Metric #: 001
Effective: 4.15.2016

Complete Aortic Evaluation for Adults with Repaired COA	
Measure Description: Proportion of adults, > 18 years of age, with repaired coarctation of the aorta (rCOA) who have undergone a complete aortic evaluation.	
Numerator	Number of patients who have had a complete aortic evaluation[1] ordered or performed during the measurement period, in the 3 years prior to the clinic visit[2], or after turning 18 years old.
Denominator	Number of patients, > 18 years old, who had a rCOA[3] and an outpatient cardiology clinic visit during the measurement period.
Denominator Exclusions	• Documentation of gadolinium AND dye allergy • Patient refusal • Pregnant women
Denominator Exceptions	None
Definitions/Notes	1. **Complete aortic evaluation** is defined as having undergone at least one of the following: thoracic CMR, CT scan, or angiography 2. **Clinic Visit:** If the patient has had multiple visits during the measurement period, use the most recent visit (i.e. last visit in the measurement period). 3. **Repaired coarctation of the aorta** can either be surgical or catheter-based.
Measurement Period	Quarterly
Sources of Data	Retrospective medical or electronic record review
Attribution	Pediatric Cardiologists, Internal Medicine Cardiologists, ACHD Cardiologists (Clinician, practice or institution)
Care Setting	Outpatient

Rationale

Adults with rCOA may develop aortic aneurysm/pseudoaneurysm proximal, distal, or at the coarctation repair site and may be asymptomatic until aortic dissection or rupture. CMR/CT is superior to physical examination and echocardiography for surveying the entire thoracic aorta for complicated vascular anatomy and future comparison

Clinical Recommendation(s)

ACC/AHA Guidelines:
Class 1

Every patient with coarctation (repaired or not) should have at least 1 cardiovascular MRI or CT scan for complete evaluation of the thoracic aorta and intracranial vessels. (Level of Evidence: B)

Warnes C, Williams, R, Bashore T, et al. ACC/AHA guidelines for the management of adults with congenital heart disease. JACC 2008:52:e143-263.

Other guidelines:

All patients should have a periodic MRI or angiogram following repair of the aortic coarctation to document the post-repair anatomy and mechanical complications (restenosis or aneurysm formation)
Grade: Consensus

Therrien J, Gatzoulis M, Graham T, Bink-Boelkens M, Connelly M, Niwa K, Mulder B, Pyeritz R, Perloff J, Somerville J, Webb GD. Canadian Cardiovascular Society Consensus Conference 2001 update: Recommendations for the Management of Adults with Congenital Heart Disease--Part II. Can J Cardiol. 2001 Oct;17(10):1029-50.

Challenges to Implementation

Some institutions without electronic medical records and proper coding of CHD diagnoses may find difficulty identifying rCOA patients from their cardiology outpatient charts.

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Metric #: 002
Effective: 10.9.2015

Appropriate counseling among pediatric cardiac patients with BMI greater than 85 %	
Measure Description: Proportion of patients, ≥ 3 years old, with a BMI greater than 85% who received appropriate counseling.	
Numerator	Number of patients who received appropriate counseling[1] for elevated BMI[2] during the measurement period or in the 12 months prior to the outpatient visit[4].
Denominator	Number of patients, ≥ 3 years of age, with a BMI[2] greater than the 85% percentile[3] (within the past 12 months) and at least one pediatric cardiology outpatient visit during the measurement period.
Denominator Exclusions	• Patients in whom an accurate height and weight cannot be obtained for medical reasons • Patients who are actively enrolled/engaged in obesity program
Denominator Exceptions	None
Definitions / Notes	**1. Appropriate counseling is defined as:** BMI ≥ 85th percentile but less than 95% percentile (a) Patient education and self-help materials for weight reduction via diet and exercise **OR** (b) Referral to a registered dietician BMI ≥ 95th percentile (a) Patient education and self-help materials **AND** a) Screen for at least one of the following co-morbid conditions: (Hypertension, Fasting insulin, Fasting blood glucose, Lipid profile, ALT, AST, gamma GT, complete metabolic panel, TSH, and urinalysis). **2. Measurement of BMI should be done as follows:** Body mass index (BMI): a measure derived from the division of the square of the height in meters into the weight in kilograms. **3. BMI percentile should be calculated as follows:** A patient's BMI percentile is determined from plotting the BMI on CDC growth charts 4. **Clinic Visit:** If the patient has had multiple visits during the measurement period, use the most recent visit (i.e. last visit in the measurement period).
Measurement Period	Quarterly
Sources of Data	Retrospective medical record review, electronic medical record

Attribution	Clinician, practice or institution
Care Setting	Outpatient

Rationale

Obesity has become one of the most important public health problems in the United States. One third of the children are overweight (BMI >= 85th percentile). BMI is the single most important predictor of cardiovascular morbidity. Monitoring

Clinical Recommendation(s)

ACC/AHA Guidelines:
None available

Other guidelines/references:
None available

Challenges to Implementation

Some clinicians may not have electronic systems to support BMI documentation. Documentation of BMI may be viewed as time consuming, and not a sub-specialty problem. This problem is exacerbated by the perception that family and patients may not comply with recommendations and because the impact of intervention is delayed with no perceived immediate reward.

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Metric #: 003
Effective: 10.9.2015

BMI measurement in ambulatory pediatric cardiac patients	
Measure Description: Proportion of patients, ≥ 3 years old, who had their BMI measured and BMI percentile calculated.	
Numerator	Number of patients who had documentation of BMI[1] measurement and percentile[2] calculated during the measurement period or in the 12 months prior to the outpatient visit[3].
Denominator	Number of patients, ≥ 3 years old, with at least one pediatric outpatient visit during the measurement period.
Denominator Exclusions	• Patients in whom an accurate height and weight cannot be obtained for medical reasons.
Denominator Exceptions	None
Definitions / Notes	**1. Measurement of BMI should be done as follows:** Body mass index (BMI): a measure derived from the division of the square of the height in meters into the weight in kilograms **2. BMI percentile should be calculated as follows:** A patient's BMI percentile is determined from plotting the BMI on CDC growth charts 3. **Clinic Visit:** If the patient has had multiple visits during the measurement period, use the most recent visit (i.e. last visit in the measurement period).
Measurement Period	Quarterly
Sources of Data	Retrospective medical record review, electronic medical record
Attribution	Clinician, practice or institution
Care Setting	Outpatient
Rationale	
Obesity has become one of the most important public health problems in the United States. One third of the children are overweight (BMI >= 85th percentile). BMI is the single most important predictor of cardiovascular morbidity.	
Clinical Recommendation(s)	
ACC/AHA Guidelines: None available **Other guidelines/references:** Pediatric Cardiovascular Risk Reduction Initiative by NHLBI http://www.nhlbi.nih.gov/guidelines/cvd_ped/index.htm	

Challenges to Implementation
Some clinicians may not have electronic systems to support BMI documentation. Documentation of BMI may be viewed as time consuming, and not a sub-specialty problem. This problem is exacerbated by the perception that family and patients may not comply with recommendations and because the impact of intervention is delayed with no perceived immediate reward.
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Metric #: 004
Effective: 12.3.2015

Critical Results Reporting in Pediatric Echocardiography		
Measure Description: Median time between study completion and referring provider notification for all pediatric exams with critical results AND Proportion of critical results reported within recommended timeframes. **Note:** *This metric includes <u>three</u> parts including (1) median time reporting critical test results (2) proportion of results communicated with 60 mins and (3) proportion of results communicated within 120 mins. The denominator should be the same number for ALL three parts.*		
Part I	**Median**	Median time[1] between study completion[2] and referring provider (or member of care team) notification for all pediatric exams with critical test[4] results during the measurement period.
	Denominator	Total number of pediatric echocardiograms for which critical results[4] were reported and communicated[3] during the measurement period.
Part II	**Numerator**	Number of pediatric echocardiograms for which critical results were reported and communicated in less than <u>60 mins</u>
	Denominator	Total number of pediatric echocardiograms for which critical results were reported and communicated during the measurement period.
Part III	**Numerator**	Number of pediatric echocardiograms for which critical results were reported in less than <u>120 mins</u>
	Denominator	Total number of pediatric echocardiograms for which critical results were reported and communicated during the measurement period.
Denominator Exclusions		Patients for whom the critical test result is not a new finding (i.e. Patients with previous documentation of the same critical result, previously communicated within the past 30 days of the most recent test result in the measurement period).
Denominator Exceptions		None
Definitions / Notes		**1. Median time (in minutes)** can be calculated by arranging all the observations from lowest value to highest value and picking the middle value. If there is an even number of observations (and no single middle value), the median is average of the two middle values. 2. **Study completion** is defined as the time the last image was obtained (typically time-stamped on the digital image). 3. **Documentation of completion** should include the time and method of communication, and specifically name the person to whom the information was communicated. **4. Critical Results** include any of the following: o New critical congenital heart disease (CHD), including duct-dependent lesions (such as critical aortic or pulmonary stenosis, critical aortic coarctation, functional single ventricle

	with severe pulmonary stenosis or pulmonary atresia, hypoplastic left heart syndrome) and total anomalous pulmonary venous return (infradiaphragmatic or other type with obstruction) ○ New moderate or severe-ventricular systolic dysfunction (as defined by lab-specific criteria) ○ New severe valvular regurgitation or stenosis ○ New moderate or large pericardial effusion ○ New intracardiac vegetation or mass ○ New pulmonary hypertension with pulmonary arterial pressure greater than two-thirds systemic pressure
Measurement Period	Quarterly
Sources of Data	Prospective worksheet (see attached Worksheet Template), retrospective medical record review, electronic medical record, echo reports, echo database
Attribution	Communication and documentation of critical results should be performed by the interpreting physician. Information communicated should include: patient name, medical record number, test completed, and result(s). When verbally communicated, the receiver of the information should confirm their own understanding of key findings from the individual who gave them the critical test result information by writing down, reading back, and seeking confirmation of patient name, medical record number, and critical results. Communication of critical results should be documented in the echocardiography report, and should include: • Critical result • Date, time, and method of communication • Name of person to whom the communication was delivered When unable to reach the ordering provider (or their designee), the process should be escalated by contacting the provider on call for the ordering provider's practice, or by using alternative institutional electronic communication methods. If electronic communication is used, a receipt request should be used to ensure confirmation of communication.
Care Setting	Outpatient

Rationale

Health care organizations should ensure critical diagnostic findings are communicated in a timely and appropriate manner. Failure to communicate abnormal diagnostic test results can lead to errors, adverse events, and liability claims.

