post-operative complications (e.g., surgical vs. medical management, reintubation) • Demonstrates advanced endoscopic skills (endoscopic mucosal resection [EMR], EUS, stenting) • Performs routine open and minimally invasive motility operations	• Develops a treatment plan for complex patient with benign and malignant disorders • Manages complex post-operative complications • Able to establish a diagnostic and assessment plan for complex patients with benign and malignant esophageal disease (e.g., short esophagus, sigmoid esophagus) • Selects ideal treatment option for complex benign and malignant esophageal disease (e.g., consideration of comorbidities, chemo/ radiotherapy [RT]/surgery vs. surgery vs. chemo/RT, does patient have short esophagus) • Manages complex post-operative complications (e.g., fistula, gastric necrosis) • Performs routine esophageal resections • Operatively manages esophageal perforation/trauma	• Performs complex esophageal resections (e.g., colon interposition) • Performs redo motility operations • Performs minimally invasive esophagectomy
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Lung and Airway — Medical Knowledge				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic anatomy and pathology (e.g., segmental anatomy, types of lung cancer) • Knows basic pulmonary physiology (e.g., A-a gradient, pulmonary function tests, ventilation perfusion scan, diffusion, respiratory mechanics, V/Q mismatch) • Lists clinical manifestations of benign, malignant, and traumatic disorders (e.g., clinical diagnosis of chronic obstructive pulmonary disease [COPD], signs and symptoms of advanced metastatic lung neoplasms, of immediate life-threatening traumatic injuries, gas exchange) • Lists diagnostic and/or staging tools available for the evaluation of benign, malignant, and traumatic disorders (e.g., CXR, CT, PET, EBUS, PFTs, mediastinoscopy, flexible/rigid bronchoscopy)	• Understands common variations in anatomy and pathology (e.g., azygous lobe, mixed lung cancer histologies) • Understands physiologic changes accompanying benign, malignant, and traumatic disorders (e.g., pulmonary shunt, tension pneumothorax causing decreased venous return, secondary pulmonary hypertension with COPD, pulmonary vascular resistance) • Generates differential diagnosis of disease with similar manifestations (e.g., lung nodules, airway tumors, hemoptysis work-up) • Understands advantages and disadvantages of diagnostic tools in evaluating benign, malignant, and traumatic disorders (e.g., CXR vs. CT, EBUS vs. mediastinoscopy, CT vs. angiogram) • Understands advantages and disadvantages of various treatment options for benign,	• Understands the role of treatment on physiology of benign and malignant disorders (e.g., pneumonectomy increases pulmonary pressure and RV strain) • Identifies the common variants of the clinical manifestations of benign, malignant, and traumatic disorders (e.g., various bronchial adenomas, traumatic tracheobronchial injuries) • Interprets normal and common abnormalities associated with benign, malignant, and traumatic disorders (e.g., PET abnormalities, interpret EBUS findings, interpret PFT results, acid-base) • Identifies appropriate treatment for routine patient with benign, malignant, and traumatic disorders (e.g., medical therapy for pulmonary fibrosis, less than lobectomy for compromised lung function, rationale for sublobar resection) • Knows basic outcome literature for benign and	• Understands complex variations in anatomy and pathology, including congenital (e.g., cystic adenomatoid formation, AV malformation, tracheo-esophageal fistula, pulmonary sequestration, subtypes of adenocarcinoma) • Adapts therapeutic management based on understanding of physiology for various disease states (e.g., changes associated with lung volume reduction) • Distinguishes the complex clinical manifestations and complications of benign, malignant, and traumatic disorders (e.g., post-pneumonectomy BPF, tracheoesophageal fistula, traumatic disruption mainstem bronchi) • Interprets and integrates complex abnormalities associated with benign, malignant, and traumatic disorders (e.g., applies results from quantitative V/Q scans, myocardial oxygen consumption	• Presents on outcomes of benign or malignant disorders at local, regional, or national meetings (e.g., using STS or institutional database for outcomes research)

• Lists treatment options for benign, malignant, and traumatic disorders (e.g., lobectomy, operative intervention for hemothorax) • Know basic outcomes for benign and malignant disorders (e.g., morbidity and mortality for lobectomy)	malignant, and traumatic disorders, including the impact of staging (e.g., use of induction therapy, airway stents) • Understand risks, benefits and complications of treatment modalities (e.g., morbidity and mortality for VATS and open lobectomy)	malignant disorders (e.g., International Association for the Study of Lung Cancer [IASLC] survival data for lung cancer stages, survival rates for advanced lung diseases like COPD, idiopathic pulmonary fibrosis [IPF])	[mVO2] max toward the decision making for lung resection) • Identifies appropriate treatment for complex patient with benign, malignant, and traumatic disorders (e.g., radiofrequency ablation [RFA] for high risk lung cancer patients, lung reduction surgery, stents for arteriovenous malformation [AVM], tracheal disorders) • Knows outcomes for all treatment modalities and complications, including databases and clinical trials (e.g., National Emphysema Treatment Trail [NETT] trial results, induction therapy for stage IIIa disease)	
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Lung and Airway — Patient Care and Technical Skills				
Level 1	Level 2	Level 3	Level 4	Level 5
• Orders basic diagnostic/assessment tests for routine benign, malignant, and traumatic disorders (e.g., chest x-ray [CXR], PET, CT, angiogram) • Lists basic treatment options for routine benign, malignant, and traumatic disorders (e.g., chemo/radiation therapy, needle decompression for tension pneumothorax) • List common complications for benign, malignant, and traumatic disorders and their treatment (e.g., bronchopleural fistula [BPF], prolonged air leak, hemoptysis) • Demonstrates basic surgical skills (simulation vs. OR) (e.g., positioning patient, suturing) • Obtains ATLS certification	• Interprets diagnostic/assessment tests for routine benign, malignant, and traumatic disorders (e.g., interprets pulmonary function tests [PFTs], recognizes false positives on PET) • Recognizes routine post-operative and disease-related complications (e.g., complications after lobectomy) • Demonstrates basic endoscopic skills (e.g., making ports, running videoscope) • Demonstrates basic minimally invasive skills (FLS) • Provides basic intra-operative assistance • Performs common bedside procedures (e.g., tracheostomy, chest tube, central line)	• Prioritizes diagnostic/assessment tests for routine benign, malignant, and traumatic disorders (e.g., obtain magnetic resonance imaging [MRI] based on CT results, bronchoscopy for pneumomediastinum) • Selects ideal treatment option for routine benign, malignant, and traumatic disorders (e.g., combination therapy for advanced lung cancer, when not to operate for lung cancer, interventions for tension pneumothorax, need for surgical lung biopsy, contraindications for lung cancer surgery) • Manages routine post-operative and disease-related complications (e.g., post-operative air leak, spontaneous pneumothorax) • Demonstrates advanced endoscopic skills (e.g., endobronchial ultrasound [EBUS], stenting, proper placement of ports) • Performs routine open lung resection • Performs basic video-assisted thoracoscopic surgery (VATS) procedures	• Establishes a diagnostic and assessment plan for complex patients with benign, malignant, and traumatic disorders (e.g., order of tests for TEF, quantitative ventilation/perfusion [V/Q] for compromised lung function) • Selects ideal treatment option for complex benign, malignant, and traumatic disorders (e.g., interventions for TEF, guide for stage III and intravenous [IV] lung cancer, Pancoast tumor) • Manages complex post-operative and disease-related complications (e.g., BPF, right middle lobe [RML] torsion) • Performs complex open lung resection (e.g., Pancoast, sleeve) • Performs VATS lobectomies	• Performs tracheal resections/traumatic tracheal repair • Performs robotic lung resections, VATS segmentectomy
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Comments:				**Not yet rotated** ☐

Chest Wall/Pleura/Mediastinum — Medical Knowledge				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic chest wall, pleural, and mediastinal anatomy and pathology (e.g., anatomic features on a CT scan) • Knows basic chest wall and pleural physiology (e.g., physiology of chest tube drainage and pleural pressures) • Lists clinical manifestations of benign, malignant, and traumatic disorders of the chest wall, pleura, and mediastinum (e.g., cough, shortness of breath with pleural effusion, or painless mass with chest wall tumor) • Lists diagnostic and/or staging tools available for the evaluation of benign, malignant, and traumatic disorders (e.g., CT, chest x-ray, MRI, PET, ultrasound, fine needle aspiration [FNA], EBUS, mediastinoscopy, EUS) • Lists treatment options for benign, malignant, and traumatic disorders (e.g., medical vs. surgical management of chest	• Understands common variations in anatomy and pathology (e.g., cervical rib, replaced right subclavian vessel) • Understands physiologic changes accompanying benign, malignant, and traumatic disorders (e.g., physiology post lung resection, flail chest, physiologic changes that accompany pleural effusions) • Generates differential diagnosis of disease with similar manifestations (e.g., differential of chest wall masses) • Understands advantages and disadvantages of diagnostic tools in evaluating benign, malignant, and traumatic disorders (e.g., difficulty diagnosing mesothelioma, options for diagnosing mediastinal tumors) • Understands advantages and disadvantages of various treatment options for benign, malignant, and traumatic disorders,	• Understands complex integrations between anatomy and pathology (e.g., thoracic outlet syndrome, Pancoast tumor, dumbbell neurogenic tumors) • Understands the role of treatment on physiology of benign, malignant, and traumatic disorders (e.g., physiologic changes that accompany chest wall resection) • Identifies the common variants of the clinical manifestations of benign, malignant, and traumatic disorders (e.g., neurogenic vs. vascular symptoms for thoracic outlet syndrome, types of pleural effusions) • Interprets normal and common abnormalities associated with benign, malignant, and traumatic disorders (e.g., radiographic features of different chest wall tumors and mediastinal masses) • Identifies appropriate treatment for routine patients with benign,	• Understands complex variations in anatomy and pathology, including congenital (e.g., chest wall tumors requiring multimodality therapy) • Compares and contrasts therapeutic management based on understanding of physiology for various disease states (e.g., resection only vs. resection and reconstruction of various chest wall lesions, pleural drainage techniques for massive pleural effusions • Distinguishes the complex clinical manifestations of benign, malignant, and traumatic disorders, as well as manifestations of the treatment of these disorders (e.g., presentation of an infected chest wall reconstruction) • Interprets and integrates complex abnormalities associated with benign, malignant, and traumatic disorders (e.g., use of MRI for	• Knows complex alternatives for chest wall reconstruction (e.g., flaps available for chest wall reconstruction) • Presents on outcomes of benign or malignant disorders at local, regional, or national meetings

wall tumors, treatment options for pleural effusion) • Knows basic complications for benign and malignant disorders (e.g., bleeding, wound infection, empyema, pneumothorax)	including the impact of staging (e.g., thoracentesis vs. chest tube drainage vs. thoracoscopy for benign and malignant pleural effusion) • Understands risks, benefits and complications of treatment modalities (e.g., complications associated with chest wall reconstruction)	malignant, and traumatic disorders • Knows basic outcome literature for benign and malignant disorders (e.g., survival and local recurrence rate after resection of chest wall tumors)	thoracic outlet tumor, diagnosis of lymphoma vs. Hodgkin's Disease vs. thymoma) • Identifies appropriate treatment for complex patients with benign, malignant, and traumatic disorders • Knows outcomes for all treatment modalities and complications, including databases and clinical trials (e.g., pleurectomy vs. extrapleural pneumonectomy for mesothelioma)	
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Chest Wall/Pleura/Mediastinum — Patient Care and Technical Skills				
Level 1	Level 2	Level 3	Level 4	Level 5
• Orders basic diagnostic/assessment tests for routine benign, malignant, and traumatic diseases (e.g., chest x-ray, CT, PET) • Lists basic treatment options for routine benign, malignant, and traumatic diseases • Lists common complications for benign, malignant, and traumatic diseases and their treatment • Demonstrates basic surgical skills (simulation vs. OR) (e.g., knot tying, suturing) • Performs common bedside procedures (e.g., chest drain/tube, thoracentesis, pleurodesis)	• Interprets diagnostic/assessment tests for routine benign, malignant, and traumatic diseases (e.g., distinguish free flowing and loculated pleural effusions, chest wall involvement by tumor) • Suggests treatment options for routine benign, malignant, and traumatic diseases • Recognizes routine post-operative and disease-related complications (e.g., wound infection, pleural fluid loculation) • Demonstrates basic endoscopic and ultrasound guidance skills (e.g., handling video scope) • Demonstrates basic minimally invasive skills • Provides basic intra-operative assistance	• Prioritizes diagnostic/assessment tests for routine benign, malignant, and traumatic diseases (e.g., prioritize use of imaging to evaluate chest wall trauma) • Selects ideal treatment option for routine benign, malignant, and traumatic diseases (e.g., options for malignant mesothelioma) • Manages routine post-operative and disease-related complications (e.g., need for radiologic vs. surgical intervention for wound infection after chest wall reconstruction) • Demonstrates advanced endoscopic skills (e.g., performs uncomplicated EBUS or mediastinoscopy) • Performs open and VATS procedures for uncomplicated pleural or mediastinal disorders (e.g., VATS pleural or mediastinal biopsy, open Stage I/II thymectomy) • Performs simple chest wall resection (e.g., resects a laterally placed small chondrosarcoma [<3cm])	• Establishes a diagnostic and assessment plan for complex patients with benign, malignant, and traumatic diseases (e.g., evaluation for posterior tumor involving spine) • Selects ideal treatment option for complex benign, malignant, and traumatic diseases (e.g., induction therapy for certain mediastinal malignancies, post-operative empyema with or without BPF) • Manages complex post-operative and disease-related complications (e.g., management of post-resectional empyema with and without BPF) • Performs open and VATS procedures for complex pleural and mediastinal disorders (e.g., open decortication for a complex loculated pleural effusion, thymectomy for a Stage III thymoma) • Performs complex chest wall resection and/or reconstruction (e.g., large chest wall lesion with reconstruction)	• Surgically manages mesothelioma (e.g., radical pleurectomy and decortication with diaphragm reconstruction)
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Critical Care — Medical Knowledge				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic normal cardiopulmonary physiology (e.g., normal left ventricular pressure-volume curve) • Lists clinical manifestations of critically-ill cardiovascular and thoracic patients (e.g., chest pain, shortness of breath, tachycardia) • Lists diagnostic tools available for evaluation of critically-ill patients with cardiovascular and thoracic diseases (e.g., interpretation of hemodynamic data (Swan-Ganz); electrocardiogram [ECG] including exercise data, coronary angiography, cardiac cath hemodynamics, echocardiography) • Lists treatment options for critically-ill patients with cardiovascular and thoracic diseases (e.g., providing hemodynamic support with inotropic and vasoactive drugs, intra-aortic balloon counterpulsation,	• Understands pathophysiologic changes accompanying cardiovascular and thoracic disease (e.g., Frank-Starling curves for the left ventricle • Generates differential diagnosis of diseases in critically-ill patients with cardiovascular and thoracic diseases (e.g., differential diagnosis of patient with chest pain: cardiac—myocardial infarction, unstable angina, acute pericarditis, coronary spasm, hypertrophic cardiomyopathy, anemia, myocarditis, aortic dissection and pulmonary hypertension; pulmonary—pulmonary embolism, pneumonia, pleuritis and pneumothorax) • Understands advantages and disadvantages of diagnostic tools in evaluating critically-ill patients with cardiovascular and thoracic diseases • Understands advantages	• Understands the role of treatment on pathophysiology of cardiovascular and thoracic disease (e.g., relationship between left ventricular output, left atrial pressure (preload) and aortic pressure (afterload) • Identifies the common variants of the clinical manifestations of critically-ill cardiovascular and thoracic patients (e.g., differential diagnosis of post-operation cardiac surgery patient with chest pain; myocardial ischemia, musculoskeletal pain, pericarditis, pneumothorax) • Interprets normal and common abnormalities associated with critically-ill patients with cardiovascular and thoracic diseases (e.g., echo images of normal ventricular function, systolic and diastolic dysfunction) • Identifies appropriate	• Adapts therapeutic management based on understanding of pathophysiology (e.g., selection of inotropic drugs in the treatment of hypotension and low cardiac output depending on etiology) • Distinguishes the complex clinical manifestations and complications of critically-ill cardiovascular and thoracic patients (e.g., low cardiac output due to right ventricular failure; demonstration of low cardiac output with elevated right-sided filling pressures, and relatively normal or decreased left-sided filling pressures) • Interprets and integrates complex abnormalities associated with critically-ill patients with cardiovascular and thoracic diseases • Identifies appropriate treatment for complex critically-ill patients with cardiovascular and thoracic diseases (e.g.,	• Understands the need for complex ventilation strategies (e.g., oscillating ventilation) • Conducts research on critical care and presents at a local, regional or national meeting

Return to Table of Contents

circulatory assist devices)	and disadvantages of various treatment options for critically-ill patients with cardiovascular and thoracic diseases (e.g., indications for inotropes, IABP, and ventricular assist device [VADs])	treatment for routine critically-ill patients with cardiovascular and thoracic diseases (e.g., management strategies for post-operative arrhythmias, nutrition, mechanical ventilation modes, premature ventricular contractions, atrial fibrillation, atrial flutter, ventricular fibrillation) • Manages post-operation low cardiac output • Knows basic outcome literature for critically-ill patients with cardiovascular and thoracic diseases	treatment of wall motion abnormalities after CABG, dialysis options) • Understands risk adjustment and outcome databases (e.g., scoring systems)	
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Critical Care — Patient Care and Technical Skills

Level 1	Level 2	Level 3	Level 4	Level 5
• Orders basic diagnostic, nutritional and assessment tests for critically-ill patients with cardiovascular and thoracic diseases (e.g., pre- and post-operative) • Lists basic treatment options for critically-ill patients with cardiovascular and thoracic diseases • Orders appropriate prophylactic intensive care unit (ICU) measures to prevent complications (e.g., nutritional support, glucose management, ulcer and deep venous thrombosis [DVT] prophylaxis) • Obtains Advanced Cardiac Life Support [ACLS] certification • Demonstrates basic ICU surgical skills (simulation or bedside), including IV, arterial line, Foley catheter, nasogastric (NG) tube	• Interprets and prioritizes diagnostic and physiologic assessment tests for critically-ill patients with cardiovascular and thoracic diseases • Suggests treatment plans for critically-ill patients with cardiovascular and thoracic diseases, including preventive care (e.g., prophylactic antibiotics) • Recognizes routine ICU related complications (e.g., line sepsis, DVT, ventilator acquired pneumonia, pneumothorax) • Performs cardioversion for arrhythmias • Demonstrates advanced ICU surgical skills (simulation or bedside), including central line, pulmonary artery (PA) catheter, chest tube • Demonstrates routine ventilator management • Manages temporary pace maker	• Establishes a diagnostic and assessment plan for critically-ill patients with cardiovascular and thoracic diseases • Selects ideal treatment option for critically-ill patients with cardiovascular and thoracic diseases • Manages routine ICU complications (e.g., line sepsis, DVT, ventilator acquired pneumonia, pneumothorax) • Demonstrates complex ventilator management • Performs open chest resuscitation • Performs emergency pericardiocentesis	• Establishes a diagnostic and assessment plan for complex critically-ill patients with cardiovascular and thoracic diseases (e.g., patient with multi-system organ failure) • Selects ideal treatment options for complex critically-ill patients with cardiovascular and thoracic diseases • Manages complex ICU-related complications (e.g., acute respiratory distress syndrome [ARDS], acute renal failure, low cardiac output, stroke, metabolic abnormalities) • Troubleshoots assist devices	• Obtains Board certification in critical care
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Ethics and Values — Professionalism				
Level 1	Level 2	Level 3	Level 4	Level 5
• Understands basic bioethical principles and is able to identify ethical issues in CT surgery • Demonstrates behavior that conveys caring, honesty, and genuine interest in patients and their families	• Recognizes ethical issues in practice and is able to discuss, analyze, and manage common ethical situations • Demonstrates behavior that shows insight into the impact of one's core values and beliefs on patient care	• Analyzes and manages ethical issues in complicated and challenging situations • Understands the beliefs, values, and practices of diverse and vulnerable patient populations and the potential impact on patient care	• Uses a systematic approach to analyzing and managing ethical issues, including advertising, billing, and conflicts of interest • Develops a mutually agreeable care plan in the context of conflicting physician and patient values and beliefs	• Leads institutional and organizational ethics programs • Develops programs to ensure equality of care in diverse, vulnerable, and underserved populations
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Comments:				**Not yet achieved Level 1** ☐

Personal Accountability — Professionalism				
Level 1	Level 2	Level 3	Level 4	Level 5
• Understands and manages issues related to fatigue and sleep deprivation • Exhibits professional behavior (e.g., reliability, industry, integrity, and confidentiality)	• Demonstrates management of personal emotional, physical, and mental health • Recognizes individual limits in clinical situations, and asks for assistance when needed • Ensures that the medical record, including EMR, is timely, accurate, and complete	• Identifies and manages situations in which maintaining personal emotional, physical, and mental health is challenged • Understands conflicting interests of self, family, and others and their effects on the delivery of medical care • Understands physician accountability to physicians, society, and the profession	• Recognizes signs of physician impairment, including fatigue, and demonstrates appropriate steps to address impairment in self and in colleagues • Prioritizes and balances conflicting interests of self, family, and others to optimize medical care	• Develops institutional and organizational strategies to improve physician wellness
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Comments:				**Not yet achieved Level 1** ☐

Interpersonal and Communication Skills				
Level 1	Level 2	Level 3	Level 4	Level 5
• Develops a positive relationship with patients in uncomplicated situations and recognizes communication conflicts • Recognizes multidisciplinary approach to patient care • Understands the patient's/family's perspective while engaged in active listening • Utilizes interpreters as needed • Appreciates effective communication to prevent medical error • Participates in effective transitions of care	• Negotiates and manages simple patient/family-related and team conflicts • Responds to the social and cultural context of the patient and family to ensure the patient understands and is able to participate in health care decision-making • Understands the effects of computer use on information accuracy and potential effects on the physician/patient relationship	• Sustains working relationships and manages complex and challenging situations, including coordination and transitions of care • Customizes the delivery of emotionally difficult information • Manages transitions of care and optimizes communication across systems • Maintains collegial relationships with other professional staff	• Negotiates and manages conflict in complex and challenging situations (including vulnerable populations), and develops working relationships across specialties and systems of care • Organizes and facilitates family/health care team conferences • Is able to facilitate/lead team-based care activities (e.g., OR team, multidisciplinary cancer conference) • Uses multiple forms of communication (e.g., e-mail, patient portal, social media) ethically and with respect for patient privacy	• Develops models and approaches to managing difficult communications and seeks leadership opportunities within professional organizations • Coaches others to improve communication skills
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Comments:				**Not yet achieved Level 1** ☐

Patient Safety — Systems-based Practice				
Level 1	Level 2	Level 3	Level 4	Level 5
• Understands the differences between medical errors, near misses, and sentinel events • Understands the roles of care team members	• Participates in the use of tools to prevent adverse events (e.g., checklists and briefings) • Describes the common system causes for errors	• Consistently uses tools to prevent adverse events (e.g., checklists and briefings) • Reports problematic behaviors, processes, and devices, including errors and near misses • Demonstrates structured communication tool for hand-offs	• Participates in the analysis of shared team experiences to prevent future errors using proven analysis techniques (e.g., root cause analysis, failure mode effects analysis) • Leads team by promoting situational awareness and input by all team members • Conducts morbidity and mortality conferences to improve patient safety	• Leads curriculum design to teach teamwork and communication skills to health care professionals • Leads multidisciplinary teams (e.g., human factors engineers, social scientists) to address patient safety issues
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Comments:				**Not yet achieved Level 1** ☐

Resource Allocation — Systems-based Practice				
Level 1	Level 2	Level 3	Level 4	Level 5
• Describes practice variations in resource consumption, such as the utilization of diagnostic tests	• Describes the cost implications of using resources and practice variation	• Participates in responsible use of health care resources seeking appropriate assistance	• Practices cost effective care (e.g., managing length of stay, operative efficiency)	• Designs measurement tools to monitor and provide feedback to providers/teams on resource consumption to facilitate improvement
☐	☐	☐	☐	☐ ☐ ☐ ☐ ☐
Comments:				**Not yet achieved Level 1** ☐

Practice Management — Systems-based Practice				
Level 1	Level 2	Level 3	Level 4	Level 5
• Understands basic health payment systems, including uninsured care • Uses EMR appropriately	• Understands the importance of documentation for coding • Able to document inpatient diagnoses • Understands different practice models	• Understands principles of diagnosis, evaluation and management, and procedure coding • Compares and contrasts different practice models	• Codes routine diagnoses, encounters, and surgical procedures; documents medical necessity • Recognizes basic elements needed to establish practice (e.g., negotiations, malpractice insurance, contracts, staffing, compliance, facility accreditation) • Establishes timeline and identifies resources for transition to practice (e.g. information technology, legal, financial, personnel)	• Participates in advocacy activities for health policy • Creates curriculum to teach practice management • Codes complex and unusual diagnoses, encounters and surgical procedures
☐	☐	☐	☐	☐ ☐ ☐ ☐
Comments:				**Not yet achieved Level 1** ☐

The 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 — Practice-based Learning and Improvement				
Level 1	Level 2	Level 3	Level 4	Level 5
• Aware of one's own level of knowledge and expertise and uses feedback from teachers, colleagues, and patients • Identifies learning resources	• Continually seeks and incorporates feedback to improve performance • Develops a learning plan and uses published review articles and guidelines	• Demonstrates a balanced and accurate self-assessment of competence, investigates clinical outcomes and areas for continued improvement • Selects an appropriate evidence-based information tool to answer specific questions	• Demonstrates improvement in clinical outcomes based on continual self-assessment and national database participation • Performs self-directed learning with little external guidance using evidence-based information tools; learning plan includes a process to remain current in knowledge over time	• Demonstrates consistent behavior of incorporating evidence-based information in common practice areas
☐	☐	☐	☐	☐ ☐ ☐ ☐ ☐
Comments:				**Not yet achieved Level 1** ☐

Research and Teaching — Practice-based Learning and Improvement				
Level 1	Level 2	Level 3	Level 4	Level 5
• Describes basic concepts in clinical epidemiology, biostatistics, and clinical reasoning; can categorize research study design • Participates in the education of patients, families, and junior learners	• Ranks study designs and can distinguish relevant research outcomes (e.g., patient-oriented evidence that matters) from other types of evidence • Teaches patients, families, and junior learners	• Applies a set of critical appraisal criteria to different types of research, including synopses of original research findings, systematic reviews and meta-analyses, and clinical practice guidelines • Teaches colleagues and other health professionals in both formal and informal settings; assesses and provides feedback to junior learners	• Formulates a searchable question, describes a plan to investigate it, and participates in a research project • Organizes educational activities at the program level	• Independently plans and executes a research program • Develops educational curriculum and assessment tools
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Comments:				**Not yet achieved Level 1** ☐

Milestones—CARDIOTHORACIC SURGERY TECHNICAL SKILLS—PART I

RESIDENT NAME_____YR OF TRAINING_____ DATE_____
EVALUATOR_____initials_____

Level	Novice	Advanced Beginner	Intermediate	Competent
1. Ischemic Heart Disease	1 **Demonstrates** basic surgical skills (sim or OR)	2 **Assesses**/harvests conduits (e.g., vein mapping) **Performs** surgical opening and closing **Provides** basic intraop assist **Performs** proximal anastomosis	3 **Institutes**/weans from CPB **Performs** routine CABG	4 **Manages** complex CAD (e.g., redo CABG, VSD, ischemic MR, off-pump CABG
2. Cardiopulmonary Bypass	1 **Demonstrates** basic surgical skills (sim or OR)	2 **Performs** axillary, femoral, arterial, or venous cannulation **Performs** peripheral vasc access **Performs** surgical opening and closing **Assists** perfusionist w/ CPB setup and pump run	3 **Cannulates,** institutes CPB, incl myocardial protection in routine cases **Manages** CPB and myocardial protection in routine cases **Weans** and decannu-lates from CPB for routine cases **Recognizes**/manages common acute cx (e.g., coagulopathy. pump failure)	4 **Cannulates**, institutes CPB, incl myocardial protection in complex cases **Manages** CPB and myocardial protection in complex cases **Weans** and decannulates from CPB for complex cases **Institutes** temp circ support for cardiogenic shock (e.g., IABP, ECMO, short-term LV assist **Recognizes**/manages unusual cx (e.g., aortic dissection)
3. Valve Disease	1 **Demonstrates** basic surgical skills (sim or OR)	2 **Identifies** surgical approach for each valve **Performs** surgical opening and closing **Provides** basic intraop assist	3 **Institutes**/weans from CPB **Performs** optimal myocardial protection **Performs** routine valve replacement	4 **Performs** complex valve replacement **Performs** valve repair
4. Great Vessel Disease	1 **Demonstrates** basic surgical skills (sim or OR)	2 **Identifies** surgical approach **Performs** surgical opening, closing, vascular access **Provides** basic intraop assist	3 **Institutes**/weans from CPB **Performs** optimal perfusion and myocardial/neuro protection **Performs** routine aortic replacement **Performs** simple vasc anastomosis	4 **Performs** complex great replacement **Performs** aortic repair **Participates** in endovasc aortic surgery

Additional Comments:

Additional Comments:

Additional Comments:

Additional Comments:

Return to Table of Contents

Milestones—CARDIOTHORACIC SURGERY TECHNICAL SKILLS—PART II

RESIDENT NAME_____YR OF TRAINING_____ DATE_____
EVALUATOR_____initials_____

Level	Novice	Advanced Beginner	Intermediate	Competent
5. Esophagus	1 **Demonstrates** basic surgical skills (sim or OR)	2 **Demonstrates** basic endoscopic skills **Demonstrates** basic min. invasive skills (FLS) **Provides** basic intraop assistance **Performs** basic hand-sewn and stapled anastomosis	3 **Demonstrates** advanced endoscopic skills (endo-mucosal resection (EMR), EUS, stenting) **Performs** routine open and minimally invasive motility operations	4 **Performs** routine esophageal resections **Operatively** manages esophageal perforation/ trauma
Additional Comments:				
6. Lung and Airway	1 **Demonstrates** basic surgical skills (sim or OR)(e.g., positioning patient, suturing)	2 **Demonstrates** basic endoscopic skills (e.g., ports, running videoscope) **Demonstrates** basic min. invasive skills (FLS) **Provides** basic op assist **Performs** common bed-side procedures (e.g, trach, tube, central lines)	3 **Demonstrates** advanced endoscopic skills (e.g., EBUS, stenting, proper port placement **Performs** routine open lung resection **Performs** basic VATS procedures	4 **Performs** complex open lung resection (e.g., Pancoast, sleeve) **Performs** VATS lobectomies
Additional Comments:				
7. Chest wall/Pleura/ Mediastinum	1 **Demonstrates** basic surgical skills (sim or OR)(e.g., knot-tying, suturing) **Performs** common bedside procedures (e.g., chest drain/tube, thoracentesis, pleurodesis	2 **Demonstrates** basic endoscopic and U/S guidance skills (e.g., handling video scope) **Demonstrates** basic min. invasive skills **Provides** basic intraop assistance	3 **Demonstrates** advanced endoscopic skills (e.g., uncomplicated EBUS or mediastinoscopy) **Performs** open and VATS procedures for uncomplica-ted pleural/mediastinal dz (e.g., VATS bx, open Stage I/II thymectomy **Performs** simple chest wall resection (e.g., resect small lateral chondrosarc (<3cm))	4 **Performs** open and VATS procedures for complex dz (e.g., open decort for complex loculated pleural effusion, thymectomy for Stage III thymoma) **Performs** complex chest wall resection/reconstruction (e.g., large chest wall lesion w/ reconstruction)
Additional Comments:				
8. Critical Care	1 **Demonstrates** basic ICU surg skills (sim or bedside), incl. IV, art. line, Foley, NG tube	2 **Performs** cardioversion **Demonstrates** advanced ICU surg skills (sim or bed-side), incl. central line, PA cath, chest tube **Demonstrates** routine ventilator management **Manages** temp. pacemaker	3 **Demonstrates** complex ventilator management **Performs** open chest resuscitation **Performs** emergency pericardiocentesis	4 **Troubleshoots** assist devices
Additional Comments:				

Return to Table of Contents

Sample TS Milestones Evaluation Forms from Northwestern University

Ischemic Heart Disease					
Anatomy	0 No knowledge	1 Basic anatomy and physiology (e.g. angiogram)	2 Common variations anatomy/pathology (e.g. left dominant)	3 Integrate complex anatomy/pathology (e.g. anomalous CA)	4 Anatomy/pathology in complex situations (e.g. redo)
Physiology	0 No knowledge	1 Basic cellular and vascular physiology	2 Changes with IHD (e.g. ischemia, reperfusion, infarction)	3 Role of treatment on physiology of IHD	4 Physiology of complications (e.g. heart failure)
Clinical manifestations	0 No knowledge	1 List manifestations (e.g. angina, MI)	2 Differential diagnosis of similar manifestations (e.g. esophageal, aortic)	3 Common variants of presentation (e.g. unstable angina, silent MI)	4 Complex clinical manifestations (e.g. VSD, acute MR)
Diagnostic tools	0 No knowledge	1 List diagnostic tools (e.g. echo, cath, MRI)	2 Advantages and disadvantages of tools	3 Interprets normal and common abnormal findings (e.g. coronary stenosis, RWMA)	4 Interprets complex abnormalities (e.g. ischemic MR)
Treatment plan	0 No knowledge	1 List treatment options (e.g. CABG, PCI)	2 Advantages and disadvantages of treatment options	3 Appropriate treatment for routine patient with IHD	4 Appropriate treatment for complex IHD (redo, hybrid CABG)
Complications/ outcomes	0 No knowledge	1 Basic complications (e.g. bleeding, infarction, stroke)	2 Risks, benefits, complications	3 ACC/STS/AATS guidelines, basic outcome data (e.g. SYNTAX)	4 Outcomes of all treatment modalities and complications
Comments:					

End stage cardiopulmonary disease					
Anatomy	0 No knowledge	1	2 Basic pathology (e.g. end stage lung dz, cardiomyopathy)	3 Common variants (e.g. COPD vs. IPF, ischemic vs. dilated cardiomyopathy)	4 Complex anatomy/pathology (e.g. adult congenital)
Physiology	0 No knowledge	1 Normal respiratory and cardiac physiology	2 Changes with cardiac and pulmonary failure (low CO, tachycardia hypoxemia)	3 Role of treatment on physiology (e.g. medical tx vs. IABP vs. mech support)	4 Adapts treatment based on physiology (e.g. VAD, advanced ventilator strategies)
Clinical manifestations	0 No knowledge	1 List clinical manifestations (e.g. L sided vs. R sided failure)	2 Differential diagnosis of causes of cardiac and pulmonary failure	3 Common variants (e.g. post partum, infectious)	4 Complex manifestations (e.g. adult congenital, acute MR)

Diagnostic tools	0 No knowledge	1 List diagnostic tools (e.g. Swan, echo)	2 Advantages and disadvantages of tools	3 Interprets normal and common abnormalities (e.g. Swan values, acute vs. chronic)	4 Interprets/integrates complex abnormalities (e.g. RV vs. LV vs. biventricular failure)
Treatment plan	0 No knowledge	1 Understands natural history	2 Lists treatment options (e.g. VAD vs. transplant, LVRS vs. transplant)	3 Advantages and disadvantages of treatment options	4 Appropriate treatment for cardiac/pulmonary failure (e.g. selection criteria for transplant)
Complications/ outcomes	0 No knowledge		2 Signs of decompensation, need for intervention	3 Common complications of treatment	4 Basic outcomes for treatment of cardiac/pulm failure (e.g. limits of mechanical support)
Comments:					
Critical Care					
Physiology	0 No knowledge	1 Basic normal cardiopulmonary physiology	2 Pathophysiologic changes (e.g. Frank Starling curve)	3 Role of treatment on pathophysiology (e.g. manipulating CO, afterload, preload)	4 Adapts treatment based on pathophysiology (e.g. chooses appropriate inotropes)
Clinical manifestations	0 No knowledge	1 List manifestations (e.g. chest pain, dyspnea)	2 Differential diagnosis of critically ill pt	3 Common variants (e.g. post op pain vs. ischemic pain)	4 Complex manifestations (e.g. low cardiac output from R heart failure)
Diagnostic tools	0 No knowledge	1 List diagnostic tools (e.g. swan, cath, echo)	2 Advantages and disadvantages of tools	3 Interprets normal and common abnormalities (e.g. echo images, swan numbers)	4 Interprets/ integrates complex abnormalities (e.g. tamponade, wall motion abnormalities
Treatment plan	0 No knowledge	1 List treatment options (e.g. inotropes, vasodilators, IABP)	2 Advantages and disadvantages of treatment options	3 Appropriate treatment for routine abnormalities (e.g. arrhythmias)	4 Appropriate treatment for complex abnormalities (e.g. dialysis options, MI s/p CABG)
Complications/ outcomes	0 No knowledge			3 Manages post op low cardiac output, knows basic outcome literature	4 Understands risk adjustment and outcome databases
Comments:					

Professionalism					
Ethical issues		1 Understands basic ethical principles	2 Can discuss and manage common ethically challenging situations (e.g. withdrawal of care)	3 Manages ethical issues in complex situations (e.g. Jehovah's witness)	4 Manages issues related to billing, advertising, conflict of interest
Ethical behavior		1 Conveys caring, honesty and genuine interest in patients & families		3 Understands beliefs and values of diverse populations	4 Develops a mutually acceptable care plan in the face of differences
Personal health		1 Understands impact of fatigue	2 Manages personal emotional, physical and mental health	3 Identifies situations in which maintaining personal health is challenging	4 Recognizes signs of physician impairment
Accountability		1 Exhibits reliability, industry, integrity, confidentiality	2 Recognizes individual limits and asks for help when needed	3 Recognizes conflicting interests of self, family and others on delivery of medical care	4 Balances interests of self and others to optimize medical care
Comments:					
Interpersonal and Communication Skills					
Conflict management		1 Recognizes communication conflicts	2 Manages simple team and patient/family conflicts	3 Sustains working relationships in challenging situations	4 Manages conflict in challenging situations, develops relationships across specialties
Teamwork		1 Recognizes multidisciplinary approaches to patient care		3 Maintains collegial relationship with other professional staff	4 Leads team-based care activities
Patient and family interactions		1 Understands patient/family perspective	2 Responds to social and cultural context of patient and family	3 Customizes delivery of emotionally difficult information	4 Facilitates family conferences
Transitions of care		1 Participates in effective transitions of care	2 Understands effects of computer use on information accuracy	3 Manages transitions of care	4 Uses multiple forms of communication with respect for patient privacy
Comments:					
Systems Based Practice					
Resource allocation		1 Describes variation in resource consumption	2 Describes cost implications of using resources and practice variation	3 Participates in responsible use of health care resources	4 Practices cost-effective care

Practice management		1 Understands basic health payment systems	2 Understands different practice models	3 Compares and contrasts practice models	4 Recognizes basic elements needed to establish practice and identifies resources
Patient safety		1 Understands roles of care team members	2 Participates in use of tools to prevent adverse events (e.g. checklists, time out)	3 Consistently uses tools to prevent adverse events (e.g. checklists, handoffs)	4 Leads team by promoting situational awareness and input by all team members
Error management		1 Understands differences between errors, near misses and sentinel events	2 Describes common system causes for errors	3 Reports errors and near misses	4 Leads M+M
Comments:					
Practice Based Learning					
Self-assessment		1 Aware of own level of knowledge and uses feedback	2 Seeks feedback and incorporates to improve performance	3 Demonstrates a balanced and accurate self-assessment	4 Demonstrates improvement based on continual self-assessment
Teaching		1 Participates in education of patients and junior learners	2 Teaches patients and junior learners	3 Leads conferences, provides feedback to junior learners	4 Organizes educational activities at the program level
Comments:					
Cardiopulmonary Bypass					
Components/ circuit	0 No knowledge	1 List basic components of circuit	2 Cannulation techniques and options (e.g. bicaval, peripheral, partial)	3 Cardioplegia solutions and delivery modes	4 Advanced support (e.g. circ arrest or ECMO)
Physiology/ pharmacology	0 No knowledge	1 Pulsatile vs. nonpulsatile	2 IABP physiology	3 Pharmacology and physiology of postcardiotomy hemodynamics	4 Treatment of postcardiotomy shock syndrome
Myocardial protection	0 No knowledge	1 Basics (e.g. O2 demand)	2 Options for protection routine and trauma (e.g. cardioplegia types, delivery strategies)	3 Advantages/ disadvantages of protection strategies	

