

The Congenital Cardiac Milestone Project

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



July 2015

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The Milestones are designed only for use in evaluation of fellows in the context of their participation in ACGME-accredited residency or fellowship programs. The Milestones provide a framework for assessment of the development of the fellow 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.

Congenital Cardiac Milestones

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Milestone Reporting

This document presents milestones designed for programs to use in semi-annual review of fellow 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 fellow performance as a fellow moves from entry into fellowship through graduation. In the initial years of implementation, the Review Committee will examine Milestone performance data for each program's fellows as one element in the Next Accreditation System (NAS) to determine whether fellows overall are progressing.

For each period, review and reporting will involve selecting Milestone levels that best describe a fellow'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 in the subspecialty.

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

- Level 1:** The fellow demonstrates milestones expected of an incoming fellow.
- Level 2:** The fellow is advancing and demonstrates additional milestones, but is not yet performing at a mid-fellowship level.
- Level 3:** The fellow continues to advance and demonstrate additional milestones, consistently including the majority of milestones targeted for fellowship.
- Level 4:** The fellow has advanced so that he or she now substantially demonstrates the milestones targeted for fellowship. This level is designed as the graduation target.
- Level 5:** The fellow has advanced beyond performance targets set for fellowship 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 fellows 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 fellowship 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.

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.

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

Answers to Frequently Asked Questions about Milestones are available on the Milestones web page:

<http://www.acgme.org/acqmeweb/Portals/0/MilestonesFAQ.pdf>.

The diagram below presents an example set of milestones for one sub-competency in the same format as the ACGME Report Worksheet. For each reporting period, a fellow's performance on the milestones for each sub-competency will be indicated by selecting the level that best describes that fellow's performance in relation to those milestones.

Patient Care — Technical Skills and Performance				
Level1	Level2	Level3	Level4	Level5
<ul style="list-style-type: none"> Performs repair of simple lesions (e.g., patent ductus arteriosus, secundum atrial septal defect, coarctation, pulmonary artery band, vascular rings, epicardial pace makers) Employs principles and strategies of cardiopulmonary bypass and myocardial protection for simple lesions 	<ul style="list-style-type: none"> Performs repair of moderately complex lesions (e.g., ventricular septal defect, simple tetralogy of Fallot, primum atrial septal defect, sinus venosus atrial septal defect, neonatal coarctation) Employs principles and strategies of cardiopulmonary bypass and myocardial protection for moderately complex lesions 	<ul style="list-style-type: none"> Performs repair of higher complexity lesions (e.g., complete atrioventricular septal defect, unobstructed, total anomalous pulmonary venous return, Glenn, Fontan, tricuspid atresia, systemic to pulmonary artery shunt) Employs principles and strategies for re-operative surgery (right ventricle to pulmonary artery conduit revision, pulmonary valve insertion) Employs principles and strategies of cardiopulmonary bypass and myocardial protection for complex lesions, including deep hypothermia and circulatory arrest and modified cerebral perfusion 	<ul style="list-style-type: none"> Performs repair of the most complex lesions (e.g., Stage 1 procedure for hypoplastic left heart syndrome, tetralogy of Fallot with pulmonary atresia, arterial switch for simple transposition, repair of common arterial trunk, Damus-Kaye-Stansel, obstructed total anomalous pulmonary venous return, Ebstein's anomaly of the tricuspid valve) Demonstrates appropriate interpretation and decision making regarding intra-operative transesophageal and epicardial echocardiograms 	<ul style="list-style-type: none"> Performs Hybrid Stage 1 procedures Performs repair of rare and uncommon variants (e.g., corrected transposition, common arterial trunk with interrupted aortic arch, hypoplastic left heart syndrome [HLHS] with left ventricle to coronary fistula, heart transplant)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comments:				

Selecting a response box in the middle of a level implies that milestones in that level and in lower levels have been substantially demonstrated.

Selecting a response box on the line in between levels indicates that milestones in lower levels have been substantially demonstrated as well as **some** milestones in the higher level(s).