This quality metric will evaluate timely communication of critical pediatric echocardiography results to referring providers who are not the interpreting echocardiographer. The metric will be calculated as the mean time between study completion and referring provider (or any member of the care team) notification for all pediatric exams with critical results.

Clinical Recommendation(s)

American College of Radiology Guidelines

Non-routine communications: Routine reporting of imaging findings is communicated through channels established by the hospital or diagnostic imaging facility. However, in emergent or other non-routine clinical situations, the interpreting physician should expedite the delivery of a diagnostic imaging report (preliminary or final in a manner that reasonably ensures timely receipt of the findings.

Situations that may require non-routine communication

- Findings that suggest a need for immediate or urgent intervention. Generally, these cases may occur in the emergency and surgical departments or critical care units and may include pneumothorax, pneumoperitoneum, or a significantly misplaced line or tube.
- Findings that are discrepant with a preceding interpretation of the same examination and where failure to act may adversely affect patient health. These cases may occur when the final interpretation is discrepant with a preliminary report or when significant discrepancies are encountered upon subsequent review of a study after a final report has been submitted.
- Findings that the interpreting physician reasonably believes may be seriously adverse to the patient's health and are unexpected by the treating or referring physician. These cases may not require immediate attention but, if not acted on, may worsen over time and possibly result in an adverse patient outcome.

Documentation of non-routine communications

- Interpreting physicians should document all non-routine communications and include the time and method of communication and specifically name the person to whom the communication was delivered. Documentation is best placed in the radiology report or the patient's medical record but may be entered in a department log and/or personal journal. Documentation preserves a history for the purpose of substantiating certain findings or events. Documentation may also serve as evidence of such communication, if later contested.

Methods of communication

- Communication methods are dynamic and varied. It is important, however, that non-routine communications be handled in a manner most likely to reach the attention of the treating or referring physician in time to provide the most benefit to the patient. Communication by telephone or in person to the treating or referring physician or his/her representative is appropriate and assures receipt of the findings. This may be accomplished directly by the interpreting physician or, when judged appropriate, by the interpreting physician's designee. There are other forms of communication that provide documentation of receipt which may also suffice to demonstrate that the communication has been delivered and acknowledged.
- While other methods of communication may be considered, including text pager, facsimile, voice messaging and other nontraditional approaches, these methods may not assure receipt of the communication. Therefore, in these instances, the interpreting physician may consider initiating a system that explicitly requests confirmation of receipt of the report by the clinician. If confirmation or other response is not received within a time appropriate to the diagnosis after the initial communication, a staff person should notify the clinician to document follow-up. Regardless of the method selected, it must be in compliance with state and federal law.

(ACR PRACTICE GUIDELINE FOR COMMUNICATION OF DIAGNOSTIC IMAGING FINDINGS, 2010)

Other guidelines:

- Critical results of tests and diagnostic procedures fall significantly outside the normal range and may indicate a life-threatening situation. The objective is to provide the responsible licensed caregiver these results within an established time frame so that the patient can be promptly treated. *(Joint Commission National Patient Safety Goal NPSG.02.03.01)*
- Critical Values. Each laboratory should have a policy for reporting critical values and a method to communicate these findings to the referring physician. Possible critical values might include aortic dissection, a new large pericardial effusion, findings consistent with cardiac tamponade, a new cardiac mass or thrombus, new severe LV or RV dysfunction, new valvular vegetations, new severe valvular regurgitation or stenosis, and high-risk stress echocardiographic findings. Documentation of physician-to-physician communication of the critical values must be present in the report, an addendum, or the patient's medical record. The laboratory should have a procedure for tracking compliance of this reporting policy. (American Society of Echocardiography Recommendations for Quality Echocardiography Laboratory Operations. (2011). Picard, et al. *Journal of the American Society of Echocardiography, 24*(1), 1-10.
- Intersocietal Accreditation Commission – Echocardiography: The IAC Standards and Guidelines for Pediatric Echocardiography Accreditation (last revision August 2012).
    - Section 3.2A – Provisions must exist for the timely reporting of examination data.
    - Section 3.2.1A – There must be a policy in place for communicating critical results.

Automated Detection of Critical Results in Radiology Reports (a study presented at the Society for Imaging Informatics in Medicine 2011 Annual Meeting):
http://www.siim2011.org/abstracts/communication_ss_lakhani.html

Challenges to Implementation

Lab-specific definitions for critical results such as "new moderately or severely depressed right or left ventricular systolic function" or "significant change in existing ventricular or valvular function in comparison to previous studies" will be necessary to ensure uniform reporting of critical results.
Staff and referring providers will require education and training in the critical results process.
Data collection and auditing require dedicated time.

There may be issues with operational feasibility and workflow, especially in small centers where studies are not immediately reviewed. In this situation, it will be critical for the individuals performing the exams to immediately notify the interpreting physician.

Alternative methods for notification of the referring provider may vary depending on the clinical setting (hospital vs outpatient clinic), and will require complete contact information for referring providers. Determining the actual number of studies with critical results (including those that are not coded correctly as "critical") may be more difficult for labs without a central report database.

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Adverse Events with Sedated Pediatric Echocardiography	
Measure Description: Proportion of sedated echocardiograms associated with adverse events.	
Numerator	Number of moderate/deep sedated transthoracic echo procedures associated with minor[2], moderate[3], or severe[4] adverse events. ***Note:*** *Include only the adverse events that occur during the sedation episode[1].*
Denominator	Number of moderate or deep sedated transthoracic echocardiograms performed for children < 3 years of age during the measurement period. **Note**: *Include transthoracic echocardiograms performed by anyone completing a sedated echo (both anesthesiologist and non-anesthesiologists) and at any location, either an echocardiography lab or in partnership with echocardiography labs.*
Denominator Exclusions	Sedated echocardiographic studies where echocardiography is not the sole procedure for which sedation is performed, but which are performed in conjunction with additional procedures (Eg. patient having an echocardiogram performed under the same sedation as a minor urologic surgical procedure). These studies would be excluded from this metric as adverse events occurring may be related to the associated procedure rather than to the sedation requirements of the pediatric echocardiogram.
Denominator Exceptions	None
Definitions / Notes	1. **Sedation Episode**: time of receipt of sedation to discharge by the individual administering the sedation 2. **Minor events** o Desaturation – fall in saturation of 10% or more from baseline and/or unplanned oxygen use o Apnea more than 15 seconds requiring stimulation o Allergic reaction not requiring treatment o Vomiting o Prolonged sedation (greater than 2 hours from initial medication administration to completion of study OR per center's definition, dependent on agent used) o Prolonged recovery (greater than 2 hours from completion of echo to return to baseline OR per center's definition, dependent on agent used) o Inadequate sedation to perform study. 3. **Moderate events** o Oxygenation/ventilation compromise requiring non-invasive ventilation (includes bag and mask and CPAP) o Intubation o Use of reversal agents o Aspiration o Hemodynamic compromise requiring fluid resuscitation o Unplanned overnight observation

	○ Allergic reaction requiring treatment ○ Agitation/delirium requiring treatment (includes use of additional medications) ○ IV related complication ○ Emergent anesthesia/sedation consultation required ○ Hypoglycemia requiring treatment ○ Hypothermia ○ Stridor ○ Wheezing ○ Laryngospasm 4. **Severe events** ○ Cardiopulmonary arrest ○ Permanent injury or disability (especially neurologic) ○ Death
Measurement Period	Quarterly
Sources of Data	Prospective flowsheet, retrospective medical record review, electronic medical records are all appropriate sources of data.
Attribution	This metric should be reported by each echocardiography laboratory performing sedated transthoracic echocardiography. Data will be assessed quarterly, by the laboratory director or his/her designate and reviewed with the laboratory staff involved in the ordering and provision of sedation and in the interpretation of echocardiograms performed under sedation. Some centers may wish to delegate responsibility for collection of data to a member of a sedation team if sedation is not provided directly by the cardiologists.
Care Setting	Outpatient

Rationale

This metric assesses the safety of administration of sedation in the population of vulnerable patients who require sedation for completion of a transthoracic echocardiogram as part of their care for complete delineation of anatomy and physiology. The need for sedated echocardiography in infants and small children whose cooperation cannot always be won is recognized in the pediatric cardiology community. Sedation has recognized potential complications, and there are numerous guideline documents recognizing the need for monitoring and responding to adverse events during sedation. Quality assurance processes should include periodic review of adverse events and consideration of changes in policy to minimize these events; physicians involved in the ordering and performance of these studies should be involved in quality assurance reviews of these procedures within their laboratories.

Clinical Recommendation(s)

ACC/AHA Guidelines
None

Other Guidelines:

References for need for quality assurance review processes:

1. American Academy of Pediatrics American Academy of Dentistry; Cote JC, Wilson S: Guidelines for monitoring and management of pediatric patients during and after sedation for diagnostic and therapeutic procedures. An update. *Pediatrics* 2006; 118; 2587

The essence of medical error reduction is a careful examination of index events and root-cause analysis of how the event could be avoided in the future. Therefore, each facility should maintain records that track adverse events such as desaturation, apnea, laryngospasm, the need for airway interventions including jaw thrust or positive pressure ventilation, prolonged sedation, unanticipated use of reversal agents, unintended or prolonged hospital admission, and unsatisfactory sedation/analgesia/anxiolysis.

Guidelines for monitoring for adverse events/presence of individuals skilled in resuscitation:

2. Guidelines and Standards for Performance of a Pediatric Echocardiogram: A Report from the Task Force of the Pediatric Council of the American Society of Echocardiography *JASE* 2006: 19:1413:

Written policies including, but not limited to, the type of sedatives, appropriate dosing for age and size, and proper monitoring of children during and after the examination should exist for the use of conscious sedation in children. Each laboratory should have a written procedure in place for handling acute medical emergencies in children. This should include a fully equipped cardiac arrest cart (crash cart) and other necessary equipment for responding to medical emergencies in pediatric patients of all sizes.