Coagulation/ acid base management	0 No knowledge	1 Coagulation pathways	2 Coagulation cascade inhibitors (e.g. heparin, warfarin, argatroban)	3 Acid/base and anticoagulation management on bypass (e.g. pH stat)	4 Diagnosis and treatment of HIT, coagulopathy
Complications	0 No knowledge	1 List complications (e.g. bleeding, renal failure, pulmonary dysfunction)	2 Understands complications including when and why they occur	3 Manages routine complications (e.g. air in heart, inadequate drainage, incomplete arrest)	4 Manages complex complications (e.g. aortic dissection, air embolism)
Comments:					
Valvular Disease					
Anatomy	0 No knowledge	1 Basic anatomy and pathology	2 Common variations in anatomy/ pathology (e.g. bicuspid aortic valve, types of MR)	3 Integrate complex anatomy/ pathology (e.g. bicuspid AS, functional MR)	4 Complex variations anatomy/pathology (e.g. CAD and MR, bicuspid valve and ascending aneurysm)
Physiology	0 No knowledge	1 Basic valve physiology	2 Changes with valve disease (pulm HTN with MR)	3 Effect of treatment on physiology (e.g. afib treatment on output)	4 Adapts treatment based on physiology (e.g. MR and TR in AS or CAD)
Clinical manifestations	0 No knowledge	1 List manifestations (e.g. dyspnea, angina, syncope)	2 Differential diagnosis of similar manifestations (e.g. CAD, emphysema)	3 Common variants of valve disease (e.g. fatigue, exercise intolerance)	4 Complex clinical manifestations (e.g. staging CHF)
Diagnostic tools	0 No knowledge	1 List tools	2 Advantages and disadvantages of tools (e.g. TTE vs. TEE)	3 Interprets normal and common abnormalities (e.g. intraop TEE)	4 Interprets/ integrates complex abnormalities (e.g. HOCM)
Treatment plan	0 No knowledge	1 Lists treatment options (e.g. valvuloplasty, repair)	2 Advantages and disadvantages of treatment options	3 Appropriate treatment for routine valve disease	4 Appropriate treatment for complex valve disease (e.g. combined CABG, root enlargement)
Complications/ outcomes	0 No knowledge	1 Basic complications (e.g. perivalvular leak, endocarditis)	2 Natural history of valve disease and incidence of complications	3 ACC/STS/AATS guidelines for surgery, basic outcome data	4 Outcomes of all treatment modalities and complications
Comments:					

Great Vessel Disease					
Anatomy	0 No knowledge	1 Basic anatomy and pathology (e.g. aortic branching)	2 Common variations anatomy/pathology (e.g. location aortic transection)	3 Integrate complex anatomy/pathology (e.g. types of aortic dissection)	4 Complex variations anatomy/pathology (e.g. vascular rings)
Clinical manifestations	0 No knowledge	1 List manifestations (e.g. chest pain, Marfan's)	2 Differential diagnosis of similar manifestations (e.g. MI, esophageal spasm)	3 Common variants of manifestations (e.g. bowel ischemia, renal dysfunction)	4 Complex clinical manifestations (e.g. acute MI vs. dissection)
Diagnostic tools	0 No knowledge	1 List diagnostic tools (e.g. TEE, CT, angio, MR)	2 Advantages and disadvantages of tools	3 Interprets normal and common abnormalities (e.g. ascending aneurysm, dissection)	4 Integrates/interprets complex abnormalities (e.g. penetrating aortic ulcer, arch aneurysm)
Treatment plan	0 No knowledge	1 List treatment options	2 Advantages and disadvantages of options (e.g. endo vs. open)	3 Appropriate treatment for routine patient (e.g. neuroprotection, circ arrest)	4 Appropriate treatment for complex patients (CPB techniques)
Complications/ outcomes	0 No knowledge	1 Basic complications (e.g. stroke, paraplegia)	2 Natural history and incidence of complications (e.g. rupture)	3 Basic outcome literature	4 Outcomes of all treatment modalities and complications
Comments:					

Sample Nursing Evaluation Forms from Northwestern University

Professionalism					
Ethical behavior		1 Conveys caring, honesty and genuine interest in patients and families		3 Understands beliefs and values of diverse populations	4 Develops a mutually acceptable care plan in the face of differences
Accountability		1 Exhibits reliability, industry, integrity, confidentiality	2 Recognizes individual limits and asks for help when needed	3 Recognizes conflicting interests of self, family and others on delivery of medical care	4 Balances interests of self and others to optimize medical care
Ethical issues		1 Understands basic ethical principles	2 Can discuss and manage common ethically challenging situations (e.g. withdrawal of care)	3 Manages ethical issues in complex situations (e.g. Jehovah's witness)	4 Manages issues related to billing, advertising, conflict of interest
Personal health		1 Understands impact of fatigue	2 Manages personal emotional, physical and mental health	3 Identifies situations in which maintaining personal health is challenging	4 Recognizes signs of physician impairment
Comments:					
Interpersonal and Communication Skills					
Conflict management		1 Recognizes communication conflicts	2 Manages simple team and patient/family conflicts	3 Sustains working relationships in challenging situations	4 Manages conflict in challenging situations, develops relationships across specialties
Teamwork		1 Recognizes multidisciplinary approaches to patient care		3 Maintains collegial relationship with other professional staff	4 Leads team-based care activities
Patient and family interactions		1 Understands patient/family perspective	2 Responds to social and cultural context of patient and family	3 Customizes delivery of emotionally difficult information	4 Facilitates family conferences
Transitions of care		1 Participates in effective transitions of care	2 Understands effects of computer use on information accuracy	3 Manages transitions of care	4 Uses multiple forms of communication with respect for patient privacy
Comments:					

Systems Based Practice					
Patient safety		1 Understands roles of care team members	2 Participates in use of tools to prevent adverse events (e.g. checklists, time out)	3 Consistently uses tools to prevent adverse events (e.g. checklists, handoffs)	4 Leads team by promoting situational awareness and input by all team members
Resource allocation		1 Describes variation in resource consumption	2 Describes cost implications of using resources and practice variation	3 Participates in responsible use of health care resources	4 Practices cost-effective care
Practice management		1 Understands basic health payment systems	2 Understands different practice models	3 Compares and contrasts practice models	4 Recognizes basic elements needed to establish practice and identifies resources
Comments:					
Practice Based Learning					
Teaching		1 Participates in education of patients and junior learners	2 Teaches patients and junior learners	3 Leads conferences, provides feedback to junior learners	4 Organizes educational activities at the program level
Self-assessment		1 Aware of own level of knowledge and uses feedback	2 Seeks feedback and incorporates to improve performance	3 Demonstrates a balanced and accurate self-assessment	4 Demonstrates improvement based on continual self-assessment
Comments:					

Sample Peer Evaluation Forms from Northwestern University

Critical Care					
Physiology	0 No knowledge	1 Basic normal cardiopulmonary physiology	2 Pathophysiologic changes (e.g. Frank Starling curve)	3 Role of treatment on pathophysiology (e.g. manipulating CO, afterload, preload)	4 Adapts treatment based on pathophysiology (e.g. chooses appropriate inotropes)
Clinical manifestations	0 No knowledge	1 List manifestations (e.g. chest pain, dyspnea)	2 Differential diagnosis of critically ill pt	3 Common variants (e.g. post op pain vs. ischemic pain)	4 Complex manifestations (e.g. low cardiac output from R heart failure)
Diagnostic tools	0 No knowledge	1 List diagnostic tools (e.g. swan, cath, echo)	2 Advantages and disadvantages of tools	3 Interprets normal and common abnormalities (e.g. echo images, swan numbers)	4 Interprets/ integrates complex abnormalities (e.g. tamponade, wall motion abnormalities
Treatment plan	0 No knowledge	1 List treatment options (e.g. inotropes, vasodilators, IABP)	2 Advantages and disadvantages of treatment options	3 Appropriate treatment for routine abnormalities (e.g. arrhythmias)	4 Appropriate treatment for complex abnormalities (e.g. dialysis options, MI s/p CABG)
Complications/ outcomes	0 No knowledge			3 Manages post op low cardiac output, knows basic outcome literature	4 Understands risk adjustment and outcome databases
Comments:					
Professionalism					
Ethical behavior		1 Conveys caring, honesty and genuine interest in patients and families		3 Understands beliefs and values of diverse populations	4 Develops a mutually acceptable care plan in the face of differences
Personal health		1 Understands impact of fatigue	2 Manages personal emotional, physical and mental health	3 Identifies situations in which maintaining personal health is challenging	4 Recognizes signs of physician impairment
Accountability		1 Exhibits reliability, industry, integrity, confidentiality	2 Recognizes individual limits and asks for help when needed	3 Recognizes conflicting interests of self, family and others on delivery of medical care	4 Balances interests of self and others to optimize medical care

Ethical issues		1 Understands basic ethical principles	2 Can discuss and manage common ethically challenging situations (e.g. withdrawal of care)	3 Manages ethical issues in complex situations (e.g. Jehovah's witness)	4 Manages issues related to billing, advertising, conflict of interest
Comments:					
Interpersonal and Communication Skills					
Conflict management		1 Recognizes communication conflicts	2 Manages simple team and patient/family conflicts	3 Sustains working relationships in challenging situations	4 Manages conflict in challenging situations, develops relationships across specialties
Teamwork		1 Recognizes multidisciplinary approaches to patient care		3 Maintains collegial relationship with other professional staff	4 Leads team-based care activities
Patient and family interactions		1 Understands patient/family perspective	2 Responds to social and cultural context of patient and family	3 Customizes delivery of emotionally difficult information	4 Facilitates family conferences
Transitions of care		1 Participates in effective transitions of care	2 Understands effects of computer use on information accuracy	3 Manages transitions of care	4 Uses multiple forms of communication with respect for patient privacy
Comments:					
Systems Based Practice					
Patient safety		1 Understands roles of care team members	2 Participates in use of tools to prevent adverse events (e.g. checklists, time out)	3 Consistently uses tools to prevent adverse events (e.g. checklists, handoffs)	4 Leads team by promoting situational awareness and input by all team members
Resource allocation		1 Describes variation in resource consumption	2 Describes cost implications of using resources and practice variation	3 Participates in responsible use of health care resources	4 Practices cost-effective care
Practice management		1 Understands basic health payment systems	2 Understands different practice models	3 Compares and contrasts practice models	4 Recognizes basic elements needed to establish practice and identifies resources
Error management		1 Understands differences between errors, near misses and sentinel events	2 Describes common system causes for errors	3 Reports errors and near misses	4 Leads M+M

Comments:					
Practice Based Learning					
Teaching		1 Participates in education of patients and junior learners	2 Teaches patients and junior learners	3 Leads conferences, provides feedback to junior learners	4 Organizes educational activities at the program level
Self-assessment		1 Aware of own level of knowledge and uses feedback	2 Seeks feedback and incorporates to improve performance	3 Demonstrates a balanced and accurate self-assessment	4 Demonstrates improvement based on continual self-assessment
Comments:					

Sample Thoracic Evaluation Forms from Northwestern University

Esophagus					
Anatomy	0 No knowledge	1 Basic anatomy and pathology (e.g. muscle layers, vascular supply)	2 Common variations (e.g. lymphatic drainage of various parts)	3 Integrates anatomy and pathology (e.g. fascial planes in mediastinitis)	4 Complex anatomy/pathology (e.g. congenital atresia)
Physiology	0 No knowledge	1 Basic foregut physiology (e.g.motility)	2 Changes with pathology (e.g.motility disorders, reflux)	3 Role of treatment on physiology (e.g. dumping after esophagectomy)	4 Adapts treatment based on physiology (partial vs. total fundoplication)
Clinical manifestations	0 No knowledge	1 List manifestations (e.g. heartburn)	2 Differential diagnosis for manifestations	3 Common variants of esophageal disease (benign vs. malignant stricture)	4 Complex clinical manifestations (TEF, type IV hernia)
Diagnostic tools	0 No knowledge	1 List diagnostic tools (e.g. manometry, pH testing, EUS)	2 Advantages and disadvantages of tools	3 Interprets normal and common abnormalities (e.g. motility tracings)	4 Interprets/integrates complex abnormalities (e.g. short esophagus)
Treatment plan	0 No knowledge	1 List treatment options (e.g. surgery vs. chemo, botox vs. Heller)	2 Advantages and disadvantages of treatment, cancer staging	3 Appropriate treatment for routine patient	4 Appropriate treatment for complex patient (e.g. redo nissen)
Complications/ outcomes	0 No knowledge	1 Basic complications (e.g. leak, recurrent reflux)	2 Incidence of complications and management	3 Basic outcomes literature (benign and malignant)	4 Outcomes of all treatment modalities and complications
Comments:					
Lung and Airway					
Anatomy	0 No knowledge	1 Basic anatomy and pathology (e.g. lung segments, types of lung CA)	2 Common variations (e.g. azygous lobe, mixed histology, uncommon tumors)		4 Complex variations (e.g. congenital lesions, TEF, tracheal tumors)
Physiology	0 No knowledge	1 Basic physiology (e.g. A-a gradient)	2 Changes with pulmonary disease (e.g. shunt, pulm HTN, tension PTX)	3 Role of treatment on physiology (e.g. effects of pneumonectomy)	4 Adapts treatment based on physiology (e.g. sublobar resection with limited PFTs, LVRS)
Clinical manifestations	0 No knowledge	1 List manifestations	2 Differential diagnosis for manifestations	3 Common variants of manifestations (e.g. tracheal tumors, presentation of COPD)	4 Complex manifestations (e.g. BPF, TEF)

Diagnostic tools	0 No knowledge	1 List diagnostic tools	2 Advantages and disadvantages of tools	3 Interprets normal and common abnormalities (e.g. PFTs, PET)	4 Interprets/integrates complex abnormalities (e.g. quant V/Q, MVO2)
Treatment plan	0 No knowledge	1 List treatment options (e.g. lobe vs. segment vs. SBRT)	2 Advantages and disadvantages of options	3 Appropriate treatment for routine patient	4 Appropriate treatment for complex patient (e.g. poor PFTs, tracheal disorders)
Complications/ outcomes	0 No knowledge	1 Basic complications	2 Incidence and management of complications	3 Basic outcomes (e.g. IASLC lung cancer survival)	4 Outcomes of all treatment modalities and complications (e.g. NETT, induction for stage IIIA)
Comments:					
Chest wall/pleura/mediastinum					
Anatomy	0 No knowledge	1 Basic anatomy and pathology (e.g. mediastinal compartments)	2 Common variations (e.g. cervical rib, replaced R subclavian)	3 Integrates anatomy and pathology (e.g Pancoast syndrome, dumbbell tumor)	4 Complex variations (e.g. vascular rings, mesothelioma)
Physiology	0 No knowledge	1 Basic physiology (e.g. pleural pressures)	2 Changes with pathology (e.g. flail chest, paralyzed diaphragm)	3 Role of treatment on physiology (e.g. effects of chest wall resection)	4 Adapts treatment based on physiology (e.g. need for reconstruction of defects)
Clinical manifestations	0 No knowledge	1 List manifestations	2 Differential diagnosis for manifestations	3 Common variants of manifestations (e.g. neurogenic vs. vascular symptoms for TOS)	4 Complex manifestations (e.g. infected chest wall reconstruction)
Diagnostic tools	0 No knowledge	1 List diagnostic tools	2 Advantages and disadvantages of tools	3 Interprets normal and common abnormalities (e.g. radiographic features of chest wall tumors)	4 Interprets/integrates complex abnormalities (e.g. MRI for TOS, diagnostic plan for lymphoma vs thymoma))
Treatment plan	0 No knowledge	1 List treatment options (e.g. pleurodesis vs. pleurX)	2 Advantages and disadvantages of options	3 Appropriate treatment for routine patient	4 Appropriate treatment for complex patient (e.g. sternal tumor, mesothelioma)
Complications/ outcomes	0 No knowledge	1 Basic complications	2 Incidence and management of complications	3 Basic outcomes (e.g. local recurrence and survival for chest wall tumors)	4 Outcomes of all treatment modalities and complications (e.g. pleurectomy vs. EPP for meso)

Comments:					
Professionalism					
Ethical issues		1 Understands basic ethical principles	2 Can discuss and manage common ethically challenging situations (e.g. withdrawal of care)	3 Manages ethical issues in complex situations (e.g. Jehovah's witness)	4 Manages issues related to billing, advertising, conflict of interest
Ethical behavior		1 Conveys caring, honesty and genuine interest in patients and families		3 Understands beliefs and values of diverse populations	4 Develops a mutually acceptable care plan in the face of differences
Personal health		1 Understands impact of fatigue	2 Manages personal emotional, physical and mental health	3 Identifies situations in which maintaining personal health is challenging	4 Recognizes signs of physician impairment
Accountability		1 Exhibits reliability, industry, integrity, confidentiality	2 Recognizes individual limits and asks for help when needed	3 Recognizes conflicting interests of self, family and others on delivery of medical care	4 Balances interests of self and others to optimize medical care
Comments:					
Interpersonal and Communication Skills					
Conflict management		1 Recognizes communication conflicts	2 Manages simple team and patient/family conflicts	3 Sustains working relationships in challenging situations	4 Manages conflict in challenging situations, develops relationships across specialties
Teamwork		1 Recognizes multidisciplinary approaches to patient care		3 Maintains collegial relationship with other professional staff	4 Leads team-based care activities
Patient and family interactions		1 Understands patient/family perspective	2 Responds to social and cultural context of patient and family	3 Customizes delivery of emotionally difficult information	4 Facilitates family conferences
Transitions of care		1 Participates in effective transitions of care	2 Understands effects of computer use on information accuracy	3 Manages transitions of care	4 Uses multiple forms of communication with respect for patient privacy
Comments:					

Systems Based Practice					
Patient safety		1 Understands roles of care team members	2 Participates in use of tools to prevent adverse events (e.g. checklists, time out)	3 Consistently uses tools to prevent adverse events (e.g. checklists, handoffs)	4 Leads team by promoting situational awareness and input by all team members
Resource allocation		1 Describes variation in resource consumption	2 Describes cost implications of using resources and practice variation	3 Participates in responsible use of health care resources	4 Practices cost-effective care
Practice management		1 Understands basic health payment systems	2 Understands different practice models	3 Compares and contrasts practice models	4 Recognizes basic elements needed to establish practice and identifies resources
Comments:					
Practice Based Learning					
Self assessment		1 Aware of own level of knowledge and uses feedback	2 Seeks feedback and incorporates to improve performance	3 Demonstrates a balanced and accurate self assessment	4 Demonstrates improvement based on continual self assessment
Teaching		1 Participates in education of patients and junior learners	2 Teaches patients and junior learners	3 Leads conferences, provides feedback to junior learners	4 Organizes educational activities at the program level
Comments:					

Milestone Reporting Mechanisms: eValue and Other Platform Modifications

Stephen C. Yang, MD | The John Hopkins Medical Institutions | JCTSE TS Educators Breakfast Club | AATS 2014

"The Milestones provide a framework for the assessment of the development of the resident physician in key dimensions of the elements of physician competency in a specialty or subspecialty. The Milestones are designed only for use in evaluation of resident physicians in the context of their participation in Accreditation Council for Graduate Medical Education (ACGME) - accredited residency or fellowship programs. They neither represent the entirety of the dimensions of the 6 domains of physician competency, nor are they designed to be relevant in any other context." – Stephen C. Yang, Journal of Graduate Medical Education, March 2014

Key Points for Choosing the Right Electronic Platform

- #1: Dependent on your Institution's Graduate Medical Committee
- Make sure you are able to import and show summary data from evaluations/ tools
- Generate simple counts of how many evaluators chose a certain answer to a certain question
- Connect evaluation questions to Milestones reports by: competency, unique questions, and/or directly verbatim

Platform #1: E-Value

E*VALUE owering Healthcare Education

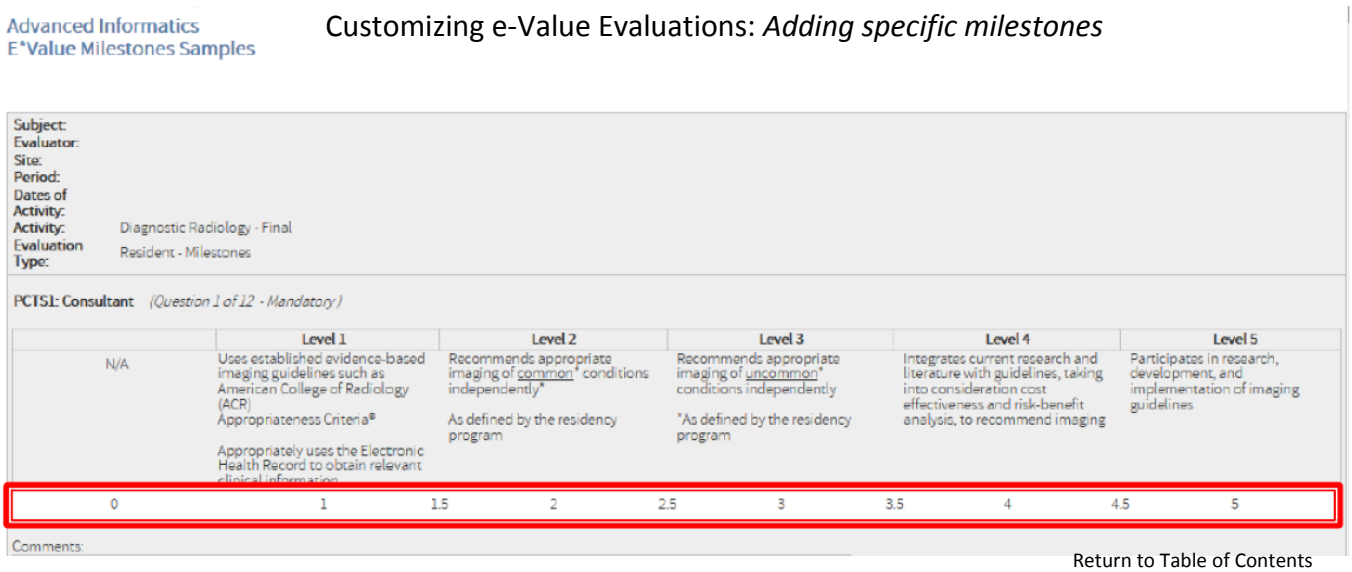
Information to get started: Website: https://www.e-value.net

Login name: gmeclient

Password: milestones

Advanced Informatics
E*Value Milestones Samples

Customizing e-Value Evaluations: *Adding specific milestones*



Subject:
Evaluator:
Site:
Period:
Dates of Activity:
Activity: Diagnostic Radiology - Final
Evaluation Type: Resident - Milestones

PCTS1: Consultant *(Question 1 of 12 - Mandatory)*

	Level 1	Level 2	Level 3	Level 4	Level 5
N/A	Uses established evidence-based imaging guidelines such as American College of Radiology (ACR) Appropriateness Criteria® Appropriately uses the Electronic Health Record to obtain relevant clinical information	Recommends appropriate imaging of common* conditions independently* As defined by the residency program	Recommends appropriate imaging of uncommon* conditions independently *As defined by the residency program	Integrates current research and literature with guidelines, taking into consideration cost effectiveness and risk-benefit analysis, to recommend imaging	Participates in research, development, and implementation of imaging guidelines

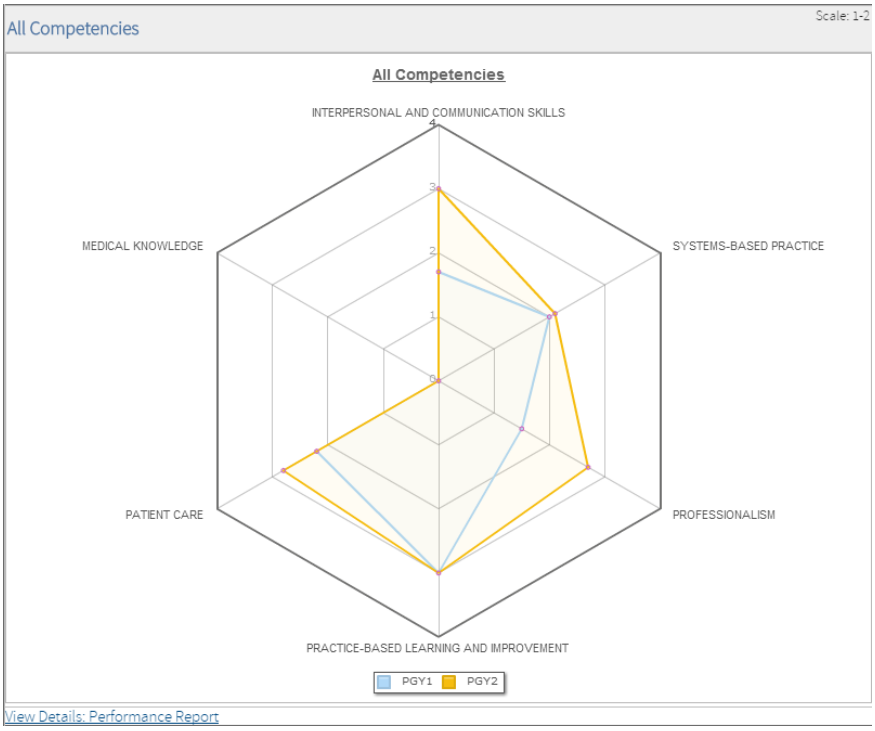
0 1 1.5 2 2.5 3 3.5 4 4.5 5

Comments:

Return to Table of Contents

Customizing e-Value Evaluations: *Generating individual and collective polar graphs*

Radar Chart Comparison



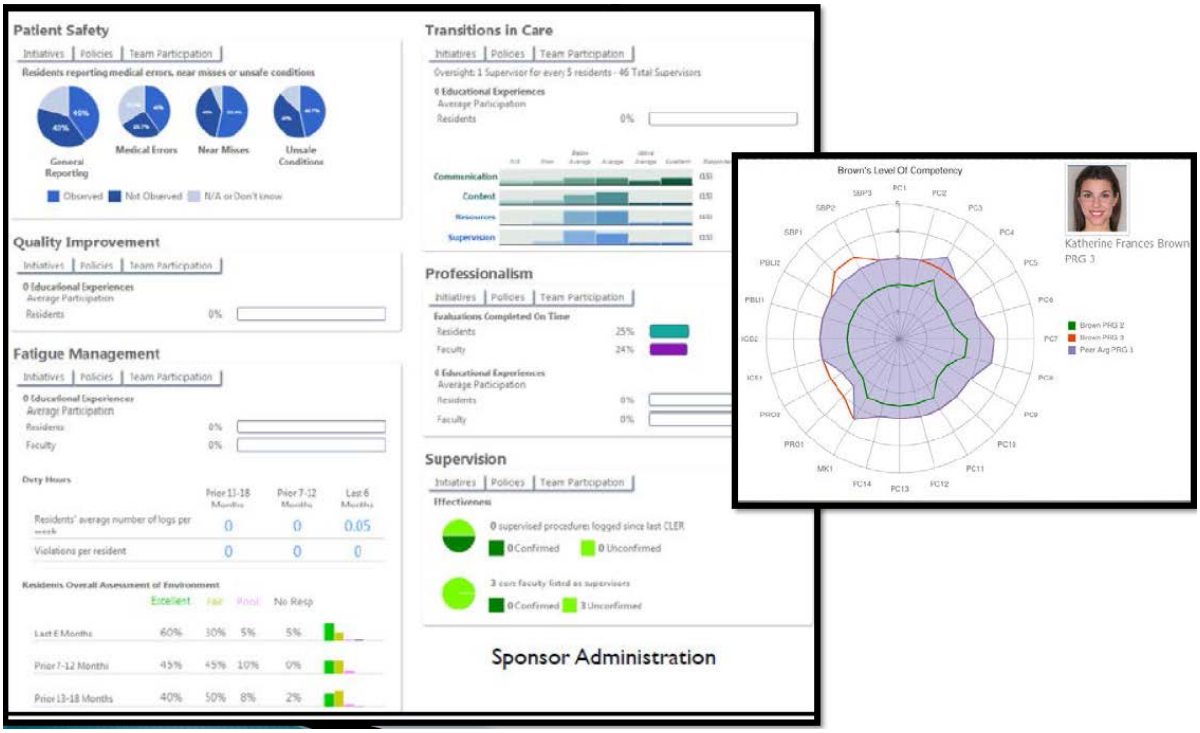
Platform #2: MedHub

Customizing MedHub Evaluations: *Online video modules*

Return to Table of Contents

Platform #3: New Innovation

Customizing New Innovation Evaluations: *Report Generation*



Assessment Tools Specific for CT Surgery

- SESATS
- Moodle Courses
- TSC Curriculum and Modules
- Simulation/ Video Assessment
- Database Patient Outcomes
- Observation of Patient Encounters
- Presentation skills
- Patient evaluation
- QI Review
- Residents as educator
- Chart audit

Return to Table of Contents

Implementing Milestones with Evidence: The San Antonio Solution

A.J. Carpenter, MD, PhD | UTHSCSA | JCTSE TS Educators Breakfast Club | AATS 2014

Introduction

- The Milestones are not intended to be evaluation tools in which the faculty express their opinions, but rather to be objectives for the resident to achieve.
- Competency Based Education
- The milestones need to be used as an evaluation tool engaging the residents in their own education.

Milestones list knowledge and skills the resident is expected to achieve:

- Resident guidance
- Program structure
- Residency Program Review

Residency Program Responsibility

- Define evidence by which the milestones are achieved/ competency demonstrated

Resident Responsibility

- Understand requirements
- Be an active participant in meeting each milestone

Reporting Responsibility

- Submit levels to the ACGME for EACH resident, twice annually
- Be prepared to provide evidence

Return to Table of Contents

Sample Assessment Form

Medical Knowledge: Ischemic Heart Disease				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic anatomy and pathology (identifies coronary anatomy on angiogram) • Knows basic cellular and vascular physiology • Lists clinical manifestations of ischemic heart disease (e.g., angina, myocardial infarction) • Lists diagnostic tools available for evaluation of ischemic heart disease • Lists treatment options for ischemic heart disease (e.g., CABG, PCI) • Knows basic complications for ischemic heart disease	• Understands common variations in anatomy and pathology (e.g., left dominant system) • Understands physiologic changes accompanying ischemic heart disease (e.g., ischemia, ischemia reperfusion injury, infarction, recovering myocardium) • Generates differential diagnosis of disease with similar manifestations (e.g., esophageal and aortic problems, pleurisy • Understands advantages and disadvantages of diagnostic tools in evaluating ischemic heart disease (e.g., EKG vs. echocardiogram vs.	• Understands complex integrations between anatomy and pathology (e.g., anomalous coronary artery) • Understands the role of treatment on physiology of ischemic heart disease • Identifies the common variants of the clinical manifestations of ischemic heart disease (e.g., unstable angina, acute myocardial infarction, silent ischemia) • Interprets normal and common abnormalities associated with ischemic heart disease (e.g., reads coronary angiogram, complex EKG)	• Understands complex variations in anatomy and pathology, including congenital (e.g., able to identify coronary anatomy in reoperative surgery) • Adapts therapeutic management based on understanding of physiology of complications of ischemic heart disease (e.g., post infarct VSD, ischemic mitral regurgitation) • Distinguishes the complex clinical manifestations and complications of ischemic heart disease • Interprets and integrates complex abnormalities associated with ischemic heart disease	• Understands implications of SYNTAX score • Presents on outcomes of ischemic heart disease at local, regional or national meeting

Breaking the Big Task into Smaller Ones

Knowledge milestones can be broken up into Adult Cardiac, Thoracic, Congenital and Critical Care.

Skills milestones can be broken up into Adult Cardiac, Thoracic and Critical Care

The "Core Competencies":

- Professionalism
- Interpersonal and Communication skills
- Systems Based Practice
- Practice Based Learning.

Return to Table of Contents

How to Evaluate Medical Knowledge Milestones

- Identify Didactic Content
  - Thoracic Surgical Curriculum (mostly)
- Document Resident Participation
  - Attendance
- Assess Resident's Understanding
  - Quizzes/ Clinical Scenarios

Sample Medical Knowledge Milestone Assessment Form: Ischemic Heart Disease

MILESTONE Level 1	Date	Faculty	Assessment Method	MILESTONE Level 2	Date	Faculty	Assessment Method
Knows basic anatomy and pathology (identifies coronary anatomy on angiogram) CV01				Understands common variations in anatomy and pathology (e.g., left dominant system) CV01, CV02			
Knows basic cellular and vascular physiology CV01				Understands physiologic changes accompanying ischemic heart disease (e.g., ischemia, ischemia reperfusion injury, infarction, recovering myocardium) CV07			
Lists clinical manifestations of ischemic heart disease (e.g., angina, myocardial infarction) CV07				Generates differential diagnosis of disease with similar manifestations (e.g., esophageal and aortic problems, pleurisy) CV07			
Lists diagnostic tools available for evaluation of ischemic heart disease CV07				Understands advantages and disadvantages of diagnostic tools in evaluating ischemic heart disease (e.g., EKG vs. echocardiogram vs. angiogram) CV07			
Lists treatment options for ischemic heart disease (e.g., CABG, PCI) CV08, CV09				Understands advantages and disadvantages of various treatment options for ischemic heart disease CV08			

Return to Table of Contents

How to Evaluate Patient Care and Technical Skills Milestones

- Identify Relevant Assessment/ Environment
  - Didactic, Clinic, simulation, OR, Hospital
  - ? New/ Specific rotation
- Engage Resident Participation
  - Seek Experience
- Involve faculty in regular reviews
  - 1:1 Milestones review
  - Consensus evaluation

Sample Medical Patient Care/Technical Skills Assessment Form: Ischemic Heart Disease

MILESTONE Level 1	Date	Fac	Assessment Method	MILESTONE Level 2	Date	Faculty	Assessment Method
Orders basic diagnostic and preoperative assessment tests for ischemic heart disease (e.g., cardiac cath, stress test) CV03, observation				Interprets and prioritizes diagnostic and physiologic assessment tests for routine patient with ischemic heart disease Clinic/ Hospital observation			
Lists basic treatment options for routine ischemic heart disease (e.g, medical management, PCI vs. CABG) CV04				Recognizes routine post-operative complications (e.g., CVA, shock, tamponade, interprets abnormal EKG) Hospital observation			
Demonstrates basic surgical skills (simulation vs. OR) Sim lab/ OR observation				Suggests treatment plan for patient with routine ischemic heart disease Clinic/ Hospital observation			

Return to Table of Contents

Core Competency

- Professionalism
    - 360° reviews
    - Faculty consensus
- Interpersonal and communication skills
    - 360° reviews
- Systems based practice
    - Engage residents in patient safety projects
    - Group discussions resource allocation
    - Business/ Practice management curriculum
- Practice based learning
    - Coding, compliance, billing
    - M&M conferences, Quality improvement projects
    - 360° reviews- student, junior residents

Summarizing and Reporting Levels

- Math (# bullets achieved/ # available) x 5
    - Medical Knowledge: Ischemic Heart Disease
        - 25 Bullets
        - If 10 are achieved, level is 2
- Clinical Competency Committee reviews each Resident's Assessment form, agrees (or not), does the math

Each Resident/ Each Milestone

Level

Entered directly to the ACGME website

Return to Table of Contents

Northwestern University's Milestones Worksheet - Shari Meyerson, MD as presented at the Sunday, April 27, 2014
JCTSE Thoracic Surgery Educators Breakfast Club

NOTE: This document is a summary of the interactive Excel spreadsheet that may be found on the JCTSE web site at:
http://www.jctse.org/education/educationthoracic-surgery-milestones-2/

Northwestern University's Milestones Worksheet Shari Meyerson, MD, Program Director General Thoracic Surgery, Northwestern Memorial Hospital

Column A:	List of all the individual bullet points of the Milestones.
Column B:	Curriculum -- Dr. Meyerson used this to blueprint where in the curriculum she expected the resident to learn this point (e.g. conference topic, a specific rotation or another experience).
Column C:	Evaluation -- Dr. Meyeson used this to blueprint her sources of evaluation for each point which includes faculty evals, nursing evals, checklists, QI projects, research projects, etc.
Column D:	Date Achieved -- During the CCC meetings, the program coordinator puts an x in the box if it is decided the resident has met that bullet point.
	After the meeting, Dr. Meyerson uses "Find and Replace" to put the date of the meeting in where each of the x's are.
Column E:	Evidence -- This is where the program coordinator records what they used to decide the resident has met that bullet point (i.e. evals, research projects, nursing evals, student evals, etc.)
	They go through the conference schedule in advance and add-in any conferences that the resident has led as one source of evidence.
Column F:	This is the first part of the calculator. It defaults to 0 and will change to 1 if anything is typed in the date achieved box.
Columns H-Q:	Calculates the Milestones
	The output of the calculation shows-up in the table at the bottom (row 557-582, column B) under the heading of Current Status .
	After the worksheet is updated for each meeting you should highlight the values under Current Status and copy them.
	Then, highlight the next empty box in row 557 and choose "Paste Special" (right click and it will be an option). This takes you to a list of choices where you should pick "values."
	This will copy the numbers of the resident's current Milestones into a fresh column which can be titled with the date of the meeting.
	Doing this over time will build a chart where each column represents a CCC meeting giving you a record of their progress.
	It is these numbers from the chart that will need to be submitted to the ACGME.

The first worksheet shows a sample of how the form is completed after one CCC meeting was completed for an imaginary resident. The second sample worksheet is blank.