Patient Care — Technical Skills and Performance				
Level 1	Level 2	Level 3	Level 4	Level 5
<ul style="list-style-type: none"> • Performs repair of simple lesions (e.g., patent ductus arteriosus, secundum atrial septal defect, coarctation, pulmonary artery band, vascular rings, epicardial pace makers) • Employs principles and strategies of cardiopulmonary bypass and myocardial protection for simple lesions 	<ul style="list-style-type: none"> • Performs repair of moderately complex lesions (e.g., ventricular septal defect, simple tetralogy of Fallot, primum atrial septal defect, sinus venosus atrial septal defect, neonatal coarctation) • Employs principles and strategies of cardiopulmonary bypass and myocardial protection for moderately complex lesions 	<ul style="list-style-type: none"> • Performs repair of higher complexity lesions (e.g., complete atrioventricular septal defect, unobstructed, total anomalous pulmonary venous return, Glenn, Fontan, tricuspid atresia, systemic to pulmonary artery shunt) • Employs principles and strategies for re-operative surgery (right ventricle to pulmonary artery conduit revision, pulmonary valve insertion) • Employs principles and strategies of cardiopulmonary bypass and myocardial protection for complex lesions, including deep hypothermia and circulatory arrest, and modified cerebral perfusion 	<ul style="list-style-type: none"> • Performs repair of the most complex lesions (e.g., Stage 1 procedure for hypoplastic left heart syndrome, tetralogy of Fallot with pulmonary atresia, arterial switch for simple transposition, repair of common arterial trunk, Damus-Kaye-Stansel, obstructed total anomalous pulmonary venous return, Ebstein’s anomaly of the tricuspid valve) • Demonstrates appropriate interpretation and decision making regarding intra-operative transesophageal and epicardial echocardiograms 	<ul style="list-style-type: none"> • Performs Hybrid Stage 1 procedures • Performs repair of rare and uncommon variants (e.g., corrected transposition, common arterial trunk with interrupted aortic arch, hypoplastic left heart syndrome [HLHS] with left ventricle to coronary fistula, heart transplant)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Patient Care — Pre- and Post-operative Care				
Level 1	Level 2	Level 3	Level 4	Level 5
<ul style="list-style-type: none"> • Demonstrates ability to place central venous and arterial lines and chest tubes • Manages inotropic support and ventilator in pre- and post-operative patients • Manages post-operative care and complications following simple lesion repair 	<ul style="list-style-type: none"> • Interprets echocardiographic data and images • Interprets catheterization data and images • Performs chest exploration at the bedside • Manages post-operative care and complications following moderately complex lesion repair • Manages post-operative pulmonary vascular resistance 	<ul style="list-style-type: none"> • Performs cannulation and management of extracorporeal membrane oxygenation (ECMO) • Manages post-operative care and complications following complex lesion repair 	<ul style="list-style-type: none"> • Manages post-operative care and complications following the most complex lesion and uncommon variant repairs 	<ul style="list-style-type: none"> • Performs cannulation and management of ventricular assist devices (VAD) in infants and neonates • Teaches VAD and ECMO management for infants and neonates to junior learners • Teaches post-operative care and management of complications following full range of congenital heart lesions to junior learners
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Medical Knowledge — Anatomy and Diagnosis				
Level 1	Level 2	Level 3	Level 4	Level 5
<ul style="list-style-type: none"> • Demonstrates knowledge of anatomy of simple congenital cardiac lesions (e.g., patent ductus arteriosus, atrial septal defect, coarctation) • Demonstrates knowledge of appropriate diagnostic techniques for simple congenital cardiac lesions 	<ul style="list-style-type: none"> • Demonstrates knowledge of anatomy of moderately complex lesions (e.g., ventricular septal defect, primum atrial septal defect, tetralogy of Fallot), including the conducting system of the heart • Demonstrates knowledge of appropriate diagnostic techniques for moderately complex lesions • Demonstrates knowledge of interpretation of diagnostic studies (e.g., echocardiographic data and images, catheterization data and images) 	<ul style="list-style-type: none"> • Demonstrates knowledge of anatomy of higher complexity lesions (e.g., tricuspid atresia, complete atrioventricular septal defect, total anomalous pulmonary venous return, simple transposition) • Demonstrates knowledge of appropriate diagnostic techniques for higher complexity lesions • Demonstrates knowledge of interpretation of diagnostic studies (e.g., magnetic resonance imaging [MRI], computed tomography [CT], computed tomography angiography [CTA]) 	<ul style="list-style-type: none"> • Demonstrates knowledge of anatomy of most complex lesions (e.g., tetralogy of Fallot with pulmonary atresia, double outlet right ventricle, corrected transposition) and uncommon or rare variants (e.g., common arterial trunk with interrupted aortic arch) • Demonstrates knowledge of appropriate diagnostic studies for the most complex lesions, including uncommon variants 	<ul style="list-style-type: none"> • Teaches anatomy and diagnostics of complex lesions to junior learners
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Medical Knowledge — Pathophysiology and Natural History of the Disease				
Level 1	Level 2	Level 3	Level 4	Level 5