3. THE JOINT COMMISSION, COMPREHENSIVE ACCREDITATION MANUAL FOR HOSPITALS (CAMH). (2012).
Provision of Care, Treatment, and Services Standards PC.03.01.01, PC.03.01.05, PC.03.01.03, PC.03.01.07
Record of Care Standard: RC.02.01.03
Performance Improvement Standard: PI.01.01.01

Individuals administering moderate or deep sedation and anesthesia are qualified and have credentials to manage and rescue patients at whatever level of sedation or anesthesia is achieved, either intentionally or unintentionally… In addition to the individual performing the procedure, a sufficient number of qualified staff are present to evaluate the patient, to provide the sedation and/or anesthesia, to help with the procedure, and to monitor and recover the patient… For operative or other high-risk procedures, including those that require the administration of moderate or deep sedation or anesthesia: The hospital has equipment available to monitor the patient's physiological status… For operative or other high-risk procedures, including those that require the administration of moderate or deep sedation or anesthesia: The hospital has resuscitation equipment available…During operative or other high risk procedures, including those that require the administration of moderate or deep sedation or anesthesia, the patient's oxygenation, ventilation, and circulation are monitored continuously… The hospital assesses the patient's physiological status immediately after the operative or other high-risk procedure and/or as the patient recovers from moderate or deep sedation or anesthesia.

4. Practice Guidelines for Sedation and Analgesia by Non-Anesthesiologists: An updated report by the American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists. *Anesthesiology* 2002; 96:1004

All patients undergoing sedation/analgesia should be monitored by pulse oximetry with appropriate alarms. In addition, ventilatory function should be continually monitored by observation or auscultation. Monitoring of exhaled carbon dioxide should be considered for all patients receiving deep sedation and

for patients whose ventilation cannot be directly observed during moderate sedation. When possible, blood pressure should be determined before sedation/analgesia is initiated. Once sedation/analgesia is established, blood pressure should be measured at 5-minintervals during the procedure, unless such monitoring interferes with the procedure… Individuals monitoring patients receiving sedation/analgesia should be able to recognize the associated complication. At least one individual capable of establishing a patent airway and positive pressure ventilation, as well as a means for summoning additional assistance, should be present whenever sedation/analgesia is administered. It is recommended that an individual with advanced life support skills be immediately available (within 5 min) for moderate sedation and within the procedure room for deep sedation.

Challenges to Implementation

Not all laboratories have facilities for sedated echocardiography. Laboratories not performing studies under sedation would not use this metric.

There may be difficulty within laboratories in designating specific adverse events as minor, moderate, or severe, though guidelines included in this metric should be helpful.
The definition of prolonged sedation and prolonged recovery will vary between centers using different sedative medications as the time course for sedation and recovery will vary depending on the agent utilized.

Echocardiographic laboratories routinely using sedation services or anesthesia teams to perform sedation may not have direct access to information regarding adverse events and may need to partner with colleagues in other areas such as anesthesia or intensive care to obtain this data. However it is critical that those making decisions to sedate patients for echocardiography, and involved in the performance and interpretation of these echocardiograms be familiar with the adverse events occurring in the course of sedation and modify their practice of referral for and performance of sedation accordingly.

It is anticipated that the number of moderate and major events annually in each lab will be low, which may make it difficult to improve the metric over data review cycles. The process of review of events may be more valuable than the value of the metric itself in guiding the modification of sedation practices to optimize patient care.

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Metric #: 006
Effective: 10.9.2015

Daily documentation of nutrition for infant cardiac admissions	
Measure Description: Proportion of days infants, ≤ 30 days of age with cardiac disease, had both feeding status and caloric intake documented.	
Numerator	Number of days[1] during which the infants had their feeding status[2] and caloric intake[3] documented.
Denominator	Number of days infants, ≤ 30 days of age, with cardiac disease[4] are admitted to a patient care unit during the measurement period.
Denominator Exclusions	Infants with cardiac disease admitted for less than 24 hours.
Denominator Exceptions	None
Definitions / Notes	1. **Days**: 24-Hour Periods 2. **Feeding status** include parenteral and enteral. 3. **Caloric intake** is documented as calories per kilograms per day. 4. **Cardiac disease** is defined as an acquired or congenital heart defect **Note:** *Feeding status/caloric intake should be documented every 24 hours. (Eg. If a patient is admitted for 28 hours, only one instance of feeding status needs to be documented. After 48 hours, there would need to be two notes regarding feeding status, etc.)*
Measurement Period	Quarterly
Sources of Data	Medical record
Attribution	Unit and institution level
Care Setting	Inpatient

Rationale

Nutrition is a critical component of care for infants with congenital heart disease. Although documentation of daily fluid intake is a standardized activity performed by nurses, assessment or measurement of nutritional intake is not consistently performed.

Clinical Recommendation(s)

ACC/AHA Guidelines:

Supporting literature:

1. Varan B, Kursad T, Yilmaz Y. Malnutrition and growth failure in cyanotic and acyanotic congenital heart disease with and without pulmonary hypertension. *Arch Dis Child*. 1999;81:49-52.
2. Cameron JW, Rosenthal A, Olson AD. Malnutrition in hospitalized children with congenital heart disease. *Arch Pediatr Adolesc Med*. 1995;149(10):1098-1102.

Challenges to Implementation
Requires primary data collection

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Metric #: 007
Effective: 1.7.2016

Chest Pain – Documentation of Family History	
Measure Description: Proportion of patients, 5-18 years old, with a chief complaint of chest pain who have documentation of a family history of early coronary artery disease, cardiomyopathy and sudden cardiac or unexplained death.	
Numerator	Number of patients with documentation of family history[1] of early coronary artery disease[2] (in a first and/or second degree relative[3]), cardiomyopathy, and sudden cardiac or unexplained death during the measurement period or in the past 12 months from the clinic visit[4].
Denominator	Number of patients, ages 5-18 years old, seen for initial consultation in an ambulatory pediatric cardiology clinic visit[1] with a chief complaint of chest pain during the measurement period.
Denominator Exclusions	None
Denominator Exceptions	None
Definitions/Notes	1. **Documentation of family history**: includes documentation of the presence or absence of cardiomyopathy, early coronary artery disease, and sudden cardiac or unexplained death 2. **Early coronary artery disease (CAD)**: includes those with CAD before the age of 55 years for males and before the age of 65 years in females. 3. **First and/or second-degree relative**: a patient's first-degree relative is a parent, sibling, or child. A second-degree relative is an uncle, aunt, nephew, niece, grandparent, grandchild, or half-sibling. 4. **Clinic Visit:** If the patient has had multiple visits during the measurement period, use the most recent visit (i.e. last visit in the measurement period).
Measurement Period	Quarterly
Sources of Data	Retrospective medical record review, electronic medical record
Attribution	This measure should be reported by pediatric cardiologists and practitioners evaluating children in the outpatient setting.
Care Setting	Outpatient
Rationale	
Family history should document the presence or absence of cardiomyopathy, early coronary artery disease in a first-degree relative, and sudden cardiac or unexplained death. Several retrospective studies have shown chest pain can be the presenting symptom in HCM[1-5]. The AHA recommendations for screening child athletes recommends obtaining a family history to include HCM, DCM, SCD<50[6]. Our expert panel supports this recommendation in children presenting with chest pain. Class IIa recommendation Level of evidence: C	

Clinical Recommendation(s)

ACC/AHA Guidelines

A Scientific Statement From the American Heart Association Expert Panel on Population and Prevention Science; the Councils on Cardiovascular Disease in the Young, Epidemiology and Prevention, Nutrition, Physical Activity and Metabolism, High Blood Pressure Research, Cardiovascular Nursing, and the Kidney in Heart Disease; and the Interdisciplinary Working Group on Quality of Care and Outcomes Research. Circulation. 2006; 114:2710-2738

Other guidelines:

Expert panel on integrated guidelines for cardiovascular health and risk reduction in children and adolescents. Pediatrics 2011; 128;S213-S256

Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents and Grading of the Evidence Review for the Role of Family History in Cardiovascular Health ; NIH Publication No. 12-7486 October 2012

- Overwhelmingly consistent evidence from observational studies strongly supports inclusion of a positive family history of early coronary heart disease in identifying children at risk for accelerated atherosclerosis and for the presence of an abnormal risk profile. (Grade B)
- For adults, a positive family history is defined as a parent and/or sibling with a history of treated angina, myocardial infarction, percutaneous coronary catheter interventional procedure, coronary artery bypass grafting, stroke or sudden cardiac death before age 55 years in men or age 65 years in women. Because the parents and siblings of children and adolescents are usually young themselves, it was the Expert Panel's consensus that when evaluating family history in a child, history should also be ascertained for the occurrence of CVD in grandparents, aunts, and uncles, although the evidence supporting this is insufficient to date. (Grade D)
- Overwhelmingly consistent evidence from observational studies shows that identification of a positive family history for CVD and/or CV risk factors should lead to evaluation of all family members, especially parents, for CV risk factors. (Grade B)
- Family history evolves as a child matures, so regular updates are necessary as part of routine pediatric care. (Grade D)
- Education about the importance of accurate and complete family health information should be part of routine care for children and adolescents. As genetic sophistication increases, linking family history to specific genetic abnormalities will provide important new knowledge about the atherosclerotic process. (Grade D).