Return to Table of Contents

	A	B	C	D	E
1	Item	Curriculum	Evaluation	Date Achieved	Evidence
2	Medical Knowledge Ischemic Heart Disease				
3	Knows basic anatomy and pathology (identifies coronary anatomy on angiogram)	anatomy and physiology/cath	TSITE, faculty evaluation, presentation	today	cardiac anaotmy, fac eval
4	Knows basic cellular and vascular physiology	anatomy and physiology	TSITE, faculty evaluation, presentation	today	fac eval
5	Lists clinical manifestations of ischemic heart disease (e.g., angina, myocardial infarction)	CABG	TSITE, faculty evaluation, presentation	today	fac eval
6	Lists diagnostic tools available for evaluation of ischemic heart disease	echo, cath	TSITE, faculty evaluation, presentation	today	fac eval
7	Lists treatment options for ischemic heart disease (e.g., CABG, PCI)	CABG	TSITE, faculty evaluation, presentation	today	fac eval
8	Knows basic complications for ischemic heart disease	CABG complications	TSITE, faculty evaluation, presentation		
9	Understands common variations in anatomy and pathology (e.g., left dominant system)	anatomy/physiology, cath	TSITE, faculty evaluation, presentation		
10	Understands physiologic changes accompanying ischemic heart disease (e.g., ischemia, ischemia reperfusion injury, infarction, recovering myocardium)	acute MI	TSITE, faculty evaluation, presentation		
11	Generates differential diagnosis of disease with similar manifestations (e.g., esophageal and aortic problems, pleurisy	CABG	TSITE, faculty evaluation, presentation		
12	Understands advantages and disadvantages of diagnostic tools in evaluating ischemic heart disease (e.g., EKG vs. echocardiogram vs. angiogram	echo, cath, nuc med	TSITE, faculty evaluation, presentation		
13	Understands advantages and disadvantages of various treatment options for ischemic heart disease	CABG vs PCI, conduit selection, on vs off pump	TSITE, faculty evaluation, presentation		
14	Understands risks, benefits and complications of treatment modalities	CABG outcomes, CABG complications	TSITE, faculty evaluation, presentation		
15	Understands complex integrations between anatomy and pathology (e.g., anomalous coronary artery)	coronary anomalies	TSITE, faculty evaluation, presentation		
16	Understands the role of treatment on physiology of ischemic heart disease	low cardiac output, CABG outcomes	TSITE, faculty evaluation, presentation		
17	Identifies the common variants of the clinical manifestations of ischemic heart disease (e.g., unstable angina, acute myocardial infarction, silent ischemia)	acute MI	TSITE, faculty evaluation, presentation		
18	Interprets normal and common abnormalities associated with ischemic heart disease (e.g., reads coronary angiogram, complex EKG)	cath, echo	TSITE, faculty evaluation, presentation		
19	Identifies appropriate treatment for routine patient with ischemic heart disease.	CABG vs PCI	TSITE, faculty evaluation, presentation		
20	Familiar with ACC/STS/AATS guidelines	risk stratification/indications	TSITE, faculty evaluation, presentation		
21	Knows basic outcome literature for ischemic heart disease (e.g., SYNTAX Trial)	CABG vs PCI	TSITE, faculty evaluation, presentation		
22	Understands complex variations in anatomy and pathology, including congenital (e.g., able to identify coronary anatomy in reoperative surgery)	redo surgery, coronary anomalies	TSITE, faculty evaluation, presentation		
23	Adapts therapeutic management based on understanding of physiology of complications of ischemic heart disease (e.g., post infarct VSD, ischemic mitral regurgitation)	postinfarct VSD, ischemic MR, LV aneurysm	TSITE, faculty evaluation, presentation		

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
24	Distinguishes the complex clinical manifestations and complications of ischemic heart disease	CABG complications, postinfarct VSD	TSITE, faculty evaluation, presentation		
25	Interprets and integrates complex abnormalities associated with ischemic heart disease	low cardiac output, postinfarct VSD, acute MR	TSITE, faculty evaluation, presentation		
26	Identifies appropriate treatment for complex patient with ischemic heart disease (e.g., hybrid CABG)	hybrid CABG	TSITE, faculty evaluation, presentation		
27	Knows outcomes for all treatment modalities and complications, including databases and clinical trials (e.g., STS Database)	CABG vs PCI, CABG outcomes	TSITE, faculty evaluation, presentation		
28	Understands implications of SYNTAX score	CABG vs PCI	TSITE, faculty evaluation, presentation		
29	Presents on outcomes of ischemic heart disease at local, regional or national meeting	resident research projects	CT research day presentations, national meetings		
30	Patient Care: Ischemic Heart Disease				
31	Orders basic diagnostic and preoperative assessment tests for ischemic heart disease (e.g., cardiac cath, stress test)	PGY1 CCU	faculty evaluations		
32	Lists basic treatment options for routine ischemic heart disease (e.g, medical management, PCI vs. CABG)	CABG vs PCI	faculty evaluations	today	fac eval
33	Demonstrates basic surgical skills (simulation vs. OR)	gen surg skills lab	gen surg PGY1 VOP	today	fac eval
34	Interprets and prioritizes diagnostic and physiologic assessment tests for routine patient with ischemic heart disease	PGY2 cardiac	faculty evaluations		
35	Recognizes routine post-operative complications (e.g., CVA, shock, tamponade, interprets abnormal EKG)	PGY3 cardiac	faculty evaluations	today	peer eval
36	Suggests treatment plan for patient with routine ischemic heart disease	PGY2 cardiac	faculty evaluations, chart audit		
37	Assesses and harvests conduits (e.g., vein mapping)	PGY1 cardiac	faculty evaluations	today	PA eval
38	Performs surgical opening and closing	PGY2 cardiac	faculty evaluations		
39	Provides basic intraoperative assisting	PGY2 cardiac	faculty evaluations		
40	Performs proximal coronary anastomosis	PGY3 cardiac, vessel anastomosis simulator	faculty evaluations, vessel anastomosis evaluation form		
41	Establishes a diagnostic and assessment plan for patients with routine ischemic heart disease (e.g., role of functional testing in ischemic heart disease)	PGY2 cardiac	faculty evaluations		
42	Manages routine post-operative complications (e.g., return to the OR vs. return to cath lab)	PGY3 cardiac	faculty evaluations		
43	Selects ideal treatment option for patient with routine ischemic heart disease.(e.g., institutes treatment per ACC/STS/AATS guidelines)	PGY1 CCU	faculty evaluations		
44	Institutes and weans patient from cardiopulmonary bypass	PGY3 cardiac	faculty evaluations, case logs		
45	Performs routine CABG	PGY4 cardiac	faculty evaluations, case logs		
46	Establishes a diagnostic and assessment plan for complex patients with ischemic heart disease	PGY5 cardiac	faculty evaluations		
47	Manages complex post-operative complications(e.g., need for ventricular assist)	PGY5 cardiac	faculty evaluations		
48	Selects ideal treatment option for patient with complex ischemic heart disease (e.g., combined coronary and carotid disease)	PGY5 cardiac	faculty evaluations		
49	Manages complex coronary disease (e.g., redo CABG, VSD, ischemic MR, off pump)	PGY6 cardiac	faculty evaluations		

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
50	Independently performs reoperative coronary bypass grafting	PGY6 cardiac	faculty evaluations, case logs		
51	Independently performs coronary enterectomy	PGY6 cardiac	faculty evaluations, case logs		
52	Medical knowledge: Cardiopulmonary Bypass				
53	Lists basic components of cardiopulmonary bypass apparatus (e.g., oxygenator, pump heads, heat exchanger, low level alarm, in line monitoring)	pump anatomy	TSITE, faculty evaluation, presentation	today	case logs, fac eval
54	Understands pulsatile vs. non-pulsatile pump physiology	physiology of bypass	TSITE, faculty evaluation, presentation	today	fac eval
55	Understands basic myocardial protection. (e.g., O2 requirement, O2 delivery, myocardial relaxation)	myocardial protection	TSITE, faculty evaluation, presentation	today	fac eval
56	Understands coagulation cascade (e.g., intrinsic and extrinsic pathways)	physiology of bypass	TSITE, faculty evaluation, presentation		
57	Lists complications of cardiopulmonary bypass (e.g., bleeding, renal failure, pulmonary dysfunction)	pump disasters, complications of bypass	TSITE, faculty evaluation, presentation		
58	Discusses options for myocardial protection (e.g., cardioplegia vs. beating heart)	myocardial protection	TSITE, faculty evaluation, presentation		
59	Discusses cannulation techniques and options for cardiopulmonary bypass (e.g., single venous, bicaval, aortic, peripheral arteries, cold, full or partial)	cannulation strategies	TSITE, faculty evaluation, presentation		
60	Understands intra-aortic balloon pump physiology (e.g., diastolic augmentation and presystolic dip)	failure to wean	TSITE, faculty evaluation, presentation		
61	Understands coagulation cascade inhibitors (e.g., heparin, argatroban)	physiology of bypass	TSITE, faculty evaluation, presentation		
62	Understands complications of cardiopulmonary bypass	complications of bypass	TSITE, faculty evaluation, presentation		
63	Lists treatment strategies for cardiac injury without cardiac bypass, including trauma	thoracic trauma	TSITE, faculty evaluation, presentation		
64	Demonstrates knowledge of cardioplegia solutions and delivery modes (e.g., crystalloid, blood, antegrade, retrograde)	myocardial protection	TSITE, faculty evaluation, presentation		
65	Demonstrates knowledge of acid-base and anticoagulation management on cardiopulmonary bypass (e.g., pH stat, alpha stat, ACT)	physiology of bypass	TSITE, faculty evaluation, presentation		
66	Demonstrates knowledge of pharmacologic management of postcardiotomy hemodynamics (e.g., inotropes, vasodilators)	anesthesia/pharm	TSITE, faculty evaluation, presentation		
67	Discusses advantages and disadvantages of different myocardial protection strategies	myocardial protection	TSITE, faculty evaluation, presentation		
68	Lists management strategies of routine complications related to cardiopulmonary bypass (e.g., air in the heart, inadequate drainage, incomplete arrest)	pump anatomy	TSITE, faculty evaluation, presentation		
69	Demonstrates knowledge of postoperative sequelae from cardiopulmonary bypass (e.g., low cardiac output syndrome, coagulopathies, arrhythmias, HIT)	complications of bypass	TSITE, faculty evaluation, presentation		
70	Explains advanced cardiopulmonary support (e.g., circulatory arrest or ECMO)	ECMO	TSITE, faculty evaluation, presentation		
71	Explains the management of postcardiotomy shock syndrome (e.g., inotropes, IABP, mechanical support)	failure to wean	TSITE, faculty evaluation, presentation		
72	Explains management strategies of complex complications related to cardiopulmonary bypass (e.g., aortic dissection, air embolism)	type A dissection, pump disasters	TSITE, faculty evaluation, presentation		

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
73	Explains treatment strategies for postoperative sequelae from cardiopulmonary bypass (e.g., low cardiac output syndrome, coagulopathies, arrhythmias, HIT)	failure to wean	TSITE, faculty evaluation, presentation		
74	Develops simulation scenarios for complications related to cardiopulmonary bypass	resident research projects	CT research day presentations		
75	Patient Care: Cardiolpulmonary Bypass				
76	Demonstrates basic surgical skills (simulation vs. OR)	PGY2 cardiac	faculty evaluations	today	PGY 1 VOP, fac eval
77	Performs axillary, femoral, arterial or venous cannulation	PGY2 cardiac	faculty evaluations, venous cannulation evaluation form		
78	Performs peripheral vascular access	PGY1 cardiac	faculty evaluations, case logs		
79	Performs surgical opening and closing	PGY2 cardiac	faculty evaluations, case logs		
80	Assists perfusionist with cardiopulmonary bypass setup and pump run	PGY1 cardiac	faculty evaluations, case logs	today	case logs
81	Cannulates and institutes cardiopulmonary bypass including myocardial protection in routine cases	PGY3 cardiac	faculty evaluations, aortic cannulation evaluation form		
82	Manages cardiopulmonary bypass and myocardial protection in routine cases	PGY4 cardiac	faculty evaluations, case logs		
83	Weans and decannulates from cardiopulmonary bypass for routine cases	PGY4 cardiac	faculty evaluations		
84	Recognizes and manage common acute complications (e.g., coagulopathy, pump failure)	PGY4 cardiac	faculty evaluations		
85	Cannulates and institutes cardiopulmonary bypass including myocardial protection in complex cases	PGY4 cardiac	faculty evaluations		
86	Manages cardiopulmonary bypass and myocardial protection in complex cases	PGY5 cardiac	faculty evaluations		
87	Weans and decannulates from cardiopulmonary bypass for complex cases	PGY5 cardiac	faculty evaluations		
88	Institutes temporary circulatory support for cardiogenic shock (e.g., intraaortic balloon pump, ECMO, short term LV assist)	PGY6 cardiac	faculty evaluations		
89	Recognizes and manages unusual acute complications (e.g., aortic dissection)	PGY6 cardiac	faculty evaluations		
90	Operates in a hostile chest (e.g., radiation, porcelain aorta, use of epiaortic probe, patent grafts)	PGY6 cardiac	faculty evaluations, case logs		
91	Performs left ventricular assist device procedures or transplant	PGY5 cardiac	faculty evaluations, case logs		
92	Medical Knowledge: Valvular Disease				
93	Knows basic anatomy and pathology of valvular heart disease	anatomy/physiology	TSITE, faculty evaluation, presentation	today	cardiac anaotmy, fac eval
94	Knows basic normal valve physiology	anatomy/physiology	TSITE, faculty evaluation, presentation	today	fac eval
95	Lists clinical manifestations of isolated valvular heart disease (e.g., dyspnea, angina, edema, syncope)	AI, AS, MR, MS	TSITE, faculty evaluation, presentation	today	fac eval
96	Lists diagnostic tools available for evaluation of valvular heart disease	echo, AI, AS, MR, MS	TSITE, faculty evaluation, presentation		
97	Lists treatment options for valvular heart disease	repair, replacement, TAVI	TSITE, faculty evaluation, presentation		
98	Knows basic complications for valvular heart disease (e.g., peri-operative complications for aortic valve replacement)	repair, replacement, TAVI	TSITE, faculty evaluation, presentation		
99	Knows common variations in anatomy and pathology of valvular heart disease (e.g., Mitral Prolapse, Types)	AI, AS, MR, MS	TSITE, faculty evaluation, presentation		

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
100	Explains physiologic changes accompanying valvular heart disease (e.g., pulmonary hypertension)	AI, AS, MR, MS	TSITE, faculty evaluation, presentation		
101	Generates differential diagnosis of diseases with similar manifestations (e.g., coronary artery disease, emphysema)	AI, AS, MR, MS	TSITE, faculty evaluation, presentation		
102	Explains advantages and disadvantages of diagnostic tools in evaluating valvular heart disease (e.g., surface vs. transesophageal echo)	AI, AS, MR, MS, echo	TSITE, faculty evaluation, presentation		
103	Recites advantages and disadvantages of various treatment options for valvular heart disease (e.g., repair vs. replacement)	repair, replacement, TAVI	TSITE, faculty evaluation, presentation		
104	Recites risks, benefits and complications of treatment modalities (e.g., cites frequency of common complications)	repair, replacement, TAVI	TSITE, faculty evaluation, presentation		
105	Explains complex integrations between anatomy and pathology of valvular heart disease(e.g., bicuspid aortic valve and stenosis, functional mitral and tricuspid regurgitation	bicuspid valve, tricuspid, multiple valves	TSITE, faculty evaluation, presentation		
106	Explains the role of treatment on physiology of valvular heart disease, including arrhythmia management,(e.g., the mechanism of surgical atrial fibrillation treatment	maze, AI, AS, MR, MS	TSITE, faculty evaluation, presentation		
107	Identifies the common variants of the clinical manifestations of valvular heart disease(e.g., fatigue)	AI, AS, MR, MS	TSITE, faculty evaluation, presentation		
108	Interprets normal and common abnormalities associated with valvular heart disease, including intraoperative transesophageal echocardiography	echo	TSITE, faculty evaluation, presentation		
109	Identifies appropriate treatment for routine patient with valvular heart disease	repair, replacement, TAVI	TSITE, faculty evaluation, presentation		
110	Familiar with ACC/STS/AATS guidelines	AI, AS, MR, MS, echo	TSITE, faculty evaluation, presentation		
111	Explains basic outcome literature for valvular heart disease(e.g., durability of mitral valve repair)	repair, replacement, TAVI	TSITE, faculty evaluation, presentation		
112	Explains complex variations in anatomy and pathology, including congenital (e.g., contribution of coronary disease to mitral regurgitation, bicuspid aortic valve and ascending aneurysm)	ischemic MR, bicuspid AV/congenital AS	TSITE, faculty evaluation, presentation		
113	Adapts therapeutic management based on understanding of physiology (e.g., explains when to correct mitral or tricuspid regurgitation in setting of aortic stenosis or coronary artery disease)	multiple valves, tricuspid	TSITE, faculty evaluation, presentation		
114	Distinguishes the complex clinical manifestations and complications of valvular heart disease (e.g., staging CHF)	recipient selection	TSITE, faculty evaluation, presentation		
115	Interprets and integrates complex abnormalities associated with valvular heart disease (e.g., hypertrophic obstructive cardiomyopathy)	HOCM	TSITE, faculty evaluation, presentation		
116	Identifies appropriate treatment for complex patient with valvular heart disease (e.g., combined coronary, aneurysm or root enlargement)	ascending/root aneurysm, endocarditis	TSITE, faculty evaluation, presentation		
117	Explains outcomes for all treatment modalities and complications, including databases and clinical trials (e.g., outcome after minimally invasive valves, success of sinus restoration in surgery for atrial fibrillation)	repair, replacement, TAVI	TSITE, faculty evaluation, presentation		
118	Presents on outcomes valvular heart disease at local, regional or national meeting	resident research projects	CT research day presentations, national meetings		
119	Patient Care: Valvular Disease				
120	Orders basic diagnostic and preoperative assessment tests for valvular heart disease	PGY1 cardiac	faculty evaluations	today	fac eval

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
121	Lists basic treatment options for routine valvular heart disease	PGY1 cardiac	faculty evaluations	today	fac eval
122	Demonstrates basic surgical skills (simulation vs. OR)	PGY2 cardiac	faculty evaluations	today	fac eval
123	Interprets and prioritizes diagnostic and physiologic assessment tests for routine patient with valvular heart disease (e.g., echocardiogram, cardiac cath)	PGY2 cardiac	faculty evaluations		
124	Suggests treatment plan for patient with routine single valvular heart disease (e.g., single valve replacement in a symptomatic patient with aortic stenosis)	PGY2 cardiac	faculty evaluations		
125	Recognizes routine post-operative complications (e.g., identifies surgically significant bleeding)	PGY3 cardiac	faculty evaluations		
126	Identifies surgical approach for each valve	PGY3 cardiac	faculty evaluations	today	fac eval
127	Performs surgical opening and closing	PGY2 cardiac	faculty evaluations		
128	Performs basic intraoperative assisting	PGY2 cardiac	faculty evaluations		
129	Provides a diagnostic and assessment plan for patients with routine valvular heart disease (e.g., intra-operative TEE)	PGY3 cardiac	faculty evaluations		
130	Selects ideal treatment option for patient with acquired valvular heart disease (e.g., double valve replacement)	PGY4 cardiac	faculty evaluations		
131	Manages routine post-operative complications (e.g., decides to return to operating room, management of heart block)	PGY4 cardiac	faculty evaluations		
132	Institutes and weans patient from cardiopulmonary bypass	PGY4 cardiac	faculty evaluations, case logs		
133	Performs optimal myocardial protection strategy	PGY4 cardiac	faculty evaluations		
134	Performs routine valvular replacement	PGY4 cardiac	faculty evaluations, case logs		
135	Forms a diagnostic and assessment plan for complex patients with valvular heart disease (e.g., intra-operative mitral regurgitation on a patient scheduled for isolated coronary artery bypass)	PGY5 cardiac	faculty evaluations		
136	Selects ideal treatment option for patient with complex valvular heart disease (e.g., valvular repair, congenital valve repair)	PGY5 cardiac	faculty evaluations		
137	Manages complex post-operative complications, including arrhythmias (e.g., management of paravalvular leak or SAM)	PGY5 cardiac	faculty evaluations		
138	Performs complex valvular replacement	PGY6 cardiac	faculty evaluations, case logs		
139	Performs valvular repair	PGY6 cardiac	faculty evaluations, case logs		
140	Selects ideal plan for a patient with prior transcatheter valve, minimally invasive valve	PGY6 cardiac	faculty evaluations		
141	Performs minimally invasive, percutaneous, or robotic approaches to valvular heart disease	PGY6 cardiac	faculty evaluations, case logs		
142	Performs atrial and ventricular arrhythmia surgery	PGY5 cardiac	faculty evaluations, case logs		
143	Performs reconstruction of fibrous trigone in patient with endocarditis of mitral and aortic valves	PGY6 cardiac	faculty evaluations, case logs		
144	Medical Knowledge: Great Vessel Disease				
145	Knows basic anatomy and pathology of great vessels (e.g., aortic dissection classification, including spinal cord and cerebral perfusion)	type A + B dissection	TSITE, faculty evaluation, presentation	today	fac eval
146	Lists clinical manifestations of great vessel disease, acquired and traumatic (e.g., chest pain syndromes, Marfan's syndrome)	type A + B dissection, traumatic transection	TSITE, faculty evaluation, presentation	today	fac eval

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
147	Lists diagnostic tools available for evaluation of great vessel disease	type A dissection, TAAA	TSITE, faculty evaluation, presentation		
148	Lists treatment options for great vessel disease	type A + B dissection, traumatic transection, ascending, arch + TAAA	TSITE, faculty evaluation, presentation		
149	Knows basic complications for great vessel disease (e.g., natural history treated and untreated)	type A + B dissection, traumatic transection, ascending, arch + TAAA	TSITE, faculty evaluation, presentation		
150	Understands common variations in anatomy and pathology of adult great vessel disease, acquired and traumatic (e.g., descending aortic tear from blunt trauma)	traumatic transection	TSITE, faculty evaluation, presentation		
151	Generates differential diagnosis of diseases with similar manifestations (e.g., myocardial infarction, esophageal spasm)	type A dissection	TSITE, faculty evaluation, presentation		
152	Understands advantages and disadvantages of diagnostic tools in evaluating great vessel disease (e.g., CT scan vs. MRI vs. echocardiography vs. angiography)	type A dissection, TAAA	TSITE, faculty evaluation, presentation 4/6/12		
153	Understands advantages and disadvantages of various treatment options for great vessel disease (endovascular vs. open)	type B dissection, traumatic transection, TAAA	TSITE, faculty evaluation, presentation		
154	Understands risks, benefits and complications of treatment modalities	type A + B dissection, traumatic transection, ascending, arch + TAAA	TSITE, faculty evaluation, presentation 4/6/12		
155	Understands integrations between anatomy and pathology of great vessel disease, acquired, congenital and traumatic (e.g., atherosclerosis, penetrating ulcer, aortic dissection)	type A + B dissection, traumatic transection, ascending, arch + TAAA	TSITE, faculty evaluation, presentation 4/6/12		
156	Identifies the common variants of the clinical manifestations of great vessel disease, acquired, congenital and traumatic (e.g., bowel ischemia, renal insufficiency)	type A + B dissection, traumatic transection, ascending, arch + TAAA	TSITE, faculty evaluation, presentation 4/6/12		
157	Interprets normal and common abnormalities associated with great vessel disease (e.g., sensitivity, specificity, accuracy of aortic imaging techniques)	type A + B dissection, traumatic transection, ascending, arch + TAAA	TSITE, faculty evaluation, presentation 4/6/12		
158	Identifies appropriate and/or adjunct treatment for routine patient with great vessel disease (neuroprotection, spinal cord protection, renal)	type A + B dissection, traumatic transection, ascending, arch + TAAA	TSITE, faculty evaluation, presentation 4/6/12		
159	Knows basic outcome literature for great vessel disease	type A + B dissection, traumatic transection, ascending, arch + TAAA	TSITE, faculty evaluation, presentation 4/6/12		
160	Understands complex variations in anatomy and pathology of great vessel disease, acquired, congenital and traumatic (e.g., congenital arch anomalies leading to tracheal or esophageal compression)	vascular rings	TSITE, faculty evaluation, presentation		
161	Distinguishes the complex clinical manifestations and complications of great vessel disease, acquired, congenital and traumatic (e.g., myocardial infarction vs. acute aortic dissection)	type A + B dissection, traumatic transection, ascending, arch + TAAA	TSITE, faculty evaluation, presentation 4/6/12		
162	Interprets and integrates complex abnormalities associated with great vessel disease (e.g., aneurysm, dissection, pseudo-aneurysm, penetrating ulcer)	type A + B dissection, traumatic transection, ascending, arch + TAAA	TSITE, faculty evaluation, presentation 4/6/12		
163	Identifies appropriate treatment for complex patient with great vessel disease (e.g., CPB bypass techniques)	type A + B dissection, traumatic transection, ascending, arch + TAAA	TSITE, faculty evaluation, presentation 4/6/12		
164	Knows outcomes for all treatment modalities and complications, including databases and clinical trials	type A + B dissection, traumatic transection, ascending, arch + TAAA	TSITE, faculty evaluation, presentation 4/6/12		
165	Surgically manages acute and chronic pulmonary thromboembolic disease	pulmonary embolectomy	Case logs		
166	Patient Care: Great Vessel Disease				
167	Orders basic diagnostic and preoperative assessment tests for great vessel disease (e.g., CT, echo, need for cath)	PGY2 cardiac	faculty evaluations	today	fac eval
168	Lists basic treatment options for routine great vessel disease (e.g., Type A vs. Type B dissections; timing of intervention)	PGY2 cardiac, PGY 3 vascular	faculty evaluations	today	fac eval

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
169	Demonstrates basic surgical skills (simulation vs. OR)	PGY3 cardiac	faculty evaluations		
170	Obtains ATLS certification	PGY3 cardiac	ATLS certificate		
171	Interprets and prioritizes diagnostic assessment tests for routine patient with great vessel disease (e.g., risk / benefit options)	PGY4 cardiac	faculty evaluations		
172	Suggests treatment plan for patient with routine great vessel disease (e.g., endovascular vs. open repair)	PGY4 cardiac	faculty evaluations		
173	Recognizes routine post-operative complications	PGY3 cardiac	faculty evaluations		
174	Identifies surgical approach	PGY4 cardiac	faculty evaluations		
175	Performs surgical opening, closing and vascular access	PGY3 cardiac	faculty evaluations		
176	Provides basic intraoperative assisting	PGY3 cardiac	faculty evaluations		
177	Establishes a diagnostic and assessment plan for patients with routine great vessel disease (e.g., blunt aortic injury)	PGY4 cardiac	faculty evaluations		
178	Selects ideal treatment option for patient with routine great vessel disease, including perioperative monitoring, perfusion and neuroprotective strategies	PGY4 cardiac	faculty evaluations		
179	Manages routine post-operative complications	PGY3 cardiac	faculty evaluations		
180	Institutes and weans patient from cardiopulmonary bypass	PGY4 cardiac	faculty evaluations		
181	Provides optimal perfusion and myocardial/ neuroprotection	PGY4 cardiac	faculty evaluations		
182	Performs routine aortic valvular replacement	PGY4 cardiac	faculty evaluations, case logs, Valve surgery assessment form		
183	Performs simple vascular anastomosis	PGY4 cardiac, PGY3 vascular	faculty evaluations, case logs		
184	Establishes a diagnostic and assessment plan for complex patients with great vessel disease (e.g., great vessel interventions in the elderly or patients with collagen vascular disease)	PGY5 cardiac	faculty evaluations		
185	Selects ideal treatment option for patient with complex great vessel disease, including perioperative monitoring, perfusion and neuroprotective strategies (e.g., thoracoabdominal disease, chronic aortic dissections)	PGY5 cardiac	faculty evaluations		
186	Manages complex post-operative complications (e.g., multisystem organ failure)	PGY5 cardiac	faculty evaluations		
187	Performs complex great vessel replacement	PGY6 cardiac	faculty evaluations, case logs		
188	Performs aortic repair	PGY6 cardiac	faculty evaluations, case logs		
189	Participates in endovascular aortic surgery	PGY4 cardiac	faculty evaluations, case logs		
190	Performs endovascular aortic surgery	PGY6 cardiac	faculty evaluations, case logs		
191	Performs pulmonary thromboendarterectomy	PGY6 cardiac	faculty evaluations, case logs		
192	Performs hybrid approaches to complex aortic disease (e.g., debranching followed by endovascular procedure)	PGY6 cardiac	faculty evaluations, case logs		
193	Medical Knowledge : Congenital Heart Disease				
194	Lists clinical manifestations of common congenital heart diseases (e.g., cyanosis, tachypnea, mottling, failure to thrive)	VSD	TSITE, faculty evaluation, presentation		
195	Lists diagnostic tools available for evaluating congenital heart disease (e.g., EKG, chest x-ray, echocardiogram, cardiac cath)	ASD, VSD, AVSD, tet, TGA, HLHS	TSITE, faculty evaluation, presentation		
196	Lists basic congenital cardiac abnormalities (e.g., ASD, VSD, tetralogy of Fallot, transposition of great arteries)	ASD, VSD, AVSD, tet, TGA, HLHS	TSITE, faculty evaluation, presentation		

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
197	Lists physiologic changes accompanying congenital heart disease (e.g., right to left and left to right shunt, excessive or insufficient pulmonary blood flow)	ASD, VSD, AVSD, tet, TGA, HLHS	TSITE, faculty evaluation, presentation		
198	Discusses possible diagnostic modalities for various conditions	ASD, VSD, AVSD, tet, TGA, HLHS	TSITE, faculty evaluation, presentation		
199	Lists basic treatment options for congenital heart disease (e.g., diuretics, digoxin, palliative vs. definitive operations)	tet, TGA, HLHS, TAPVC	TSITE, faculty evaluation, presentation		
200	Knows basic anatomy and pathology of congenital heart disease	congenital physiology	TSITE, faculty evaluation, presentation		
201	Understands physiologic changes accompanying congenital heart disease (e.g., Eisenmenger syndrome)	VSD	TSITE, faculty evaluation, presentation		
202	Generates a differential diagnosis of diseases with similar manifestations (e.g., tachypnea due to increased pulmonary blood flow caused by ASD or VSD)	ASD, VSD	TSITE, faculty evaluation, presentation		
203	Understands the advantages and disadvantages of diagnostic tools in evaluating congenital heart disease	VSD, AVSD, tet, HLHS, coarct	TSITE, faculty evaluation, presentation		
204	Understands advantages and disadvantages of various treatment options in congenital heart disease (e.g., PA band vs. primary closure VSD)	PA band	TSITE, faculty evaluation, presentation		
205	Knows basic complications of congenital heart disease (e.g., residual VSD, heart block)	ASD, VSD, AVSD	TSITE, faculty evaluation, presentation		
206	Understands common variations in anatomy and pathology (e.g., partial and complete AV septal defect, types of VSD)	ASD, VSD, AVSD	TSITE, faculty evaluation, presentation		
207	Understands the basics of the single ventricle pathway (e.g., Truncus, Norwood, TGA)	TGA, HLHS	TSITE, faculty evaluation, presentation		
208	Understands the role of treatment on physiology of congenital heart disease (e.g., role of pulmonary artery banding, acid-base balance benefits of pH stat or alpha stat)	PA band, physiology of bypass	TSITE, faculty evaluation, presentation		
209	Understands the role of physiology of congenital heart disease on treatment modality options (e.g., PFO, increased pulmonary vascular resistance in newborns)	neonatal physiology	TSITE, faculty evaluation, presentation		
210	Identifies clinical manifestations of elective vs. emergent vs. urgent scenarios.	HLHS, TAPVC	TSITE, faculty evaluation, presentation		
211	Recognizes simple vs. complex disease	ASD, VSD, AVSD, tet, TGA, HLHS	TSITE, faculty evaluation, presentation		
212	Interprets normal and common abnormalities associated with congenital heart disease, including echocardiography (e.g., identifies valve stenosis and regurgitation)	VSD, tet	TSITE, faculty evaluation, presentation		
213	Identifies appropriate treatment for common patient with congenital heart disease (e.g., selection of palliative vs. definitive, identifies for urgent vs. elective procedures)	AVSD, PA band, HLHS	TSITE, faculty evaluation, presentation		
214	Understands strategies for complex reoperative surgery	HLHS	TSITE, faculty evaluation, presentation		
215	Understands risks, benefits and complications of various treatment modalities	ASD, coarct	TSITE, faculty evaluation, presentation		
216	Understands complex integrations between anatomy and pathology (e.g., RV dependent coronary sinusoids)	HLHS	TSITE, faculty evaluation, presentation		
217	Medical Knowledge: End Stage Cardiopulmonary Disease				
218	Knows basic cardiothoracic normal anatomy	anatomy/physiology	TSITE, faculty evaluation, presentation	today	cardiac anaotmy, fac eval

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
219	Knows basic normal respiratory and cardiovascular physiology	anatomy/physiology	TSITE, faculty evaluation, presentation	today	fac eval
220	Lists clinical manifestations of cardiac and pulmonary failure (e.g., dyspnea, fatigue, exercise intolerance, peripheral edema, pulmonary edema)	heart recipient selection, lung recipient selection	TSITE, faculty evaluation, presentation		
221	Lists diagnostic tools available for evaluation of cardiac and pulmonary failure (e.g., ABG, CXR, PA line, echo)	echo, PGY1 + 2 SICU	TSITE, faculty evaluation, presentation		
222	Understands the natural history of cardiac and pulmonary failure (e.g., end-stage emphysema)	heart recipient selection, lung recipient selection	TSITE, faculty evaluation, presentation		
223	Knows basic pathology as it relates to cardiac and pulmonary failure (e.g., lung-pneumonia, ARDS, pathology of end-stage lung disease; heart-myocardial infarction, types of cardiomyopathy)	PGY1 CCU, PGY1 + 2 SICU, ventilator management	TSITE, faculty evaluation, presentation		
224	Understands physiologic changes accompanying cardiac and pulmonary failure (e.g., increased work of breathing hypoxemia, hypercarbia, elevated lactate, tachycardia, hypotension, reduced CO)	PGY1 CCU, PGY1 + 2 SICU, ventilator management	TSITE, faculty evaluation, presentation		
225	Generates differential diagnosis of causes of heart and pulmonary failure (e.g., heart-cardiomyopathy, coronary artery disease; pulmonary - interstitial lung disease, trauma)	PGY1 CCU, PGY1 + 2 SICU	TSITE, faculty evaluation, presentation		
226	Understands advantages and disadvantages of diagnostic tools in evaluating cardiac and pulmonary failure (e.g., cardiac - PA catheter measurements, echo vs. cath, MRI pulmonary- transbronchial biopsy vs. open	PGY1 CCU, PGY1 + 2 SICU	TSITE, faculty evaluation, presentation		
227	Lists treatment options for cardiac and pulmonary failure (e.g., medical vs. surgical management)	heart recipient selection, lung recipient selection, device selection	TSITE, faculty evaluation, presentation		
228	Understands signs of decompensation and need for intervention for cardiac and pulmonary failure	heart recipient selection, lung recipient selection	TSITE, faculty evaluation, presentation		
229	Understands common variations in anatomy and pathology (e.g., advanced valvular disease, pulmonary fibrosis, sarcoidosis)	PGY1 CCU, PGY1 + 2 SICU	TSITE, faculty evaluation, presentation		
230	Understands the role of treatment on physiology of cardiac and pulmonary failure (e.g., cardiac - medical management vs. IABP vs. mechanical support; pulmonary-medical treatment vs. vent)	PGY1 CCU, PGY1 + 2 SICU	TSITE, faculty evaluation, presentation		
231	Identifies the common variants of the clinical manifestations of cardiac and pulmonary failure (e.g., cardiac-ischemic, post viral, postpartum, idiopathic; pulmonary - acute lung injury/ARDS, infn)	end stage heart failure	TSITE, faculty evaluation, presentation		
232	Interprets normal and common abnormalities associated with cardiac and pulmonary failure (e.g., cardiac - distinguishes various types of shock; pulmonary - surgical biopsy; acute vs. chronic)	PGY1 + 2 SICU, ILD	TSITE, faculty evaluation, presentation		
233	Understands advantages and disadvantages of various treatment options for cardiac and pulmonary failure	PGY2 SICU, heart recipient selection, lung recipient selection	TSITE, faculty evaluation, presentation		
234	Understands risks, benefits and complications of treatment modalities (e.g., risk benefit ratio)	heart tx outcomes, lung outcomes	TSITE, faculty evaluation, presentation		
235	Understands complex integrations between anatomy and pathology (e.g., adult with congenital heart disease)	adult CHD	TSITE, faculty evaluation, presentation		
236	Adapts therapeutic management based on understanding of physiology of cardiac and pulmonary failure (cardiac - need for mechanical support; pulmonary - need for advanced ventilation)	PGY4 thoracic, PGY4 cardiac	TSITE, faculty evaluation, presentation		
237	Distinguishes the complex clinical manifestations and complications of cardiac and pulmonary failure (e.g., adult congenital disease manifestations, mechanical complications of MI)	adult CHD, postinfarct VSD, acute MR	TSITE, faculty evaluation, presentation		
238	Interprets and integrates complex abnormalities associated with cardiac and pulmonary failure (e.g., distinguishes RV vs. LV vs. biventricular failure)	device selection	TSITE, faculty evaluation, presentation		
239	Identifies appropriate treatment for patients with cardiac and pulmonary failure and indications for transplantation or mechanical cardiopulmonary support (e.g., selection criteria for transplantation)	heart recipient selection, lung recipient selection, destination VAD, bridge VAD	TSITE, faculty evaluation, presentation		

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
240	Knows basic outcome literature for cardiac and pulmonary failure	heart tx outcomes, lung outcomes	TSITE, faculty evaluation, presentation		
241	Understands limitations of mechanical support (e.g., recognizes when risks exceed benefits)	VAD bridge + destination	TSITE, faculty evaluation, presentation		
242	Understands complex variations in anatomy and pathology as related to cardiac and pulmonary failure (e.g., Eisenmenger's complex)	VSD	TSITE, faculty evaluation, presentation		
243	Understands the immunologic mechanisms in cardiac and pulmonary transplantation	immunosuppression/rejection	TSITE, faculty evaluation, presentation		
244	Understands nonpulsatile ventricular assist physiology	VAD bridge + destination	TSITE, faculty evaluation, presentation		
245	Understands clinical manifestations of allograft rejection (e.g., hyperacute, acute and chronic rejection)	immunosuppression/rejection	TSITE, faculty evaluation, presentation		
246	Understands clinical manifestations of complications of mechanical cardiopulmonary support (e.g., bleeding, line infection, sepsis, stroke, tamponade)	VAD bridge + destination	TSITE, faculty evaluation, presentation		
247	Diagnoses complications of transplant and mechanical cardiopulmonary support (e.g., heart failure due to pulmonary hypertension, acute and chronic rejection, assist device failure, bx)	VAD bridge + destination	TSITE, faculty evaluation, presentation		
248	Identifies appropriate treatment for complex patient with cardiac and pulmonary failure	heart lung transplant	TSITE, faculty evaluation, presentation		
249	Understands how to treat acute and chronic transplant rejection (e.g., need for single vs. bi-VAD assist, cardiac vs. cardiopulmonary support, ECMO)	immunosuppression/rejection	TSITE, faculty evaluation, presentation		
250	Knows outcomes for all treatment modalities and complications, including databases and clinical trials	VAD bridge + destination, March B heart tx outcomes, April A lung outcomes	TSITE, faculty evaluation, presentation		
251	Medical Knowledge Critical Care				
252	Knows basic normal cardiopulmonary physiology (e.g., normal left ventricular pressure-volume curve)	anatomy/physiology	TSITE, faculty evaluation, presentation	today	fac eval
253	Lists clinical manifestations of critically ill cardiovascular and thoracic patients	PGY1 CCU, PGY1 + 2 SICU	TSITE, faculty evaluation, presentation	today	fac eval
254	Lists diagnostic tools available for evaluation of critically ill patients with cardiovascular and thoracic diseases (e.g., Interpretation ofhemodynamic data (Swan-Ganz); ECG including exercise data, coronary angiography, cardiac cath hemodynamics, echocardiography)	echo, cath, PGY1 CCU, PGY1 + 2 SICU	TSITE, faculty evaluation, presentation		
255	Lists treatment options for critically ill patients with cardiovascular and thoracic diseases	PGY1 CCU, PGY1 + 2 SICU	TSITE, faculty evaluation, presentation		
256	Understands pathophysiologic changes accompanying cardiovascular and thoracic disease (e.g., Frank-Starling curves for the left ventricle	PGY1 CCU, PGY1 + 2 SICU, anatomy/physiology	TSITE, faculty evaluation, presentation		
257	Generates differential diagnosis of diseases in critically ill patients with cardiovascular and thoracic diseases (e.g., Differential diagnosis of patient with chest pain ;pulmonary – PE, pneumonia, PTX)	PGY1 CCU, PGY1 + 2 SICU	TSITE, faculty evaluation, presentation		
258	Understands advantages and disadvantages of diagnostic tools in evaluating critically ill patients with cardiovascular and thoracic diseases	PGY1 CCU, PGY1 + 2 SICU	TSITE, faculty evaluation, presentation		
259	Understands advantages and disadvantages of various treatment options for critically ill patients with cardiovascular and thoracic diseases (e.g., Indications for inotropes, IABP, and VADS)	anesthesia pharmacology	TSITE, faculty evaluation, presentation		

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
260	Understands the role of treatment on pathophysiology of cardiovascular and thoracic disease (e.g., Relationship between left ventricular output, preload and afterload)	cardiac anatomy/physiology	TSITE, faculty evaluation, presentation		
261	Identifies the common variants of the clinical manifestations of critically ill cardiovascular and thoracic patients(e.g., differential diagnosis of post-op cardiac surgery patient with chest pain)	CABG complications	TSITE, faculty evaluation, presentation		
262	Interprets normal and common abnormalities associated with critically ill patients with cardiovascular and thoracic diseases (e.g., echo images systolic and diastolic dysfunction)	PGY1 + 2 SICU, echo	TSITE, faculty evaluation, presentation		
263	Identifies appropriate treatment for routine critically ill patients with cardiovascular and thoracic diseases (e.g., management strategies for postoperative arrhythmias)	PGY1 + 2 SICU	TSITE, faculty evaluation, presentation		
264	Manages post-op low cardiac output	PGY4 cardiac, post op low cardiac output	TSITE, faculty evaluation, presentation		
265	Knows basic outcome literature for critically ill patients with cardiovascular and thoracic diseases	lung cancer complications, CABG complications, BPF	TSITE, faculty evaluation, presentation		
266	Adapts therapeutic management based on understanding of pathophysiology (e.g., selection of inotropic drugs in the treatment of hypotension and low cardiac output depending on etiology)	anesthesia pharmacology	TSITE, faculty evaluation, presentation		
267	Distinguishes the complex clinical manifestations and complications of critically ill cardiovascular and thoracic patients(e.g., low cardiac output due to right ventricular failure)	low cardiac output	TSITE, faculty evaluation, presentation		
268	Interprets and integrates complex abnormalities associated with critically ill patients with cardiovascular and thoracic diseases	heart transplant complications, lung transplant complications	TSITE, faculty evaluation, presentation		
269	Identifies appropriate treatment for complex critically ill patients with cardiovascular and thoracic diseases (e.g., treatment of wall motion abnormalities after CABG, dialysis options)	device selection, , complications after esophagectomy, BPF	TSITE, faculty evaluation, presentation		
270	Understands risk adjustment and outcome databases (e.g., scoring systems)	risk stratification	TSITE, faculty evaluation, presentation		
271	Understands the need for complex ventilation strategies (e.g., oscillating ventilation)	BPF, vent management in ARDS	TSITE, faculty evaluation, presentation		
272	Conducts research on critical care and presents at a local, regional or national meeting.	Resident research projects	CT research day presentations, national meetings		
273	Patient Care: Critical Care				
274	Orders basic diagnostic, nutritional and assessment tests for critically ill patients with cardiovascular and thoracic diseases (e.g., pre and post-operative)	PGY1 + 2 SICU	Faculty evaluations SICU	today	peer eval
275	Lists basic treatment options for critically ill patients with cardiovascular and thoracic diseases	PGY1 + 2 SICU	Faculty evaluations SICU	today	fac eval
276	Orders appropriate prophylactic ICU measures to prevent complications (e.g., nutritional support, glucose management, ulcer and DVT prophylaxis)	PGY1 + 2 SICU	Faculty evaluations SICU	today	peer eval, fac eval
277	Obtains ACLS certification	PGY1 orientation week	ACLS certificate	today	orientation
278	Demonstrates basic ICU surgical skills (simulation or bedside), including IV, arterial line, Foley catheter, NG tube	PGY1 + 2 SICU	VOP books	today	VOP book
279	Interprets and prioritizes diagnostic and physiologic assessment tests for critically ill patients with cardiovascular and thoracic diseases	PGY1 + 2 SICU, PGY 4 cardiac	Faculty evaluations SICU		
280	Suggests treatment plan for critically ill patients with cardiovascular and thoracic diseases, including preventive care (e.g., prophylactic antibiotics)	PGY3 cardiac, thoracic	Faculty evaluation	today	fac eval