<ul style="list-style-type: none"> • Demonstrates knowledge of pathophysiology and natural history of simple lesions (e.g., patent ductus arteriosus, atrial septal defect, coarctation), including timing of repair 	<ul style="list-style-type: none"> • Demonstrates knowledge of pathophysiology and natural history of moderately complex lesions (e.g., ventricular septal defect, primum atrial septal defect, tetralogy of Fallot), including timing of repair 	<ul style="list-style-type: none"> • Demonstrates knowledge of pathophysiology and natural history of higher complexity lesions (e.g., tricuspid atresia and single ventricle, complete atrioventricular septal defect, total anomalous pulmonary venous return, simple transposition, lesions producing heart failure), including timing of repair 	<ul style="list-style-type: none"> • Demonstrates knowledge of pathophysiology and natural history of most complex lesions (e.g., tetralogy of Fallot with pulmonary atresia, double outlet right ventricle, corrected transposition) and uncommon or rare variants (e.g., common arterial trunk with interrupted aortic arch) • Demonstrates knowledge of contraindications to repair in complex lesions 	<ul style="list-style-type: none"> • Teaches pathophysiology and natural history of complex lesions to junior learners
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Medical Knowledge — Pathophysiology and Management of the Post-operative State				
Level 1	Level 2	Level 3	Level 4	Level 5
<ul style="list-style-type: none"> • Demonstrates knowledge of pathophysiology and management of low complexity post-operative state (e.g., patent ductus arteriosus, secundum atrial septal defect, coarctation) 	<ul style="list-style-type: none"> • Demonstrates knowledge of pathophysiology and management of moderate complexity post-operative state (e.g., ventricular septal defect, primum atrial septal defect, complete atrioventricular septal defect, tetralogy of Fallot) 	<ul style="list-style-type: none"> • Demonstrates knowledge of pathophysiology and management of high complexity post-operative state (e.g., neonatal total anomalous pulmonary venous return, simple transposition, Glenn, Fontan, heart transplant) 	<ul style="list-style-type: none"> • Demonstrates knowledge of pathophysiology and management of the highest complexity post-operative state (e.g., neonatal palliated single ventricle, tetralogy of Fallot with pulmonary atresia, double outlet right ventricle, corrected transposition, common arterial trunk with interrupted aortic arch, hypoplastic left heart syndrome with left ventricle to coronary fistula) 	<ul style="list-style-type: none"> • Teaches pathophysiology and management of the highest complexity post-operative state to junior learners
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Systems-based Practice				
Level 1	Level 2	Level 3	Level 4	Level 5
<ul style="list-style-type: none"> • Consistently uses tools to prevent adverse events (e.g., checklists, briefings) • Understands principles of diagnosis, evaluation and management, and procedure coding • Codes routine diagnoses, encounters, and surgical procedures; documents medical necessity 	<ul style="list-style-type: none"> • Describes how practice variations affect cost and resource consumption • Uses health care resources responsibly 	<ul style="list-style-type: none"> • Understands the leadership, management, and funding of the congenital heart surgery team • Leads team by promoting situational awareness and input by all team members • Codes complex and unusual diagnoses, encounters, and surgical procedures • Practices cost-effective care (e.g., managing length of stay, operative efficiency) 	<ul style="list-style-type: none"> • Formally analyzes shared team experiences to prevent future errors using proven analysis techniques (e.g., root cause analysis, failure mode effects analysis) • Establishes timeline and identifies resources for transition to practice 	<ul style="list-style-type: none"> • Participates in advocacy activities for health policy for congenital heart disease patients
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Practice-based Learning and Improvement				
Level 1	Level 2	Level 3	Level 4	Level 5
<ul style="list-style-type: none"> • Is aware of one's own level of knowledge and expertise, and uses feedback from teachers, colleagues, and patients • Teaches patients, families, and junior learners 	<ul style="list-style-type: none"> • Continually seeks and incorporates feedback to improve performance • Develops a learning plan and uses published review articles and guidelines • Assesses and provides feedback to junior learners 	<ul style="list-style-type: none"> • Demonstrates a balanced and accurate self-assessment of competence; investigates clinical outcomes and areas for continued improvement • Selects evidence-based information to answer specific questions 	<ul style="list-style-type: none"> • Performs self-directed learning with little external guidance using evidence-based information • Develops a process to remain current in knowledge over time • Organizes educational activities at the program level 	<ul style="list-style-type: none"> • Independently plans and executes a research project • Develops an educational curriculum and assessment tools
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Professionalism				
Level 1	Level 2	Level 3	Level 4	Level 5
<ul style="list-style-type: none"> • Demonstrates behavior that conveys compassion, honesty, and genuine interest in patients and families • Exhibits professional behavior (e.g., reliability, industry, integrity, and confidentiality) 	<ul style="list-style-type: none"> • Recognizes ethical issues in practice, and is able to discuss, analyze, and manage ethical situations (e.g., genetic counseling, patient's life expectancy and functional capacity) • Recognizes individual limits in clinical situations and asks for assistance when needed 	<ul style="list-style-type: none"> • Understands the beliefs, values, and practices of diverse and vulnerable patient populations, and the potential impact of these on patient care • Prioritizes and balances conflicting interests of self, family, and others to optimize medical care 	<ul style="list-style-type: none"> • Develops a mutually agreeable care plan in context of conflicting physician and patient values and beliefs • Demonstrates understanding of signs of physician impairment and understands appropriate steps to address impairment in self and colleagues 	<ul style="list-style-type: none"> • Develops programs to ensure equality of care in diverse, vulnerable, and underserved populations
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				