References:

1. Kane DA, Fulton DR, Saleeb S, Zhou J, Lock JE, Geggel RL. Needles in hay: chest pain as the presenting symptom in children with serious underlying cardiac pathology. Congenit Heart Dis 2010;5:366-73.
2. Yetman AT, McCrindle BW, MacDonald C, Freedom RM, Gow R. Myocardial bridging in children with hypertrophic cardiomyopathy--a risk factor for sudden death. N Engl J Med 1998;339:1201-9.
3. Azzano O, Bozio A, Sassolas F, et al. [Natural history of hypertrophic obstructive cardiomyopathy in young patients: apropos of 40 cases]. Archives des maladies du coeur et des vaisseaux 1995;88:667-72.
4. Hickey EJ, McCrindle BW, Larsen SH, et al. Hypertrophic cardiomyopathy in childhood: disease natural history, impact of obstruction, and its influence on survival. Ann Thorac Surg 2012;93:840-8.
5. Sharma J, Hellenbrand W, Kleinman C, Mosca R. Symptomatic myocardial bridges in children: a case report with review of literature. Cardiol Young 2011;21:490-4.
6. Maron BJ, Thompson PD, Ackerman MJ, et al. Recommendations and considerations related to preparticipation screening for cardiovascular abnormalities in competitive athletes: 2007 update: a scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism: endorsed by the American College of Cardiology Foundation. Circulation 2007;115:1643-455

Challenges to Implementation
Family members may have poor knowledge/recollection as to actual diagnoses of relatives. Many non-myopathic conditions (e.g. CHF) are referred to by laypersons by various terms such as “enlarged heart”.

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Metric #: 008
Effective: 10.9.2015

Electrocardiogram for chest pain	
Measure Description: Proportion of patients, 5-18 years old, with a chief complaint of chest pain who completed an electrocardiogram (ECG).	
Numerator	Number of patients who had an ECG performed within 30 days (before or after) their initial consultation for chest pain.
Denominator	Number of patients, age 5-18 years old, seen for an initial consultation in an ambulatory pediatric cardiology clinic with a chief complaint of chest pain during the measurement period.
Denominator Exclusions	Patient refusal
Denominator Exceptions	None
Definitions/Notes	None
Measurement Period	Quarterly
Sources of Data	Retrospective medical record review, electronic medical record, ECG storage systems
Attribution	This measure should be reported by physicians or physician extenders
Care Setting	Outpatient

Rationale

Cardiac etiology for chest pain is rare in children[1-11]. Of 3700 patients presenting with chest pain to outpatient cardiology clinic with an ECG, there were no cardiac deaths at median 4.4 year follow up[1]. Multiple retrospective studies show small number of abnormal ECGs in patients presenting with chest pain with the following diagnoses: pericarditis, myocarditis, arrhythmias, and cardiomyopathy[2-7]. Meta-analysis of asymptomatic children who underwent ECG screening demonstrated high negative predictive value for hypertrophic cardiomyopathy, long QT syndrome, and Wolff-Parkinson-White syndrome[9].

Class I Recommendation
Level of evidence: C

Clinical Recommendation(s)

ACC/AHA Guidelines

ACC/AHA Guidelines for Ambulatory Electrocardiography. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Revise the Guidelines for Ambulatory Electrocardiography). Developed in collaboration with the North American Society for Pacing and Electrophysiology. JACC 1999; 34(3): 912-48.

Other guidelines:

Management of Pediatric Chest Pain Using a Standardized Assessment and Management Plan. Pediatrics 2011; 128; 239-245

Resource Utilization Reduction for Evaluation of Chest Pain in Pediatrics Using a Novel Standardized

Clinical Assessment and Management Plan (SCAMP). J Am Heart Assoc. 2012; 1:1-7

References:

1. Saleeb SF, Li WY, Warren SZ, Lock JE. Effectiveness of screening for life-threatening chest pain in children. Pediatrics 2011;128:e1062-8.
2. Sert A, Aypar E, Odabas D, Gokcen C. Clinical characteristics and causes of chest pain in 380 children referred to a paediatric cardiology unit. Cardiol Young 2012:1-7.
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7. Drossner DM, Hirsh DA, Sturm JJ, et al. Cardiac disease in pediatric patients presenting to a pediatric ED with chest pain. The American journal of emergency medicine 2011;29:632-8.
8. Friedman KG, Kane DA, Rathod RH, et al. Management of pediatric chest pain using a standardized assessment and management plan. Pediatrics 2011;128:239-45.
9. Rodday AM, Triedman JK, Alexander ME, et al. Electrocardiogram screening for disorders that cause sudden cardiac death in asymptomatic children: a meta-analysis. Pediatrics 2012;129:e999-1010.
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11. Evangelista JA, Parsons M, Renneburg AK. Chest pain in children: diagnosis through history and physical examination. Journal of pediatric health care : official publication of National Association of Pediatric Nurse Associates & Practitioners 2000;1.
12. Saleeb SF, Li WY, Warren SZ, Lock JE. Effectiveness of screening for life-threatening chest pain in children. Pediatrics 2011;128:e1062-8

Challenges to Implementation

- ECG may not be well documented in patient chart.
- Chest pain may not be listed as the chief complaint but may be an associated symptom.
- Noncompliance with getting the ECG done.

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Metric #: 009
Effective: 10.9.2015

Echocardiogram for exertional chest pain	
Measure Description: Proportion of patients, 5-18 years old, with a history of exertional chest pain who had an echocardiogram.	
Numerator	Number of patients who had an echocardiogram (including comment regarding coronary artery anatomy) performed 6 months prior or 30 days after the clinic visit.
Denominator	Number of patients, ages 5-18 years old, seen for initial consultation in an ambulatory pediatric cardiology clinic for chief complaint of exertional chest pain during the measurement period.
Denominator Exclusions	• Previous cardiac MRI/CT within 6 months with documentation of coronary artery anatomy, or chest pain characteristic of musculoskeletal chest pain or exercise induced asthma. • Patient refusal
Denominator Exceptions	None
Definitions/Notes	None
Measurement Period	Quarterly
Sources of Data	Retrospective medical record review, electronic medical record
Attribution	This measure should be reported by physicians or physician extenders.
Care Setting	Outpatient

Rationale

Sudden death may occur with exertion related to coronary artery anomalies.[1]
Coronary artery anomaly is the most common cardiac diagnosis to present with CP.[2]
Exertional CP is useful for identifying coronary anomalies.[2]
Class IIb recommendation.
Level of evidence: B

References:

1. Eckart RE, Scoville SL, Campbell CL, et al. Sudden death in young adults: a 25-year review of autopsies in military recruits. Ann Intern Med 2004;141:829-34.
2. Kane DA, Fulton DR, Saleeb S, Zhou J, Lock JE, Geggel RL. Needles in hay: chest pain as the presenting symptom in children with serious underlying cardiac pathology. Congenit Heart Dis 2010;5:366-73.

Clinical Recommendation(s)

ACC/AHA Guidelines

ACCF/ASE/AHA/ASNC/HFSA/HRS/SCAI/SCCM/SCCT/SCMR 2011 AppropriateUse Criteria for Echocardiography. A Report of the AmericanCollege of Cardiology Foundation Appropriate Use Criteria Task Force, American Society of Echocardiography, American Heart Association, American Society of Nuclear Cardiology, Heart Failure Society of America, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Critical Care Medicine, Society of Cardiovascular Computed Tomography, and Society for Cardiovascular Magnetic Resonance Endorsed by the American College of Chest Physicians. J Am Coll Cardiol. 2011;57(9):1126-66. “Symptoms or conditions potentially related to suspected cardiac etiology including but not limited to chest pain”

Other guidelines:
Management of pediatric chest pain using a standardized assessment and management plan. Pediatrics. 2011;128(2):239-45.

Challenges to Implementation

Exertional CP is an imperfect marker (both sensitivity and specificity)[1,2], and a high proportion (33% in one cohort) may have exertional CP[3].

Exertional CP could also be exercise-induced asthma, and may not require an echocardiogram.

References:

1. Eckart RE, Scoville SL, Campbell CL, et al. Sudden death in young adults: a 25-year review of autopsies in military recruits. Ann Intern Med 2004;141:829-34.
2. Kane DA, Fulton DR, Saleeb S, Zhou J, Lock JE, Geggel RL. Needles in hay: chest pain as the presenting symptom in children with serious underlying cardiac pathology. Congenit Heart Dis 2010;5:366-73.
3. Saleeb SF, Li WY, Warren SZ, Lock JE. Effectiveness of screening for life-threatening chest pain in children. Pediatrics 2011;128:e1062-8.

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Metric #: 010
Effective: 10.9.2015

Recommendation for Antibiotic Prophylaxis in Patients with Heterotaxy and Asplenia	
Measure Description: Proportion of patients, < 5 years old, with heterotaxy and asplenia and a documented recommendation for antibiotic prophylaxis.	
Numerator	Number of patients with at least one documented recommendation for antibiotic prophylaxis within a note in the medical record.
Denominator	Number of patients, < 5 years old, with diagnosis of heterotaxy and asplenia who had an outpatient visit[1] to the pediatric cardiology clinic during the measurement period.
Denominator Exclusions	• Patients with heterotaxy in whom documentation of normal splenic function has occurred (irrespective of method used to determine normalcy of splenic function). • Patients who do not have congenital heart disease, but who have documented asplenia or hyposplenism and are being seen by a pediatric cardiologist for varied reasons (the most common example would be patients with sickle cell disease).
Denominator Exceptions	None
Definitions/Notes	1. **Clinic Visit:** If the patient has had multiple visits during the measurement period, use the most recent visit (i.e. last visit in the measurement period).
Measurement Period	Quarterly
Sources of Data	Retrospective review of outpatient clinic notes.
Attribution	N/A
Care Setting	Outpatient

Rationale

While controversy exists as to the age at which antibiotic prophylaxis should continue to be recommended, most experts agree that antibiotic prophylaxis against severe pneumococcal disease is appropriate until the age of 5. Documented rates of severe pneumococcal sepsis decrease markedly after the age of 5. However, there is no national published guideline on which to rely for guidance in this issue.

Clinical Recommendation(s)

Price, VE et al. The Prevention and Management of Children with Asplenia or Hyposplenia. Infect Dis Clin N Am (2007) 21:697.

Challenges to Implementation

The lack of a standard means to document the recommendation for antibiotic prophylaxis in the medical record may make assessment of adherence to the metric cumbersome. Some institutions may differ on what is included under a diagnosis of “heterotaxy”.