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
281	Recognizes routine ICU related complications (e.g., line sepsis, DVT, ventilator acquired pneumonia, pneumothorax)	PGY1 + 2 SICU	Faculty evaluations SICU	today	peer eval, fac eval
282	Performs cardioversion for arrhythmias	PGY4 cardiac	Faculty evaluation		
283	Demonstrates advanced ICU surgical skills (simulation or bedside), including central line, PA catheter, chest tube	PGY2 SICU	Faculty evaluations SICU		
284	Demonstrates routine ventilator management	PGY1 + 2 SICU	Faculty evaluations SICU	today	peer eval, fac eval
285	Manages temporary pace maker	PGY3 cardiac	Faculty evaluation		
286	Establishes a diagnostic and assessment plan for critically ill patients with cardiovascular and thoracic diseases	PGY4 cardiac, thoracic	Faculty evaluation		
287	Selects ideal treatment option for critically ill patients with cardiovascular and thoracic diseases	PGY4 cardiac, thoracic	Faculty evaluation		
288	Manages routine ICU complications (e.g., line sepsis, DVT, ventilator acquired pneumonia, pneumothorax)	PGY2 SICU, PGY3 cardiac, thoracic	Faculty evaluation		
289	Demonstrates complex ventilator management	PGY5 cardiac, thoracic	Faculty evaluation		
290	Performs open chest resuscitation	PGY4 cardiac	Faculty evaluation		
291	Performs emergency pericardiocentesis	PGY6 cardiac	Faculty evaluation		
292	Establishes a diagnostic and assessment plan for complex critically ill patients with cardiovascular and thoracic diseases (e.g., patient with multi-system organ failure)	PGY5 cardiac, thoracic	Faculty evaluation		
293	Selects ideal treatment option for complex critically ill patients with cardiovascular and thoracic diseases	PGY5 cardiac, thoracic	Faculty evaluation		
294	Manages complex ICU related complications (e.g., ARDS, acute renal failure, low cardiac output, stroke, metabolic abnormalities)	PGY6 cardiac, thoracic	Faculty evaluation		
295	Troubleshoots assist devices	PGY5 cardiac, thoracic	Faculty evaluation		
296	Obtains board certification in critical care.	Requires advanced year	Critical care certificate		
297	Medical Knowledge: Esophagus				
298	Knows basic anatomy and pathology (e.g., identifies gastrointestinal anatomy innervation and blood supply, endoscopic landmarks)	anatomy/physiology	TSITE, faculty evaluation, presentation	today	fac eval
299	Knows basic foregut physiology (e.g., basic esophageal motility)	anatomy/physiology	TSITE, faculty evaluation, presentation		
300	Lists clinical manifestations of benign and malignant disorders (e.g., heart burn, chest pain, dysphagia, odynophagia	GERD/Barrett's,	TSITE, faculty evaluation, presentation		
301	Lists diagnostic and/or staging tools available for the evaluation of benign and malignant disorders (e.g., manometry, pH testing, EUS)	ph probe, EUS, manometry, Benign esophageal conference	TSITE, faculty evaluation, presentation		
302	Lists treatment options for benign and malignant disorders (e.g., surgery vs. chemo/RT vs. chemo/RT alone for malignancy)	treatment by stage	TSITE, faculty evaluation, presentation		
303	Knows basic complications for benign and malignant disorders (e.g., perforation, recurrent reflux, pulmonary aspiration)	achalasia, failed nissen, esophagectomy outcomes/complications	TSITE, faculty evaluation, presentation		
304	Understands common variations in anatomy and pathology (e.g., lymphatic drainage)	esophagus anatomy/physiology	TSITE, faculty evaluation, presentation		
305	Understands physiologic changes accompanying malignancy and motility disorders (e.g., achalasia, reflux, esophageal spasm)	achalasia, esophageal spasm, GERD	TSITE, faculty evaluation, presentation		

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
306	Generates differential diagnosis of disease with similar manifestations (e.g., achalasia vs. pseudoachalasia; coronary syndrome vs. esophageal spasm)	achalasia, esophageal spasm, GERD	TSITE, faculty evaluation, presentation		
307	Understands advantages and disadvantages of diagnostic tools in evaluating benign and malignant disorders (e.g., endoscopy vs. EUS vs. barium swallow)	evaluation of esophageal cancer, EUS, ph probe, manometry	TSITE, faculty evaluation, presentation		
308	Understands advantages and disadvantages of various treatment options for benign and malignant disorders, including the impact of staging (e.g., pluses and minus of treatment options)	treatment by stage	TSITE, faculty evaluation, presentation		
309	Understands risks, benefits and complications of treatment modalities (e.g., slipped Nissen, anastomotic leak)	failed Nissen, esophagectomy complications	TSITE, faculty evaluation, presentation		
310	Understands complex integrations between anatomy and pathology (e.g., fascial planes in descending mediastinitis)	anatomy/physiology	TSITE, faculty evaluation, presentation		
311	Understands the role of treatment on physiology of malignancy and motility disorders (e.g., post-op esophagectomy complications - dumping syndrome)	esophagectomy complications	TSITE, faculty evaluation, presentation		
312	Identifies the common variants of the clinical manifestations of benign and malignant disorders(e.g., benign vs. malignant stricture)	evaluation of esophageal cancer	TSITE, faculty evaluation, presentation		
313	Interprets normal and common abnormalities associated with benign and malignant disorders (e.g., interprets EUS, common motility tracings)	ph probe, EUS, manometry, Benign esophageal conference	TSITE, faculty evaluation, presentation		
314	Identifies appropriate treatment for routine patient with benign and malignant disorders (e.g., treatment options for high grade dysplasia - EMR vs. esophagectomy)	achalasia, Barrett's, EMR/stents	TSITE, faculty evaluation, presentation		
315	Knows basic outcome literature for benign and malignant disorders	fundoplications, esophageal cancer outcomes	TSITE, faculty evaluation, presentation		
316	Understands complex variations in anatomy and pathology, including congenital (e.g., esophageal atresia)	TEF	TSITE, faculty evaluation, presentation		
317	Adapts therapeutic management based on understanding of physiology for various disease states (e.g., partial vs. total fundoplication)	fundoplications	TSITE, faculty evaluation, presentation		
318	Distinguishes the complex clinical manifestations and complications of benign and malignant disorders (e.g., Type IV hernias, TEF)	diverticula, paraesophageal hernias	TSITE, faculty evaluation, presentation		
319	Interprets and integrates complex abnormalities associated with benign and malignant disorders (e.g., short esophagus, achalasia with sigmoid esophagus)	failed Nissen	TSITE, faculty evaluation, presentation		
320	Identifies appropriate treatment for complex patient with benign and malignant disorders,(e.g., primary vs. redo Nissen, redo myotomy vs. esophagectomy)	October A achalasia, failed Nissen	TSITE, faculty evaluation, presentation		
321	Knows outcomes for all treatment modalities and complications, including databases and clinical trials	esophageal cancer outcomes, October A fundoplications	TSITE, faculty evaluation, presentation		
322	Understands imaging for colon interposition	colon interposition	TSITE, faculty evaluation, presentation, mock orals		
323	Understands need for colon interposition	colon interposition	TSITE, faculty evaluation, presentation, mock orals		
324	Presents on outcomes of benign or malignant disorders at local, regional or national meeting	Resident research projects	CT research day presentations, national meetings		
325	Patient Care: Esophagus				
326	Performs preoperative assessment	PGY2 thoracic	faculty evaluations	today	fac eval
327	Orders basic diagnostic/assessment tests for routine benign and malignant esophageal disease (e.g., EUS, CT/PET, pH testing, manometry)	PGY2 thoracic	faculty evaluations		
328	Demonstrates basic surgical skills (simulation vs. OR)	PGY2 thoracic	faculty evaluations	today	fac eval

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
329	Interprets hemodynamics and suggests appropriate diagnostic imaging	PGY2 thoracic	faculty evaluations		
330	Recognizes routine post-operative complications	PGY2 thoracic	faculty evaluations	today	peer eval, fac eval
331	Prioritizes diagnostic/assessment tests for routine benign and malignant esophageal disease (e.g., Barium swallow vs. EUS vs. endoscopy)	PGY2 thoracic	faculty evaluations		
332	Lists basic treatment options for routine benign and malignant esophageal disease (e.g., Nissen fundoplication, esophageal resection, Toupet)	PGY2 thoracic	faculty evaluations		
333	Recognizes common post-operative complications (e.g., leak, slipped Nissen, cardiac arrhythmia)	PGY2 thoracic	faculty evaluations		
334	Demonstrates basic endoscopic skills	PGY1 thoracic	faculty evaluations	today	simulator curriculum, fac eval
335	Demonstrates basic minimally invasive skills (FLS)	PGY3 MIS	faculty evaluations		
336	Provides basic intraoperative assistance	PGY2 thoracic	faculty evaluations		
337	Performs basic hand sewn and stapled anastomosis	PGY4 thoracic	faculty evaluations		
338	Develops a treatment plan for routine patient with benign and malignant disorders	PGY3 thoracic, PGY3 MIS	faculty evaluations, chart audit		
339	Manages routine post-operative complications	PGY3 thoracic	faculty evaluations		
340	Interprets diagnostic/assessment tests for routine benign and malignant esophageal disease (e.g., basic manometry tracings, EUS and PET/CT scan results	PGY3 thoracic	faculty evaluations		
341	Selects ideal treatment option after assessment of diagnostic test results for routine benign and malignant esophageal disease.	PGY3 thoracic	faculty evaluations, mock orals		
342	Manages common post-operative complications (e.g., surgical vs. medical management, reintubation)	PGY3 thoracic	faculty evaluations, mock orals		
343	Demonstrates advanced endoscopic skills (EMR, EUS, stenting)	PGY5 thoracic	faculty evaluations		
344	Performs routine open and minimally invasive motility operations	PGY4 thoracic, PGY3 MIS	faculty evaluations, case logs		
345	Develops a treatment plan for complex patient with benign and malignant disorders	PGY4 thoracic	faculty evaluations		
346	Manages complex post-operative complications	PGY5 thoracic	faculty evaluations		
347	Able to establish a diagnostic and assessment plan for complex patients with benign and malignant esophageal disease (e.g., short esophagus, sigmoid esophagus)	PGY5 thoracic	faculty evaluations, mock orals		
348	Selects ideal treatment option for complex benign and malignant esophageal disease (e.g., consideration of comorbidities, chemo/RT/surgery vs. surgery vs. chemo/RT, does patient have short esophagus)	PGY5 thoracic	faculty evaluations		
349	Manages complex post-operative complications (e.g., fistula, gastric necrosis)	PGY6 thoracic	faculty evaluations		
350	Performs routine esophageal resections	PGY4 thoracic	faculty evaluations, case logs		
351	Operatively manages esophageal perforation/trauma	PGY4 thoracic	faculty evaluations, case logs		
352	Performs complex esophageal resections (e.g., colon interposition)	PGY6 thoracic	faculty evaluations, case logs		
353	Performs redo motility operations	PGY6 thoracic	faculty evaluations, case logs		
354	Performs minimally invasive esophagectomy	PGY6 t horacic	faculty evaluations, case logs		
355	Medical Knowledge: Lung and Airway				
356	Knows basic anatomy and pathology (e.g., segmental anatomy, types of lung cancer)	lung anatomy/physiology	TSITE, faculty evaluation, presentation	today	fac eval

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
357	Knows basic pulmonary physiology (e.g., A-a gradient, pulmonary function tests, ventilation perfusion scan, diffusion, respiratory mechanics, V/Q mismatch)	lung anatomy/physiology	TSITE, faculty evaluation, presentation		
358	Lists clinical manifestations of benign, malignant and traumatic disorders (e.g., clinical diagnosis of COPD, signs and symptoms of advanced metastatic lung neoplasms,)	LVRS, trauma	TSITE, faculty evaluation, presentation	today	fac eval
359	Lists diagnostic and/or staging tools available for the evaluation of benign, malignant and traumatic disorders (e.g., CXR, CT, PET, EBUS, PFTs, mediastinoscopy, flexible/rigid bronchoscopy)	staging lung cancer, solitary pulmonary nodule	TSITE, faculty evaluation, presentation	today	fac eval
360	Lists treatment options for benign, malignant and traumatic disorders (e.g., lobectomy, operative intervention for hemothorax)	treatment by stage, sleeve, pneumonectomy, empyema, effusions	TSITE, faculty evaluation, presentation		
361	Know basic outcomes for benign and malignant disorders (e.g., morbidity and mortality for lobectomy)	lung cancer outcomes,	TSITE, faculty evaluation, presentation		
362	Understands common variations in anatomy and pathology (e.g., azygous lobe, mixed lung cancer histologies)	lung anatomy, chemo choices	TSITE, faculty evaluation, presentation		
363	Understands physiologic changes accompanying benign, malignant, and traumatic disorders (e.g., pulmonary shunt, tension pneumothorax causing decreased venous return)	spontaneous pneumothorax, marginal patient	TSITE, faculty evaluation, presentation		
364	Generates differential diagnosis of disease with similar manifestations (e.g., lung nodules, airway tumors, hemoptysis workup)	solitary pulmonary nodule, massive hemoptysis	TSITE, faculty evaluation, presentation		
365	Understands advantages and disadvantages of diagnostic tools in evaluating benign, malignant and traumatic disorders (e.g., CXR vs. CT, EBUS vs. mediastinoscopy, CT vs. angiogram)	radiology, EBUS vs med	TSITE, faculty evaluation, presentation		
366	Understands advantages and disadvantages of various treatment options for benign, malignant and traumatic disorders, including the impact of staging (e.g., use of induction therapy, airway stents)	treatment by stage, endobronchial therapies	TSITE, faculty evaluation, presentation		
367	Understand risks, benefits and complications of treatment modalities (e.g., morbidity and mortality for VATS and open lobectomy)	outcomes/complications lung cancer, VATs vs open	TSITE, faculty evaluation, presentation		
368	Understands the role of treatment on physiology of benign and malignant disorders (e.g., pneumonectomy increases pulmonary pressure and RV strain)	pneumonectomy	TSITE, faculty evaluation, presentation		
369	Identifies the common variants of the clinical manifestations of benign, malignant and traumatic disorders (e.g., various bronchial adenomas, traumatic tracheobronchial injuries)	fungus, MAI/TB, carcinoid	TSITE, faculty evaluation, presentation		
370	Interprets normal and common abnormalities associated with benign, malignant and traumatic disorders (e.g., PET abnormalities, interpret EBUS findings, interpret PFT results, acid-base)	marginal patient, staging lung cancer	TSITE, faculty evaluation, presentation		
371	Identifies appropriate treatment for routine patient with benign, malignant and traumatic disorders (e.g., medical therapy for pulmonary fibrosis, less than lobectomy for compromised lung function,)	XRT, metastatic disease	TSITE, faculty evaluation, presentation		
372	Know basic outcome literature for benign and malignant disorders (e.g., IASLC survival data for lung cancer stages, survival rates for advanced lung diseases like COPD, IPF)	lung cancer outcomes	TSITE, faculty evaluation, presentation		
373	Understands complex variations in anatomy and pathology, (including congenital (e.g., cystic adenomatoid formation, AV malformation, tracheo-esophageal fistula, pulmonary sequestration)	congenital lung	TSITE, faculty evaluation, presentation		
374	Adapts therapeutic management based on understanding of physiology for various disease states (e.g., changes associated with lung volume reduction)	LVRS	TSITE, faculty evaluation, presentation		
375	Distinguishes the complex clinical manifestations and complications of benign, malignant and traumatic disorders (e.g., postpneumonectomy BPF, tracheoesophageal fistula)	complications esophagectomy, BPF, chylothorax, acquired TEF	TSITE, faculty evaluation, presentation		

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
376	Interprets and integrates complex abnormalities associated with benign, malignant and traumatic disorders (e.g., applies results from quantitative V/Q scans, mVO2 max toward the decision making)	marginal patient	TSITE, faculty evaluation, presentation		
377	Identifies appropriate treatment for complex patient with benign, malignant and traumatic disorders (e.g., RFA for high risk lung cancer patients, lung reduction surgery, tracheal disorders)	tracheal tumors, benign tracheal stneosis, tracheomalacia, LVRS, tx recipient selection	TSITE, faculty evaluation, presentation		
378	Knows outcomes for all treatment modalities and complications, including databases and clinical trials (e.g., NETT trial results, induction therapy for stage IIIa disease)	LVRS, outcomes/complications	TSITE, faculty evaluation, presentation		
379	Presents on outcomes of benign or malignant disorders at local, regional or national meeting (e.g., using STS or institutional database for outcomes research)	Resident research projects	CT research day presentations, national meetings		
380	Patient Care: Lung and Airway				
381	Orders basic diagnostic/assessment tests for routine benign, malignant and traumatic disorders (e.g., CXR, PET, CT, angiogram)	PGY1 thoracic	Faculty evaluations	today	fac eval
382	Lists basic treatment options for routine benign, malignant and traumatic disorders (e.g., chemo/radiation therapy, needle decompression for tension pneumothorax)	PGY1 thoracic	Faculty evaluations	today	fac eval
383	List common complications for benign, malignant and traumatic disorders and their treatment (e.g., BPF, prolonged air leak, hemoptysis)	PGY2 thoracic	Faculty evaluations		
384	Demonstrates basic surgical skills (simulation vs. OR) (e.g., positioning patient, suturing)	PGY1 thoracic	Faculty evaluations	today	PGY1 VOP, fac eval
385	Obtains ATLS certification	PGY3 ATLS course	ATLS certificate		
386	Interprets diagnostic/assessment tests for routine benign, malignant and traumatic disorders (e.g., interprets PFTs, recognizes false positives on PET)	PGY2 thoracic	Faculty evaluations		
387	Recognizes routine post-operative and disease related complications (e.g., complications after lobectomy)	PGY2 thoracic	Faculty evaluations		
388	Demonstrates basic endoscopic skills (e.g., making ports, running videoscope)	PGY2 thoracic	Faculty evaluations		
389	Demonstrates basic minimally invasive skills (FLS)	PGY3 thoracic, PGY3 MIS	Faculty evaluations		
390	Provides basic intraoperative assistance	PGY2 thoracic	Faculty evaluations		
391	Performs common bedside procedures (e.g., tracheostomy, chest tube, central line)	PGY2 thoracic	Faculty evaluations, Trach assessment		
392	Prioritizes diagnostic/assessment tests for routine benign, malignant and traumatic disorders (e.g., obtain MRI based on CT results, bronchoscopy for pneumomediastinum)	PGY3 thoracic	Faculty evaluations		
393	Selects ideal treatment option for routine benign, malignant and traumatic disorders (e.g., combination therapy for advanced lung cancer, when not to operate for lung cancer)	PGY3 thoracic	Faculty evaluations, Mock orals		
394	Manages routine post-operative and disease related complications (e.g., postop air leak, spontaneous pneumothorax)	PGY3 thoracic	Faculty evaluations		
395	Demonstrates advanced endoscopic skills (e.g., EBUS, stenting, proper placement of ports)	PGY5 thoracic	Faculty evaluations		
396	Performs routine open lung resection	PGY4 thoracic	Faculty evaluations, case logs		
397	Performs basic VATS procedures	PGY2 thoracic	Faculty evaluations, case logs		
398	Establishes a diagnostic and assessment plan for complex patients with benign, malignant and traumatic disorders (e.g., order of tests for TEF, quantitative V/Q for compromised lung function)	PGY4 thoracic	Faculty evaluations, Mock orals		
399	Selects ideal treatment option for complex benign, malignant and traumatic disorders (e.g., interventions for TEF, guide for stage III and IV lung cancer, Pancoast tumor)	PGY5 thoracic	Faculty evaluations, Mock orals		

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
400	Manages complex post-operative and disease related complications (e.g., BPF, RML torsion)	PGY5 thoracic	Faculty evaluations		
401	Performs complex open lung resection (e.g., Pancoast, sleeve)	PGY5 thoracic	Faculty evaluations, case logs		
402	Performs VATS lobectomies	PGY5 thoracic	Faculty evaluations, case logs		
403	Performs tracheal resections/traumatic tracheal repair	PGY6 thoracic	Faculty evaluations, case logs		
404	Performs robotic lung resections, VATS segmentectomy	PGY6 thoracic	Faculty evaluations, case logs		
405	Medical Knowledge: Chest Wall, Pleura, Mediastinum				
406	Knows basic chest wall, pleural, and mediastinal anatomy and pathology (e.g., anatomic features on a CT scan)	radiology, lung anatomy	TSITE, faculty evaluation	today	fac eval
407	Knows basic chest wall and pleural physiology (e.g., physiology of chest tube drainage and pleural pressures)	lung physiology	TSITE, faculty evaluation	today	fac eval
408	Lists clinical manifestations of benign, malignant and traumatic disorders of the chest wall, pleura, and mediastinum (e.g., cough, shortness of breath with pleural effusion)	evaluation of mediastinal mass	TSITE, faculty evaluation	today	fac eval
409	Lists diagnostic and/or staging tools available for the evaluation of benign, malignant and traumatic disorders (e.g., CT, chest x-ray, MRI, PET, ultrasound, FNA, EBUS, mediastinoscopy, EUS)	advanced bronchoscpy, July B EUS, July A radiology	TSITE, faculty evaluation	today	fac eval
410	Lists treatment options for benign, malignant and traumatic disorders (e.g., medical vs. surgical management of chest wall tumors, treatment options for pleural effusion)	chest wall tumors, December B empyema, pleural effusions	TSITE, faculty evaluation	today	fac eval
411	Knows basic complications for benign and malignant disorders (e.g., bleeding, wound infection, empyema, pneumothorax)	empyema, pleural effusion	TSITE, faculty evaluation		
412	Understands common variations in anatomy and pathology (e.g., cervical rib, replaced right subclavian vessel)	thoracic outlet, pectus	TSITE, faculty evaluation		
413	Understands physiologic changes accompanying benign, malignant and traumatic disorders (e.g., physiology post lung resection, flail chest, physiologic changes that accompany pleural effusions)	pneumonectomy, thoracic trauma	TSITE, faculty evaluation		
414	Generates differential diagnosis of disease with similar manifestations (e.g., differential of chest wall masses)	chest wall tumors, mediastinal tumors	TSITE, faculty evaluation		
415	Understands advantages and disadvantages of diagnostic tools in evaluating benign, malignant and traumatic disorders (e.g., difficulty diagnosing mesothelioma, diagnosing mediastinal tumors)	chest wall tumors, mediastinal tumors, mesothelioma	TSITE, faculty evaluation		
416	Understands advantages and disadvantages of various treatment options for benign, malignant and traumatic disorders (e.g., thoracentesis vs. chest tube drainage vs. thoracoscopy for pleural effusion)	malignant effusion	TSITE, faculty evaluation		
417	Understands risks, benefits and complications of treatment modalities (e.g., complications associated with chest wall reconstruction)	chest wall tumors	TSITE, faculty evaluation		
418	Understands complex integrations between anatomy and pathology (e.g., thoracic outlet syndrome, Pancoast tumor, dumbbell neurogenic tumors)	thoracic outlet, neurogenic tumors	TSITE, faculty evaluation		
419	Understands the role of treatment on physiology of benign, malignant and traumatic disorders (e.g., physiologic changes that accompany chest wall resection)	pectus, chest wall tumors	TSITE, faculty evaluation		
420	Identifies the common variants of the clinical manifestations of benign, malignant and traumatic disorders (e.g., neurogenic vs. vascular symptoms for thoracic outlet syndrome, types of effusions)	thoracic outlet, empyema, malignant effusions	TSITE, faculty evaluation		
421	Interprets normal and common abnormalities associated with benign, malignant and traumatic disorders (e.g., radiographic features of different chest wall tumors and mediastinal masses)	chest wall tumors, mediastinal tumors	TSITE, faculty evaluation		

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
422	Identifies appropriate treatment for routine patient with benign, malignant and traumatic disorders.	chest wall tumors, mediastinal tumors	TSITE, faculty evaluation		
423	Knows basic outcome literature for benign and malignant disorders (e.g., survival and local recurrence rate after resection of chest wall tumors)	chest wall tumors, thymoma, germ cell tumors, neurogenic tumors	TSITE, faculty evaluation		
424	Understands complex variations in anatomy and pathology, including congenital (e.g., chest wall tumors requiring multimodality therapy)	chest wall tumors	TSITE, faculty evaluation		
425	Compares and contrasts therapeutic management based on understanding of physiology for various disease states (e.g., resection only vs. resection and reconstruction of various chest wall lesions)	chest wall tumors	TSITE, faculty evaluation		
426	Distinguishes the complex clinical manifestations of benign, malignant and traumatic disorders as well as manifestations of the treatment of these disorders (e.g., infected chest wall reconstruction)	chest wall tumors	TSITE, faculty evaluation		
427	Interprets and integrates complex abnormalities associated with benign, malignant and traumatic disorders (e.g., use of MRI for thoracic outlet tumor, diagnosis of lymphoma vs. thymoma)	evaluation of a mediastinal mass, thoracic outlet	TSITE, faculty evaluation,mock orals		
428	Identifies appropriate treatment for complex patient with benign, malignant and traumatic disorders	chest wall tumors, thymoma, germ cell tumors, neurogenic tumors	TSITE, faculty evaluation,mock orals		
429	Knows outcomes for all treatment modalities and complications, including databases and clinical trials (e.g., pleurectomy vs. extrapleural pneumonectomy for mesothelioma)	mesothelioma	TSITE, faculty evaluation		
430	Knows complex alternatives for chest wall reconstruction (e.g., flaps available for chest wall reconstruction)	chest wall tumors	TSITE, faculty evaluation, mock orals		
431	Presents on outcomes of benign or malignant disorders at local, regional or national meeting	Resident research projects	CT research day presentations, national meetings		
432	Patient Care: Chest Wall, Pleura, Mediastinum				
433	Orders basic diagnostic/assessment tests for routine benign, malignant and traumatic diseases (e.g., chest x-ray, CT, PET)	PGY1 thoracic	Faculty evaluation	today	fac eval
434	Lists basic treatment options for routine benign, malignant and traumatic diseases.	PGY2 thoracic	Faculty evaluation	today	fac eval
435	Lists common complications for benign, malignant and traumatic diseases and their treatment	PGY2 thoracic	Faculty evaluation		fac eval
436	Demonstrates basic surgical skills (simulation vs. OR) (e.g., knot tying, suturing)	General surgery skills lab	PGY1 VOP	today	PGY1 VOP, fac eval
437	Performs common bedside procedures (e.g., chest drain/tube, thoracentesis, pleurodesis)	PGY1 + 2 SICU	VOP books	today	VOP book, fac eval
438	Interprets diagnostic/assessment tests for routine benign, malignant and traumatic diseases (e.g., distinguish free flowing and loculated pleural effusions, chest wall involvement by tumor)	PGY1 thoracic	Faculty evaluation	today	fac eval
439	Suggests treatment options for routine benign, malignant and traumatic diseases.	PGY2 thoracic	Faculty evaluation		
440	Recognizes routine post-operative and disease related complications (e.g., wound infection, pleural fluid loculation)	PGY2 thoracic	Faculty evaluation		
441	Demonstrates basic endoscopic and ultrasound- guidance skills (e.g., handling video scope)	PGY1 thoracic	Faculty evaluation, bronch assessment form	today	simulator curriculum, fac eval
442	Demonstrates basic minimally invasive skills.	PGY2 thoracic	Faculty evaluation		
443	Provides basic intraoperative assistance.	PGY2 thoracic	Faculty evaluation		
444	Prioritizes diagnostic/assessment tests for routine benign, malignant and traumatic diseases (e.g., prioritize use of imaging to evaluate chest wall trauma)	PGY2 thoracic	Faculty evaluation		

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
445	Selects ideal treatment option for routine benign, malignant and traumatic diseases (e.g., options for malignant mesothelioma)	PGY3 thoracic	Faculty evaluation		
446	Manages routine post-operative and disease related complications (e.g., need for radiologic vs. surgical intervention for wound infection after chest wall reconstruction)	PGY3 thoracic	Faculty evaluation		
447	Demonstrates advanced endoscopic skills (e.g., performs uncomplicated EBUS or mediastinoscopy)	PGY4 thoracic	Faculty evaluation, case log		
448	Performs open and VATS procedures for uncomplicated pleural or mediastinal disorders (e.g., VATS pleural or mediastinal biopsy, open Stage I/II thymectomy)	PGY3 thoracic	Faculty evaluation, case log		
449	Performs simple chest wall resection (e.g., resects a laterally placed small chondrosarcoma (<3cm))	PGY4 thoracic	Faculty evaluation, case log		
450	Establishes a diagnostic and assessment plan for complex patients with benign, malignant and traumatic diseases (e.g., evaluation for posterior tumor involving spine)	PGY4 thoracic	Faculty evaluation		
451	Selects ideal treatment option for complex benign, malignant and traumatic diseases (e.g., induction therapy for certain mediastinal malignancies, post-operative empyema with or without BPF)	PGY4 thoracic	Faculty evaluation		
452	Manages complex post-operative and disease related complications (e.g., management of post resectional empyema with and without BPF)	PGY5 thoracic	Faculty evaluation		
453	Performs open and VATS procedures for complex pleural and mediastinal disorders (e.g., open decortication for a complex loculated pleural effusion, thymectomy for a Stage III thymoma)	PGY 5 thoracic	Faculty evaluation, case log		
454	Performs complex chest wall resection and/or reconstruction (e.g., large chest wall lesion with reconstruction)	PGY6 thoracic	Faculty evaluation, case log		
455	Surgically manages mesothelioma (e.g., radical pleurectomy and decortication with diaphragm reconstruction)	PGY6 thoracic	Faculty evaluation, case log		
456	Professionalism: Ethics and Values				
457	Understands basic bioethical principles and is able to identify ethical issues in CT surgery.	ethics	Faculty evaluation	today	fac eval
458	Demonstrates behavior that conveys caring, honesty, and genuine interest in patients and families.		Faculty evaluation, 360 evals	today	nursing eval, peer eval
459	Recognizes ethical issues in practice and is able to discuss, analyze and manage common ethical situations.	ethics	Faculty evaluation		
460	Demonstrates behavior that shows insight into the impact of one's core values and beliefs on patient care.		Faculty evaluation, 360 evals	today	nursing eval, peer eval
461	Analyzes and manages ethical issues in complicated and challenging situations.		Faculty evaluation		
462	Understands the beliefs, values and practices of diverse and vulnerable patient populations and the potential impact on patient care.	HIPPA training, PGY2 VA	Faculty evaluation		
463	Uses a systematic approach to analyzing and managing ethical issues including advertising, billing and conflicts of interest.	HIPPA training	HIPPA certification		
464	Develops a mutually agreeable care plan in context of conflicting physician and patient values and beliefs.	PGY5 thoracic, PGY6 cardiac	Faculty evaluation, 360 evals		
465	Leads institutional and organizational ethics programs.	Resident research projects	CT research day presentations, national meetings		
466	Develops programs to ensure equality of care in diverse, vulnerable and underserved populations.	Resident QI projects	QI presentations		
467	Professionalism: Personal Accountability				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
468	Understands and manages the issues related to fatigue and sleep deprivation.	Intern orientation	Faculty evaluation	today	peer eval, fac eval
469	Exhibits professional behavior (e.g., reliability, industry, integrity, and confidentiality).		Faculty evaluation, 360 evals	today	nursing eval, peer eval
470	Demonstrates management of personal emotional, physical, and mental health.	General surgery resident seminar series – emotional wellness	Faculty evaluation, 360 evals	today	fac eval
471	Recognizes individual limits in clinical situations and asks for assistance when needed.		Faculty evaluation, 360 evals	today	peer eval, fac eval
472	Ensures that the medical record (including EMR) is timely, accurate and complete.	General surgery resident seminar series – clinical documentation	Faculty evaluation	today	fac eval
473	Identifies and manages situations in which maintaining personal emotional, physical and mental health is challenged.		Faculty evaluation, 360 evals		
474	Understands conflicting interests of self, family, and others and their effects on the delivery of medical care.	General surgery resident seminar series – communication	Faculty evaluation		
475	Understands physician accountability to physicians, society and the profession.	General surgery resident seminar series – malpractice	Faculty evaluation		
476	Recognizes signs of physician impairment, including fatigue, and demonstrates appropriate steps to address impairment in self and in colleagues.	Intern orientation	Faculty evaluation		
477	Prioritizes and balances conflicting interests of self, family, and others to optimize medical care.		Faculty evaluation, 360 evals		
478	Develops institutional and organizational strategies to improve physician wellness.	Resident QI projects	QI presentations		
479	Interpersonal and Communication Skills				
480	Develops a positive relationship with patients in uncomplicated situations and recognizes communication conflicts.		Faculty evaluation	today	nursing eval, peer eval
481	Recognizes multidisciplinary approach to patient care.		Faculty evaluation, 360 eval	today	nursing eval, fac eval
482	Understands the patient's/family's perspective while engaged in active listening.		Faculty evaluation, 360 eval	today	nursing eval, peer eval
483	Utilizes interpreters, as needed.		Faculty evaluation	today	fac eval
484	Appreciates effective communication to prevent medical error.	Intern orientation – handoffs	Faculty evaluation	today	fac eval
485	Participates in effective transitions of care.		Faculty evaluation, 360 eval	today	peer eval, fac eval
486	Negotiates and manages simple patient/family-related, and team conflicts.	General surgery resident seminar series – communication	Faculty evaluation, 360 eval		
487	Responds to the social and cultural context of the patient and family to ensure the patient understands and ability to participate in health care decision-making.	General surgery resident seminar series – communication	Faculty evaluation, 360 eval		
488	Understands the effects of computer use on information accuracy and potential effects on the physician/patient relationship.		Faculty evaluation		
489	Sustains working relationships and manages complex and challenging situations, including transitions of care.		Faculty evaluation, 360 eval		
490	Customizes the delivery of emotionally difficult information.		Faculty evaluation		
491	Manages transitions of care and optimizes communication across systems.	Intern orientation – handoffs	Faculty evaluation		
492	Maintains collegial relationship with other professional staff.		Faculty evaluation, 360 eval		
493	Negotiates and manages conflict in complex and challenging situations (including vulnerable populations) and develops working relationships across specialties and systems of care.	General surgery resident seminar series – communication	Faculty evaluation, 360 eval		
494	Organizes and facilitates family/ healthcare team conferences		Faculty evaluation		

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
495	Able to facilitate/lead team based care activities, e.g., OR team, multidisciplinary cancer conference.	Thoracic multidisciplinary conference, Cardiac M+M	Faculty evaluation		
496	Uses multiple forms of communication (e.g., email, patient portal, social media) ethically and with respect for patient privacy.		Faculty evaluation		
497	Develops models/approaches to managing difficult communications and seeks leadership opportunities within professional organizations.	TSRA, hospital committees	Leadership roles		
498	Coaches others to improve communication skills.		Faculty evaluation		
499	Systems Based Practice: Patient Safety				
500	Understands the differences between medical errors, near misses, and sentinel events.	General surgery resident seminar series – errors	Faculty evaluation		
501	Understands the roles of care team members.	Intern orientation	Faculty evaluation, 360 eval	today	nursing eval, peer eval
502	Participates in the use of tools to prevent adverse events (e.g., checklists and briefings).	General surgery resident seminar series – errors	Faculty evaluation	today	fac eval
503	Describes the common system causes for errors.	General surgery resident seminar series – errors	Faculty evaluation		
504	Consistently uses tools to prevent adverse events (e.g., checklists and briefings).	General surgery resident seminar series – errors	Faculty evaluation		
505	Reports problematic behaviors, processes, and devices including errors and near misses.	General surgery resident seminar series – errors	Faculty evaluation		
506	Demonstrates structured communication tool for hand-offs.	Intern orientation	Faculty evaluation		
507	Participates in the analysis of shared team experiences to prevent future errors using proven analysis techniques (e.g., root cause analysis, failure mode effects analysis).	Cardiac M+M conference	Faculty evaluation		
508	Leads team by promoting situational awareness and input by all team members.		Faculty evaluation, 360 eval		
509	Conducts morbidity and mortality conference to improve patient safety.	M+M conference	M+M assessment tool		
510	Leads curriculum design to teach teamwork and communication skills to healthcare professionals.	Resident research project	CT research day presentations, national meetings		
511	Leads multidisciplinary teams (e.g., human factors engineers, social scientists) to address patient safety issues.	Resident QI project	QI project presentation		
512	Systems Based Practice: Resource Allocation				
513	Describes practice variations in resource consumption, such as the utilization of diagnostic tests.	General surgery resident seminar series – critical appraisal	Faculty evaluation	today	fac eval
514	Describes the cost implications of using resources and practice variation.	General surgery resident seminar series – critical appraisal	Faculty evaluation	today	fac eval
515	Participates in responsible use of health care resources seeking appropriate assistance.	General surgery resident seminar series – critical appraisal	Faculty evaluation		
516	Practices cost effective care (e.g., managing length of stay, operative efficiency).	General surgery resident seminar series – critical appraisal	Faculty evaluation		
517	Designs measurement tools to monitor and provide feedback to providers/teams on resource consumption to facilitate improvement.	Resident research project	CT research day presentations, national meetings		
518	Systems Based Practice: Practice Management				
519	Understands basic health payment systems, including uninsured care.		Faculty evaluation	today	fac eval
520	Uses EMR appropriately.	General surgery resident seminar series – clinical documentation	Faculty evaluation	today	nursing eval, fac eval

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
521	Understands the importance of documentation for coding	General surgery resident seminar series – clinical documentation	Faculty evaluation		
522	Able to document inpatient diagnoses.	General surgery resident seminar series – clinical documentation	Faculty evaluation		
523	Understands different practice models.		Faculty evaluation		
524	Understands principles of diagnosis, evaluation and management, and procedure coding.	General surgery resident seminar series – clinical documentation	Faculty evaluation		
525	Compares and contrasts different practice models.		Faculty evaluation		
526	Codes routine diagnoses, encounters and surgical procedures. Documents medical necessity.	General surgery resident seminar series – clinical documentation	Faculty evaluation		
527	Recognizes basic elements needed to establish practice (e.g. negotiations, malpractice insurance, contracts, staffing, compliance, facility accreditation).	General surgery resident seminar series – contracts and interviews	Faculty evaluation		
528	Establishes timeline and identifies resources for transition to practice (e.g. information technology, legal, financial, personnel).	General surgery resident seminar series – contracts and interviews	Faculty evaluation		
529	Participates in advocacy activities for health policy.	STS, TSRA	Faculty evaluation		
530	Creates curriculum to teach practice management.	Resident research project	CT research day presentations, national meetings		
531	Codes complex and unusual diagnoses, encounters and surgical procedures.		Faculty evaluation		
532	Practice Based Learning: Self Improvement and Lifelong Learning				
533	Aware of one's own level of knowledge and expertise and uses feedback from teachers, colleagues and patients.		Faculty evaluation	today	peer eval, fac eval
534	Identifies learning resources.	General surgery resident seminar series – critical appraisal	Faculty evaluation	today	fac eval
535	Continually seeks and incorporates feedback to improve performance.		Faculty evaluation	today	peer eval, fac eval
536	Develops a learning plan and uses published review articles and guidelines**.**	General surgery resident seminar series – clinical documentation	Faculty evaluation	today	fac eval
537	Demonstrates a balanced and accurate self-assessment of competence, investigates clinical outcomes and areas for continued improvement.		Faculty evaluation		
538	Selects an appropriate evidence-based information tool to answer specific questions.		Faculty evaluation		
539	Demonstrates improvement in clinical outcomes based on continual self-assessment and national database participation.		Faculty evaluation		
540	Performs self-directed learning with little external guidance using evidence-based information tools. Learning plan includes a process to remain current in knowledge over time.		Faculty evaluation		
541	Demonstrates consistent behavior of incorporating evidence based information in common practice areas.		Faculty evaluation		
542	Practice Based Learning: Research and Teaching				
543	Describes basic concepts in clinical epidemiology, biostatistics, and clinical reasoning; can categorize research study design.	General surgery resident seminar series – critical appraisal	Faculty evaluation		
544	Participates in the education of patients, families and junior learners.		Faculty evaluation, 360 eval	today	student eval, nursing eval
545	Ranks study designs and can distinguish relevant research outcomes (e.g., patient-oriented evidence that matters) from other types of evidence.	General surgery resident seminar series – critical appraisal	Faculty evaluation		
546	Teaches patients, families and junior learners.		Faculty evaluation, 360 eval	today	student eval, nursing eval

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
547	Applies a set of critical appraisal criteria to different types of research, including synopses of original research findings, systematic reviews and meta-analyses, and clinical practice guidelines.		Faculty evaluation		
548	Teaches colleagues and other health professionals in both formal and informal settings. Assesses and provides feedback to junior learners.		Faculty evaluation, 360 eval		
549	Formulates a searchable question, describes a plan to investigate it, and participate in a research project.	Resident research project	CT research day presentations, national meetings		
550	Organizes educational activities at the program level.	Resident research project	CT research day presentations, national meetings		
551	Independently plans and executes a research program.	Resident research project	CT research day presentations, national meetings		
552	Develops educational curriculum and assessment tools.	Resident research project	CT research day presentations, national meetings		
553					
554					