Interpersonal and Communication Skills				
Level 1	Level 2	Level 3	Level 4	Level 5
<ul style="list-style-type: none"> • Develops a positive relationship with patients and teams in uncomplicated situations, and recognizes communication conflicts • Understands the patient's/family's perspective while engaged in active listening • Appreciates effective communication to prevent medical error • Participates in effective transitions of care • Ensures that the medical record, including the electronic medical record (EMR), is timely, accurate, and complete 	<ul style="list-style-type: none"> • Negotiates and manages simple patient-, family-, and team-related conflicts • Responds to the social and cultural context of the patient and family • Understands the effects of computer use on information accuracy, and potential effects on the physician/patient relationship • Manages transitions of care, and optimizes communication across systems • Uses multiple forms of communication (e.g., e-mail, patient portal, social media) ethically and with respect for patient privacy 	<ul style="list-style-type: none"> • Sustains working relationships and manages complex and challenging situations, including transitions of care • Demonstrates the ability to deliver emotionally difficult information 	<ul style="list-style-type: none"> • Negotiates and manages conflict in complex and challenging situations, including with vulnerable populations, and develops working relationships across specialties and systems of care • Organizes and leads family/congenital care team conferences 	<ul style="list-style-type: none"> • Develops models/approaches to managing difficult communications, and seeks leadership opportunities within professional organizations • Coaches others to improve communication skills
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:				