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Metric #: 011
Effective: 12.3.2015

Influenza Vaccination Compliance of Health Care Personnel	
Measure Description: Proportion of health care personnel (HCP) in a pediatric cardiology practice who receive timely influenza vaccination.	
Numerator	Number of HCP[1] who received an influenza vaccination during the current flu season[2]
Denominator	Number of health care personnel working in patient care areas at least one working day during the measurement period
Denominator Exclusions	• Personnel with medical reasons to forego vaccination • Visiting team members not employed by primary employer (technical supportive staff such as pacemaker/ICD technicians).
Denominator Exceptions	None
Definitions/Notes	1. **Health care personnel**: Medical, front office/check-in, other administrative staff (i.e. practice managers, schedulers), all clinical personnel: ECG technicians, medical assistants (CNA), LPN, RN, MD, NP, PA, as well as imaging personnel including sonographers, and other healthcare personnel. [http://www.hhs.gov/ash/initiatives/hai/hcpflu.html] 2. **Current Flu Season**: period of time between when the vaccine becomes available (approximately October each year) until March of the following year.
Measurement Period	Quarterly (Quarter 1: Jan 1 to Mar 31st, Quarter 4: Oct 1st to Dec 31st)
Sources of Data	Documentation/confirmation of vaccine administration by Clinical Director/Manager of practice.
Attribution	Shared accountability: Practice administrative & clinical leadership; all staff; all health care providers
Care Setting	Outpatient

Rationale

Overall, 67% of HCP report having received the Influenza vaccine for 2011-12 season. This is improving, but remains poor. Pediatric cardiologists and their staff care for a potentially vulnerable patient population prone to increased morbidity/mortality from influenza.

Clinical Recommendation(s)

ACC/AHA Guidelines:

None

Other guidelines: "Emphasis that all HCP, not just those with direct patient care duties, should receive an annual influenza vaccination." "Comprehensive programs to increase vaccine coverage among HCP are needed; influenza vaccination rates among HCP within facilities should be measured and reported regularly." MMWR November 25, 2012, Vol 60, No. 7. Immunization of Health-Care Personnel: Recommendations of the Advisory Committee on Immunization Practices.

Challenges to Implementation
Varied forms of leadership among practices, may lead to diffusion of responsibility or confusion of who is to provide oversight and accountability. There may also be varied methods of accounting vaccinations among staff.

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Metric #: 012
Effective: 10.9.2015

Adherence to Recommended Regimens of Secondary Prevention of Rheumatic Fever in Patients with a Previous History of Rheumatic Fever

Measure Description: Proportion of patients with documented recommendation for antibiotics for secondary prevention of rheumatic fever.

Numerator	Number of patients with a documented recommendation, or a specific prescription, for the prevention of secondary rheumatic fever.
Denominator	Number of patients, ≤ 21 years old, with a known prior diagnosis of rheumatic fever and an outpatient clinic visit during the measurement period.
Denominator Exclusions	None
Denominator Exceptions	None
Definitions/Notes	None
Measurement Period	Quarterly
Sources of Data	Retrospective medical record review of outpatient clinic note
Attribution	N/A
Care Setting	Outpatient

Rationale

Although rheumatic fever is uncommon in the US in the current era, there are periodic increases in the case rate from time to time and clinicians must therefore remain aware of this important sequela of a common bacterial infection. Patients who have an episode of rheumatic fever are at very high risk of recurrent rheumatic fever with subsequent episodes of streptococcal pharyngitis, with the potential significant deleterious effects on cardiac valvular function. It is therefore important for clinicians to document a) that indicated patients are receiving the correct prophylactic regimen and b) that, if indicated, a recommendation for ongoing adherence to a prophylactic regimen is documented.

Clinical Recommendation(s)

ACC/AHA Guidelines

Table 3. Duration of Secondary Rheumatic Fever Prophylaxis

Category	Duration After Last Attack	Rating
Rheumatic fever with carditis and residual heart disease (persistent valvular disease*)	10 years or until 40 years of age (whichever is longer), sometimes lifelong prophylaxis (see text)	IC
Rheumatic fever with carditis but no residual heart disease (no valvular disease*)	10 years or until 21 years of age (whichever is longer)	IC
Rheumatic fever without carditis	5 years or until 21 years of age (whichever is longer)	IC

Rating indicates classification of recommendation and LOE (eg, IC indicates class I, LOE C).

Circulation. 2009;119:1541-1551

Challenges to Implementation
The relative rarity of rheumatic fever in the US, along with the fact that many patients may have had their rheumatic fever many years previously, may make it difficult for clinicians to properly ascertain a prior history of rheumatic fever. Also, the lack of a standard means to document need for SBE prophylaxis in the medical record may make assessment of adherence to the metric cumbersome.

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Metric #: 013
Effective: 2.8.2016

Aspirin therapy in Acute and Subacute Phases	
Measure Description: Proportion of Kawasaki Disease (KD) patients with a recommendation for aspirin during the first 6 weeks after onset of disease.	
Numerator	Number of patients who were prescribed (upon discharge) daily low dose aspirin (<10 mg/kg/day) for 6 weeks or more.
Denominator	Number of patients, ≤ 18 years old, who had an inpatient discharge within the measurement period for acute KD.
Denominator Exclusions	• Patients with G6PD deficiency (who should receive an alternative therapy) • Patients on other anti-platelet therapy • Other contraindications to aspirin therapy (allergy, recent chickenpox vaccination)
Denominator Exclusions	None
Definitions/Notes	None
Measurement Period	Quarterly
Sources of Data	Pediatric cardiologists' outpatient medical records
Attribution	This measure should be reported by all pediatric cardiologists
Care Setting	Inpatient

Rationale

All patients discharged with the diagnosis of Kawasaki disease should be placed on antiplatelet therapy irrespective of receiving intravenous immunoglobulin (IVIG). Risk of aneurysm development persists during this period, and thrombosis risk exists in patients with aneurysms. Furthermore, accelerated thrombocytosis provides a hypercoagulable state after the first week.

Clinical Recommendation(s)

ACC/AHA Guidelines Evidence level C recommendations

"When high-dose aspirin is discontinued, clinicians begin low-dose aspirin (3 to 5 mg/kg per day) and maintain it until the patient shows no evidence of coronary changes by 6 to 8 weeks after the onset of illness." Guidelines also recommend continued antiplatelet therapy for patients with coronary involvement.

Newburger JW, Takahashi M, Gerber MA, Gewitz MH, Tani LY, Burns JC, Shulman ST, Bolger AF, Ferrieri P, Baltimore RS, Wilson WR, Baddour LM, Levison ME, Pallasch TJ, Falace DA, Taubert KA. Diagnosis, treatment, and long-term management of Kawasaki disease: a statement for health professionals from the Committee on Rheumatic Fever, Endocarditis and Kawasaki Disease, Council on Cardiovascular Disease in the Young, American Heart Association. Circulation. 2004 Oct 26;110(17):2747-71.

Other references:

Durongpisitkul K, Gururaj VJ, Park JM, Martin CF. The prevention of coronary artery aneurysm in Kawasaki disease: A meta-analysis on the efficacy of aspirin and immunoglobulin treatment. Pediatrics. 1995; 96: 1057–1061.

Challenges to Implementation
The accuracy of the reporting method will depend on each physician's verification process.

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Metric #: 014
Effective: 10.9.2015

Appropriate Follow-up, Cardiac Evaluation	
Measure Description: Proportion of Kawasaki Disease (KD) patients who received an echocardiographic evaluation within 3 weeks of a hospital discharge.	
Numerator	Number of patients who had at least one echocardiogram within 3 weeks after being discharged from the hospital.
Denominator	Number of KD patients, ≤ 18 years old, who had an outpatient cardiology clinic visit during the measurement period and who had their initial inpatient hospital discharge[1] for KD within the past 12 months of the outpatient visit. **Note:** *Only KD patients who have been followed by the same clinic since their initial inpatient hospital discharge meet the denominator criteria.*
Denominator Exclusions	• Patients at higher risk including those with persistent or recrudescent fever or who remained hospitalized longer than five days or were readmitted • Patients with aneurysms any time in their medical history • Patient/guardian refusal
Denominator Exceptions	None
Definitions/Notes	**1. Initial inpatient hospital discharge** refers to the time the patient was discharged with a primary diagnosis of Kawasaki disease.
Measurement Period	Quarterly
Sources of Data	pediatric cardiologists' outpatient medical record or echocardiographic report
Attribution	This measure should be reported by pediatric cardiologists caring for patients with Kawasaki Disease.
Care Setting	Outpatient

Rationale

Patients with KD can develop coronary dilation and aneurysm formation during the first 2 months of illness. Lack of standard evaluation at these specific time points will result in underdiagnoses of coronary artery abnormalities

Clinical Recommendation(s)

ACC/AHA Guidelines

"For uncomplicated cases, echocardiographic evaluation should be performed at the time of diagnosis, at 2 weeks, and at 6 to 8 weeks after onset of the disease."

1. Newburger JW, Takahashi M, Gerber MA, Gewitz MH, Tani LY, Burns JC, Shulman ST, Bolger AF, Ferrieri P, Baltimore RS, Wilson WR, Baddour LM, Levison ME, Pallasch TJ, Falace DA, Taubert KA. Diagnosis, treatment, and long-term management of Kawasaki disease: a statement for health professionals from the Committee on Rheumatic Fever, Endocarditis and Kawasaki Disease, Council on Cardiovascular Disease in the Young, American Heart Association. Circulation. 2004 Oct 26;110(17):2747-71.

Other guidelines:

1. Lowry AW, Knudson JD, Myones BL, Moodie DS, Han YS. Variability in delivery of care and echocardiogram surveillance of Kawasaki disease. Congenital Heart Disease. 2012 Jul-Aug;7(4):336-43.
2. Scott JS, Ettedgui JA, Neches WH. Cost-effective use of echocardiography in children with Kawasaki disease. Pediatrics. 1999 Nov;104(5):e57

Challenges to Implementation

Patients are not seen in a timely fashion.