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
555					
556	**Milestone**	**Current Status**	**Today**		
557	Medical Knowledge: Ischemic Heart Disease	0.5	0.5		
558	Patient Care: Ischemic Heart Disease	0.5	0.5		
559	Medical Knowledge: Cardiopulmonary Bypass	0.5	0.5		
560	Patient Care: Cardiopulmonary Bypass	1.5	1.5		
561	Medical Knowledge: Valvular Disease	0.5	0.5		
562	Patient Care: Valvular Disease	1.5	1.5		
563	Medical Knowledge: Great Vessel Disease	0.5	0.5		
564	Patient Care: Great Vessel Disease	0.5	0.5		
565	Medical Knowledge: Congenital Heart Disease	0.0	0		
566	Medical Knowledge: End Stage Heart Disease	0.5	0.5		
567	Medical Knowledge: Esophagus	0.5	0.5		
568	Patient Care: Esophagus	0.5	0.5		
569	Medical Knowledge: Lung and Airway	0.5	0.5		
570	Patient Care: Lung and Airway	0.5	0.5		
571	Medical Knowledge: Chest Wall/Mediastinum	0.5	0.5		
572	Patient Care: Chest Wall/Mediastinum	0.5	0.5		
573	Medical Knowledge: Critical Care	0.5	0.5		
574	Patient Care: Critical Care	1.5	1.5		
575	Professionalism: Ethics and Values	1.5	1.5		
576	Professionalism: Personal Accountability	2.0	2		
577	Interpersonal and Communication Skills	1.0	1		
578	Systems Based Practice: Patient Safety	0.5	0.5		
579	Systems Based Practice: Resource Allocation	2.0	2		
580	Systems Based Practice: Practice Management	1.0	1		
581	Practice Based Learning: Self Improvement	2.0	2		
582	Practice Based Learning: Research & Teaching	0.5	0.5		

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
1	Item	Curriculum	Evaluation	Date Achieved	Evidence
2	Medical Knowledge Ischemic Heart Disease				
3	Knows basic anatomy and pathology (identifies coronary anatomy on angiogram)				
4	Knows basic cellular and vascular physiology				
5	Lists clinical manifestations of ischemic heart disease (e.g., angina, myocardial infarction)				
6	Lists diagnostic tools available for evaluation of ischemic heart disease				
7	Lists treatment options for ischemic heart disease (e.g., CABG, PCI)				
8	Knows basic complications for ischemic heart disease				
9	Understands common variations in anatomy and pathology (e.g., left dominant system)				
10	Understands physiologic changes accompanying ischemic heart disease (e.g., ischemia, ischemia reperfusion injury, infarction, recovering myocardium)				
11	Generates differential diagnosis of disease with similar manifestations (e.g., esophageal and aortic problems, pleurisy				
12	Understands advantages and disadvantages of diagnostic tools in evaluating ischemic heart disease (e.g., EKG vs. echocardiogram vs. angiogram				
13	Understands advantages and disadvantages of various treatment options for ischemic heart disease				
14	Understands risks, benefits and complications of treatment modalities				
15	Understands complex integrations between anatomy and pathology (e.g., anomalous coronary artery)				
16	Understands the role of treatment on physiology of ischemic heart disease				
17	Identifies the common variants of the clinical manifestations of ischemic heart disease (e.g., unstable angina, acute myocardial infarction, silent ischemia)				
18	Interprets normal and common abnormalities associated with ischemic heart disease (e.g., reads coronary angiogram, complex EKG)				
19	Identifies appropriate treatment for routine patient with ischemic heart disease.				
20	Familiar with ACC/STS/AATS guidelines				
21	Knows basic outcome literature for ischemic heart disease (e.g., SYNTAX Trial)				
22	Understands complex variations in anatomy and pathology, including congenital (e.g., able to identify coronary anatomy in reoperative surgery)				
23	Adapts therapeutic management based on understanding of physiology of complications of ischemic heart disease (e.g., post infarct VSD, ischemic mitral regurgitation)				
24	Distinguishes the complex clinical manifestations and complications of ischemic heart disease				
25	Interprets and integrates complex abnormalities associated with ischemic heart disease				
26	Identifies appropriate treatment for complex patient with ischemic heart disease (e.g., hybrid CABG)				
27	Knows outcomes for all treatment modalities and complications, including databases and clinical trials (e.g., STS Database)				
28	Understands implications of SYNTAX score				
29	Presents on outcomes of ischemic heart disease at local, regional or national meeting				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
30	Patient Care: Ischemic Heart Disease				
31	Orders basic diagnostic and preoperative assessment tests for ischemic heart disease (e.g., cardiac cath, stress test)				
32	Lists basic treatment options for routine ischemic heart disease (e.g, medical management, PCI vs. CABG)				
33	Demonstrates basic surgical skills (simulation vs. OR)				
34	Interprets and prioritizes diagnostic and physiologic assessment tests for routine patient with ischemic heart disease				
35	Recognizes routine post-operative complications (e.g., CVA, shock, tamponade, interprets abnormal EKG)				
36	Suggests treatment plan for patient with routine ischemic heart disease				
37	Assesses and harvests conduits (e.g., vein mapping)				
38	Performs surgical opening and closing				
39	Provides basic intraoperative assisting				
40	Performs proximal coronary anastomosis				
41	Establishes a diagnostic and assessment plan for patients with routine ischemic heart disease (e.g., role of functional testing in ischemic heart disease)				
42	Manages routine post-operative complications (e.g., return to the OR vs. return to cath lab)				
43	Selects ideal treatment option for patient with routine ischemic heart disease.(e.g., institutes treatment per ACC/STS/AATS guidelines)				
44	Institutes and weans patient from cardiopulmonary bypass				
45	Performs routine CABG				
46	Establishes a diagnostic and assessment plan for complex patients with ischemic heart disease				
47	Manages complex post-operative complications(e.g., need for ventricular assist)				
48	Selects ideal treatment option for patient with complex ischemic heart disease (e.g., combined coronary and carotid disease)				
49	Manages complex coronary disease (e.g., redo CABG, VSD, ischemic MR, off pump)				
50	Independently performs reoperative coronary bypass grafting				
51	Independently performs coronary enterectomy				
52	Medical knowledge: Cardiopulmonary Bypass				
53	Lists basic components of cardiopulmonary bypass apparatus (e.g., oxygenator, pump heads, heat exchanger, low level alarm, in line monitoring)				
54	Understands pulsatile vs. non-pulsatile pump physiology				
55	Understands basic myocardial protection. (e.g., O2 requirement, O2 delivery, myocardial relaxation)				
56	Understands coagulation cascade (e.g., intrinsic and extrinsic pathways)				
57	Lists complications of cardiopulmonary bypass (e.g., bleeding, renal failure, pulmonary dysfunction)				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
58	Discusses options for myocardial protection (e.g., cardioplegia vs. beating heart)				
59	Discusses cannulation techniques and options for cardiopulmonary bypass (e.g., single venous, bicaval, aortic, peripheral arteries, cold, full or partial)				
60	Understands intra-aortic balloon pump physiology (e.g., diastolic augmentation and presystolic dip)				
61	Understands coagulation cascade inhibitors (e.g., heparin, argatroban)				
62	Understands complications of cardiopulmonary bypass				
63	Lists treatment strategies for cardiac injury without cardiac bypass, including trauma				
64	Demonstrates knowledge of cardioplegia solutions and delivery modes (e.g., crystalloid, blood, antegrade, retrograde)				
65	Demonstrates knowledge of acid-base and anticoagulation management on cardiopulmonary bypass (e.g., pH stat, alpha stat, ACT)				
66	Demonstrates knowledge of pharmacologic management of postcardiotomy hemodynamics (e.g., inotropes, vasodilators)				
67	Discusses advantages and disadvantages of different myocardial protection strategies				
68	Lists management strategies of routine complications related to cardiopulmonary bypass (e.g., air in the heart, inadequate drainage, incomplete arrest)				
69	Demonstrates knowledge of postoperative sequelae from cardiopulmonary bypass (e.g., low cardiac output syndrome, coagulopathies, arrhythmias, HIT)				
70	Explains advanced cardiopulmonary support (e.g., circulatory arrest or ECMO)				
71	Explains the management of postcardiotomy shock syndrome (e.g., inotropes, IABP, mechanical support)				
72	Explains management strategies of complex complications related to cardiopulmonary bypass (e.g., aortic dissection, air embolism)				
73	Explains treatment strategies for postoperative sequelae from cardiopulmonary bypass (e.g., low cardiac output syndrome, coagulopathies, arrhythmias, HIT)				
74	Develops simulation scenarios for complications related to cardiopulmonary bypass				
75	Patient Care: Cardiolpulmonary Bypass				
76	Demonstrates basic surgical skills (simulation vs. OR)				
77	Performs axillary, femoral, arterial or venous cannulation				
78	Performs peripheral vascular access				
79	Performs surgical opening and closing				
80	Assists perfusionist with cardiopulmonary bypass setup and pump run				
81	Cannulates and institutes cardiopulmonary bypass including myocardial protection in routine cases				
82	Manages cardiopulmonary bypass and myocardial protection in routine cases				
83	Weans and decannulates from cardiopulmonary bypass for routine cases				
84	Recognizes and manage common acute complications (e.g., coagulopathy, pump failure)				
85	Cannulates and institutes cardiopulmonary bypass including myocardial protection in complex cases				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
86	Manages cardiopulmonary bypass and myocardial protection in complex cases				
87	Weans and decannulates from cardiopulmonary bypass for complex cases				
88	Institutes temporary circulatory support for cardiogenic shock (e.g., intraaortic balloon pump, ECMO, short term LV assist)				
89	Recognizes and manages unusual acute complications (e.g., aortic dissection)				
90	Operates in a hostile chest (e.g., radiation, porcelain aorta, use of epiaortic probe, patent grafts)				
91	Performs left ventricular assist device procedures or transplant				
92	Medical Knowledge: Valvular Disease				
93	Knows basic anatomy and pathology of valvular heart disease				
94	Knows basic normal valve physiology				
95	Lists clinical manifestations of isolated valvular heart disease (e.g., dyspnea, angina, edema, syncope)				
96	Lists diagnostic tools available for evaluation of valvular heart disease				
97	Lists treatment options for valvular heart disease				
98	Knows basic complications for valvular heart disease (e.g., peri-operative complications for aortic valve replacement)				
99	Knows common variations in anatomy and pathology of valvular heart disease (e.g., Mitral Prolapse, Types)				
100	Explains physiologic changes accompanying valvular heart disease (e.g., pulmonary hypertension)				
101	Generates differential diagnosis of diseases with similar manifestations (e.g., coronary artery disease, emphysema)				
102	Explains advantages and disadvantages of diagnostic tools in evaluating valvular heart disease (e.g., surface vs. transesophageal echo)				
103	Recites advantages and disadvantages of various treatment options for valvular heart disease (e.g., repair vs. replacement)				
104	Recites risks, benefits and complications of treatment modalities (e.g., cites frequency of common complications)				
105	Explains complex integrations between anatomy and pathology of valvular heart disease(e.g., bicuspid aortic valve and stenosis, functional mitral and tricuspid regurgitation				
106	Explains the role of treatment on physiology of valvular heart disease, including arrhythmia management,(e.g., the mechanism of surgical atrial fibrillation treatment				
107	Identifies the common variants of the clinical manifestations of valvular heart disease(e.g., fatigue)				
108	Interprets normal and common abnormalities associated with valvular heart disease, including intraoperative transesophageal echocardiography				
109	Identifies appropriate treatment for routine patient with valvular heart disease				
110	Familiar with ACC/STS/AATS guidelines				
111	Explains basic outcome literature for valvular heart disease(e.g., durability of mitral valve repair)				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
112	Explains complex variations in anatomy and pathology, including congenital (e.g., contribution of coronary disease to mitral regurgitation, bicuspid aortic valve and ascending aneurysm)				
113	Adapts therapeutic management based on understanding of physiology (e.g., explains when to correct mitral or tricuspid regurgitation in setting of aortic stenosis or coronary artery disease)				
114	Distinguishes the complex clinical manifestations and complications of valvular heart disease (e.g., staging CHF)				
115	Interprets and integrates complex abnormalities associated with valvular heart disease (e.g., hypertrophic obstructive cardiomyopathy)				
116	Identifies appropriate treatment for complex patient with valvular heart disease (e.g., combined coronary, aneurysm or root enlargement)				
117	Explains outcomes for all treatment modalities and complications, including databases and clinical trials (e.g., outcome after minimally invasive valves, success of sinus restoration in surgery for atrial fibrillation)				
118	Presents on outcomes valvular heart disease at local, regional or national meeting				
119	Patient Care: Valvular Disease				
120	Orders basic diagnostic and preoperative assessment tests for valvular heart disease				
121	Lists basic treatment options for routine valvular heart disease				
122	Demonstrates basic surgical skills (simulation vs. OR)				
123	Interprets and prioritizes diagnostic and physiologic assessment tests for routine patient with valvular heart disease (e.g., echocardiogram, cardiac cath)				
124	Suggests treatment plan for patient with routine single valvular heart disease (e.g., single valve replacement in a symptomatic patient with aortic stenosis)				
125	Recognizes routine post-operative complications (e.g., identifies surgically significant bleeding)				
126	Identifies surgical approach for each valve				
127	Performs surgical opening and closing				
128	Performs basic intraoperative assisting				
129	Provides a diagnostic and assessment plan for patients with routine valvular heart disease (e.g., intra-operative TEE)				
130	Selects ideal treatment option for patient with acquired valvular heart disease (e.g., double valve replacement)				
131	Manages routine post-operative complications (e.g., decides to return to operating room, management of heart block)				
132	Institutes and weans patient from cardiopulmonary bypass				
133	Performs optimal myocardial protection strategy				
134	Performs routine valvular replacement				
135	Forms a diagnostic and assessment plan for complex patients with valvular heart disease (e.g., intra-operative mitral regurgitation on a patient scheduled for isolated coronary artery bypass)				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
136	Selects ideal treatment option for patient with complex valvular heart disease (e.g., valvular repair, congenital valve repair)				
137	Manages complex post-operative complications, including arrhythmias (e.g., management of paravalvular leak or SAM)				
138	Performs complex valvular replacement				
139	Performs valvular repair				
140	Selects ideal plan for a patient with prior transcatheter valve, minimally invasive valve				
141	Performs minimally invasive, percutaneous, or robotic approaches to valvular heart disease				
142	Performs atrial and ventricular arrhythmia surgery				
143	Performs reconstruction of fibrous trigone in patient with endocarditis of mitral and aortic valves				
144	Medical Knowledge: Great Vessel Disease				
145	Knows basic anatomy and pathology of great vessels (e.g., aortic dissection classification, including spinal cord and cerebral perfusion)				
146	Lists clinical manifestations of great vessel disease, acquired and traumatic (e.g., chest pain syndromes, Marfan's syndrome)				
147	Lists diagnostic tools available for evaluation of great vessel disease				
148	Lists treatment options for great vessel disease				
149	Knows basic complications for great vessel disease (e.g., natural history treated and untreated)				
150	Understands common variations in anatomy and pathology of adult great vessel disease, acquired and traumatic (e.g., descending aortic tear from blunt trauma)				
151	Generates differential diagnosis of diseases with similar manifestations (e.g., myocardial infarction, esophageal spasm)				
152	Understands advantages and disadvantages of diagnostic tools in evaluating great vessel disease (e.g., CT scan vs. MRI vs. echocardiography vs. angiography)				
153	Understands advantages and disadvantages of various treatment options for great vessel disease (endovascular vs. open)				
154	Understands risks, benefits and complications of treatment modalities				
155	Understands integrations between anatomy and pathology of great vessel disease, acquired, congenital and traumatic (e.g., atherosclerosis, penetrating ulcer, aortic dissection)				
156	Identifies the common variants of the clinical manifestations of great vessel disease, acquired, congenital and traumatic (e.g., bowel ischemia, renal insufficiency)				
157	Interprets normal and common abnormalities associated with great vessel disease (e.g., sensitivity, specificity, accuracy of aortic imaging techniques)				
158	Identifies appropriate and/or adjunct treatment for routine patient with great vessel disease (neuroprotection, spinal cord protection, renal)				
159	Knows basic outcome literature for great vessel disease				
160	Understands complex variations in anatomy and pathology of great vessel disease, acquired, congenital and traumatic (e.g., congenital arch anomalies leading to tracheal or esophageal compression)				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
161	Distinguishes the complex clinical manifestations and complications of great vessel disease, acquired, congenital and traumatic (e.g., myocardial infarction vs. acute aortic dissection)				
162	Interprets and integrates complex abnormalities associated with great vessel disease (e.g., aneurysm, dissection, pseudo-aneurysm, penetrating ulcer)				
163	Identifies appropriate treatment for complex patient with great vessel disease (e.g., CPB bypass techniques)				
164	Knows outcomes for all treatment modalities and complications, including databases and clinical trials				
165	Surgically manages acute and chronic pulmonary thromboembolic disease				
166	Patient Care: Great Vessel Disease				
167	Orders basic diagnostic and preoperative assessment tests for great vessel disease (e.g., CT, echo, need for cath)				
168	Lists basic treatment options for routine great vessel disease (e.g., Type A vs. Type B dissections; timing of intervention)				
169	Demonstrates basic surgical skills (simulation vs. OR)				
170	Obtains ATLS certification				
171	Interprets and prioritizes diagnostic assessment tests for routine patient with great vessel disease (e.g., risk / benefit options)				
172	Suggests treatment plan for patient with routine great vessel disease (e.g., endovascular vs. open repair)				
173	Recognizes routine post-operative complications				
174	Identifies surgical approach				
175	Performs surgical opening, closing and vascular access				
176	Provides basic intraoperative assisting				
177	Establishes a diagnostic and assessment plan for patients with routine great vessel disease (e.g., blunt aortic injury)				
178	Selects ideal treatment option for patient with routine great vessel disease, including perioperative monitoring, perfusion and neuroprotective strategies				
179	Manages routine post-operative complications				
180	Institutes and weans patient from cardiopulmonary bypass				
181	Provides optimal perfusion and myocardial/ neuroprotection				
182	Performs routine aortic valvular replacement				
183	Performs simple vascular anastomosis				
184	Establishes a diagnostic and assessment plan for complex patients with great vessel disease (e.g., great vessel interventions in the elderly or patients with collagen vascular disease)				
185	Selects ideal treatment option for patient with complex great vessel disease, including perioperative monitoring, perfusion and neuroprotective strategies (e.g., thoracoabdominal disease, chronic aortic dissections)				
186	Manages complex post-operative complications (e.g., multisystem organ failure)				
187	Performs complex great vessel replacement				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
188	Performs aortic repair				
189	Participates in endovascular aortic surgery				
190	Performs endovascular aortic surgery				
191	Performs pulmonary thromboendarterectomy				
192	Performs hybrid approaches to complex aortic disease (e.g., debranching followed by endovascular procedure)				
193	Medical Knowledge : Congenital Heart Disease				
194	Lists clinical manifestations of common congenital heart diseases (e.g., cyanosis, tachypnea, mottling, failure to thrive)				
195	Lists diagnostic tools available for evaluating congenital heart disease (e.g., EKG, chest x-ray, echocardiogram, cardiac cath)				
196	Lists basic congenital cardiac abnormalities (e.g., ASD, VSD, tetralogy of Fallot, transposition of great arteries)				
197	Lists physiologic changes accompanying congenital heart disease (e.g., right to left and left to right shunt, excessive or insufficient pulmonary blood flow)				
198	Discusses possible diagnostic modalities for various conditions				
199	Lists basic treatment options for congenital heart disease (e.g., diuretics, digoxin, palliative vs. definitive operations)				
200	Knows basic anatomy and pathology of congenital heart disease				
201	Understands physiologic changes accompanying congenital heart disease (e.g., Eisenmenger syndrome)				
202	Generates a differential diagnosis of diseases with similar manifestations (e.g., tachypnea due to increased pulmonary blood flow caused by ASD or VSD)				
203	Understands the advantages and disadvantages of diagnostic tools in evaluating congenital heart disease				
204	Understands advantages and disadvantages of various treatment options in congenital heart disease (e.g., PA band vs. primary closure VSD)				
205	Knows basic complications of congenital heart disease (e.g., residual VSD, heart block)				
206	Understands common variations in anatomy and pathology (e.g., partial and complete AV septal defect, types of VSD)				
207	Understands the basics of the single ventricle pathway (e.g., Truncus, Norwood, TGA)				
208	Understands the role of treatment on physiology of congenital heart disease (e.g., role of pulmonary artery banding, acid-base balance benefits of pH stat or alpha stat)				
209	Understands the role of physiology of congenital heart disease on treatment modality options (e.g., PFO, increased pulmonary vascular resistance in newborns)				
210	Identifies clinical manifestations of elective vs. emergent vs. urgent scenarios.				
211	Recognizes simple vs. complex disease				
212	Interprets normal and common abnormalities associated with congenital heart disease, including echocardiography (e.g., identifies valve stenosis and regurgitation)				
213	Identifies appropriate treatment for common patient with congenital heart disease (e.g., selection of palliative vs. definitive, identifies for urgent vs. elective procedures)				
214	Understands strategies for complex reoperative surgery				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
215	Understands risks, benefits and complications of various treatment modalities				
216	Understands complex integrations between anatomy and pathology (e.g., RV dependent coronary sinusoids)				
217	Medical Knowledge: End Stage Cardiopulmonary Disease				
218	Knows basic cardiothoracic normal anatomy				
219	Knows basic normal respiratory and cardiovascular physiology				
220	Lists clinical manifestations of cardiac and pulmonary failure (e.g., dyspnea, fatigue, exercise intolerance, peripheral edema, pulmonary edema)				
221	Lists diagnostic tools available for evaluation of cardiac and pulmonary failure (e.g., ABG, CXR, PA line, echo)				
222	Understands the natural history of cardiac and pulmonary failure (e.g., end-stage emphysema)				
223	Knows basic pathology as it relates to cardiac and pulmonary failure (e.g., lung-pneumonia, ARDS, pathology of end-stage lung disease; heart-myocardial infarction, types of cardiomyopathy)				
224	Understands physiologic changes accompanying cardiac and pulmonary failure (e.g., increased work of breathing hypoxemia, hypercarbia, elevated lactate, tachycardia, hypotension, reduced CO)				
225	Generates differential diagnosis of causes of heart and pulmonary failure (e.g., heart-cardiomyopathy, coronary artery disease; pulmonary - interstitial lung disease, trauma)				
226	Understands advantages and disadvantages of diagnostic tools in evaluating cardiac and pulmonary failure (e.g., cardiac - PA catheter measurements, echo vs. cath, MRI pulmonary- transbronchial biopsy vs. open				
227	Lists treatment options for cardiac and pulmonary failure (e.g., medical vs. surgical management)				
228	Understands signs of decompensation and need for intervention for cardiac and pulmonary failure				
229	Understands common variations in anatomy and pathology (e.g., advanced valvular disease, pulmonary fibrosis, sarcoidosis)				
230	Understands the role of treatment on physiology of cardiac and pulmonary failure (e.g., cardiac - medical management vs. IABP vs. mechanical support; pulmonary-medical treatment vs. vent)				
231	Identifies the common variants of the clinical manifestations of cardiac and pulmonary failure (e.g., cardiac-ischemic, post viral, postpartum, idiopathic; pulmonary - acute lung injury/ARDS, infn)				
232	Interprets normal and common abnormalities associated with cardiac and pulmonary failure (e.g., cardiac - distinguishes various types of shock; pulmonary - surgical biopsy; acute vs. chronic)				
233	Understands advantages and disadvantages of various treatment options for cardiac and pulmonary failure				
234	Understands risks, benefits and complications of treatment modalities (e.g., risk benefit ratio)				
235	Understands complex integrations between anatomy and pathology (e.g., adult with congenital heart disease)				
236	Adapts therapeutic management based on understanding of physiology of cardiac and pulmonary failure (cardiac - need for mechanical support; pulmonary - need for advanced ventilation)				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
237	Distinguishes the complex clinical manifestations and complications of cardiac and pulmonary failure (e.g., adult congenital disease manifestations, mechanical complications of MI)				
238	Interprets and integrates complex abnormalities associated with cardiac and pulmonary failure (e.g., distinguishes RV vs. LV vs. biventricular failure)				
239	Identifies appropriate treatment for patients with cardiac and pulmonary failure and indications for transplantation or mechanical cardiopulmonary support (e.g., selection criteria for transplantation)				
240	Knows basic outcome literature for cardiac and pulmonary failure				
241	Understands limitations of mechanical support (e.g., recognizes when risks exceed benefits)				
242	Understands complex variations in anatomy and pathology as related to cardiac and pulmonary failure (e.g., Eisenmenger's complex)				
243	Understands the immunologic mechanisms in cardiac and pulmonary transplantation				
244	Understands nonpulsatile ventricular assist physiology				
245	Understands clinical manifestations of allograft rejection (e.g., hyperacute, acute and chronic rejection)				
246	Understands clinical manifestations of complications of mechanical cardiopulmonary support (e.g., bleeding, line infection, sepsis, stroke, tamponade)				
247	Diagnoses complications of transplant and mechanical cardiopulmonary support (e.g., heart failure due to pulmonary hypertension, acute and chronic rejection, assist device failure, bx)				
248	Identifies appropriate treatment for complex patient with cardiac and pulmonary failure				
249	Understands how to treat acute and chronic transplant rejection (e.g., need for single vs. bi-VAD assist, cardiac vs. cardiopulmonary support, ECMO)				
250	Knows outcomes for all treatment modalities and complications, including databases and clinical trials				
251	Medical Knowledge Critical Care				
252	Knows basic normal cardiopulmonary physiology (e.g., normal left ventricular pressure-volume curve)				
253	Lists clinical manifestations of critically ill cardiovascular and thoracic patients				
254	Lists diagnostic tools available for evaluation of critically ill patients with cardiovascular and thoracic diseases (e.g., Interpretation ofhemodynamic data (Swan-Ganz); ECG including exercise data, coronary angiography, cardiac cath hemodynamics, echocardiography)				
255	Lists treatment options for critically ill patients with cardiovascular and thoracic diseases				
256	Understands pathophysiologic changes accompanying cardiovascular and thoracic disease (e.g., Frank-Starling curves for the left ventricle				
257	Generates differential diagnosis of diseases in critically ill patients with cardiovascular and thoracic diseases (e.g., Differential diagnosis of patient with chest pain ;pulmonary – PE, pneumonia, PTX)				
258	Understands advantages and disadvantages of diagnostic tools in evaluating critically ill patients with cardiovascular and thoracic diseases				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
259	Understands advantages and disadvantages of various treatment options for critically ill patients with cardiovascular and thoracic diseases (e.g., Indications for inotropes, IABP, and VADS)				
260	Understands the role of treatment on pathophysiology of cardiovascular and thoracic disease (e.g., Relationship between left ventricular output, preload and afterload)				
261	Identifies the common variants of the clinical manifestations of critically ill cardiovascular and thoracic patients(e.g., differential diagnosis of post-op cardiac surgery patient with chest pain)				
262	Interprets normal and common abnormalities associated with critically ill patients with cardiovascular and thoracic diseases (e.g., echo images systolic and diastolic dysfunction)				
263	Identifies appropriate treatment for routine critically ill patients with cardiovascular and thoracic diseases (e.g., management strategies for postoperative arrhythmias)				
264	Manages post-op low cardiac output				
265	Knows basic outcome literature for critically ill patients with cardiovascular and thoracic diseases				
266	Adapts therapeutic management based on understanding of pathophysiology (e.g., selection of inotropic drugs in the treatment of hypotension and low cardiac output depending on etiology)				
267	Distinguishes the complex clinical manifestations and complications of critically ill cardiovascular and thoracic patients(e.g., low cardiac output due to right ventricular failure)				
268	Interprets and integrates complex abnormalities associated with critically ill patients with cardiovascular and thoracic diseases				
269	Identifies appropriate treatment for complex critically ill patients with cardiovascular and thoracic diseases (e.g., treatment of wall motion abnormalities after CABG, dialysis options)				
270	Understands risk adjustment and outcome databases (e.g., scoring systems)				
271	Understands the need for complex ventilation strategies (e.g., oscillating ventilation)				
272	Conducts research on critical care and presents at a local, regional or national meeting.				
273	Patient Care: Critical Care				
274	Orders basic diagnostic, nutritional and assessment tests for critically ill patients with cardiovascular and thoracic diseases (e.g., pre and post-operative)				
275	Lists basic treatment options for critically ill patients with cardiovascular and thoracic diseases				
276	Orders appropriate prophylactic ICU measures to prevent complications (e.g., nutritional support, glucose management, ulcer and DVT prophylaxis)				
277	Obtains ACLS certification				
278	Demonstrates basic ICU surgical skills (simulation or bedside), including IV, arterial line, Foley catheter, NG tube				
279	Interprets and prioritizes diagnostic and physiologic assessment tests for critically ill patients with cardiovascular and thoracic diseases				
280	Suggests treatment plan for critically ill patients with cardiovascular and thoracic diseases, including preventive care (e.g., prophylactic antibiotics)				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
281	Recognizes routine ICU related complications (e.g., line sepsis, DVT, ventilator acquired pneumonia, pneumothorax)				
282	Performs cardioversion for arrhythmias				
283	Demonstrates advanced ICU surgical skills (simulation or bedside), including central line, PA catheter, chest tube				
284	Demonstrates routine ventilator management				
285	Manages temporary pace maker				
286	Establishes a diagnostic and assessment plan for critically ill patients with cardiovascular and thoracic diseases				
287	Selects ideal treatment option for critically ill patients with cardiovascular and thoracic diseases				
288	Manages routine ICU complications (e.g., line sepsis, DVT, ventilator acquired pneumonia, pneumothorax)				
289	Demonstrates complex ventilator management				
290	Performs open chest resuscitation				
291	Performs emergency pericardiocentesis				
292	Establishes a diagnostic and assessment plan for complex critically ill patients with cardiovascular and thoracic diseases (e.g., patient with multi-system organ failure)				
293	Selects ideal treatment option for complex critically ill patients with cardiovascular and thoracic diseases				
294	Manages complex ICU related complications (e.g., ARDS, acute renal failure, low cardiac output, stroke, metabolic abnormalities)				
295	Troubleshoots assist devices				
296	Obtains board certification in critical care.				
297	Medical Knowledge: Esophagus				
298	Knows basic anatomy and pathology (e.g., identifies gastrointestinal anatomy innervation and blood supply, endoscopic landmarks)				
299	Knows basic foregut physiology (e.g., basic esophageal motility)				
300	Lists clinical manifestations of benign and malignant disorders (e.g., heart burn, chest pain, dysphagia, odynophagia				
301	Lists diagnostic and/or staging tools available for the evaluation of benign and malignant disorders (e.g., manometry, pH testing, EUS)				
302	Lists treatment options for benign and malignant disorders (e.g., surgery vs. chemo/RT vs. chemo/RT alone for malignancy)				
303	Knows basic complications for benign and malignant disorders (e.g., perforation, recurrent reflux, pulmonary aspiration)				
304	Understands common variations in anatomy and pathology (e.g., lymphatic drainage)				
305	Understands physiologic changes accompanying malignancy and motility disorders (e.g., achalasia, reflux, esophageal spasm)				
306	Generates differential diagnosis of disease with similar manifestations (e.g., achalasia vs. pseudoachalasia; coronary syndrome vs. esophageal spasm)				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
307	Understands advantages and disadvantages of diagnostic tools in evaluating benign and malignant disorders (e.g., endoscopy vs. EUS vs. barium swallow)				
308	Understands advantages and disadvantages of various treatment options for benign and malignant disorders, including the impact of staging (e.g., pluses and minus of treatment options)				
309	Understands risks, benefits and complications of treatment modalities (e.g., slipped Nissen, anastomotic leak)				
310	Understands complex integrations between anatomy and pathology (e.g., fascial planes in descending mediastinitis)				
311	Understands the role of treatment on physiology of malignancy and motility disorders (e.g., post-op esophagectomy complications - dumping syndrome)				
312	Identifies the common variants of the clinical manifestations of benign and malignant disorders(e.g., benign vs. malignant stricture)				
313	Interprets normal and common abnormalities associated with benign and malignant disorders (e.g., interprets EUS, common motility tracings)				
314	Identifies appropriate treatment for routine patient with benign and malignant disorders (e.g., treatment options for high grade dysplasia - EMR vs. esophagectomy)				
315	Knows basic outcome literature for benign and malignant disorders				
316	Understands complex variations in anatomy and pathology, including congenital (e.g., esophageal atresia)				
317	Adapts therapeutic management based on understanding of physiology for various disease states (e.g., partial vs. total fundoplication)				
318	Distinguishes the complex clinical manifestations and complications of benign and malignant disorders (e.g., Type IV hernias, TEF)				
319	Interprets and integrates complex abnormalities associated with benign and malignant disorders (e.g., short esophagus, achalasia with sigmoid esophagus)				
320	Identifies appropriate treatment for complex patient with benign and malignant disorders,(e.g., primary vs. redo Nissen, redo myotomy vs. esophagectomy)				
321	Knows outcomes for all treatment modalities and complications, including databases and clinical trials				
322	Understands imaging for colon interposition				
323	Understands need for colon interposition				
324	Presents on outcomes of benign or malignant disorders at local, regional or national meeting				
325	Patient Care: Esophagus				
326	Performs preoperative assessment				
327	Orders basic diagnostic/assessment tests for routine benign and malignant esophageal disease (e.g., EUS, CT/PET, pH testing, manometry)				
328	Demonstrates basic surgical skills (simulation vs. OR)				
329	Interprets hemodynamics and suggests appropriate diagnostic imaging				
330	Recognizes routine post-operative complications				
331	Prioritizes diagnostic/assessment tests for routine benign and malignant esophageal disease (e.g., Barium swallow vs. EUS vs. endoscopy)				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
332	Lists basic treatment options for routine benign and malignant esophageal disease (e.g., Nissen fundoplication, esophageal resection, Toupet)				
333	Recognizes common post-operative complications (e.g., leak, slipped Nissen, cardiac arrhythmia)				
334	Demonstrates basic endoscopic skills				
335	Demonstrates basic minimally invasive skills (FLS)				
336	Provides basic intraoperative assistance				
337	Performs basic hand sewn and stapled anastomosis				
338	Develops a treatment plan for routine patient with benign and malignant disorders				
339	Manages routine post-operative complications				
340	Interprets diagnostic/assessment tests for routine benign and malignant esophageal disease (e.g., basic manometry tracings, EUS and PET/CT scan results				
341	Selects ideal treatment option after assessment of diagnostic test results for routine benign and malignant esophageal disease.				
342	Manages common post-operative complications (e.g., surgical vs. medical management, reintubation)				
343	Demonstrates advanced endoscopic skills (EMR, EUS, stenting)				
344	Performs routine open and minimally invasive motility operations				
345	Develops a treatment plan for complex patient with benign and malignant disorders				
346	Manages complex post-operative complications				
347	Able to establish a diagnostic and assessment plan for complex patients with benign and malignant esophageal disease (e.g., short esophagus, sigmoid esophagus)				
348	Selects ideal treatment option for complex benign and malignant esophageal disease (e.g., consideration of comorbidities, chemo/RT/surgery vs. surgery vs. chemo/RT, does patient have short esophagus)				
349	Manages complex post-operative complications (e.g., fistula, gastric necrosis)				
350	Performs routine esophageal resections				
351	Operatively manages esophageal perforation/trauma				
352	Performs complex esophageal resections (e.g., colon interposition)				
353	Performs redo motility operations				
354	Performs minimally invasive esophagectomy				
355	Medical Knowledge: Lung and Airway				
356	Knows basic anatomy and pathology (e.g., segmental anatomy, types of lung cancer)				
357	Knows basic pulmonary physiology (e.g., A-a gradient, pulmonary function tests, ventilation perfusion scan, diffusion, respiratory mechanics, V/Q mismatch)				
358	Lists clinical manifestations of benign, malignant and traumatic disorders (e.g., clinical diagnosis of COPD, signs and symptoms of advanced metastatic lung neoplasms,)				
359	Lists diagnostic and/or staging tools available for the evaluation of benign, malignant and traumatic disorders (e.g., CXR, CT, PET, EBUS, PFTs, mediastinoscopy, flexible/rigid bronchoscopy)				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
360	Lists treatment options for benign, malignant and traumatic disorders (e.g., lobectomy, operative intervention for hemothorax)				
361	Know basic outcomes for benign and malignant disorders (e.g., morbidity and mortality for lobectomy)				
362	Understands common variations in anatomy and pathology (e.g., azygous lobe, mixed lung cancer histologies)				
363	Understands physiologic changes accompanying benign, malignant, and traumatic disorders (e.g., pulmonary shunt, tension pneumothorax causing decreased venous return)				
364	Generates differential diagnosis of disease with similar manifestations (e.g., lung nodules, airway tumors, hemoptysis workup)				
365	Understands advantages and disadvantages of diagnostic tools in evaluating benign, malignant and traumatic disorders (e.g., CXR vs. CT, EBUS vs. mediastinoscopy, CT vs. angiogram)				
366	Understands advantages and disadvantages of various treatment options for benign, malignant and traumatic disorders, including the impact of staging (e.g., use of induction therapy, airway stents)				
367	Understand risks, benefits and complications of treatment modalities (e.g., morbidity and mortality for VATS and open lobectomy)				
368	Understands the role of treatment on physiology of benign and malignant disorders (e.g., pneumonectomy increases pulmonary pressure and RV strain)				
369	Identifies the common variants of the clinical manifestations of benign, malignant and traumatic disorders (e.g., various bronchial adenomas, traumatic tracheobronchial injuries)				
370	Interprets normal and common abnormalities associated with benign, malignant and traumatic disorders (e.g., PET abnormalities, interpret EBUS findings, interpret PFT results, acid-base)				
371	Identifies appropriate treatment for routine patient with benign, malignant and traumatic disorders (e.g., medical therapy for pulmonary fibrosis, less than lobectomy for compromised lung function,)				
372	Know basic outcome literature for benign and malignant disorders (e.g., IASLC survival data for lung cancer stages, survival rates for advanced lung diseases like COPD, IPF)				
373	Understands complex variations in anatomy and pathology, (including congenital (e.g., cystic adenomatoid formation, AV malformation, tracheo-esophageal fistula, pulmonary sequestration)				
374	Adapts therapeutic management based on understanding of physiology for various disease states (e.g., changes associated with lung volume reduction)				
375	Distinguishes the complex clinical manifestations and complications of benign, malignant and traumatic disorders (e.g., postpneumonectomy BPF, tracheoesophageal fistula)				
376	Interprets and integrates complex abnormalities associated with benign, malignant and traumatic disorders (e.g., applies results from quantitative V/Q scans, mVO2 max toward the decision making)				
377	Identifies appropriate treatment for complex patient with benign, malignant and traumatic disorders (e.g., RFA for high risk lung cancer patients, lung reduction surgery, tracheal disorders)				
378	Knows outcomes for all treatment modalities and complications, including databases and clinical trials (e.g., NETT trial results, induction therapy for stage IIIa disease)				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
379	Presents on outcomes of benign or malignant disorders at local, regional or national meeting (e.g., using STS or institutional database for outcomes research)				
380	Patient Care: Lung and Airway				
381	Orders basic diagnostic/assessment tests for routine benign, malignant and traumatic disorders (e.g., CXR, PET, CT, angiogram)				
382	Lists basic treatment options for routine benign, malignant and traumatic disorders (e.g., chemo/radiation therapy, needle decompression for tension pneumothorax)				
383	List common complications for benign, malignant and traumatic disorders and their treatment (e.g., BPF, prolonged air leak, hemoptysis)				
384	Demonstrates basic surgical skills (simulation vs. OR) (e.g., positioning patient, suturing)				
385	Obtains ATLS certification				
386	Interprets diagnostic/assessment tests for routine benign, malignant and traumatic disorders (e.g., interprets PFTs, recognizes false positives on PET)				
387	Recognizes routine post-operative and disease related complications (e.g., complications after lobectomy)				
388	Demonstrates basic endoscopic skills (e.g., making ports, running videoscope)				
389	Demonstrates basic minimally invasive skills (FLS)				
390	Provides basic intraoperative assistance				
391	Performs common bedside procedures (e.g., tracheostomy, chest tube, central line)				
392	Prioritizes diagnostic/assessment tests for routine benign, malignant and traumatic disorders (e.g., obtain MRI based on CT results, bronchoscopy for pneumomediastinum)				
393	Selects ideal treatment option for routine benign, malignant and traumatic disorders (e.g., combination therapy for advanced lung cancer, when not to operate for lung cancer)				
394	Manages routine post-operative and disease related complications (e.g., postop air leak, spontaneous pneumothorax)				
395	Demonstrates advanced endoscopic skills (e.g., EBUS, stenting, proper placement of ports)				
396	Performs routine open lung resection				
397	Performs basic VATS procedures				
398	Establishes a diagnostic and assessment plan for complex patients with benign, malignant and traumatic disorders (e.g., order of tests for TEF, quantitative V/Q for compromised lung function)				
399	Selects ideal treatment option for complex benign, malignant and traumatic disorders (e.g., interventions for TEF, guide for stage III and IV lung cancer, Pancoast tumor)				
400	Manages complex post-operative and disease related complications (e.g., BPF, RML torsion)				
401	Performs complex open lung resection (e.g., Pancoast, sleeve)				
402	Performs VATS lobectomies				
403	Performs tracheal resections/traumatic tracheal repair				
404	Performs robotic lung resections, VATS segmentectomy				
405	Medical Konwledge: Chest Wall, Pleura, Mediastinum				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
406	Knows basic chest wall, pleural, and mediastinal anatomy and pathology (e.g., anatomic features on a CT scan)				
407	Knows basic chest wall and pleural physiology (e.g., physiology of chest tube drainage and pleural pressures)				
408	Lists clinical manifestations of benign, malignant and traumatic disorders of the chest wall, pleura, and mediastinum (e.g., cough, shortness of breath with pleural effusion)				
409	Lists diagnostic and/or staging tools available for the evaluation of benign, malignant and traumatic disorders (e.g., CT, chest x-ray, MRI, PET, ultrasound, FNA, EBUS, mediastinoscopy, EUS)				
410	Lists treatment options for benign, malignant and traumatic disorders (e.g., medical vs. surgical management of chest wall tumors, treatment options for pleural effusion)				
411	Knows basic complications for benign and malignant disorders (e.g., bleeding, wound infection, empyema, pneumothorax)				
412	Understands common variations in anatomy and pathology (e.g., cervical rib, replaced right subclavian vessel)				
413	Understands physiologic changes accompanying benign, malignant and traumatic disorders (e.g., physiology post lung resection, flail chest, physiologic changes that accompany pleural effusions)				
414	Generates differential diagnosis of disease with similar manifestations (e.g., differential of chest wall masses)				
415	Understands advantages and disadvantages of diagnostic tools in evaluating benign, malignant and traumatic disorders (e.g., difficulty diagnosing mesothelioma, diagnosing mediastinal tumors)				
416	Understands advantages and disadvantages of various treatment options for benign, malignant and traumatic disorders (e.g., thoracentesis vs. chest tube drainage vs. thoracoscopy for pleural effusion)				
417	Understands risks, benefits and complications of treatment modalities (e.g., complications associated with chest wall reconstruction)				
418	Understands complex integrations between anatomy and pathology (e.g., thoracic outlet syndrome, Pancoast tumor, dumbbell neurogenic tumors)				
419	Understands the role of treatment on physiology of benign, malignant and traumatic disorders (e.g., physiologic changes that accompany chest wall resection)				
420	Identifies the common variants of the clinical manifestations of benign, malignant and traumatic disorders (e.g., neurogenic vs. vascular symptoms for thoracic outlet syndrome, types of effusions)				
421	Interprets normal and common abnormalities associated with benign, malignant and traumatic disorders (e.g., radiographic features of different chest wall tumors and mediastinal masses)				
422	Identifies appropriate treatment for routine patient with benign, malignant and traumatic disorders.				
423	Knows basic outcome literature for benign and malignant disorders (e.g., survival and local recurrence rate after resection of chest wall tumors)				
424	Understands complex variations in anatomy and pathology, including congenital (e.g., chest wall tumors requiring multimodality therapy)				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
425	Compares and contrasts therapeutic management based on understanding of physiology for various disease states (e.g., resection only vs. resection and reconstruction of various chest wall lesions)				
426	Distinguishes the complex clinical manifestations of benign, malignant and traumatic disorders as well as manifestations of the treatment of these disorders (e.g., infected chest wall reconstruction)				
427	Interprets and integrates complex abnormalities associated with benign, malignant and traumatic disorders (e.g., use of MRI for thoracic outlet tumor, diagnosis of lymphoma vs. thymoma)				
428	Identifies appropriate treatment for complex patient with benign, malignant and traumatic disorders				
429	Knows outcomes for all treatment modalities and complications, including databases and clinical trials (e.g., pleurectomy vs. extrapleural pneumonectomy for mesothelioma)				
430	Knows complex alternatives for chest wall reconstruction (e.g., flaps available for chest wall reconstruction)				
431	Presents on outcomes of benign or malignant disorders at local, regional or national meeting				
432	Patient Care: Chest Wall, Pleura, Mediastinum				
433	Orders basic diagnostic/assessment tests for routine benign, malignant and traumatic diseases (e.g., chest x-ray, CT, PET)				
434	Lists basic treatment options for routine benign, malignant and traumatic diseases.				
435	Lists common complications for benign, malignant and traumatic diseases and their treatment				
436	Demonstrates basic surgical skills (simulation vs. OR) (e.g., knot tying, suturing)				
437	Performs common bedside procedures (e.g., chest drain/tube, thoracentesis, pleurodesis)				
438	Interprets diagnostic/assessment tests for routine benign, malignant and traumatic diseases (e.g., distinguish free flowing and loculated pleural effusions, chest wall involvement by tumor)				
439	Suggests treatment options for routine benign, malignant and traumatic diseases.				
440	Recognizes routine post-operative and disease related complications (e.g., wound infection, pleural fluid loculation)				
441	Demonstrates basic endoscopic and ultrasound- guidance skills (e.g., handling video scope)				
442	Demonstrates basic minimally invasive skills.				
443	Provides basic intraoperative assistance.				
444	Prioritizes diagnostic/assessment tests for routine benign, malignant and traumatic diseases (e.g., prioritize use of imaging to evaluate chest wall trauma)				
445	Selects ideal treatment option for routine benign, malignant and traumatic diseases (e.g., options for malignant mesothelioma)				
446	Manages routine post-operative and disease related complications (e.g., need for radiologic vs. surgical intervention for wound infection after chest wall reconstruction)				
447	Demonstrates advanced endoscopic skills (e.g., performs uncomplicated EBUS or mediastinoscopy)				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
448	Performs open and VATS procedures for uncomplicated pleural or mediastinal disorders (e.g., VATS pleural or mediastinal biopsy, open Stage I/II thymectomy)				
449	Performs simple chest wall resection (e.g., resects a laterally placed small chondrosarcoma (<3cm))				
450	Establishes a diagnostic and assessment plan for complex patients with benign, malignant and traumatic diseases (e.g., evaluation for posterior tumor involving spine)				
451	Selects ideal treatment option for complex benign, malignant and traumatic diseases (e.g., induction therapy for certain mediastinal malignancies, post-operative empyema with or without BPF)				
452	Manages complex post-operative and disease related complications (e.g., management of post resectional empyema with and without BPF)				
453	Performs open and VATS procedures for complex pleural and mediastinal disorders (e.g., open decortication for a complex loculated pleural effusion, thymectomy for a Stage III thymoma)				
454	Performs complex chest wall resection and/or reconstruction (e.g., large chest wall lesion with reconstruction)				
455	Surgically manages mesothelioma (e.g., radical pleurectomy and decortication with diaphragm reconstruction)				
456	Professionalism: Ethics and Values				
457	Understands basic bioethical principles and is able to identify ethical issues in CT surgery.				
458	Demonstrates behavior that conveys caring, honesty, and genuine interest in patients and families.				
459	Recognizes ethical issues in practice and is able to discuss, analyze and manage common ethical situations.				
460	Demonstrates behavior that shows insight into the impact of one's core values and beliefs on patient care.				
461	Analyzes and manages ethical issues in complicated and challenging situations.				
462	Understands the beliefs, values and practices of diverse and vulnerable patient populations and the potential impact on patient care.				
463	Uses a systematic approach to analyzing and managing ethical issues including advertising, billing and conflicts of interest.				
464	Develops a mutually agreeable care plan in context of conflicting physician and patient values and beliefs.				
465	Leads institutional and organizational ethics programs.				
466	Develops programs to ensure equality of care in diverse, vulnerable and underserved populations.				
467	Professionalism: Personal Accountability				
468	Understands and manages the issues related to fatigue and sleep deprivation.				
469	Exhibits professional behavior (e.g., reliability, industry, integrity, and confidentiality).				
470	Demonstrates management of personal emotional, physical, and mental health.				
471	Recognizes individual limits in clinical situations and asks for assistance when needed.				
472	Ensures that the medical record (including EMR) is timely, accurate and complete.				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
473	Identifies and manages situations in which maintaining personal emotional, physical and mental health is challenged.				
474	Understands conflicting interests of self, family, and others and their effects on the delivery of medical care.				
475	Understands physician accountability to physicians, society and the profession.				
476	Recognizes signs of physician impairment, including fatigue, and demonstrates appropriate steps to address impairment in self and in colleagues.				
477	Prioritizes and balances conflicting interests of self, family, and others to optimize medical care.				
478	Develops institutional and organizational strategies to improve physician wellness.				
479	Interpersonal and Communication Skills				
480	Develops a positive relationship with patients in uncomplicated situations and recognizes communication conflicts.				
481	Recognizes multidisciplinary approach to patient care.				
482	Understands the patient's/family's perspective while engaged in active listening.				
483	Utilizes interpreters, as needed.				
484	Appreciates effective communication to prevent medical error.				
485	Participates in effective transitions of care.				
486	Negotiates and manages simple patient/family-related, and team conflicts.				
487	Responds to the social and cultural context of the patient and family to ensure the patient understands and ability to participate in health care decision-making.				
488	Understands the effects of computer use on information accuracy and potential effects on the physician/patient relationship.				
489	Sustains working relationships and manages complex and challenging situations, including transitions of care.				
490	Customizes the delivery of emotionally difficult information.				
491	Manages transitions of care and optimizes communication across systems.				
492	Maintains collegial relationship with other professional staff.				
493	Negotiates and manages conflict in complex and challenging situations (including vulnerable populations) and develops working relationships across specialties and systems of care.				
494	Organizes and facilitates family/ healthcare team conferences				
495	Able to facilitate/lead team based care activities, e.g., OR team, multidisciplinary cancer conference.				
496	Uses multiple forms of communication (e.g., email, patient portal, social media) ethically and with respect for patient privacy.				
497	Develops models/approaches to managing difficult communications and seeks leadership opportunities within professional organizations.				
498	Coaches others to improve communication skills.				
499	Systems Based Practice: Patient Safety				
500	Understands the differences between medical errors, near misses, and sentinel events.				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
501	Understands the roles of care team members.				
502	Participates in the use of tools to prevent adverse events (e.g., checklists and briefings).				
503	Describes the common system causes for errors.				
504	Consistently uses tools to prevent adverse events (e.g., checklists and briefings).				
505	Reports problematic behaviors, processes, and devices including errors and near misses.				
506	Demonstrates structured communication tool for hand-offs.				
507	Participates in the analysis of shared team experiences to prevent future errors using proven analysis techniques (e.g., root cause analysis, failure mode effects analysis).				
508	Leads team by promoting situational awareness and input by all team members.				
509	Conducts morbidity and mortality conference to improve patient safety.				
510	Leads curriculum design to teach teamwork and communication skills to healthcare professionals.				
511	Leads multidisciplinary teams (e.g., human factors engineers, social scientists) to address patient safety issues.				
512	Systems Based Practice: Resource Allocation				
513	Describes practice variations in resource consumption, such as the utilization of diagnostic tests.				
514	Describes the cost implications of using resources and practice variation.				
515	Participates in responsible use of health care resources seeking appropriate assistance.				
516	Practices cost effective care (e.g., managing length of stay, operative efficiency).				
517	Designs measurement tools to monitor and provide feedback to providers/teams on resource consumption to facilitate improvement.				
518	Systems Based Practice: Practice Management				
519	Understands basic health payment systems, including uninsured care.				
520	Uses EMR appropriately.				
521	Understands the importance of documentation for coding				
522	Able to document inpatient diagnoses.				
523	Understands different practice models.				
524	Understands principles of diagnosis, evaluation and management, and procedure coding.				
525	Compares and contrasts different practice models.				
526	Codes routine diagnoses, encounters and surgical procedures. Documents medical necessity.				
527	Recognizes basic elements needed to establish practice (e.g. negotiations, malpractice insurance, contracts, staffing, compliance, facility accreditation).				
528	Establishes timeline and identifies resources for transition to practice (e.g. information technology, legal, financial, personnel).				
529	Participates in advocacy activities for health policy.				
530	Creates curriculum to teach practice management.				
531	Codes complex and unusual diagnoses, encounters and surgical procedures.				

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
532	Practice Based Learning: Self Improvement and Lifelong Learning				
533	Aware of one's own level of knowledge and expertise and uses feedback from teachers, colleagues and patients.				
534	Identifies learning resources.				
535	Continually seeks and incorporates feedback to improve performance.				
536	Develops a learning plan and uses published review articles and guidelines.				
537	Demonstrates a balanced and accurate self-assessment of competence, investigates clinical outcomes and areas for continued improvement.				
538	Selects an appropriate evidence-based information tool to answer specific questions.				
539	Demonstrates improvement in clinical outcomes based on continual self-assessment and national database participation.				
540	Performs self-directed learning with little external guidance using evidence-based information tools. Learning plan includes a process to remain current in knowledge over time.				
541	Demonstrates consistent behavior of incorporating evidence based information in common practice areas.				
542	Practice Based Learning: Research and Teaching				
543	Describes basic concepts in clinical epidemiology, biostatistics, and clinical reasoning; can categorize research study design.				
544	Participates in the education of patients, families and junior learners.				
545	Ranks study designs and can distinguish relevant research outcomes (e.g., patient-oriented evidence that matters) from other types of evidence.				
546	Teaches patients, families and junior learners.				
547	Applies a set of critical appraisal criteria to different types of research, including synopses of original research findings, systematic reviews and meta-analyses, and clinical practice guidelines.				
548	Teaches colleagues and other health professionals in both formal and informal settings. Assesses and provides feedback to junior learners.				
549	Formulates a searchable question, describes a plan to investigate it, and participate in a research project.				
550	Organizes educational activities at the program level.				
551	Independently plans and executes a research program.				
552	Develops educational curriculum and assessment tools.				
553					
554					

Return to Worksheet document overview.

Return to Table of Contents

	A	B	C	D	E
555					
556	**Milestone**	**Current Status**			
557	Medical Knowledge: Ischemic Heart Disease	0.0			
558	Patient Care: Ischemic Heart Disease	0.0			
559	Medical Knowledge: Cardiopulmonary Bypass	0.0			
560	Patient Care: Cardiopulmonary Bypass	0.0			
561	Medical Knowledge: Valvular Disease	0.0			
562	Patient Care: Valvular Disease	0.0			
563	Medical Knowledge: Great Vessel Disease	0.0			
564	Patient Care: Great Vessel Disease	0.0			
565	Medical Knowledge: Congenital Heart Disease	0.0			
566	Medical Knowledge: End Stage Heart Disease	0.0			
567	Medical Knowledge: Esophagus	0.0			
568	Patient Care: Esophagus	0.0			
569	Medical Knowledge: Lung and Airway	0.0			
570	Patient Care: Lung and Airway	0.0			
571	Medical Knowledge: Chest Wall/Mediastinum	0.0			
572	Patient Care: Chest Wall/Mediastinum	0.0			
573	Medical Knowledge: Critical Care	0.0			
574	Patient Care: Critical Care	0.0			
575	Professionalism: Ethics and Values	0.0			
576	Professionalism: Personal Accountability	0.0			
577	Interpersonal and Communication Skills	0.0			
578	Systems Based Practice: Patient Safety	0.0			
579	Systems Based Practice: Resource Allocation	0.0			
580	Systems Based Practice: Practice Management	0.0			
581	Practice Based Learning: Self Improvement	0.0			
582	Practice Based Learning: Research & Teaching	0.0			

Return to Worksheet document overview.

Return to Table of Contents

Implementing the CT Surgery Milestones: The Clinical Competency Committee (CCC)

Stephen C. Yang, MD | The Johns Hopkins Institutions | TSDA General Session | AATS 2014

Milestone Description: Template				
Level 1	Level 2	Level 3	Level 4	Level 5
What are the expectations for a beginning resident?	What are the milestones for a resident who has advanced over entry, but it performing at a lower level than expected at mid-residency?	What are the key developmental milestones mid residency? What should they be able to do well in the realm of the specialty at this point?	What does a graduating resident look like? What additional knowledge, skills and attitudes have they obtained? Are they ready for certification?	Stretch Goals- Exceeds expectations
After Medical School	Half way through TY year	TY graduate	Resident graduate	Practicing physician

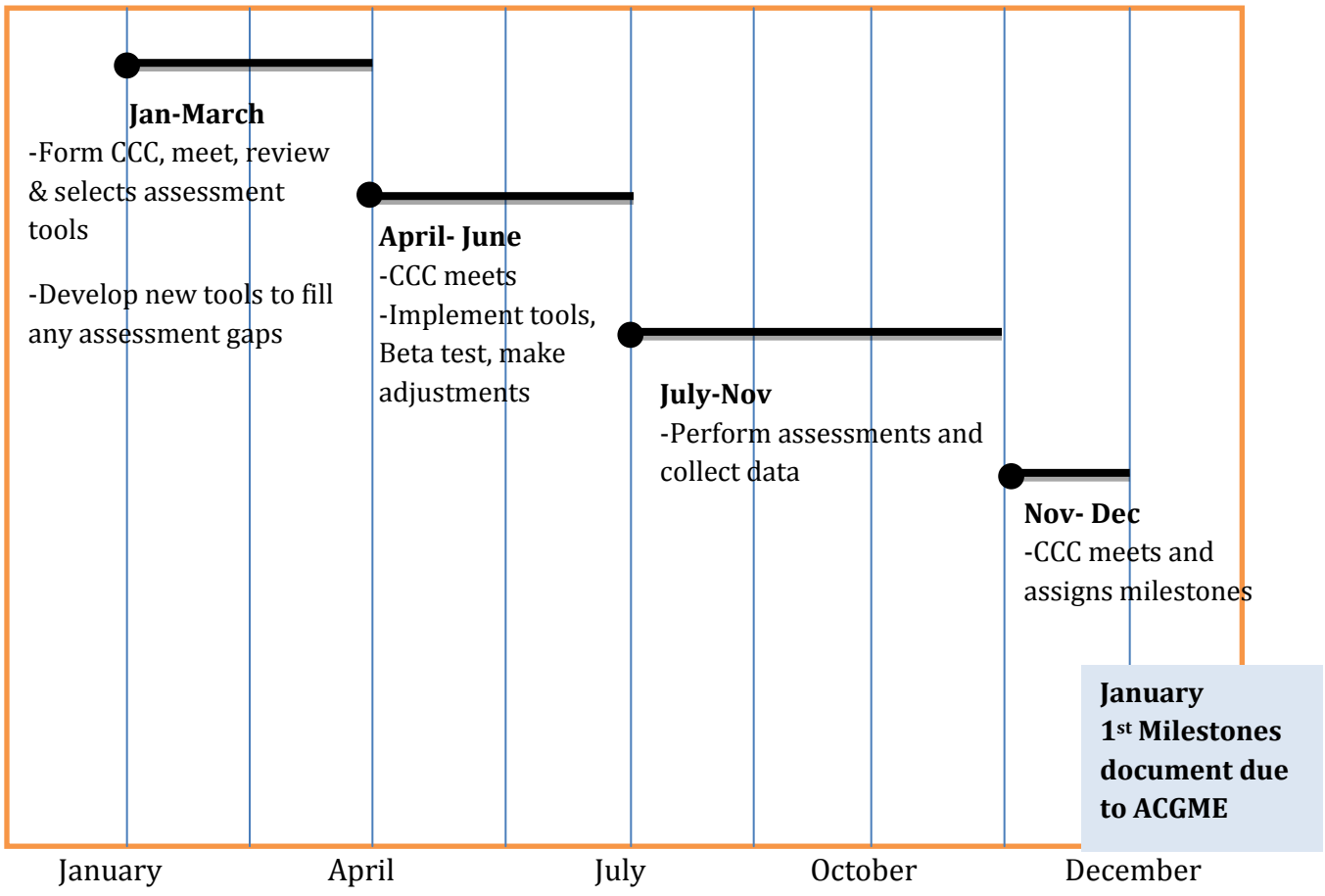
This is the base template that was used by the Cardiothoracic Surgery Working Group. The template demonstrates the expectations of the levels. Level 1 is for the beginning resident; Level 4 is for the graduating resident. A resident who achieves a Level 4 is someone who is ready for certification and independent practice. Levels 2 and 3 are those steps in-between- these residents are continuing to learn. Level 5 is for those residents who exceed the expectations of the graduating resident; residents are not expected or required to achieve a Level 5.

Milestones are progressive over time. There is no prescribed speed. Levels do not correspond to PGY or year in program.

Return to Table of Contents

CT Surgery Milestones:
Evaluation by Core Competencies

Patient Care and Medical Knowledge	Medical Knowledge
Ischemic Heart Disease	Congenital Heart Disease
Cardiopulmonary Bypass, Myocardial Protection and Temporary Circulatory Support	End Stage Cardiopulmonary Disease
Valvular Disease	
Great Vessel Disease	**General Competencies**
Critical Care	*Professionalism*- Ethics and values: personal accountability
Esophagus	*Practice Based Learning and Improvement*- Learning: Research and Teaching
Lung and Airway	*Interpersonal and Communication Skills*
Chest wall/ Pleura/ Mediastinum	*Systems Based Practice*- Patient Safety: Resource Allocation; Practice Management



Return to Table of Contents

Surgical Specialty Milestones

Specialty	# of Milestones
Congenital Cardiac	9
General Surgery	16
Otolaryngology	17
Colorectal	20
Neurosurgery	24
Pediatric Surgery	24
Thoracic	26
Plastics*	30
Vascular	31
Urology	32
Orthopedic	40*
MEAN	24

CCC: Composition

- Limit the size (4-6)
- Broad representation of Disciplines, experience, locations
- Non-faculty (e.g. RNs, mid-levels, perfusionists)
- Educators (PhD, RN)

CCC: Goals: Responsibilities

- Review/develop/implement assessment tools
- Review trainee portfolios
- Enforce completion of assessment data
- Review assessment data for accuracy
- Assign milestone levels for each trainee biannually
- Develop remediation strategies
- Review faculty and trainee surveys, peer evaluations

CCC: Methodologies

- Review current assessment tools and find strengths and weaknesses
- Implement assessment tools that are practical with maximal faculty compliance
- Intervention strategies for struggling residents/remediation plans
- Provide career development

Return to Table of Contents

CCC: Principles

- Everyone must buy in
- Improve timeliness and quality of evals/feedback
- All members need to be fair
- Implement assessment tools that are practical with maximal faculty compliance
- Intervention strategies for struggling residents/ remediation plans
- Provide career development

CCC: Models

- Each CCC member is responsible for one trainee (their assigned mentee)- best for small programs
- Each CCC member is responsible for one or more competencies for all trainees
- All CCC members review all assessment data for all trainees and come to milestone level consensus

CCC: Challenges

- Selecting/developing effective assessment tools
- Incorporating milestone assessments
- Subgrouping PGY years
- Faculty development
- Individualize curriculum
- Time commitment

CCC: Faculty Development

- Milestones and evaluation principles
- Integrating /synthesizing data
- Providing timely and appropriate feedback
- Thresholds of concern

Return to Table of Contents

CCC: "Legal" Issues

- Are meetings and practices "peer protected"
- Meeting minutes: Discoverable
- How will differences between CCC chair/ members/ PD be managed
- What is the appeals process?

CCC: Using the Milestone Data

- Formative feedback and summative evaluation of trainees
- Resident promotion decisions
- Curriculum and educational program assessment and improvement
- Educational research

ACGME Toolbox

- Record Review
- Chart Stimulation Recall
- Check List
- Global Rating
- Standardized Patients
- OSCE/CASPE
- Simulations and Models
- 360 Global Rating
- Learning Portfolios
- ITE
- Mock Oral Exam
- Procedures and Case Logs
- Patient Survey

Return to Table of Contents

Cardiothoracic Surgery Educational Milestones: How do they fit in with Curriculum Development

Stephen C. Yang, MD | The Johns Hopkins Medical Institutions | Implementation of a Surgical Curriculum in Cardiothoracic Surgery Program | STS 2014

Next Accreditation System (NAS) Outcome Project Timeline

1999- Outcome Project Begins → **2001**- Quadrads (Board, PD, RRC, Res) Convened → **2002- 2008**- Implementation of 6 competency Domains

-General Competencies Defined

- Increasing emphasis on educational outcomes (vs. process)

-Translate core competencies into specialty-specific competencies

-Residency programs expected to develop instructional and assessment methods for integrating the competencies in their curricula

-ACGME assessment "toolbox" developed

Milestones: The next step in the Outcome Project

2009- 2012- Milestone Development → **2013 & Beyond**

-All specialties completed by 12/2012

-Pilot testing began

-Large scale implementation of milestones for testing

-NAS launch~ staggered approach (e.g. 4-5 specialties at first)

Return to Table of Contents

Dr. Nasca's Seminal Column in May 2008 ACGME Bulletin

- Vows to achieve outcomes-based accreditation
- Introduces concept of milestones as part of the vision
- Frames the milestone development initiative as a specialty community effort
- Charge= each specialty to identify milestones of competency development

Milestones Defined

General Definition- Skill and knowledge-based developments that commonly occur by a specific time

Milestone Project Definition- Specific behaviors, attributes, or outcomes in the general competency domains to be demonstrated by residents by a particular point during residency

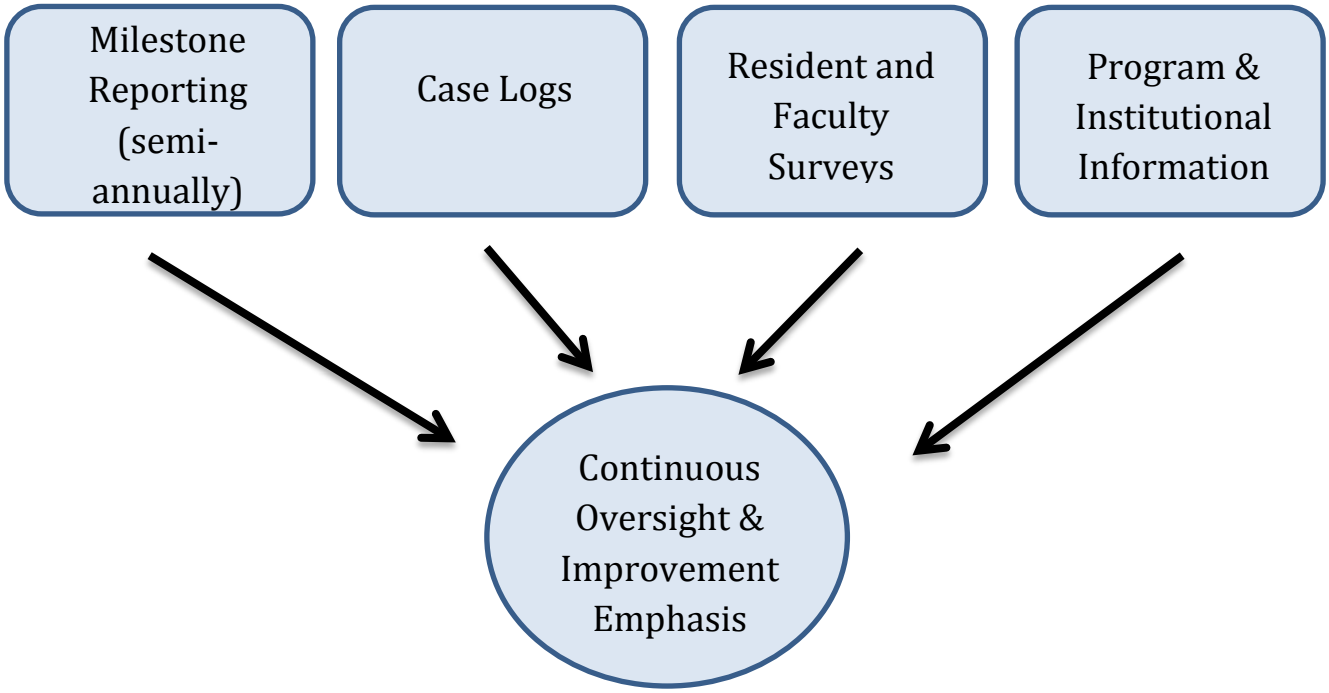
ACGME Accreditation System

- The Next Accreditation System (NAS)
  - July 2013 for 7 specialties
    - Emergency Medicine, Internal Medicine, Pediatrics, Neurological Surgery, Orthopaedic Surgery, Diagnostic Radiology, and Urology.
- Cardiothoracic Surgery → July 2014
- Expected to do milestone evaluations every 6 months
- http://www.acgme-nas.org/

Return to Table of Contents

…ACGME Accreditation System continued

Milestones are a cornerstone of the new system and are meant to be progressive throughout the training of a resident.



Educational Milestones

- Measurement tools to assess educational outcomes
- Close collaboration of RRC, ABTS, TSDA, JCTSE and professional societies
- Assess the attainment of competency in a logical trajectory of professional development
- Composite Milestones data submitted semiannually, representing consensus of Clinical Competency Committee
- It is not an assessment tool

Return to Table of Contents

Thoracic Milestone Participants

Advisory Board

- William Baumgartner
- John Calhoon
- David Fullerton
- John Potts
- Peggy Simpson
- Doug Wood
- Peggy Simpson (ACGME)
- Laura Edgar (ACGME)

Working Group

- Carolyn Reed/ Walter Merrill (Chair)
- Andrea J. Carpenter
- Jim Fann
- Robert Higgins
- Rick Lee
- Tom Nguyen (TSRA)
- Ara Vaporciyan
- Tom Varghese
- Ed Verrier
- Cam Wright
- Steve Yang

Thoracic Surgery Milestone Project: *Available Assessment Tools*

- Review available tools for assessment
- Specific tools for CT surgery programs
- Develop future strategies for your own institutional program and curriculum

Critical for Good Assessment

- Valid, practical, acceptable
- Has a direct educational effect
- Catalytic effect: feedback drives learning forward
- Makes professional practice more transparent
- Measures actual performance
- Identifies areas for improvement

Critical Principles of Choosing Assessment Strategies

- Decide if the strategies are:
  - Formative (monitor learning, feedback, e.g. evals)
  - Summative (evaluate learning, e.g. exams)
- How will results be provided to trainees and program directors
- Determine the remediation strategies

Return to Table of Contents

ACGME ToolBox

- Record Review
- Chart Stimulation Recall
- Check List
- Global Rating
- Standardized Patients
- OSCE/CASPE
- Simulation and Models
- 360 Global Rating
- ITE
- Mock Oral Exam
- Procedures and Case logs
- Patient Survey

Assessment Tools Specific for CT Surgery

- SESATS
- Moodle Courses
- Simulation/Video Assessment
- Database Patient Outcomes
- Senior tour
- Observation of Patient Encounters
- Presentation skills
- Patient evaluation
- QI Review
- Residents as educator
- Chart audit

Return to Table of Contents

Assessment Toolbox Matrix
(Modified ACGME, 2000)

COMPTETENCY	Record Review	Chart Stimulation Recall	Check List	Global Rating	Standardized Patients	OSCE/ CASPE	Simulations and Models	360 Global Rating	Learning Portfolios	ITE	Mock Oral Exam	Procedures and Case Logs	Patient Survey
Patient care/ Technical Skills	1	1	2		2	1		2	2		2	2	1
Medical Knowledge		1				2	2	3		1	1		
Practice-Based learning and improvement													
Evaluate care/self-improvement	2	2			2	2	3	1	1		1	2	2
Research and Teaching	1	2	3	3					1	3			
Interpersonal and Communication skills			3		1	1		2					1
Professionalism													
Ethics and Values		2	2			1	2	1	2				1
Personal Accountability									2		2	2	2
System-based Practice													
Patient Safety			1			3		1	2				1
Resource Allocation	3					3		2	3				
Practice Management		2	3			2		2	3	1			

Key:

1= most desirable
2= next best method
3= potentially applicable

Adapted from Toolbox of Assessment Methods, ACGME and ABMS, V 1.1, Sept 2000.

Return to Table of Contents

Cognitive Assessment: Available Content and Strategies in Thoracic Surgery

Content	***Assessment Strategy***
ITE	Exam Scores
SESATS	Performance
Mock Oral Exams	Performance
OSCE	All competencies
Moodle Rooms/ Assessment Quizzes	Performance, participation, professionalism
Op Logs	Reflection, professionalism, outcomes
SCORE (16)	Performance

Mapping the Milestones

Ischemic Heart Disease example:

Topics	Core ABTS Curriculum Topic	Basic Level Content	Relevant Milestone (Level)	Advanced Level Content	Relevant Milestone (Level)
CV07	Ischemic Heart Disease I	Diagnosis, investigation of IHD Cardiac Imaging	MK-IHD (1) PC-IHD (1,2,3) MK-IHD (2,3)	Management guidelines	MK-IHD (3,4) PC-IHD
CV08	Ischemic Heart Disease II	Role of PCI, hybrid approaches and non-operative treatment	MK-IHD (1,3,4) PC-IHD (1,2)	Combined coronary/ carotid disease	PC-IHD (4)
CV09	Ischemic Heart Disease III	Surgical revascularization, Conduits, on/off pump approaches	PC-IHD (2)	Role of TMR, Repeat revascularization	PC-IHD (4)
CV10	Ischemic Heart Disease IV	Complications of IHD/MI, Presentation/ Diagnosis	MK-IHD (3)	Treatment options for complications of IHD/ MI	MK-IHD (4) PC-IHD (4)

Return to Table of Contents

…continued Mapping the Milestones

Ischemic Heart Disease example:

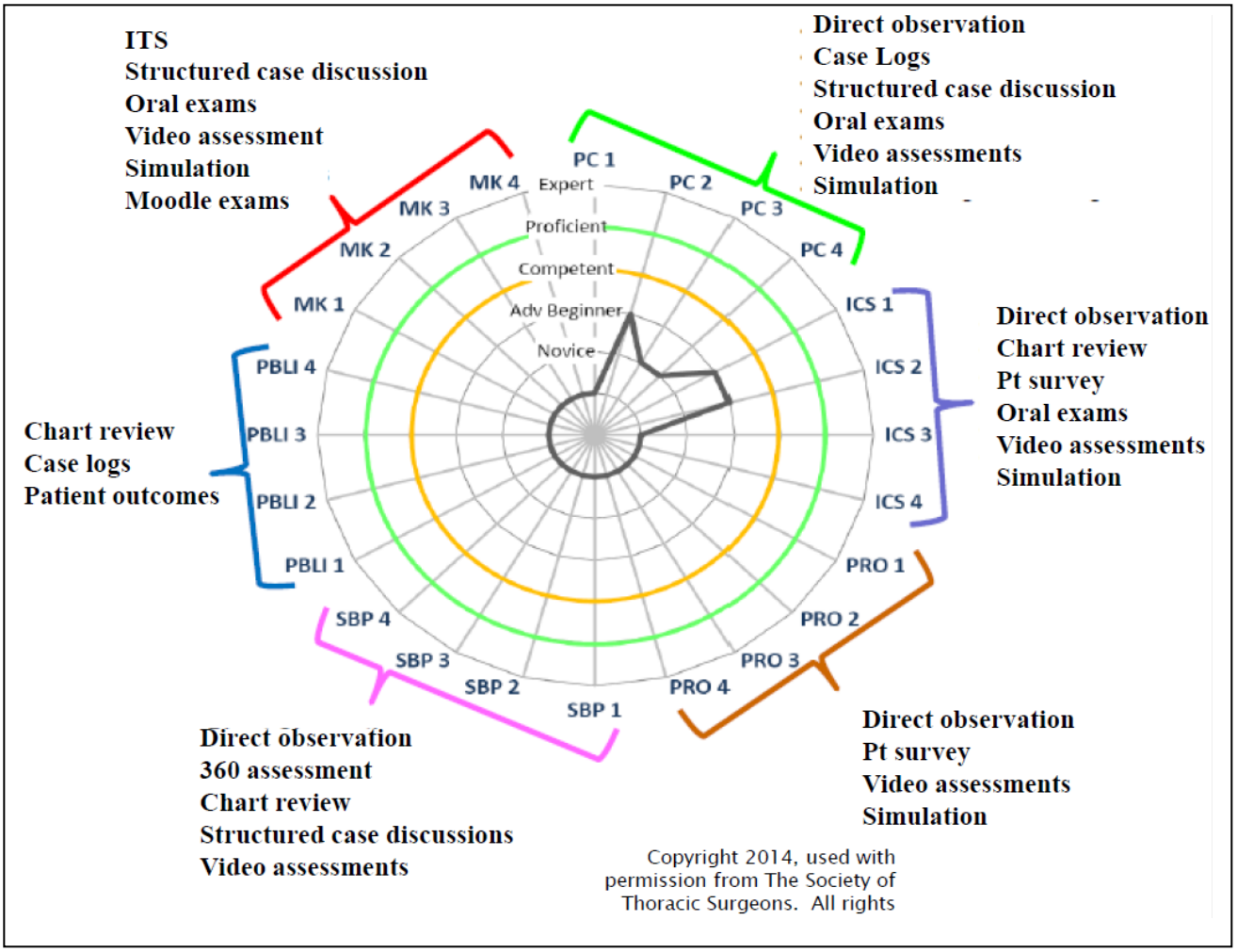
Medical Knowledge: Ischemic Heart Disease				
Level 1	Level 2	Level 3	Level 4	Level 5
Knows basic anatomy and pathology (identifies coronary anatomy on angiogram) CV01-B, CV02-A Knows basic cellular and vascular physiology CV01-B Lists clinical manifestations of IHD (e.g. angina, myocardial infarction) CV07-B Lists diagnostic tools available for evaluation of IHD CV03-B Lists treatment options for IHD (e.g. CABG, PCI) CV03-B; CV08-B Knows basic complications for IHD CV04-B	Understand common variations in anatomy and pathology (e.g., left dominant system) CV01-B, CV02-A Understand physiologic changes accompanying IHD (e.g. ischemic, ischemia reperfusion injury) CV01-B, CV06-B Generates differential diagnosis of disease with similar manifestations (e.g. esophageal and aortic problems) CV03-B Understands advantages and disadvantages of diagnostic tools in evaluating IHD (e.g. EKG vs. echocardiogram vs. anglogram) CV03-B, CV07B ……	Understands complex integrations between anatomy and pathology (e.g. anomalous coronary artery) CV01-A, CV02-A Understands the role of treatment on physiology of IHD CV01-A Identifies the common variants of the clinical manifestations of IHD (e.g. unstable angina, acute myocardial infarction, silent ischemic) CV10-B Interprets normal and common abnormalities associated with ischemic heart disease (e.g. reads coronary aniogram, complex EKG) CV07-B Identifies appropriate treatment for routine patient with IHD CV08-B	Understands comples variations in anatomy and pathology, including congenital (e.g. able to identify coronary anatomy in reoperative surgery) CV01-A, CV02-A Adapts therapeutic management based on understanding of physiology of complications of IHD (e.g. post infarct VSD, Ischemic mitral regurgitation) CV01-A Distinguishes the complex clinical manifestations and complications of IHD CV10-A Interprets and integrates complex abnormalities associated with IHD CV10-A Identifies appropriate treatment for complex patient….	Understands implications of SYNTAX score Presents on outcomes of IHD at local, regional or national meeting

Codes:

Green- Linked to the Thoracic Surgical Curriculum

E.g. CV01-B= Topic CV01
(B=Basic, A=Advanced

Return to Table of Contents



Return to Table of Contents

The Milestones Project

Walter H. Merrill, MD | Vanderbilt University Medical Center | | TS-RACS Annual Meeting 2013

Accreditation Council for Graduate Medical Education

Background Information

- 1999- ACGME introduces six clinical competencies
- 2009- Restructuring of the accreditation system based on educational outcomes
- 2013- Phased implementation of NAS
- 2014- NAS adopted in cardiothoracic surgery

Aims of NAS

- Enhance ability of training programs to prepare physicians for practice
- Allow ACGME to accredit training programs based on educational outcomes
- Reduce the burden associated with current structure and process-based approach

Stakeholders Expect…

- Physicians be leaders of team-oriented care
- Literacy in information technology to improve care
- Sensitivity to cost-effectiveness
- Involve patients in their own care
- Physicians possess skills a requisite clinical and professional attributes

Limitations of Current Accreditation

- Program requirements prescriptive
- Diminished opportunities for innovation
- Increased administrative burdens
- Care delivery-system changes outpace educational standards
- Emphasis on process, less so on outcomes

Return to Table of Contents

Next Accreditation System

- July 2013- emergency medicine, internal medicine, neurologic surgery, orthopedic surgery, pediatrics, diagnostic radiology, urology
- July 2014- full implementation
    - Move to annual data collection
    - RRC performs annual trend evaluation: Milestones, resident and faculty survey data, operative case log data, educational outcomes
    - Clinical Competency Committee
    - Elimination of PIF
    - 10 year cycle of self-study
    - 10 year cycle of accreditation site visit
    - Submit Milestones data semiannually

Educational Milestones

- Measurement tools to assess educational outcomes
- Close collaboration of RRC, ABTS, TSDA, JCTSE and professional societies
- Assess the attainment of competency in a logical trajectory of professional development
- Composite Milestones data submitted semiannually, representing consensus of Clinical Competency Committee
- Organized under six competency domains
- Observable steps on continuum of increasing ability
- Describe trajectory from neophyte to practitioner
- Intuitively known by experienced educators
- Provide framework and language to describe progress
- Articulate shared understanding of expectations
- Set aspirational goals of excellence

ACGME Goals for Milestones

- Permits fruition of the promise of focus on outcomes
- Tracks what is important
- Uses universal tools for assessments
- RRCs track unidentified individuals' trajectories
- Specialty specific normative data