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Metric #: 015
Effective: 10.9.2015

Appropriate Consideration and Evaluation of Fever	
Measure Description: Proportion of Kawasaki Disease (KD) patients who were evaluated for fever after discharge.	
Numerator	Number of patients who have documentation of the presence or absence of fever during the outpatient visit.
Denominator	Number of KD patients, ≤ 18 years old, who had their first outpatient pediatric cardiology clinic visit during the measurement period and after their initial inpatient hospital discharge[1].
Denominator Exclusions	Patients whose first outpatient visit is more than two months after discharge from hospital.
Denominator Exceptions	None
Definitions/Notes	**1. Initial inpatient hospital discharge** refers to the time the patient was discharged with a primary diagnosis of Kawasaki disease.
Measurement Period	Quarterly
Sources of Data	Pediatric cardiologists' outpatient medical record
Attribution	Pediatric Cardiologists seeing patients for first outpatient visit after diagnosis and treatment of KD
Care Setting	Outpatient

Rationale

Patients with KD who have persistent or recurrent fever after IVIG are at increased risk for developing coronary changes/aneurysms, and should be identified for re-evaluation and re-treatment.

Clinical Recommendation(s)

ACC/AHA guidelines

"Failure to respond usually is defined as persistent of recrudescent fever ≥ 36 hours after completion of the initial IVIG infusion. Most experts recommend retreatment with IVIG, 2 g/kg"

Newburger JW, Takahashi M, Gerber MA, Gewitz MH, Tani LY, Burns JC, Shulman ST, Bolger AF, Ferrieri P, Baltimore RS, Wilson WR, Baddour LM, Levison ME, Pallasch TJ, Falace DA, Taubert KA. Diagnosis, treatment, and long-term management of Kawasaki disease: a statement for health professionals from the Committee on Rheumatic Fever, Endocarditis and Kawasaki Disease, Council on Cardiovascular Disease in the Young, American Heart Association. *Circulation*. 2004 Oct 26;110(17):2747-71.

Other guidelines:

Japanese Circulation Society Guidelines

"It is important to treat patients not responding to initial IVIG therapy, who will count for about 15% of children with Kawasaki disease"

JCS Joint Working Group. Guidelines for diagnosis and management of cardiovascular sequelae in Kawasaki disease (JCS 2008). *Circ J.* 2010 Sep;74(9):1989-2020.

Challenges to Implementation
This metric assesses the cardiologists' concern for this important issue of recurrent fever, not whether the inpatient team appropriately counseled the parents, or whether the parents followed instructions. Therefore, there should be no significant challenges.

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Metric #: 016
Effective: 5.11.2016

Appropriate Care (No Therapy or Restrictions)	
Measure Description: Proportion of Kawasaki Disease (KD) patients with documentation to not restrict physical activities.	
Numerator	Number of patients with documentation to not restrict physical activities during the measurement period or 3 years prior to the outpatient clinic visit[1].
Denominator	Number of KD patients, 6-18 years, who had an outpatient pediatric clinic visit[1] during the measurement period.
Denominator Exclusions	• Patients who are unable to do any physical activity or sports for other reasons • Patients with a history of aneurysm (any time in medical history) • Patients with a KD diagnosis < 6 weeks from outpatient visit date
Denominator Exceptions	None
Definitions/Notes	1. **Clinic Visit:** If the patient has had multiple visits during the measurement period, use the most recent visit (i.e. last visit in the measurement period).
Measurement Period	Quarterly
Sources of Data	Pediatric cardiologists' outpatient medical record
Attribution	This measure should be reported by the pediatric cardiologist evaluating the patient during or after the post-6 week follow-up appointment.
Care Setting	Outpatient

Rationale

KD patients should have no restrictions on physical activities after 6 weeks post KD diagnosis based on the risk stratification categories listed below.

Clinical Recommendation(s)

AAP/AHA guidelines

Risk Level I—Patients with no coronary artery changes on echocardiography at any stage of the illness

- No antiplatelet therapy is needed beyond the initial 6 to 8 weeks after the onset of illness.
- No restriction of physical activity is necessary after 6 to 8 weeks.
- Because the degree of future risk for ischemic heart disease in this category of patients is still undetermined, periodic assessment and counseling about known cardiovascular risk factors every 5 years is suggested.
- Coronary angiography is not recommended.

Risk Level II—Patients with transient coronary artery ectasia or dilatation (disappearing within the initial 6 to 8 weeks after the onset of illness)

- No antiplatelet therapy is needed beyond the initial 6 to 8 weeks after the onset of illness.
- No restriction of physical activity is necessary after 6 to 8 weeks.
- Risk assessment and counseling is recommended at 3- to 5-year intervals.
- Coronary angiography is not recommended.

Newburger JW, Takahashi M, Gerber MA, Gewitz MH, Tani LY, Burns JC, Shulman ST, Bolger AF, Ferrieri P, Baltimore RS, Wilson WR, Baddour LM, Levison ME, Pallasch TJ, Falace DA, Taubert KA. Diagnosis, treatment, and long-term management of Kawasaki disease: a statement for health professionals from the Committee on Rheumatic Fever, Endocarditis and Kawasaki Disease, Council on Cardiovascular Disease in the Young, American Heart Association. Circulation. 2004 Oct 26;110(17):2747-71

Challenges to Implementation

Patients lost to follow-up.

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Metric #: 017
Effective: 10.9.2015

Stress Evaluation with Aneurysms	
Measure Description: Proportion of Kawasaki Disease (KD) patients, ages ≥ 10 years, with persistent coronary aneurysms who have a stress test to guide recommendations for exercise participation.	
Numerator	Number of patients who received or had a recommendation for stress testing[1] within 30 months of the most recent visit[2] for small aneurysms[3] or within 18 months for giant aneurysms[4].
Denominator	Number of KD patients, ≥ 10 years old, with persistent coronary aneurysms[5] and who had an outpatient office visit[2] during the measurement period.
Denominator Exclusions	Patients who decline the stress testing.
Denominator Exceptions	None
Definitions/Notes	1. **Stress testing** includes either myocardial perfusion imaging or stress-echocardiography. 2. **Clinic Visit:** If the patient has had multiple visits during the measurement period, use the most recent visit (i.e. last visit in the measurement period). **3. Small Coronary Aneurysms (CAA):** Z scores are >2.5 to <5. 4. **Giant Coronary Artery Aneurysms (CAA):** Z scores are >10 or maximum dimension is > 8 mm. **5. Persistent Coronary Artery Aneurysms (CAA):** is a coronary segment that has not returned to normal internal lumen diameter or morphology
Measurement Period	Quarterly
Sources of Data	Pediatric cardiologists' outpatient medical record
Attribution	Pediatric cardiologists
Care Setting	Outpatient
Rationale	
Coronary artery stenosis and thrombotic occlusion may develop in patients with coronary artery aneurysms, placing them at risk for myocardial ischemia or infarction.	
Clinical Recommendation(s)	
AHA/AAP Guidelines "Stress tests with myocardial perfusion evaluation may be useful in the second decade to guide recommendations for physical activity. In patients with isolated (solitary) small to medium (3-6 mm , or z score between 3 and 7) coronary artery aneurysm ≥1 coronary artery, stress tests with myocardial perfusion imaging is recommended every 2 years in patients >10 years old. In patients with ≥1 large coronary artery aneurysm (>6 mm), including giant aneurysms, and patients in whom a coronary artery contains multiple (segmented) or complex aneurysms with or without obstruction recommendations about physical activity should be guided by annual stress tests with myocardial perfusion evaluation".	

1. Newburger JW, Takahashi M, Gerber MA, Gewitz MH, Tani LY, Burns JC, Shulman ST, Bolger AF, Ferrieri P, Baltimore RS, Wilson WR, Baddour LM, Levison ME, Pallasch TJ, Falace DA, Taubert KA. Diagnosis, treatment, and long-term management of Kawasaki disease: a statement for health professionals from the Committee on Rheumatic Fever, Endocarditis and Kawasaki Disease, Council on Cardiovascular Disease in the Young, American Heart Association. Circulation. 2004 Oct 26;110(17):2747-71.
2. 36th Bethesda Conference. Task Force 2: Thomas P. Graham, MD; David J. Driscoll, MD; Welton M. Gersony, MD; Jane W. Newburger, MD, MPH; Albert Rocchini, MD; Jeffrey A. Towbin, MD *J Am Coll Cardiol.* 2005;45(8):1326-1333

Challenges to Implementation

Availability of these techniques may be limited, and interpretation of data is variable

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Metric #: 018
Effective: 10.9.2015

Appropriate Follow-up for Patients with Giant Coronary Aneurysms	
Measure Description: Proportion of Kawasaki Disease (KD) patients with a history of giant coronary artery aneurysms who have documentation of being educated regarding symptoms of angina and myocardial infarction.	
Numerator	Number of patients with documentation of being educated regarding symptoms of angina and MI within the last 3 years from the clinic visit[1].
Denominator	Number of KD patients, ≤ 18 years old, with current giant coronary artery aneurysms[2] and who had outpatient clinic visit[1] during the measurement period.
Denominator Exclusions	None
Denominator Exceptions	None
Definitions/Notes	1. **Clinic Visit:** If the patient has had multiple visits during the measurement period, use the most recent visit (i.e. last visit in the measurement period). 2. **Giant Coronary Artery Aneurysms** (CAA): Z scores are >10 or maximum dimension is > 8 mm.
Measurement Period	Quarterly
Sources of Data	Pediatric cardiologists' outpatient medical record
Attribution	This measure should be reported by pediatric cardiologists caring for patients with Kawasaki Disease.
Care Setting	Outpatient

Rationale

Patients with a history of giant coronary aneurysms have a substantial risk of myocardial ischemia/infraction. Rapid recognition of symptoms may result in improved outcomes of patients presenting with myocardial infarction related to their previous Kawasaki disease.

Suda K, Iemura M, Nishiono H, Teramachi Y, Koteda Y, Kishimoto S, et al. Long-Term Prognosis of Patients with Kawasaki Disease Complicated by Giant Coronary Aneurysms : A Single-Institution Experience. Circulation. 2011;123:1836-1842.

Clinical Recommendation(s)

ACC/AHA guidelines

Guidelines currently under revision.