Return to Table of Contents

Educational Milestones

Working Group

Edward Bove	Carolyn Reed (Chair)
Andrea Carpenter	Peggy Simpson
Laura Edgar	Ara Vaporciyan
Jim Fann	Thomas Varghese
Robert Higgins	Edward Verrier
Richard Lee	Cameron Wright
Walter Merrill	Stephen Yang
Tom Nguyen	

Advisory Group

William Baumgartner	David Fullerton
Timothy Brigham	John Potts
John Calhoon	Doug Wood

Summary

- Milestones for CT Surgery implemented July 2014
- Semi-annual assessment of residents by Clinical Competency Committee using Milestones
- Goal is to help all residents achieve level 4 by the time they complete training
- Level 5 achievement is desired goal to be achieved later in practice

Conclusions

- Next Accreditation System
    - Creates national framework for assessment (Milestones)
    - Reduction in administrative burden and eliminates focus on process
    - Stimulates innovation in education; raise the ceiling and the floor

Return to Table of Contents

G. TS Milestones Linked to TSC

Topics	Core ABTS Curriculum Topic	Basic Level Content	Relevant Milestone (Level)	Advanced Level Content	Relevant Milestone (Level)
CV 1	Cardiac Surgery General Management I	Cardiac Anatomy	MK-IHD (1,2) MK-Valv (1,2) MK-End Stage CP (1)	Advanced Anatomy	MK-IHD (3,4) MK-Valv (3,4) MK-End Stage CP (3-5)
		Cardiac Physiology	MK-IHD (1,2) MK-Valv(1,2) MK-End Stage CP (1)	Advanced Physiology	MK-IHD (3,4) MK-Valvular (3,4) MK-End Stage CP (3-5)
CV 2	Cardiac Surgery General Management II	Cardiovascular pharmacology, Microbiology	MK - Critical Care (1,4)	Pathology	MK- IHD (1-4) MK-Valv (1-4)
CV 3	Cardiac Surgery General Management III	Diagnosis, evaluation and treatment	MK-IHD (1-2) PC-IHD (1-2) MK-Valv (1-2) PC-Valv (1-2)	Cardiac Rehabilitation	
		Risk assessment	MK-IHD (2) MK-Valv (2)		
		Cardiopulmonary resuscitation	PC-CC (3)		
CV 4	Cardiac Surgery General Management IV	management of complications of cardiac surgery	MK-IHD (1-3)	wound infection/sternal disruption	
		cardiac tamponade postoperative management	PC-ISH (2)		
CV 5	Cardiopulmonary bypass/mycardial protection/circulatory support I	Pathophysiology of CPB	MK-CPB (1)	Management of CPB Complications of CPB	MK-CPB (3,4) PC-IHD (3) PC-CPB (3,4)
CV 6	Cardiopulmonary bypass/mycardial protection/circulatory support II	Basic Myocardial physiology / protection	MK-CPB (1,2)	Techniques of MP	PC-IHD (4)
		I/R injury	MK-IHD (2)	IABP	MK-CPB (2,4) PC-CPB (4)
		Protection solutions	MK-CPB (3)		
CV 7	Ischemic Heart Disease I	Diagnosis, investigation of IHD	MK-IHD (1) PC-IHD (1,2,3)	Management guidelines	MK-IHD (3,4) PC-IHD (3,4)
		Cardiac Imaging	MK-IHD (2,3)		

Topics	Core ABTS Curriculum Topic	Basic Level Content	Relevant Milestone (Level)	Advanced Level Content	Relevant Milestone (Level)
CV 8	Ischemic Heart Disease II	Role of PCI, hybrid approaches and non-operative treatment	MK-IHD (1,3,4) PC-IHD (1,2)	Combined coronary / carotid disease	PC-IHD (4)
CV 9	Ischemic Heart Disease III	Surgical revascularization Conduits On / off pump Approaches	PC-IHD (2)	Role of TMR Repeat revascularization	PC-IHD (4)
CV 10	Ischemic Heart Disease IV	Complications of IHD / MI Presentation / Diagnosis	MK-IHD (3)	Treatment options for complications of IHD / MI	MK-IHD (4) PC-IHD (4)
CV 11	Heart Valve Disease I	Aortic valve anatomy and physiology	MK-Valv (1)	Indications for operative management (AS)	MK-Valv (1-3) PC-Valv (1-4)
		AS pathophysiology	MK-Valv (2,3)	Guidelines (AS)	MK-Valv (3,4)
		Diagnosis/assessment	MK-Valv (1,2) PC-Valv (1,2,3)	valve selection	MK-Valv (2-4)
		Results of Surgery (AS)	MK-Valv (3)		
CV 12	Heart Valve Disease II	AI pathophysiology	MK-Valv (2,3)	Indications for operative management (AI)	MK-Valv (1-3) PC-Valv (1-4)
		Diagnosis/assessment	MK-Valv (1,2) PC-Valv (1,2,3)	Guidelines (AI)	MK-Valv (3,4)
		Results of Surgery (AI)	MK-Valv (3)		
CV 13	Heart Valve Disease III	Mitral valve anatomy and physiology	MK-Valv (1)	Indications for operative management (MR)	MK-Valv (1-3) PC-Valv (1-4)
		MR pathophysiology/natural history	MK-Valv (2,3)	Guidelines (MR)	MK-Valv (3,4)
		Diagnosis and assessment	MK-Valv (1,2) PC-Valv (1,2,3)		
		Results of Surgery (MR)	MK-Valv (3)		
CV 14	Heart Valve Disease IV	MS pathophysiology/natural history	MK-Valv (2,3)	Indications for operative management (MS)	MK-Valv (1-3) PC-Valv (1-4)
		Diagnosis and assessment	MK-Valv (1,2) PC-Valv (1,2,3)	Guidelines (MS)	MK-Valv (3,4)
		Results of Surgery (MS)	MK-Valv (3)		
CV 15	Heart Valve Disease V	Tricuspid valve anatomy and physiology	MK-Valv (1)	Indications for operative management (TV)	MK-Valv (1-3) PC-Valv (1-4)
		Pulmonary valve	MK-Valv (2,3)	Guidelines (TV)	MK-Valv (3,4)
		Diagnosis and assessment	MK-Valv (1,2) PC-Valv (1,2,3)		
		Results of Surgery (TV)	MK-Valv (3)		
CV 16	Heart Valve Disease VI	Endocarditis general indications Antibiotics/prophylaxis		valve specific	
CV 17	Heart Valve Disease VII	TAVR	PC-Valv (5)	TAVR	PC-Valv (5)

Topics	Core ABTS Curriculum Topic	Basic Level Content	Relevant Milestone (Level)	Advanced Level Content	Relevant Milestone (Level)
CV 18	Great Vessel Disease I	General overview Vascular pathology Natural history	MK-GVD (1) MK-GVD (1,2,3) MK-GVD (1)	Imaging interpretation	MK-GVD (1,2,3) PC-GVD (2)
CV 19	Great Vessel Disease II	Management of acute great vessel disease Indications of surgery/risk assessment	MK-GVD (1,2) PC-GVD (1,2,3) MK-GVD (1,2)	General operative techniques Acute great vessel disease Spinal and cerebral protection	MK-GVD (3,4) PC-GVD (3)
CV 20	Great Vessel Disease III	Management ofchronic great vessel disease	MK-GVD (4) PC-GVD (4)	Treatment of chronic great vesssel disease , Endovascular Treatment	MK-GVD (1,4) PC-GVD (2,4,5)
CV 21	Great Vessel Disease IV	Thromboembolic disease	MK-GVD (5)	Percutaneous / Surgical Embolectomy	PC-GVD (5)
CV 22	Cardiac Conduction System Disorders I	Anatomy of conduction pathways Atrial conduction disorders Ventricular conduction disorders		Surgical treatment of atrial fibrillation	
CV 23	Cardiac Conduction System Disorders II	Pacemakers and AICD		Complications of pacemakers and AICD	
CV 24	Diseases of the Pericardium and Myocardium I	Pathophysiology (tamponade, constrictive, restrictive) Diagnosis and imaging		Pericardial disease patient management	
CV 25	Diseases of the Pericardium and Myocardium II	Cardiac tumor knowledge		cardiac tumor management/technical skills	
CV 26	Diseases of the Pericardium and Myocardium III	HOCM knowledge	MK-Critical care (2) MK-End stage CP disease (2)	HOCM management/technical skills	MK-valvular disease (4)
CV 27	Heart Failure and Cardiac Transplant I	Diagnosis and management of heart failure	MK-End stage CP disease (1,2)	Surgical remodeling, non-transplant	
CV 28	Heart Failure and Cardiac Transplant II	General information (devices)	MK-End stage CP disease (4)	General Information (outcomes)	MK-End stage CP disease (1,5)
CV 29	Heart Failure and Cardiac Transplant III	LVAD knowledge Adult ECMO	MK-End stage CP disease (3,5)	LVAD management/clinical skills	MK-End stage CP disease (4,5)
CV 30	Heart Failure and Cardiac Transplant IV	Transplant knowledge	MK-End stage CP disease (4,5)	Transplant knowledge	MK-End stage CP disease (4,5)

Topics	Core ABTS Curriculum Topic	Basic Level Content	Relevant Milestone (Level)	Advanced Level Content	Relevant Milestone (Level)
CV 31	Cardiothoracic trauma I	General management	MK-L&A (1)	Aortic injury patient management Cardiac injury patient management	
CV 32	Cardiothoracic trauma II	Chest wall and pulmonary injury knowledge	MK-L&A (1,2) MK-CW/P/M (2)	Chest wall and pulmonary injury management	MK-CW/P/M (3
		Diaphragm injury knowledge		Diaphragm injury management	
CV 33	Cardiothoracic trauma III	Esophageal injury knowledge		Esophageal injury management	
		Tracheobronchial injury knowledge	MK-L&A (4)	Tracheobronchial injury management	
TS 1	Thoracic Surgery General Management I	General knowledge including lung anatomy	MK-L&A (1,2)	Management	MK-L&A (1)
TS 2	Thoracic Surgery General Management II	Physiology	MK-L&A (1,2)	Imaging	MK-L&A (4)
TS 3	Thoracic Surgery General Management III	Risk assessment lung	MK-L&A (1,4)	Postop complications lung	MK-L&A (1,2)
TS 4	Thoracic Surgery General Management IV	Risk assessment esophageal		Postop complications esophageal	MK-E (1,2)
TS 5	Neopasm of the lung I	Benign and malignant tumors	MK-L&A (1,2,4)		
		Epidemiology and genetics signatures presentation			
TS 6	Neopasm of the lung II	Stage I Staging including all staging tools Stage I survival and recurrence patterns	MK-L&A (1) MK-L&A (4)	Stage I treatment and multimodality Non-resectional techniques	MK-L&A (4)
TS 7	Neopasm of the lung III	Stage II Staging including all staging tools Stage II survival and recurrence patterns	MK-L&A (1) MK-L&A (4)	Stage II treatment and multimodality Non-resectional techniques	MK-L&A (4)
TS 8	Neopasm of the lung IV	Stage III Staging including all staging tools	MK-L&A (1)	Stage III treatment and multimodality	MK-L&A (4)
		Stage III survival and recurrence patterns	MK-L&A (4)	Non-resectional techniques	
TS 9	Neopasm of the lung V	Stage IV Staging including all staging tools	MK-L&A (1)	Stage IV treatment and multimodality	
		Stage IV survival and recurrence patterns	MK-L&A (4)	Non-resectional techniques surgical palliation	
TS 10	Neopasm of the lung VI	Secondary and metastatic neoplasm of the lung	MK-L&A (4)	Secondary and metastatic neoplasms: outcomes, treatment	MK-L&A (4)
TS 11	Benign Lung Conditions I	Bronchiectasis (knowledge)	MK-L&A (2)	Bronchiectasis (patient care)	MK-L&A (4)
		Bacterial Infection (general overview)	MK-L&A (2)	Bacterial Infection (nosocomial infection, community acquired)	MK-L&A (4)

Topics	Core ABTS Curriculum Topic	Basic Level Content	Relevant Milestone (Level)	Advanced Level Content	Relevant Milestone (Level)
TS 12	Benign Lung Conditions II	Tuberculosis and atypical mycobacteria (knowledge)	MK-L&A (2)	Tuberculosis and atypical mycobacteria (patient care)	MK-L&A (4)
		Mycotic infection (knowledge)	MK-L&A (2)	Mycotic infection (patient care)	MK-L&A (4)
TS 13	Benign Lung Conditions III	Parasitic Disease (knowledge)	MK-L&A (2)	Parasitic Disease (patient care)	MK-L&A (4)
		hemoptysis	MK-L&A (1,3)		
		Interstitial Lung Disease (Knowledge)	MK-L&A (2)	Interstitial Lung Disease (patient care)	MK-L&A (4)
TS 14	Benign Lung Conditions IV	Emphysema and Bullae (etiology and pathophysiology, indications for bullectomy)	MK-L&A (2)	Emphysema and Bullae (Nett trial part 1 and 2, pulmonary rehab)	MK-L&A (4)
TS 15	Disorders of the pleura I	anatomy and pathophysiology of the pleura	MK-CW/P/M (1,2)	hyperhydrosis	MK-CW/P/M (4)
TS 16	Disorders of the pleura II	Mesothelioma and fibrous tumors	MK-CW/P/M (1)	Mesothelioma and fibrous tumors	MK-CW/P/M (3,4)
TS 17	Disorders of the pleura III	lung abscess and empyema (knowledge)	MK-CW/P/M (1)	lung abscess and empyema (patient care)	MK-CW/P/M (3)
TS 18	Disorders of the pleura IV	pleural effusions (general information and benign)	MK-CW/P/M (1,2)	pleural effusions (malignant)	MK-CW/P/M (1)
TS 19	Disorders of the chest wall I	Anatomy (basic)	MK-CW/P/M (1)	Anatomy (advanced)	MK-CW/P/M (2,3)
		Diagnosis and imaging of the chest wall (basic)	MK-CW/P/M (1,2)	diagnosis and imaging of the chest wall: (advanced)	MK-CW/P/M (2,3,4)
TS 20	Disorders of the chest wall II	Chest wall tumor (knowledge, patient care)	MK-CW/P/M (1)	chest wall resection and reconstruction and outcomes	MK-CW/P/M (2,3,4,5)
				Inflammatory and infectious conditions	MK-CW/P/M (3,4)
TS 21	Disorders of the chest wall III	Thoracic Outlet syndrome	MK-CW/P/M (1,2,3)	Congenital and Pectus Deformity	MK-CW/P/M (4)
TS 22	Disorders of the Diaphragm	Anatomy and pathophysiology		patient management	
		Imaging techniques; physiologic consequences of herniation/paresis		Surgical techniques; required replacement and reconstructive materials	
TS 23	Disorders of the mediastinum I	Mediastinal general knowledge	MK-CW/P/M (1)	mediastinal infections	MK-E (3)
TS 24	Disorders of the mediastinum II	Diagnosis/assessment	MK-CW/P/M (1,2)	Germ cell tumors	MK-CW/P/M (4)
		Lymphoma	MK-CW/P/M (4)		

Topics	Core ABTS Curriculum Topic	Basic Level Content	Relevant Milestone (Level)	Advanced Level Content	Relevant Milestone (Level)
TS 25	Disorders of the mediastinum III	Mediastinal cysts	MK-CW/P/M (4)	misc mediastinal tumor	MK-CW/P/M (4)
				neurogenic tumors	MK-CW/P/M (3)
TS 26	Disorders of the mediastinum IV	Thymic knowledge	MK-CW/P/M (3,4)	Thymic tumors patient management/clinical skills	MK-CW/P/M (3)
TS 27	Endoscopy	Endoscopic anatomy (airway and esophagus)		bronchial and esophageal stents	
		Role of rigid vs flexible	MK - E (2)	nonsurgical ablative techniques (airway and esophagus)	
TS 28	Endoscopy II	Mediastinoscopy, Chamberlain, EBUS, EUS	MK - E (2) MK -L&A (2)	Anesthetic management/ventilation during endoscopy	
TS 29	Disorders of the Airway I	Anatomy of the larynx trachea and bronchus	MK-L&A (1)	Techniques for surgical resection	
		Signs/symptoms and presentation of airway disease	MK-L&A (4)	Bronchoplastic procedures	
TS 30	Disorders of the Airway II	Pathology of tracheal tumors	MK-L&A (3)	Medical and oncologic airway disease treatments	
TS 31	Disorders of the Airway III	Sign and symptoms of anastomotic Complications and tracheoesophageal fistula	MK-L&A (3)	Management of anastomotic complications and treatment of tracheoesophageal fistula	
TS 32	Management of Benign Esophageal Disorders I	Esophageal and gastric anatomy	MK-E (1,2)	Anatomy of small bowel and colon as it relates to reconstruction	MK-E (5)
TS 33	Management of Benign Esophageal Disorders II	Diagnostic tests and tools and their interpretations	MK-E (1,2,3)	Nonsurgical therapies for motility disorders, reflux and achalasia	MK-E (1)
TS 34	Management of Benign Esophageal Disorders III	Pathophysiology of motility disorders, diverticula	MK-E (1,2)	Surgical options for motility disorders, diverticula	MK-E (1)
TS 35	Management of Benign Esophageal Disorders IV	Pathophysiology of reflux, infections strictures, trauma, and TE fistulas	MK-E (3,4)	Surgical options for reflux, infections, strictures, trauma and TEF	MK-E (4)
TS 36	Management of Esophageal Neoplasia I	Anatomy of esophagus and stomach	MK-E (1)	Screening and prevention	
		Anatomy of colon	MK-E (5)	Risk assessment	
TS 37	Management of Esophageal Neoplasia II	Etiology/epidemiology of esophageal cancer		Esophageal resection options; complications of resection	MK-E (1,3)
TS 38	Management of Esophageal Neoplasia III	Diagnosis and staging for esophageal cancer	MK-E (1,2)	Barrett's Esophagus: diagnosis and treatment	MK-E (3)
TS 39	Management of Esophageal Neoplasia IV	Benign Esophageal neoplasms Stage I and II: staging, survival and recurrence patterns	MK-E (3)	Stage I and II: treatment, multimodality, and non-surgical options	MK-E (4)

Topics	Core ABTS Curriculum Topic	Basic Level Content	Relevant Milestone (Level)	Advanced Level Content	Relevant Milestone (Level)
TS 40	Management of Esophageal Neoplasia V	Stage III and IV: staging, survival and recurrence patterns	MK-E (3)	Stage III and IV: treatment, multimodality, and non-surgical options	MK-E (4)
TS 41	Lung transplant I	Patient and donor selection	MK-End Stage CP Dis (1,4)	Donor/implantation surgical procedures	MK-End stage CP Dis (5)
TS 42	Lung transplant II	Basic pharmacology of immunosuppression	MK-End Stage CP Dis (5)	Management of complications: reperfusion injury, rejection, acute/chronic, anastomotic	MK-End stage CP Dis (4,5)
CD 1	Congenital Heart Disease General Management I	Embryology / Anatomy / Physiology	MK-CHD (1,2,3)		
CD 2	Congenital Heart Disease General Management II	Imaging & Diagnosis	MK-CHD (1,2)		
CD 3	Pediatric Circulatory Support & Perioperative Care	Myocardial protection / CPB / Perioperative Care	MK-CHD (2,3)	Circulatory Arrest / Cerebral Protection / ECMO	
CD 4	Left to right shunts	ASD /VSD / PAPVR / PDA	MK-CHD (2, 3)	AVCD / APW	
CD 5	Cyanotic Heart Disease	TOF / Basic Transposition	MK-CHD (2)	Advanced Transposition / TAPVR / DORV / Truncus Arteriosus / Ebsteins Anomaly	
CD 6	Single Ventricle Lesions	Single Ventricle Physiology / Management / Palliative Operations	MK-CHD (4)	Single Left Ventricle / Single Right Ventricle / Complex Single Ventricle	
CD 7	Left ventricular outflow tract obstruction	AS / Subaortic Membrane / Supravalvar AS / COA		IAA / Shones Compex /	
CD 8	Right ventricular outflow tract obstruction	Pulmonic Stenosis / DCRV		PA VSD / PA IVS / Supravalvar PS	
CD 9	Vascular Rings and Slings / Coronary Anomalies	Vascular Ring		Vascular Sling / ALCAPA	
CD 10	Pediatric Heart and Lung Tranplant	Basic Heart and Lung Transplant		Advanced Heart and Lung Tx / Devices	
CD 11	Adult Congenital Heart Disease	Guidelines / Management / Common Diseases	MK-CHD (1, 2, 3)	AAOCA / Sinus Valsalva Aneutsym / LV Aortic Tunnel	
CD 12	Congenital Thoracic Disease	Congenital Thoracic Disease	MK-E (4)		
CC 1	Critical Care	Ventilator management		Nutrition	
CC 2	Critical Care	Periop Coagulation management		Anticoagulation	
CC 3	Critical Care	Vasoactiver drug management		Sepsis	

TSC Linked to TS Milestones

Medical Knowledge: Ischemic Heart Disease				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic anatomy and pathology (identifies coronary anatomy on angiogram) ***CV 1-B, CV 2-A*** • Knows basic cellular and vascular physiology ***CV 1-B*** • Lists clinical manifestations of ischemic heart disease (e.g., angina, myocardial infarction) ***CV 7-B*** • Lists diagnostic tools available for evaluation of ischemic heart disease ***CV 3-B*** • Lists treatment options for ischemic heart disease (e.g., CABG, PCI) ***CV 3-B; CV 8-B*** • Knows basic complications for ischemic heart disease ***CV 4-B***	• Understands common variations in anatomy and pathology (e.g., left dominant system) ***CV 1-B, CV 2-A*** • Understands physiologic changes accompanying ischemic heart disease (e.g., ischemia, ischemia reperfusion injury, infarction, recovering myocardium) ***CV 1-B, CV 6-B*** • Generates differential diagnosis of disease with similar manifestations (e.g., esophageal and aortic problems, pleurisy ***CV 3-B*** • Understands advantages and disadvantages of diagnostic tools in evaluating ischemic heart disease (e.g., EKG vs. echocardiogram vs. angiogram ***CV 3-B, CV 7-B*** • Understands advantages	• Understands complex integrations between anatomy and pathology (e.g., anomalous coronary artery) ***CV 1-A, CV 2-A*** • Understands the role of treatment on physiology of ischemic heart disease ***CV 1-A*** • Identifies the common variants of the clinical manifestations of ischemic heart disease (e.g., unstable angina, acute myocardial infarction, silent ischemia) ***CV 10-B*** • Interprets normal and common abnormalities associated with ischemic heart disease (e.g., reads coronary angiogram, complex EKG) ***CV 7-B*** • Identifies appropriate treatment for routine patient with ischemic heart disease ***CV 8-B***	• Understands complex variations in anatomy and pathology, including congenital (e.g., able to identify coronary anatomy in reoperative surgery) ***CV 1-A, CV 2-A*** • Adapts therapeutic management based on understanding of physiology of complications of ischemic heart disease (e.g., post infarct VSD, ischemic mitral regurgitation) ***CV 1-A*** • Distinguishes the complex clinical manifestations and complications of ischemic heart disease ***CV 10-A*** • Interprets and integrates complex abnormalities associated with ischemic heart disease ***CV 10-A*** • Identifies appropriate treatment for complex	• Understands implications of SYNTAX score • Presents on outcomes of ischemic heart disease at local, regional or national meeting ***Codes:*** Green – Linked to JC/TSDA National Curriculum ***e.g. CV 1-B = Topic CV1, (B=Basic, A=Advanced)***

	and disadvantages of various treatment options for ischemic heart disease ***CV 3-B*** • Understands risks, benefits and complications of treatment modalities ***CV3-B, CV 4-B***	• Familiar with ACC/STS/AATS guidelines ***CV 7-A*** • Knows basic outcome literature for ischemic heart disease (e.g., SYNTAX Trial) ***CV 7-A***	patient with ischemic heart disease (e.g., hybrid CABG) ***CV 8-B*** • Knows outcomes for all treatment modalities and complications, including databases and clinical trials (e.g., STS Database) ***CV 7-A***	
☐	☐	☐	☐	☐ ☐ ☐ ☐ ☐
Comments:				

Patient Care and Technical SKILLS: Ischemic Heart Disease				
Level 1	Level 2	Level 3	Level 4	Level 5
• Orders basic diagnostic and preoperative assessment tests for ischemic heart disease (e.g., cardiac cath, stress test) ***CV 7-B*** • Lists basic treatment options for routine ischemic heart disease (e.g, medical management, PCI vs. CABG) ***CV 8-B*** • Demonstrates basic surgical skills (simulation vs. OR)	• Interprets and prioritizes diagnostic and physiologic assessment tests for routine patient with ischemic heart disease ***CV 7-B*** • Recognizes routine post-operative complications (e.g., CVA, shock, tamponade, interprets abnormal EKG) ***CV 4-B*** • Suggests treatment plan for patient with routine ischemic heart disease ***CV 8-B*** • Assesses and harvests conduits (e.g., vein mapping) ***CV 9-B*** • Performs surgical opening and closing • Provides basic intraoperative assisting • Performs proximal coronary anastomosis	• Establishes a diagnostic and assessment plan for patients with routine ischemic heart disease (e.g., role of functional testing in ischemic heart disease) ***CV 7-B*** • Manages routine post-operative complications (e.g., return to the OR vs. return to cath lab) ***CV 4-B*** • Selects ideal treatment option for patient with routine ischemic heart disease.(e.g., institutes treatment per ACC/STS/AATS guidelines) ***CV 7-A*** • Institutes and weans patient from cardiopulmonary bypass ***CV 5-A*** • Performs routine CABG	• Establishes a diagnostic and assessment plan for complex patients with ischemic heart disease ***CV 7-A*** • Manages complex post-operative complications(e.g., need for ventricular assist) ***CV 10-A*** • Selects ideal treatment option for patient with complex ischemic heart disease (e.g., combined coronary and carotid disease) ***CV 8-A*** • Manages complex coronary disease (e.g., redo CABG, VSD, ischemic MR, off pump) ***CV 9-A***	• Independently performs reoperative coronary bypass grafting • Independently performs coronary enterectomy
☐	☐	☐	☐	☐	☐	☐	☐	☐
Comments:				

TSC Linked to TS Milestones

Return to Table of Contents

Medical Knowledge: Cardiopulmonary Bypass, Myocardial Protection and Temporary Circulatory Support				
Level 1	Level 2	Level 3	Level 4	Level 5
• Lists basic components of cardiopulmonary bypass apparatus (e.g., oxygenator, pump heads, heat exchanger, low level alarm, in line monitoring) • Understands pulsatile vs. non-pulsatile pump physiology ***CV 5-B*** • Understands basic myocardial protection. (e.g., O2 requirement, O2 delivery, myocardial relaxation) ***CV 6-B*** • Understands coagulation cascade (e.g., intrinsic and extrinsic pathways) • Lists complications of cardiopulmonary bypass (e.g., bleeding, renal failure, pulmonary dysfunction)	• Discusses options for myocardial protection (e.g., cardioplegia vs. beating heart) ***CV 6-B*** • Discusses cannulation techniques and options for cardiopulmonary bypass (e.g., single venous, bicaval, aortic, peripheral arteries, cold, full or partial) • Understands intra-aortic balloon pump physiology (e.g., diastolic augmentation and presystolic dip) ***CV 6-A*** • Understands coagulation cascade inhibitors (e.g., heparin, argatroban) • Understands complications of cardiopulmonary bypass ***CV 5-A*** • Lists treatment strategies for cardiac injury without cardiac bypass, including trauma	• Demonstrates knowledge of cardioplegia solutions and delivery modes (e.g., crystalloid, blood, antegrade, retrograde) ***CV 6-B, CV 6-A*** • Demonstrates knowledge of acid-base and anticoagulation management on cardiopulmonary bypass (e.g., pH stat, alpha stat, ACT) ***CV 5-A*** • Demonstrates knowledge of pharmacologic management of postcardiotomy hemodynamics (e.g., inotropes, vasodilators) ***CV 5-A*** • Discusses advantages and disadvantages of different myocardial protection strategies ***CV 6-A*** • Lists management strategies of routine	• Explains advanced cardiopulmonary support (e.g., circulatory arrest or ECMO) • Explains the management of postcardiotomy shock syndrome (e.g., inotropes, IABP, mechanical support) ***CV 6-A*** • Explains management strategies of complex complications related to cardiopulmonary bypass (e.g., aortic dissection, air embolism) ***CV 5-A*** • Explains treatment strategies for postoperative sequelae from cardiopulmonary bypass (e.g., low cardiac output syndrome, coagulopathies, arrhythmias, HIT) ***CV 5-A***	• Develops simulation scenarios for complications related to cardiopulmonary bypass

TSC Linked to TS Milestones

Return to Table of Contents

		complications related to cardiopulmonary bypass (e.g., air in the heart, inadequate drainage, incomplete arrest) ***CV 5-A*** • Demonstrates knowledge of postoperative sequelae from cardiopulmonary bypass (e.g., low cardiac output syndrome, coagulopathies, arrhythmias, HIT) ***CV 5-A***		
☐	☐	☐	☐	☐	☐	☐	☐	☐
Comments:				

Patient Care and technical Skills: Cardiopulmonary Bypass, Myocardial Protection and Temporary Circulatory Support				
Level 1	Level 2	Level 3	Level 4	Level 5
• Demonstrates basic surgical skills (simulation vs. OR)	• Performs axillary, femoral, arterial or venous cannulation • Performs peripheral vascular access • Performs surgical opening and closing • Assists perfusionist with cardiopulmonary bypass setup and pump run	• Cannulates and institutes cardiopulmonary bypass including myocardial protection in routine cases • Manages cardiopulmonary bypass and myocardial protection in routine cases ***CV 5-A*** • Weans and decannulates from cardiopulmonary bypass for routine cases • Recognizes and manage common acute complications (e.g., coagulopathy, pump failure) ***CV 5-A***	• Cannulates and institutes cardiopulmonary bypass including myocardial protection in complex cases • Manages cardiopulmonary bypass and myocardial protection in complex cases • Weans and decannulates from cardiopulmonary bypass for complex cases • Institutes temporary circulatory support for cardiogenic shock (e.g., intraaortic balloon pump, ECMO, short term LV assist) ***CV 6-A*** • Recognizes and manages unusual acute complications (e.g., aortic dissection) ***CV 5-A***	• Operates in a hostile chest (e.g., radiation, porcelain aorta, use of epiaortic probe, patent grafts) • Performs left ventricular assist device procedures or transplant
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐				
Comments:				

TSC Linked to TS Milestones

Return to Table of Contents

Medical Knowledge: Valvular Disease				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic anatomy and pathology of valvular heart disease ***CV 1-B, CV 11-B*** • Knows basic normal valve physiology ***CV 1-B; CV 11-B*** • Lists clinical manifestations of isolated valvular heart disease (e.g., dyspnea, angina, edema, syncope) ***CV 11-B*** • Lists diagnostic tools available for evaluation of valvular heart disease ***CV 11-B*** • Lists treatment options for valvular heart disease ***CV 11-A*** • Knows basic complications for valvular heart disease (e.g., peri-operative complications for aortic valve replacement)	• Knows common variations in anatomy and pathology of valvular heart disease (e.g., Mitral Prolapse, Type 1,2 and 3) ***CV 1-B, CV 11-B*** • Explains physiologic changes accompanying valvular heart disease (e.g., pulmonary hypertension) ***CV 11-B*** • Generates differential diagnosis of diseases with similar manifestations (e.g., coronary artery disease, emphysema) • Explains advantages and disadvantages of diagnostic tools in evaluating valvular heart disease (e.g., surface vs. transesophageal echo) ***CV 11-B*** • Recites advantages and disadvantages of various treatment options for valvular heart disease	• Explains complex integrations between anatomy and pathology of valvular heart disease(e.g., bicuspid aortic valve and stenosis, functional mitral and tricuspid regurgitation ***CV 1-A, CV 11-B*** • Explains the role of treatment on physiology of valvular heart disease, including arrhythmia management,(e.g., the mechanism of surgical atrial fibrillation treatment ***CV 1-A*** • Identifies the common variants of the clinical manifestations of valvular heart disease(e.g., fatigue, exercise intolerance • Interprets normal and common abnormalities associated with valvular heart disease, including intraoperative transesophageal	• Explains complex variations in anatomy and pathology, including congenital (e.g., contribution of coronary disease to mitral regurgitation, bicuspid aortic valve and ascending aneurysm) ***CV 1-A*** • Adapts therapeutic management based on understanding of physiology (e.g., explains when to correct mitral or tricuspid regurgitation in setting of aortic stenosis or coronary artery disease) ***CV 1-A*** • Distinguishes the complex clinical manifestations and complications of valvular heart disease (e.g., staging of congestive heart failure) • Interprets and integrates complex abnormalities associated with valvular	• Presents on outcomes valvular heart disease at local, regional or national meeting

TSC Linked to TS Milestones

Return to Table of Contents

	(e.g., repair vs. replacement) ***CV 11-A, CV 11-A*** • Recites risks, benefits and complications of treatment modalities (e.g., cites frequency of common complications) ***CV3B***	echocardiography • Identifies appropriate treatment for routine patient with valvular heart disease ***CV 11-A*** • Familiar with ACC/STS/AATS guidelines ***CV 11-A*** • Explains basic outcome literature for valvular heart disease(e.g., durability of mitral valve repair) ***CV 11-B, CV 11-A***	heart disease (e.g., hypertrophic obstructive cardiomyopathy) • Identifies appropriate treatment for complex patient with valvular heart disease (e.g., combined coronary, aneurysm or root enlargement) • Explains outcomes for all treatment modalities and complications, including databases and clinical trials (e.g., outcome after minimally invasive valves, success of sinus restoration in surgery for atrial fibrillation) ***CV 11-A***	
☐	☐	☐	☐	☐ ☐ ☐ ☐ ☐

Comments:

Patient Care and Technical Skills: Valvular Disease				
Level 1	Level 2	Level 3	Level 4	Level 5
• Orders basic diagnostic and preoperative assessment tests for valvular heart disease ***CV 11-B*** • Lists basic treatment options for routine valvular heart disease ***CV 11-A*** • Demonstrates basic surgical skills (simulation vs. OR)	• Interprets and prioritizes diagnostic and physiologic assessment tests for routine patient with valvular heart disease (e.g., echocardiogram, cardiac cath) ***CV 11-B*** • Suggests treatment plan for patient with routine single valvular heart disease (e.g., single valve replacement in a symptomatic patient with aortic stenosis) ***CV 11-A*** • Recognizes routine post-operative complications (e.g., identifies surgically significant bleeding) • Identifies surgical approach for each valve • Performs surgical opening and closing • Performs basic intraoperative assisting	• Provides a diagnostic and assessment plan for patients with routine valvular heart disease (e.g., intra-operative transesophageal echocardiogram) ***CV 11-B*** • Selects ideal treatment option for patient with acquired valvular heart disease (e.g., double valve replacement) ***CV 11-A*** • Manages routine post-operative complications (e.g., decides to return to operating room, management of heart block) • Institutes and weans patient from cardiopulmonary bypass • Performs optimal myocardial protection strategy • Performs routine valvular replacement	• Forms a diagnostic and assessment plan for complex patients with valvular heart disease (e.g., intra-operative mitral regurgitation on a patient scheduled for isolated coronary artery bypass) ***CV 11-A*** • Selects ideal treatment option for patient with complex valvular heart disease (e.g., valvular repair, congenital valve repair) ***CV 11-A*** • Manages complex post-operative complications, including arrhythmias (e.g., management of paravalvular leak or SAM) • Performs complex valvular replacement • Performs valvular repair	• Selects ideal plan for a patient with prior transcatheter valve, minimally invasive valve ***CV 17-B&A*** • Performs minimally invasive, percutaneous, or robotic approaches to valvular heart disease • Performs atrial and ventricular arrhythmia surgery • Performs reconstruction of fibrous trigone in patient with endocarditis of mitral and aortic valves

☐	☐	☐	☐	☐	☐	☐	☐	☐	
Comments:									

Medical Knowledge: Great Vessel Disease				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic anatomy and pathology of great vessels (e.g., aortic dissection classification, including spinal cord and cerebral perfusion) ***CV18*** • Lists clinical manifestations of great vessel disease, acquired and traumatic (e.g., chest pain syndromes, Marfan's syndrome) ***CV18*** • Lists diagnostic tools available for evaluation of great vessel disease ***CV18*** • Lists treatment options for great vessel disease ***CV19*** • Knows basic complications for great vessel disease (e.g., natural history treated and untreated) ***CV18***	• Understands common variations in anatomy and pathology of adult great vessel disease, acquired and traumatic (e.g., descending aortic tear from blunt trauma) ***CV18*** • Generates differential diagnosis of diseases with similar manifestations (e.g., myocardial infarction, esophageal spasm) ***CV18*** • Understands advantages and disadvantages of diagnostic tools in evaluating great vessel disease (e.g., CT scan vs. MRI vs. echocardiography vs. angiography) ***CV18*** • Understands advantages and disadvantages of various treatment options for great vessel disease (endovascular vs. open) ***CV19***	• Understands integrations between anatomy and pathology of great vessel disease, acquired, congenital and traumatic (e.g., atherosclerosis, penetrating ulcer, aortic dissection) ***CV19*** • Identifies the common variants of the clinical manifestations of great vessel disease, acquired, congenital and traumatic (e.g., bowel ischemia, renal insufficiency) ***CV18*** • Interprets normal and common abnormalities associated with great vessel disease (e.g., sensitivity, specificity, accuracy of aortic imaging techniques) ***CV18*** • Identifies appropriate and/or adjunct treatment for routine patient with great vessel	• Understands complex variations in anatomy and pathology of great vessel disease, acquired, congenital and traumatic (e.g., congenital arch anomalies leading to tracheal or esophageal compression) ***CV20*** • Distinguishes the complex clinical manifestations and complications of great vessel disease, acquired, congenital and traumatic (e.g., myocardial infarction vs. acute aortic dissection) ***CV19,20*** • Interprets and integrates complex abnormalities associated with great vessel disease (e.g., aneurysm, dissection, pseudo-aneurysm, penetrating ulcer) ***CV20*** • Identifies appropriate treatment for complex	• Surgically manages acute and chronic pulmonary thromboembolic disease ***CV21***

TSC Linked to TS Milestones

Return to Table of Contents

	• Understands risks, benefits and complications of treatment modalities ***CV19***	disease (neuroprotection, spinal cord protection, renal) ***CV19*** • Knows basic outcome literature for great vessel disease	patient with great vessel disease (e.g., CPB bypass techniques) ***CV19*** • Knows outcomes for all treatment modalities and complications, including databases and clinical trials	
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐				
Comments: **Does not differentiate between acute and chronic as the TS Curriculum does**				

Patient Care and Technical Skills: Great Vessel Disease				
Level 1	Level 2	Level 3	Level 4	Level 5
• Orders basic diagnostic and preoperative assessment tests for great vessel disease (e.g., CT, echo, need for cath) ***CV19*** • Lists basic treatment options for routine great vessel disease (e.g., Type A vs. Type B dissections; timing of intervention) ***CV19*** • Demonstrates basic surgical skills (simulation vs. OR) • Obtains ATLS certification	• Interprets and prioritizes diagnostic assessment tests for routine patient with great vessel disease (e.g., risk / benefit options) ***CV19*** • Suggests treatment plan for patient with routine great vessel disease (e.g., endovascular vs. open repair) ***CV20*** • Recognizes routine post-operative complications • Identifies surgical approach • Performs surgical opening, closing and vascular access • Provides basic intraoperative assisting	• Establishes a diagnostic and assessment plan for patients with routine great vessel disease (e.g., blunt aortic injury) ***CV19*** • Selects ideal treatment option for patient with routine great vessel disease, including perioperative monitoring, perfusion and neuroprotective strategies ***CV19*** • Manages routine post-operative complications • Institutes and weans patient from cardiopulmonary bypass • Provides optimal perfusion and myocardial/ neuroprotection • Performs routine aortic valvular replacement • Performs simple	• Establishes a diagnostic and assessment plan for complex patients with great vessel disease (e.g., great vessel interventions in the elderly or patients with collagen vascular disease) ***CV20*** • Selects ideal treatment option for patient with complex great vessel disease, including perioperative monitoring, perfusion and neuroprotective strategies (e.g., thoracoabdominal disease, chronic aortic dissections) ***CV20*** • Manages complex post-operative complications (e.g., multisystem organ failure) • Performs complex great vessel replacement • Performs aortic repair	• Performs endovascular aortic surgery ***CV20*** • Performs pulmonary thromboendarterectomy ***CV21*** • Performs hybrid approaches to complex aortic disease (e.g., debranching followed by endovascular procedure)

TSC Linked to TS Milestones

Return to Table of Contents

		vascular anastamosis	• Participates in endovascular aortic surgery ***CV20***	
☐	☐	☐	☐	☐ ☐ ☐ ☐ ☐
Comments:				