Other guidelines:

"Patients should also be educated regarding the signs and symptoms of myocardial ischemia and actions to take if they are observed."

The Japanese Circulation Society. Guidelines for the Diagnosis and Management of Cardiovascular Sequelae in Kawasaki Disease (JCS 2008).

Challenges to Implementation
Lack of adequate medical record documentation or appropriate follow-up.

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Complete Echocardiogram Evaluation	
Measure Description: Proportion of echocardiograms for Kawasaki Disease (KD) patients that include documentation of coronary artery measurements.	
Numerator	Number of echocardiograms with documentation of coronary artery measurements[1].
Denominator	Number of echocardiograms during the measurement period for KD patients, ≤ 18 years old.
Denominator Exclusions	Patients with Kawasaki disease whose coronary arteries cannot be imaged well enough for measurement (eg. due to body habitus or poor echo windows outside the control of the echocardiographer.)
Denominator Exceptions	None
Definitions/Notes	1. Measurements should include, at a minimum, the left anterior descending coronary artery (LAD) and right coronary artery (RCA). *(See clinical recommendation section below)*
Measurement Period	Quarterly
Sources of Data	Pediatric cardiologists' outpatient medical record and echocardiography reports
Attribution	This measure should be reported by the pediatric cardiologist interpreting the echocardiogram at the time of initial diagnosis.
Care Setting	Outpatient

Rationale

Initial study at time of diagnosis should be complete and contain accurate and reproducible measurements as described below. In order to maintain consistency in terms of diagnosis and risk stratification, coronary artery measurements should be made from standard views and measurements should be normalized for patients' body surface area (using z-score calculations).

Clinical Recommendation(s)

ACC/AHA guidelines

In addition to standard imaging from parasternal, apical, subcostal and suprasternal notch windows, 2DE of patients with suspected Kawasaki disease should focus on imaging the left main coronary artery (LMCA), left anterior descending coronary artery (LAD), left circumflex coronary artery (LCX), right coronary artery (RCA) and posterior descending coronary arteries. If possible, multiple imaging planes should be used to visualize each of the coronary artery segments (as described below). In addition to detailed imaging of the coronary arteries, assessment of LV dimensions and LV function should be a part of all echocardiograms (standard M-mode tracings) and mention should be made of any regional wall motion abnormalities. The aortic root should be imaged, measured and compared with z-score references for BSA as mild aortic root dilation may be common in patients with Kawasaki disease. Standard views and interrogation for any valvular regurgitation and any evidence of pericardial effusion should be performed.

Echocardiographic Views of Coronary Arteries in Patients With Kawasaki Disease
Left main coronary artery: parasternal short axis at level of aortic valve; parasternal long axis of left ventricle; subcostal left ventricular long axis
Left anterior descending coronary artery: parasternal short axis at level of aortic valve; parasternal superior tangential long axis of left ventricle; parasternal short axis of left ventricle
Left circumflex: parasternal short axis at level of aortic valve; apical 4-chamber
Right coronary artery, proximal segment: parasternal short axis at level of aortic valve; parasternal long axis (inferior tangential) of left ventricle; subcostal coronal projection of right ventricular outflow tract; subcostal short axis at level of atrioventricular groove
Right coronary artery, middle segment: parasternal long axis of left ventricle (inferior tangential); apical 4-chamber; subcostal left ventricular long axis; subcostal short axis at level of atrioventricular groove
Right coronary artery, distal segment: Apical 4-chamber; subcostal atrial long axis
Posterior descending coronary artery: Apical 4-chamber (inferior); subcostal atrial long axis (inferior); parasternal long axis (inferior tangential) imaging posterior interventricular groove

Quantification of the coronary artery dimensions:
Measurements of the internal diameters of the coronary arteries should be made from inner edge to inner edge and should exclude points of branching which may have normal focal dilation. For the LMCA, proximal LAD, and proximal RCA, these measurements should be reported with z-scores (as defined below). The remaining segments may be measured and can be described as aneurysmal dilation if they measured "1.5 times that of the surrounding segment." Aneurysms should be further classified as small (< 5 mm internal diameter), medium (5-8 mm internal diameter), or giant (> 8 mm internal diameter). In addition, mention should be made of the lack of normal tapering and/or perivascular echogenicity or brightness.

Z-score measurements are based on nonlinear regression equations derived from a normal, nonfebrile population between the ages of 0-18 years (Boston Children's Hospital from 1987-2000).

$LMCA = 0.31747 \cdot (BSA^{0.36008}) - 0.02887, SD=0.03040 + (0.01514 \cdot BSA)$

$pLAD = 0.26108 \cdot (BSA^{0.37893}) - 0.02852, SD=0.01465 + (0.01996 \cdot BSA)$

$pRCA = 0.26117 \cdot (BSA^{0.39992}) - 0.02756, SD=0.02407 + (0.01597 \cdot BSA)$

Newburger JW, Takahashi M, Gerber MA, Gewitz MH, Tani LY, Burns JC, Shulman ST, Bolger AF, Ferrieri P, Baltimore RS, Wilson WR, Baddour LM, Levison ME, Pallasch TJ, Falace DA, Taubert KA. Diagnosis, treatment, and long-term management of Kawasaki disease: a statement for health professionals from the Committee on Rheumatic Fever, Endocarditis and Kawasaki Disease, Council on Cardiovascular Disease in the Young, American Heart Association. Circulation. 2004 Oct 26;110(17):2747-71.

Other guidelines:
Wyman W. Lai, MD, MPH, FASE, Tal Geva, MD, FASE, Girish S. Shirali, MD, Peter C. Frommelt, MD, Richard A. Humes, MD, FASE, Michael M. Brook, MD, Ricardo H. Pignatelli, MD, and Jack Rychik, MD. Guidelines and Standards for Performance of a Pediatric Echocardiogram: A Report from the Task Force of the Pediatric Council of the American Society of Echocardiography. J American Society of Echocardiography 2006; 19:1413-1430.

Challenges to Implementation

No electronic medical records or electronic echocardiographic reports.

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Metric #: 020
Effective: 06.01.2016

Genetic Testing in Tetralogy of Fallot Patients	
Measure Description: Proportion of Tetralogy of Fallot (ToF) patients who received a test for 22q11.2 deletion.	
Numerator	Number of ToF patients who received or had an order for 22q11.2 deletion testing any time in their medical history.
Denominator	Number of patients, ≤ 18 years old, with ToF who had a visit during the measurement period.
Denominator Exclusions	• Patient or parent refusal • Patients with repaired TOF with A-V canal, Pulmonary Atresia/MAPCAS or TOF with absent valve. • Other known genetic diagnoses
Denominator Exceptions	None
Definitions/Notes	None
Measurement Period	Quarterly
Sources of Data	Medical Record
Attribution	This measure should be reported by qualified providers with experience and expertise in this modality
Care Setting	Outpatient

Rationale

These measures are meant to be applied to all patients with a 'typical' tetralogy of Fallot repair and may not be suitable for those smaller groups with more complex subtypes. Repaired TOF patients with A-V canal, Pulmonary Atresia/MAPCAS or TOF with absent valve will be excluded. Those with major underlying genetic disorders (e.g. Trisomy 21, 13, 18; known 22q11 deficiency) will also be excluded from this set of measures.

Patients with TOF can have significant associated genetic syndromes or chromosomal anomalies in up to 25% of cases, including trisomies 21, 18 and 13, Alagille syndrome and others. Up to 15% of cases of ToF have 22q ll.2 deletion (including 6% in those with normal aortic arch and branching). This testing is important as it can have implications on the management of the patient as well as on the counseling of the family.

Clinical Recommendation(s)

ACC/AHA Guidelines

1. Wamcs CA, Williams RG, Bashore TM, Child JS, Connolly HM, Dearani JA, del Nido P, Fasulcs JW, Graham TP, J r., l lijazi ZM, Hunt SA, King ME, Landzberg MJ, Miner PD, Radford MJ, Walsh EP, Webb GO, Smith SC, Jr., Jacobs AK, Adams CD, Anderson JL, Antman EM, Buller CE, Creager MA, Ettinger SM, Halperin JL, Krumholz liM, Kushner FG, Lytle BW, Nishimura RA, Page RL, Riegel B, Tarkington LG, Yancy CW. Ace/aha 2008 guidelines for the management of adults with congenital heart disease: A report of the American College of Cardiology/American Heart Association task force on practice guidelines (writing committee to develop guidelines on the management of adults with congenital heart disease). Developed in collaboration with the American Society of Echocardiography, Heart Rhythm Society, International Society for Adult Congenital Heart

Disease, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons. Journal of the American College of Cardiology. 2008;52:c1 43-263

Other guidelines:

1. Pierpont MEet al. Genetics of congenital Heart defects: current knowledge: a scientific statement from the American Heart Association, council on Cardiovascular Disease in the Young. Circulation 2007; 11 5:3015-38.
2. Silversidcs CK, Kiess M, Beauchesne L, Bradley T, Connell y M, Niwa K, Mulder B, Therrien J. Canadian Cardiovascular Society 2009 Consensus Conference on the management of adults with congenital heart disease: outflow tract obstruction, coarctation of the aorta, tetralogy of Fallot, Ebstein anomaly and Marfan'ssyndrome. Qill.1 2010 Mar;26(3):e80-97.
3. Mom ma K, Takao A, Matsuoka R, et al. Tetralogy of Fallot associated with chromosome 22q11 .2 deletion in adolescents and young adults. Genet Mcd. 2001; 3:56-60.
4. Fahed ACet al. Genetics of congenital heart disease: the glass half empty. Circ Res 201 3; 11 2:707-20.
5. Amati F, MariA, Digilio MC, Mingarelli R, Marino 13, Giannotti A, Novelli G, Dallapiccola B. 22q l l deletions in isolated and syndromic patients with tetralogy of Fallot. /hun Genet. 1995; 95:479-482.
6. Goldmuntz E, Clark BJ, Mitchel LE et al. Frequency of22g II deletions in patients with conotruncal defects. J ACC 1998; 32:492-498

Challenges to Implementation

Data collection, submission and database management costs

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Metric #: 021
Effective: 06.01.2016

Echocardiogram performed as an outpatient during the first year of life for ASO patients

Measure Description: Proportion of Arterial Switch Operation (ASO) patients, 3-12 months, with at least one echocardiogram that reports on left ventricular function, aortic root dimensions, the degree of aortic regurgitation, the patency of the systemic and pulmonary outflow tracts, the branch pulmonary arteries, and the coronary arteries.