Medical Knowledge: Congenital Heart Disease				
Level 1	Level 2	Level 3	Level 4	Level 5
• Lists clinical manifestations of common congenital heart diseases (e.g., cyanosis, tachypnea, mottling, failure to thrive) ***CD1, 11-B*** • Lists diagnostic tools available for evaluating congenital heart disease (e.g., EKG, chest x-ray, echocardiogram, cardiac cath) ***CD2, 11-B***	• Lists basic congenital cardiac abnormalities (e.g., ASD, VSD, tetralogy of Fallot, transposition of great arteries) ***CD4,5-B*** • Lists physiologic changes accompanying congenital heart disease (e.g., right to left and left to right shunt, excessive or insufficient pulmonary blood flow) ***CD1-B*** • Discusses possible diagnostic modalities for various conditions ***CD2-B*** • Lists basic treatment options for congenital heart disease (e.g., diuretics, digoxin, palliative vs. definitive operations) ***CD3, 11-B***	• Knows basic anatomy and pathology of congenital heart disease ***CD1-B*** • Understands physiologic changes accompanying congenital heart disease (e.g., Eisenmenger syndrome) ***CD1-B*** • Generates a differential diagnosis of diseases with similar manifestations (e.g., tachypnea due to increased pulmonary blood flow caused by ASD or VSD) ***CD1, 2, 11-B*** • Understands the advantages and disadvantages of diagnostic tools in evaluating congenital heart disease ***CD2,11-B*** • Understands advantages and disadvantages of various treatment options in congenital heart disease (e.g., PA band vs. primary closure VSD) ***CD1,4-B***	• Understands common variations in anatomy and pathology (e.g., partial and complete AV septal defect, types of VSD) ***CD1-A???*** • Understands the basics of the single ventricle pathway (e.g., Truncus, Norwood, TGA) ***CD6-B*** • Understands the role of treatment on physiology of congenital heart disease (e.g., role of pulmonary artery banding, acid-base balance benefits of pH stat or alpha stat) • Understands the role of physiology of congenital heart disease on treatment modality options (e.g., PFO, increased pulmonary vascular resistance in newborns) • Identifies clinical manifestations of elective vs. emergent vs. urgent scenarios.	• Understands complex integrations between anatomy and pathology (e.g., RV dependent coronary sinusoids)

TSC Linked to TS Milestones

Return to Table of Contents

		• Knows basic complications of congenital heart disease (e.g., residual VSD, heart block) ***CD3-B***	• Recognizes simple vs. complex disease • Interprets normal and common abnormalities associated with congenital heart disease, including echocardiography (e.g., identifies valve stenosis and regurgitation) • Identifies appropriate treatment for common patient with congenital heart disease (e.g., selection of palliative vs. definitive, identifies for urgent vs. elective procedures) • Understands strategies for complex reoperative surgery • Understands risks, benefits and complications of various treatment modalities	
☐	☐	☐	☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Comments:
Does not differentiate between congenital and adult, need help from someone to verify these links

Medical Knowledge: End Stage Cardiopulmonary Disease				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic cardiothoracic normal anatomy ***CV 1-B*** • Knows basic normal respiratory and cardiovascular physiology ***CV 1-B*** • Lists clinical manifestations of cardiac and pulmonary failure (e.g., dyspnea, fatigue, exercise intolerance, peripheral edema, pulmonary edema) ***CV27-B*** • Lists diagnostic tools available for evaluation of cardiac and pulmonary failure (e.g., ABG, CXR, PA line, echo) ***CV27-B*** • Understands the natural history of cardiac and pulmonary failure (e.g., end-stage emphysema) ***CV 28-A, TS41-B***	• Knows basic pathology as it relates to cardiac and pulmonary failure (e.g., lung-pneumonia, ARDS, pathology of end-stage lung disease; heart-myocardial infarction, types of cardiomyopathy) ***CV27-B*** • Understands physiologic changes accompanying cardiac and pulmonary failure (e.g., increased work of breathing hypoxemia, hypercarbia, elevated lactate, tachycardia, hypotension, reduced CO) ***CV27-B*** • Generates differential diagnosis of causes of heart and pulmonary failure (e.g., heart-cardiomyopathy, coronary artery disease; pulmonary - interstitial lung disease, trauma) ***CV27-B*** • Understands advantages and disadvantages of diagnostic tools in	• Understands common variations in anatomy and pathology (e.g., advanced valvular disease, pulmonary fibrosis, sarcoidosis) ***CV 1-A*** • Understands the role of treatment on physiology of cardiac and pulmonary failure (e.g., cardiac - medical management vs. IABP vs. mechanical support; pulmonary-medical treatment vs. need for mechanical ventilation) • Identifies the common variants of the clinical manifestations of cardiac and pulmonary failure (e.g., cardiac-ischemic, post viral, postpartum, idiopathic; pulmonary - acute lung injury/ARDS, infectious) • Interprets normal and common abnormalities associated with cardiac and pulmonary failure (e.g., cardiac -	• Understands complex integrations between anatomy and pathology (e.g., adult with congenital heart disease) ***CV 1-A*** • Adapts therapeutic management based on understanding of physiology of cardiac and pulmonary failure (cardiac - need for mechanical support such as VAD; pulmonary - need for advanced mechanical ventilation) ***CV28-B*** • Distinguishes the complex clinical manifestations and complications of cardiac and pulmonary failure (e.g., adult congenital disease manifestations, mechanical complications of myocardial infarction) • Interprets and integrates complex abnormalities associated with cardiac and pulmonary failure	• Understands complex variations in anatomy and pathology as related to cardiac and pulmonary failure (e.g., Eisenmenger's complex) ***CV 1-A*** • Understands the immunologic mechanisms in cardiac and pulmonary transplantation ***CV30-B, TS42-B*** • Understands nonpulsatile ventricular assist physiology ***CV29-B*** • Understands clinical manifestations of allograft rejection (e.g., hyperacute, acute and chronic rejection) ***CV30-A, TS42-A*** • Understands clinical manifestations of complications of mechanical cardiopulmonary support (e.g., bleeding, line infection, sepsis, stroke, tamponade)

TSC Linked to TS Milestones

Return to Table of Contents

	evaluating cardiac and pulmonary failure (e.g., cardiac - PA catheter measurements, echo vs. cath, MRI pulmonary-transbronchial biopsy vs. open biopsy, advanced pulmonary stress test) ***CV27-B*** • Lists treatment options for cardiac and pulmonary failure (e.g., medical vs. surgical management) • Understands signs of decompensation and need for intervention for cardiac and pulmonary failure	distinguishes various types of shock; pulmonary - surgical biopsy; acute vs. chronic cardiopulmonary failure) • Understands advantages and disadvantages of various treatment options for cardiac and pulmonary failure • Understands risks, benefits and complications of treatment modalities (e.g., risk benefit ratio)	(e.g., distinguishes RV vs. LV vs. biventricular failure) • Identifies appropriate treatment for patients with cardiac and pulmonary failure and indications for transplantation or mechanical cardiopulmonary support (e.g., selection criteria for transplantation) ***CV30-B, TS41-B*** • Knows basic outcome literature for cardiac and pulmonary failure ***CV28-B, TS42-A*** • Understands limitations of mechanical support (e.g., recognizes when risks exceed benefits) ***CV29-A***	• Diagnoses complications of transplant and mechanical cardiopulmonary support (e.g., heart failure due to pulmonary hypertension, acute and chronic rejection, assist device failure, endomyocardial biopsy) ***CV30-A, TS42-A*** • Identifies appropriate treatment for complex patient with cardiac and pulmonary failure ***CV30-A, TS41-A*** • Understands how to treat acute and chronic transplant rejection (e.g., need for single vs. bi-VAD assist, cardiac vs. cardiopulmonary support, ECMO) ***CV30-A, TS41A*** • Knows outcomes for all treatment modalities and complications, including databases and clinical trials ***CV28-A***
☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments:
Nothing really covers lung failure except transplant

Medical Knowledge: Esophagus				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic anatomy and pathology (e.g., identifies gastrointestinal anatomy innervation and blood supply, endoscopic landmarks) ***TS32-B, TS36-B*** • Knows basic foregut physiology (e.g., basic esophageal motility) ***TS34-B*** • Lists clinical manifestations of benign and malignant disorders (e.g., heart burn, chest pain, dysphagia, odynophagia ***TS33-B*** , ***TS38-B*** • Lists diagnostic and/or staging tools available for the evaluation of benign and malignant disorders (e.g., manometry, pH testing, EUS) ***TS33-B*** • Lists treatment options for benign and malignant disorders	• Understands common variations in anatomy and pathology (e.g., lymphatic drainage) ***TS32-B*** • Understands physiologic changes accompanying malignancy and motility disorders (e.g., achalasia, reflux, esophageal spasm) ***TS34-B*** • Generates differential diagnosis of disease with similar manifestations (e.g., achalasia vs. pseudoachalasia; coronary syndrome vs. esophageal spasm) ***TS33-B*** , ***TS38-B*** • Understands advantages and disadvantages of diagnostic tools in evaluating benign and malignant disorders (e.g., endoscopy vs. EUS vs. barium swallow) ***TS27-B, TS28-B, TS33-B*** ,	• Understands complex integrations between anatomy and pathology (e.g., fascial planes in descending mediastinitis) ***TS23-A*** • Understands the role of treatment on physiology of malignancy and motility disorders (e.g., post-op esophagectomy complications - dumping syndrome) ***TS37-A*** • Identifies the common variants of the clinical manifestations of benign and malignant disorders(e.g., benign vs. malignant stricture) ***TS35-B*** • Interprets normal and common abnormalities associated with benign and malignant disorders (e.g., interprets EUS, common motility tracings) ***TS33-B*** • Identifies appropriate treatment for routine	• Understands complex variations in anatomy and pathology, including congenital (e.g., esophageal atresia) **CD 12-B** • Adapts therapeutic management based on understanding of physiology for various disease states (e.g., partial vs. total fundoplication) ***TS35-A*** • Distinguishes the complex clinical manifestations and complications of benign and malignant disorders (e.g., Type IV hernias, TEF) ***TS35-B*** • Interprets and integrates complex abnormalities associated with benign and malignant disorders (e.g., short esophagus, achalasia with sigmoid esophagus) ***TS35-A*** • Identifies appropriate	• Understands imaging for colon interposition ***TS36-B*** • Understands need for colon interposition ***TS32-A*** • Presents on outcomes of benign or malignant disorders at local, regional or national meeting

(e.g., surgery vs. chemo/RT vs. chemo/RT alone for malignancy) ***TS33-A, TS34-A, TS37A .*** • Knows basic complications for benign and malignant disorders (e.g., perforation, recurrent reflux, pulmonary aspiration) ***TS4-A***	• Understands advantages and disadvantages of various treatment options for benign and malignant disorders, including the impact of staging (e.g., pluses and minus of treatment options for esophageal cancer - dilation vs. myotomy for achalasia ***TS33-B*** • Understands risks, benefits and complications of treatment modalities (e.g., slipped Nissen, anastomotic leak) ***TS4-B***	patient with benign and malignant disorders (e.g., treatment options for high grade dysplasia - EMR vs. esophagectomy) ***TS38-A*** • Knows basic outcome literature for benign and malignant disorders ***TS39-B, TS 40-B***	treatment for complex patient with benign and malignant disorders,(e.g., primary vs. redo Nissen, redo myotomy vs. esophagectomy) ***TS35-A*** • Knows outcomes for all treatment modalities and complications, including databases and clinical trials ***TS39-A, TS40-A***	
☐	☐	☐	☐	☐	☐	☐	☐	☐
Comments:				

Patient Care and Technical Skills: Esophagus				
Level 1	Level 2	Level 3	Level 4	Level 5
• Performs preoperative assessment • Orders basic diagnostic/assessment tests for routine benign and malignant esophageal disease (e.g., EUS, CT/PET, pH testing, manometry) • Demonstrates basic surgical skills (simulation vs. OR)	• Interprets hemodynamics and suggests appropriate diagnostic imaging • Recognizes routine post-operative complications • Prioritizes diagnostic/assessment tests for routine benign and malignant esophageal disease (e.g., Barium swallow vs. EUS vs. endoscopy) • Lists basic treatment options for routine benign and malignant esophageal disease (e.g., Nissen fundoplication, esophageal resection, Toupet) • Recognizes common post-operative complications (e.g., leak, slipped Nissen, cardiac arrhythmia) • Demonstrates basic endoscopic skills • Demonstrates basic	• Develops a treatment plan for routine patient with benign and malignant disorders • Manages routine post-operative complications • Interprets diagnostic/assessment tests for routine benign and malignant esophageal disease (e.g., basic manometry tracings, EUS and PET/CT scan results • Selects ideal treatment option after assessment of diagnostic test results for routine benign and malignant esophageal disease. • Manages common post-operative complications (e.g., surgical vs. medical management, reintubation) • Demonstrates advanced endoscopic skills (EMR, EUS, stenting)	• Develops a treatment plan for complex patient with benign and malignant disorders • Manages complex post-operative complications • Able to establish a diagnostic and assessment plan for complex patients with benign and malignant esophageal disease (e.g., short esophagus, sigmoid esophagus) • Selects ideal treatment option for complex benign and malignant esophageal disease (e.g., consideration of comorbidities, chemo/RT/surgery vs. surgery vs. chemo/RT, does patient have short esophagus) • Manages complex post-operative complications (e.g., fistula, gastric necrosis) • Performs routine	• Performs complex esophageal resections (e.g., colon interposition) • Performs redo motility operations • Performs minimally invasive esophagectomy

	minimally invasive skills (FLS) • Provides basic intraoperative assistance • Performs basic hand sewn and stapled anastomosis	• Performs routine open and minimally invasive motility operations	esophageal resections • Operatively manages esophageal perforation/trauma	
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐				
Comments:				

Medical Knowledge: Lung and Airway				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic anatomy and pathology (e.g., segmental anatomy, types of lung cancer) ***TS1-B, TS5-B, TS29B*** • Knows basic pulmonary physiology (e.g., A-a gradient, pulmonary function tests, ventilation perfusion scan, diffusion, respiratory mechanics, V/Q mismatch) ***TS2-B*** • Lists clinical manifestations of benign, malignant and traumatic disorders (e.g., clinical diagnosis of COPD, signs and symptoms of advanced metastatic lung neoplasms, of immediate life-threatening traumatic injuries, gas exchange) ***CV32-B, TS3-B, TS13-B*** • Lists diagnostic and/or staging tools available for the evaluation of benign, malignant and traumatic disorders	• Understands common variations in anatomy and pathology (e.g., azygous lobe, mixed lung cancer histologies) ***TS1-B*** • Understands physiologic changes accompanying benign, malignant, and traumatic disorders (e.g., pulmonary shunt, tension pneumothorax causing decreased venous return, secondary pulmonary hypertension with COPD, pulmonary vascular resistance) ***TS2-B, CV32-B*** • Generates differential diagnosis of disease with similar manifestations (e.g., lung nodules, airway tumors, hemoptysis workup) ***TS5-B, TS11-B, TS12-B, TS13-B, TS14-B*** • Understands advantages and disadvantages of diagnostic tools in evaluating benign,	• Understands common variations in anatomy and pathology (e.g., azygous lobe, mixed lung cancer histologies) ***TS1-B*** • Understands physiologic changes accompanying benign, malignant, and traumatic disorders (e.g., pulmonary shunt, tension pneumothorax causing decreased venous return, secondary pulmonary hypertension with COPD, pulmonary vascular resistance) ***TS2-B, CV32-B*** • Generates differential diagnosis of disease with similar manifestations (e.g., lung nodules, airway tumors, hemoptysis workup) ***TS5-B, TS13-A, TS29-B*** • Understands advantages and disadvantages of diagnostic tools in evaluating benign, malignant and traumatic	• Understands the role of treatment on physiology of benign and malignant disorders (e.g., pneumonectomy increases pulmonary pressure and RV strain) ***TS3-A*** • Identifies the common variants of the clinical manifestations of benign, malignant and traumatic disorders (e.g., various bronchial adenomas, traumatic tracheobronchial injuries) ***TS5-B, TS29-B CV33-B, TS11-A, TS12-A, TS13-A, TS14-A*** • Interprets normal and common abnormalities associated with benign, malignant and traumatic disorders (e.g., PET abnormalities, interpret EBUS findings, interpret PFT results, acid-base) ***TS2-A*** • Identifies appropriate treatment for routine patient with benign,	• Presents on outcomes of benign or malignant disorders at local, regional or national meeting (e.g., using STS or institutional database for outcomes research)

(e.g., CXR, CT, PET, EBUS, PFTs, mediastinoscopy, flexible/rigid bronchoscopy) ***CV31-B, TS6-B. TS7-B, TS8-B, TS9-B*** • Lists treatment options for benign, malignant and traumatic disorders (e.g., lobectomy, operative intervention for hemothorax)) ***CV31-B, TS1-A*** • Know basic outcomes for benign and malignant disorders (e.g., morbidity and mortality for lobectomy) ***TS3-A***	malignant and traumatic disorders (e.g., CXR vs. CT, EBUS vs. mediastinoscopy, CT vs. angiogram) ***TS28-B*** • Understands advantages and disadvantages of various treatment options for benign, malignant and traumatic disorders, including the impact of staging (e.g., use of induction therapy, airway stents) ***CV32-B*** • Understand risks, benefits and complications of treatment modalities (e.g., morbidity and mortality for VATS and open lobectomy) ***TS3-A***	disorders (e.g., CXR vs. CT, EBUS vs. mediastinoscopy, CT vs. angiogram) ***TS28-B*** • Understands advantages and disadvantages of various treatment options for benign, malignant and traumatic disorders, including the impact of staging (e.g., use of induction therapy, airway stents) ***CV32-B*** • Understand risks, benefits and complications of treatment modalities (e.g., morbidity and mortality for VATS and open lobectomy) ***TS3-A, TS31-A***	malignant and traumatic disorders (e.g., medical therapy for pulmonary fibrosis, less than lobectomy for compromised lung function, rationale for sublobar resection) ***TS3-B, TS6-B, TS7-B, TS8-B, TS10-B, TS5-B, TS29-B CV33-B, TS11-A, TS12-A, TS13-A, TS14-A*** • Know basic outcome literature for benign and malignant disorders (e.g., IASLC survival data for lung cancer stages, survival rates for advanced lung diseases like COPD, IPF) ***TS6-A, TS7-A, TS8-A, TS9-A***	
☐	☐	☐	☐	☐ ☐ ☐ ☐ ☐

Comments:

No alternatives to surgery, pulmonary metastasis, where does airway techniques and complication fall under?

Patient Care and Technical Skills: Lung and Airway				
Level 1	Level 2	Level 3	Level 4	Level 5
• Orders basic diagnostic/assessment tests for routine benign, malignant and traumatic disorders (e.g., CXR, PET, CT, angiogram) • Lists basic treatment options for routine benign, malignant and traumatic disorders (e.g., chemo/radiation therapy, needle decompression for tension pneumothorax) • List common complications for benign, malignant and traumatic disorders and their treatment (e.g., BPF, prolonged air leak, hemoptysis) • Demonstrates basic surgical skills (simulation vs. OR) (e.g., positioning patient, suturing) • Obtains ATLS certification	• Interprets diagnostic/assessment tests for routine benign, malignant and traumatic disorders (e.g., interprets PFTs, recognizes false positives on PET) • Recognizes routine post-operative and disease related complications (e.g., complications after lobectomy) • Demonstrates basic endoscopic skills (e.g., making ports, running videoscope) • Demonstrates basic minimally invasive skills (FLS) • Provides basic intraoperative assistance • Performs common bedside procedures (e.g., tracheostomy, chest tube, central line)	• Prioritizes diagnostic/assessment tests for routine benign, malignant and traumatic disorders (e.g., obtain MRI based on CT results, bronchoscopy for pneumomediastinum) • Selects ideal treatment option for routine benign, malignant and traumatic disorders (e.g., combination therapy for advanced lung cancer, when not to operate for lung cancer, interventions for tension pneumothorax, need for surgical lung biopsy, contraindications for lung cancer surgery) • Manages routine post-operative and disease related complications (e.g., postop air leak, spontaneous pneumothorax) • Demonstrates advanced endoscopic skills (e.g., EBUS, stenting, proper placement of ports)	• Establishes a diagnostic and assessment plan for complex patients with benign, malignant and traumatic disorders (e.g., order of tests for TEF, quantitative V/Q for compromised lung function) • Selects ideal treatment option for complex benign, malignant and traumatic disorders (e.g., interventions for TEF, guide for stage III and IV lung cancer, Pancoast tumor) • Manages complex post-operative and disease related complications (e.g., BPF, RML torsion) • Performs complex open lung resection (e.g., Pancoast, sleeve) • Performs VATS lobectomies	• Performs tracheal resections/traumatic tracheal repair • Performs robotic lung resections, VATS segmentectomy

		• Performs routine open lung resection • Performs basic VATS procedures		
☐	☐	☐	☐	☐
Comments:				

Medical Knowledge: Chest Wall/Pleura/Mediastinum				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic chest wall, pleural, and mediastinal anatomy and pathology (e.g., anatomic features on a CT scan) ***TS15-B, TS16-B, TS19-B, TS23-B*** • Knows basic chest wall and pleural physiology (e.g., physiology of chest tube drainage and pleural pressures) ***TS15-B*** • Lists clinical manifestations of benign, malignant and traumatic disorders of the chest wall, pleura, and mediastinum (e.g., cough, shortness of breath with pleural effusion or painless mass with chest wall tumor) ***TS15-B, TS24-B*** • Lists diagnostic and/or staging tools available for the evaluation of benign, malignant and traumatic disorders (e.g., CT, chest x-ray,	• Understands common variations in anatomy and pathology (e.g., cervical rib, replaced right subclavian vessel) ***TS19-A, TS21-B*** • Understands physiologic changes accompanying benign, malignant and traumatic disorders (e.g., physiology post lung resection, flail chest, physiologic changes that accompany pleural effusions) ***CV32-B, TS15-B,*** • Generates differential diagnosis of disease with similar manifestations (e.g., differential of chest wall masses) ***TS18-B, TS19-B,TS24-B*** • Understands advantages and disadvantages of diagnostic tools in evaluating benign, malignant and traumatic disorders (e.g., difficulty diagnosing	• Understands complex integrations between anatomy and pathology (e.g., thoracic outlet syndrome, Pancoast tumor, dumbbell neurogenic tumors) ***TS16-A, TS19-A, TS21-B, TS25-A,*** • Understands the role of treatment on physiology of benign, malignant and traumatic disorders (e.g., physiologic changes that accompany chest wall resection) ***TS20-A*** • Identifies the common variants of the clinical manifestations of benign, malignant and traumatic disorders (e.g., neurogenic vs. vascular symptoms for thoracic outlet syndrome, types of pleural effusions) ***TS20-A, TS26-B*** • Interprets normal and	Understands complex variations in anatomy and pathology, including congenital (e.g., chest wall tumors requiring multimodality therapy) ***TS15-A, TS21-A*** Compares and contrasts therapeutic management based on understanding of physiology for various disease states (e.g., resection only vs. resection and reconstruction of various chest wall lesions, pleural drainage techniques for massive pleural effusions ***TS16-A, TS20-A,*** • Distinguishes the complex clinical manifestations of benign, malignant and traumatic disorders as well as manifestations of the treatment of these disorders (e.g., presentation of an infected chest wall	Knows complex alternatives for chest wall reconstruction (e.g., flaps available for chest wall reconstruction) ***TS20-A*** • Presents on outcomes of benign or malignant disorders at local, regional or national meeting

MRI, PET, ultrasound, FNA, EBUS, mediastinoscopy, EUS)) ***TS19-B, TS24-B*** • Lists treatment options for benign, malignant and traumatic disorders (e.g., medical vs. surgical management of chest wall tumors, treatment options for pleural effusion) ***TS16-B, TS17-B, TS18-B, TS18-A, TS20-B, TS21-B, TS24-B*** • Knows basic complications for benign and malignant disorders (e.g., bleeding, wound infection, empyema, pneumothorax)	mesothelioma, options for diagnosing mediastinal tumors) ***TS19-B, TS24-B*** • Understands advantages and disadvantages of various treatment options for benign, malignant and traumatic disorders, including the impact of staging (e.g., thoracentesis vs. chest tube drainage vs. thoracoscopy for benign and malignant pleural effusion) ***TS19-B&A, 24-B*** • Understands risks, benefits and complications of treatment modalities (e.g., complications associated with chest wall reconstruction) ***TS20-A***	common abnormalities associated with benign, malignant and traumatic disorders (e.g., radiographic features of different chest wall tumors and mediastinal masses) ***TS19-A*** • Identifies appropriate treatment for routine patient with benign, malignant and traumatic disorders. ***CV32-A, TS17-A*** • Knows basic outcome literature for benign and malignant disorders (e.g., survival and local recurrence rate after resection of chest wall tumors)***TS26-A***	reconstruction) • Interprets and integrates complex abnormalities associated with benign, malignant and traumatic disorders (e.g., use of MRI for thoracic outlet tumor, diagnosis of lymphoma vs. Hodgkin's Disease vs. thymoma) ***TS19-B, TS24-B&A,TS25-A*** • Identifies appropriate treatment for complex patient with benign, malignant and traumatic disorders ***TS16-A, TS20-A, TS21-A,*** • Knows outcomes for all treatment modalities and complications, including databases and clinical trials (e.g., pleurectomy vs. extrapleural pneumonectomy for mesothelioma)***TS20-A TS24-A, TS25-A, TS26-B,***	
☐	☐	☐	☐	☐	☐	☐	☐	☐
Comments: **No diaphragm,**				

Patient Care and Technical Skills: Chest Wall/Pleura/Mediastinum				
Level 1	Level 2	Level 3	Level 4	Level 5
• Orders basic diagnostic/assessment tests for routine benign, malignant and traumatic diseases (e.g., chest x-ray, CT, PET) • Lists basic treatment options for routine benign, malignant and traumatic diseases. • Lists common complications for benign, malignant and traumatic diseases and their treatment • Demonstrates basic surgical skills (simulation vs. OR) (e.g., knot tying, suturing) • Performs common bedside procedures (e.g., chest drain/tube, thoracentesis, pleurodesis)	• Interprets diagnostic/assessment tests for routine benign, malignant and traumatic diseases (e.g., distinguish free flowing and loculated pleural effusions, chest wall involvement by tumor) • Suggests treatment options for routine benign, malignant and traumatic diseases. • Recognizes routine post-operative and disease related complications (e.g., wound infection, pleural fluid loculation) • Demonstrates basic endoscopic and ultrasound- guidance skills (e.g., handling video scope) • Demonstrates basic minimally invasive skills. • Provides basic intraoperative assistance.	• Prioritizes diagnostic/assessment tests for routine benign, malignant and traumatic diseases (e.g., prioritize use of imaging to evaluate chest wall trauma) • Selects ideal treatment option for routine benign, malignant and traumatic diseases (e.g., options for malignant mesothelioma) • Manages routine post-operative and disease related complications (e.g., need for radiologic vs. surgical intervention for wound infection after chest wall reconstruction) • Demonstrates advanced endoscopic skills (e.g., performs uncomplicated EBUS or mediastinoscopy) • Performs open and VATS procedures for uncomplicated pleural	• Establishes a diagnostic and assessment plan for complex patients with benign, malignant and traumatic diseases (e.g., evaluation for posterior tumor involving spine) • Selects ideal treatment option for complex benign, malignant and traumatic diseases (e.g., induction therapy for certain mediastinal malignancies, post-operative empyema with or without BPF) • Manages complex post-operative and disease related complications (e.g., management of post resectional empyema with and without BPF) • Performs open and VATS procedures for complex pleural and mediastinal disorders (e.g., open decortication for a complex loculated pleural effusion, thymectomy for a Stage	• Surgically manages mesothelioma (e.g., radical pleurectomy and decortication with diaphragm reconstruction)

		or mediastinal disorders (e.g., VATS pleural or mediastinal biopsy, open Stage I/II thymectomy) • Performs simple chest wall resection (e.g., resects a laterally placed small chondrosarcoma (<3cm))	III thymoma) • Performs complex chest wall resection and/or reconstruction (e.g., large chest wall lesion with reconstruction)	
☐	☐	☐	☐	☐ ☐ ☐ ☐ ☐
Comments: **No diaphragm disease**				

Medical Knowledge: Critical Care				
Level 1	Level 2	Level 3	Level 4	Level 5
• Knows basic normal cardiopulmonary physiology (e.g., normal left ventricular pressure-volume curve) • Lists clinical manifestations of critically ill cardiovascular and thoracic patients (e.g., chest pain, shortness of breath, tachycardia) • Lists diagnostic tools available for evaluation of critically ill patients with cardiovascular and thoracic diseases (e.g., Interpretation of hemodynamic data (Swan-Ganz); ECG including exercise data, coronary angiography, cardiac cath hemodynamics, echocardiography) • Lists treatment options for critically ill patients with cardiovascular and thoracic diseases (e.g., providing	• Understands pathophysiologic changes accompanying cardiovascular and thoracic disease (e.g., Frank-Starling curves for the left ventricle • Generates differential diagnosis of diseases in critically ill patients with cardiovascular and thoracic diseases (e.g., Differential diagnosis of patient with chest pain - cardiac - myocardial infarction, unstable angina, acute pericarditis, coronary spasm, hypertrophic cardiomyopathy, anemia, myocarditis, aortic dissection and pulmonary hypertension; pulmonary - pulmonary embolism, pneumonia, pleuritis and pneumothorax) • Understands advantages and disadvantages of diagnostic tools in evaluating critically ill	• Understands the role of treatment on pathophysiology of cardiovascular and thoracic disease (e.g., Relationship between left ventricular output, left atrial pressure (preload) and aortic pressure (afterload) • Identifies the common variants of the clinical manifestations of critically ill cardiovascular and thoracic patients (e.g., differential diagnosis of post-op cardiac surgery patient with chest pain - myocardial ischemia, musculoskeletal pain, pericarditis, pneumothorax) • Interprets normal and common abnormalities associated with critically ill patients with cardiovascular and thoracic diseases (e.g., echo images of normal ventricular	• Adapts therapeutic management based on understanding of pathophysiology (e.g., selection of inotropic drugs in the treatment of hypotension and low cardiac output depending on etiology) *CV2-B* • Distinguishes the complex clinical manifestations and complications of critically ill cardiovascular and thoracic patients (e.g., low cardiac output due to right ventricular failure - demonstration of low cardiac output with elevated right-sided filling pressures, and relatively normal or decreased left-sided filling pressures) • Interprets and integrates complex abnormalities associated with critically ill patients with cardiovascular and thoracic diseases	• Understands the need for complex ventilation strategies (e.g., oscillating ventilation) • Conducts research on critical care and presents at a local, regional or national meeting.

hemodynamic support with inotropic and vasoactive drugs ***CV2-B***, intra-aortic balloon counterpulsation, circulatory assist devices)	patients with cardiovascular and thoracic diseases • Understands advantages and disadvantages of various treatment options for critically ill patients with cardiovascular and thoracic diseases (e.g., Indications for inotropes, IABP, and VADS)	function, systolic and diastolic dysfunction) • Identifies appropriate treatment for routine critically ill patients with cardiovascular and thoracic diseases (e.g., management strategies for postoperative arrhythmias, nutrition, mechanical ventilation modes, premature ventricular contractions, atrial fibrillation, atrial flutter, ventricular fibrillation) • Manages post-op low cardiac output • Knows basic outcome literature for critically ill patients with cardiovascular and thoracic diseases	• Identifies appropriate treatment for complex critically ill patients with cardiovascular and thoracic diseases (e.g., treatment of wall motion abnormalities after CABG, dialysis options) • Understands risk adjustment and outcome databases (e.g., scoring systems)	
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐				
Comments:				

Patient Care and Technical Skills: Critical Care				
Level 1	Level 2	Level 3	Level 4	Level 5
• Orders basic diagnostic, nutritional and assessment tests for critically ill patients with cardiovascular and thoracic diseases (e.g., pre and post-operative) • Lists basic treatment options for critically ill patients with cardiovascular and thoracic diseases • Orders appropriate prophylactic ICU measures to prevent complications (e.g., nutritional support, glucose management, ulcer and DVT prophylaxis) • Obtains ACLS certification • Demonstrates basic ICU surgical skills (simulation or bedside), including IV, arterial line, Foley catheter, NG tube	• Interprets and prioritizes diagnostic and physiologic assessment tests for critically ill patients with cardiovascular and thoracic diseases • Suggests treatment plan for critically ill patients with cardiovascular and thoracic diseases, including preventive care (e.g., prophylactic antibiotics) • Recognizes routine ICU related complications (e.g., line sepsis, DVT, ventilator acquired pneumonia, pneumothorax) • Performs cardioversion for arrhythmias • Demonstrates advanced ICU surgical skills (simulation or bedside), including central line, PA catheter, chest tube • Demonstrates routine ventilator management	• Establishes a diagnostic and assessment plan for critically ill patients with cardiovascular and thoracic diseases • Selects ideal treatment option for critically ill patients with cardiovascular and thoracic diseases • Manages routine ICU complications (e.g., line sepsis, DVT, ventilator acquired pneumonia, pneumothorax) • Demonstrates complex ventilator management • Performs open chest resuscitation ***CV3B*** • Performs emergency pericardiocentesis	• Establishes a diagnostic and assessment plan for complex critically ill patients with cardiovascular and thoracic diseases (e.g., patient with multi-system organ failure) • Selects ideal treatment option for complex critically ill patients with cardiovascular and thoracic diseases • Manages complex ICU related complications (e.g., ARDS, acute renal failure, low cardiac output, stroke, metabolic abnormalities) • Troubleshoots assist devices	• Obtains board certification in critical care.

	• Manages temporary pace maker			
☐	☐	☐	☐	☐	☐	☐	☐	☐
Comments:				

Professionalism – Ethics and Values				
Level 1	Level 2	Level 3	Level 4	Level 5
• Understands basic bioethical principles and is able to identify ethical issues in CT surgery. • Demonstrates behavior that conveys caring, honesty, and genuine interest in patients and families.	• Recognizes ethical issues in practice and is able to discuss, analyze and manage common ethical situations. • Demonstrates behavior that shows insight into the impact of one's core values and beliefs on patient care.	• Analyzes and manages ethical issues in complicated and challenging situations. • Understands the beliefs, values and practices of diverse and vulnerable patient populations and the potential impact on patient care.	• Uses a systematic approach to analyzing and managing ethical issues including advertising, billing and conflicts of interest. • Develops a mutually agreeable care plan in context of conflicting physician and patient values and beliefs.	• Leads institutional and organizational ethics programs. • Develops programs to ensure equality of care in diverse, vulnerable and underserved populations.
☐	☐	☐	☐	☐ ☐ ☐ ☐ ☐
Comments:				

Professionalism – Personal Accountability				
Level 1	Level 2	Level 3	Level 4	Level 5
• Understands and manages the issues related to fatigue and sleep deprivation. • Exhibits professional behavior (e.g., reliability, industry, integrity, and confidentiality).	• Demonstrates management of personal emotional, physical, and mental health. • Recognizes individual limits in clinical situations and asks for assistance when needed. • Ensures that the medical record (including EMR) is timely, accurate and complete.	• Identifies and manages situations in which maintaining personal emotional, physical and mental health is challenged. • Understands conflicting interests of self, family, and others and their effects on the delivery of medical care. • Understands physician accountability to physicians, society and the profession.	• Recognizes signs of physician impairment, including fatigue, and demonstrates appropriate steps to address impairment in self and in colleagues. • Prioritizes and balances conflicting interests of self, family, and others to optimize medical care.	• Develops institutional and organizational strategies to improve physician wellness.
☐	☐	☐	☐	☐	☐	☐	☐	☐
Comments:				

Interpersonal and Communication Skills				
Level 1	Level 2	Level 3	Level 4	Level 5
• Develops a positive relationship with patients in uncomplicated situations and recognizes communication conflicts. • Recognizes multidisciplinary approach to patient care. • Understands the patient's/family's perspective while engaged in active listening. • Utilizes interpreters, as needed. • Appreciates effective communication to prevent medical error. • Participates in effective transitions of care.	• Negotiates and manages simple patient/family-related, and team conflicts. • Responds to the social and cultural context of the patient and family to ensure the patient understands and ability to participate in health care decision-making. • Understands the effects of computer use on information accuracy and potential effects on the physician/patient relationship.	• Sustains working relationships and manages complex and challenging situations, including transitions of care. • Customizes the delivery of emotionally difficult information. • Manages transitions of care and optimizes communication across systems. • Maintains collegial relationship with other professional staff.	• Negotiates and manages conflict in complex and challenging situations (including vulnerable populations) and develops working relationships across specialties and systems of care. • Organizes and facilitates family/ healthcare team conferences • Able to facilitate/lead team based care activities, e.g., OR team, multidisciplinary cancer conference. • Uses multiple forms of communication (e.g., email, patient portal, social media) ethically and with respect for patient privacy.	• Develops models/approaches to managing difficult communications and seeks leadership opportunities within professional organizations. • Coaches others to improve communication skills.
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

TSC Linked to TS Milestones

Return to Table of Contents

Comments:

Systems Based Practice – Patient Safety				
Level 1	Level 2	Level 3	Level 4	Level 5
• Understands the differences between medical errors, near misses, and sentinel events. • Understands the roles of care team members.	• Participates in the use of tools to prevent adverse events (e.g., checklists and briefings). • Describes the common system causes for errors.	• Consistently uses tools to prevent adverse events (e.g., checklists and briefings). • Reports problematic behaviors, processes, and devices including errors and near misses. • Demonstrates structured communication tool for hand-offs.	• Participates in the analysis of shared team experiences to prevent future errors using proven analysis techniques (e.g., root cause analysis, failure mode effects analysis). • Leads team by promoting situational awareness and input by all team members. • Conducts morbidity and mortality conference to improve patient safety.	• Leads curriculum design to teach teamwork and communication skills to healthcare professionals. • Leads multidisciplinary teams (e.g., human factors engineers, social scientists) to address patient safety issues.
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Comments:				

Systems Based Practice – Resource Allocation				
Level 1	Level 2	Level 3	Level 4	Level 5
• Describes practice variations in resource consumption, such as the utilization of diagnostic tests.	• Describes the cost implications of using resources and practice variation.	• Participates in responsible use of health care resources seeking appropriate assistance.	• Practices cost effective care (e.g., managing length of stay, operative efficiency).	• Designs measurement tools to monitor and provide feedback to providers/teams on resource consumption to facilitate improvement.
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐				
Comments:				

Systems Based Practice – Practice Management				
Level 1	Level 2	Level 3	Level 4	Level 5
• Understands basic health payment systems, including uninsured care. • Uses EMR appropriately.	• Understands the importance of documentation for coding • Able to document inpatient diagnoses. • Understands different practice models.	• Understands principles of diagnosis, evaluation and management, and procedure coding. • Compares and contrasts different practice models.	• Codes routine diagnoses, encounters and surgical procedures. Documents medical necessity. • Recognizes basic elements needed to establish practice (e.g. negotiations, malpractice insurance, contracts, staffing, compliance, facility accreditation). • Establishes timeline and identifies resources for transition to practice (e.g. information technology, legal, financial, personnel).	• Participates in advocacy activities for health policy. • Creates curriculum to teach practice management. • Codes complex and unusual diagnoses, encounters and surgical procedures.
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Comments:				

Practice Based Learning and Improvement - The 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.				
Level 1	Level 2	Level 3	Level 4	Level 5
• Aware of one's own level of knowledge and expertise and uses feedback from teachers, colleagues and patients. • Identifies learning resources.	• Continually seeks and incorporates feedback to improve performance. • Develops a learning plan and uses published review articles and guidelines.	• Demonstrates a balanced and accurate self-assessment of competence, investigates clinical outcomes and areas for continued improvement. • Selects an appropriate evidence-based information tool to answer specific questions.	• Demonstrates improvement in clinical outcomes based on continual self-assessment and national database participation. • Performs self-directed learning with little external guidance using evidence-based information tools. Learning plan includes a process to remain current in knowledge over time.	• Demonstrates consistent behavior of incorporating evidence based information in common practice areas.
☐	☐	☐	☐	☐
Comments:				

Practice Based Learning and Improvement – Research and Teaching				
Level 1	Level 2	Level 3	Level 4	Level 5
• Describes basic concepts in clinical epidemiology, biostatistics, and clinical reasoning; can categorize research study design. • Participates in the education of patients, families and junior learners.	• Ranks study designs and can distinguish relevant research outcomes (e.g., patient-oriented evidence that matters) from other types of evidence. • Teaches patients, families and junior learners.	• Applies a set of critical appraisal criteria to different types of research, including synopses of original research findings, systematic reviews and meta-analyses, and clinical practice guidelines. • Teaches colleagues and other health professionals in both formal and informal settings. Assesses and provides feedback to junior learners.	• Formulates a searchable question, describes a plan to investigate it, and participate in a research project. • Organizes educational activities at the program level.	• Independently plans and executes a research program. • Develops educational curriculum and assessment tools.
☐	☐	☐	☐	☐
Comments:				

G. Other Resources

1. The New England Journal Of Medicine

    a. The Next GME Accreditation System – Rationale and Benefits

    b. http://www.nejm.org/doi/pdf/10.1056/NEJMsr1200117

2. ACGME News and Views

    a. Residency Programs' Evaluations of the Competencies: Data Provided to the ACGME About Types of Assessments Used by Programs

    b. http://www.jgme.org/doi/pdf/10.4300/JGME-02-04-30

Return to Table of Contents