Numerator	Number of patients who had at least one echocardiogram between 3-12 months that reports on left ventricular function, aortic root dimensions, the degree of aortic regurgitation, the patency of the systemic and pulmonary outflow tracts, the branch pulmonary arteries, and the coronary arteries. ***Note:*** *Echocardiogram must report on ALL the above elements to meet the numerator criteria.*
Denominator	Number of ASO patients, 12-36 months old, who had at least one outpatient cardiology clinic visit during the measurement period.
Denominator Exclusions	Patients/parents who refuse the test.
Denominator Exceptions	None
Definitions/Notes	None
Measurement Period	Quarterly
Sources of Data	Medical Record, or echocardiographic archiving system.
Attribution	This measure should be reported by the departmental quality manager.
Care Setting	Outpatient

Rationale

Patients after ASO are at risk of myocardial dysfunction, aneurysm of the ascending aorta, aortic regurgitation, systemic and pulmonary outflow obstruction and branch pulmonary arterial stenosis.

1. Schwartz ML, Gauvreau K, del Nido P, Mayer JE, Colan SD. Long-term predictors of aortic root dilation and aortic regurgitation after arterial switch operation. Circulation. 2004;110(11 Suppl 1):II128-32.
2. Massin MM, Nitsch GB, Däbritz S, Seghaye MC, Messmer BJ, von Bernuth G. Growth of pulmonary artery after arterial switch operation for simple transposition of the great arteries. Eur J Pediatr. 1998 Feb;157(2):95-100.
3. Losay J, Touchot A, Capderou A, Piot JD, Belli E, Planché C, Serraf A. Aortic valve regurgitation after arterial switch operation for transposition of the great arteries: incidence, risk factors, and outcome. J Am Coll Cardiol. 2006;47(10):2057-62.
4. Hutter PA, Thomeer BJ, Jansen P, Hitchcock JF, Faber JA, Meijboom EJ, Bennink GB. Fate of the aortic root after arterial switch operation. Eur J Cardiothorac Surg. 2001;20(1):82-8.
5. Khairy P, Clair M, Fernandes SM, Blume ED, Powell AJ, Newburger JW, Landzberg MJ, Mayer JE Jr. Cardiovascular outcomes after the arterial switch operation for D-transposition of the great arteries. Circulation.2013;127(3):331-9.

Clinical Recommendation(s)
ACC/AHA Guidelines N/A Other guidelines: N/A
Challenges to Implementation
It may not be possible to obtain all of the information in all patients, for these, comments should be made that attempts had been undertaken to obtain all of the information.

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Metric #: 022
Effective: 06.01.2016

Periodic neurodevelopmental assessment for ASO patients

Measure Description: Proportion of Arterial Switch Operation (ASO) patients, 2-5 years old, who were recommended to have a neurodevelopmental evaluation.

Numerator	Number of patients with at least one documented recommendation for a neurodevelopmental evaluation in their medical chart between the ages of 2-5 years old.
Denominator	Number of ASO patients, ages 5-9 years, who have had at least one outpatient cardiology clinic visit during the measurement period
Denominator Exclusions	None
Denominator Exceptions	None
Definitions/Notes	N/A
Measurement Period	Quarterly
Sources of Data	Medical Record
Attribution	This measure should be reported by the departmental quality manager.
Care Setting	Outpatient

Rationale

Patients after ASO are at high risk of neurodevelopmental disorder.

1. Hövels-Gürich HH, Seghaye MC, Schnitker R, Wiesner M, Huber W, Minkenberg R, Kotlarek F, Messmer BJ, Von Bernuth G. Long-term neurodevelopmental outcomes in school-aged children after neonatal arterial switch operation. J Thorac Cardiovasc Surg. 2002 Sep;124(3):448-58.
2. Marino BS, Lipkin PH, Newburger JW, Peacock G, Gerdes M, Gaynor JW, Mussatto KA, Uzark K, Goldberg CS, Johnson WH Jr, Li J, Smith SE, Bellinger DC, Mahle WT; American Heart Association Congenital Heart Defects Committee, Council on Cardiovascular Disease in the Young, Council on Cardiovascular Nursing, and Stroke Council. Neurodevelopmental outcomes in children with congenital heart disease: evaluation and management: a scientific statement from the American Heart Association. Circulation. 2012 Aug 28;126(9):1143-72.

Clinical Recommendation(s)

ACC/AHA Guidelines

Children with CHD are at increased risk of developmental disorder or disabilities or developmental delay.

Periodic developmental surveillance, screening, evaluation, and reevaluation throughout childhood may enhance identification of significant deficits, allowing for appropriate therapies and education to enhance later academic, behavioral, psychosocial, and adaptive functioning. (Marino BS et al.)

Other guidelines: N/A

Challenges to Implementation
None

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Metric #: 023
Effective: 06.01.2016

Assessment of ASO patient lipid profile

Measure Description: Proportion of Arterial Switch Operation (ASO) patients, with documentation of a fasting lipid profile by age 11

Numerator	Number of patients with at least one documented fasting lipid profile between the ages of 2 and 11 years.
Denominator	Number of ASO patients, ages 11-15 years, who had an outpatient cardiology clinic visit during the measurement period.
Denominator Exclusions	Patients who refused the lipid profile.
Denominator Exceptions	None
Definitions/Notes	None
Measurement Period	Quarterly
Sources of Data	Medical Record
Attribution	This measure should be reported by the departmental quality manager.
Care Setting	Outpatient

Rationale

Patients after ASO are at high risk of acquired cardiovascular disease.

1. Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents; National Heart, Lung, and Blood Institute. Expert panel on integrated guidelines for cardiovascular health and risk reduction in children and adolescents: summary report. Pediatrics. 2011 Dec;128 Suppl 5:S213-56.
2. Pasquali SK, Marino BS, Powell DJ, McBride MG, Paridon SM, Meyers KE, Mohler ER, Walker SA, Kren S, Cohen MS. Following the arterial switch operation, obese children have risk factors for early cardiovascular disease. Congenit Heart Dis. 2010 Jan-Feb;5(1):16-24.

Clinical Recommendation(s)

ACC/AHA Guidelines

Other guidelines: Expert Panel on Integrated Guidelines for Cardiovascular Health… Pediatrics Dec 2011

9 to 11 years	**Universal Screening** Non-FLP: **Calculate non-HDL Cholesterol:** **Non-HDL cholesterol = TC – HDL cholesterol** If non-HDL ≥ 145 mg/dL ± HDL < 40 mg/dL[b]: Obtain FLP twice, average results OR FLP: If LDL cholesterol ≥ 130 mg/dL ± non-HDL cholesterol ≥ 145 mg/dL ± HDL cholesterol < 40 mg/dL ± triglycerides ≥ 100 mg/dL If < 10 y, ≥ 130 mg/dL if ≥ 10 y: Repeat FLP, average results	Grade B Strongly recommend

Challenges to Implementation
None

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Transition planning for ASO patients	
Measure Description: Proportion of Arterial Switch Operation (ASO) patients, ≥ 18 years old, with documentation of transition planning within 2 years.	
Numerator	Number of patients with at least one documented transition plan[1] in their medical record in the past 2 years from the clinic visit.
Denominator	Number of ASO patients, age ≥ 18 years, who had an outpatient pediatric cardiology clinic visit during the measurement period and were also seen at the clinic in the past 2 years from the visit.
Denominator Exclusions	None
Denominator Exceptions	None
Definitions/Notes	**1. Transition Plan**: should include documentation regarding their medical cardiac destination (i.e. indication of where the patient will receive their follow-up cardiac care) and ongoing insurance coverage (i.e. indication that the patient's payment options were explored)
Measurement Period	Quarterly
Sources of Data	Medical Record
Attribution	This measure should be reported by the departmental quality manager.
Care Setting	Outpatient

Rationale

Adults with CHD are often lost to follow-up and present with significant complications.

1. Reid GJ, Irvine MJ, McCrindle BW, Sananes R, Ritvo PG, Siu SC, Webb GD. Prevalence and correlates of successful transfer from pediatric to adult health care among a cohort of young adults with complex congenital heart defects. Pediatrics. 2004 Mar;113(3 Pt 1):e197-205.
2. Gurvitz M, Valente AM, Broberg C, Cook S, Stout K, Kay J, Ting J, Kuehl K, Earing M, Webb G, Houser L, Opotowsky A, Harmon A, Graham D, Khairy P, Gianola A, Verstappen A, Landzberg M; Alliance for Adult Research in Congenital Cardiology (AARCC). Prevalence and Predictors of Gaps in Care Among Adult Congenital Heart Disease Patients (The Health, Education and Access Research Trial: HEART-ACHD). J Am Coll Cardiol. 2013 (in press)
3. Sable C, Foster E, Uzark K, Bjornsen K, Canobbio MM, Connolly HM, Graham TP, Gurvitz MZ, Kovacs A, Meadows AK, Reid GJ, Reiss JG, Rosenbaum KN, Sagerman PJ, Saidi A, Schonberg R, Shah S, Tong E, Williams RG; American Heart Association Congenital Heart Defects Committee of the Council on Cardiovascular Disease in the Young Council on Cardiovascular Nursing, Council on Clinical Cardiology, and Council on Peripheral Vascular Disease. Best practices in managing transition to adulthood for adolescents with congenital heart disease: the transition process and medical and psychosocial issues: a scientific statement from the American Heart Association. Circulation. 2011 Apr 5;123(13):1454-85.

Clinical Recommendation(s)

ACC/AHA Guidelines

The pediatric cardiology provider should initiate and work together with the adolescent on a transition plan using a transition resource binder and/or health "passport" ***(Class I; Level of Evidence C). Sable et***

al. 2011.
Other guidelines: N/A
Challenges to Implementation
None
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