The Interventional Cardiology Fellowship Program at Brown is based at Rhode Island Hospital (RIH) with The Miriam Hospital (TMH) as a major participating site. The program is one year in duration and has approval to train four fellows. Each fellow has six rotations at RIH and six at TMH and two fellows will be at each site each month. A rotation schedule has been designed to optimize integration among the fellows and faculty at the two sites. The rotations at each site will include experience performing interventions in the Catheterization Laboratory and a half-day weekly outpatient experience in the subspecialty fields of Cardiovascular Disease and Interventional Cardiology. One half-day weekly is also protected from clinical responsibility to pursue scholarly activity. During rotations at RIH fellows will cover call from home every other week. During rotations at TMH fellows will cover call every other night and weekend. Including the daytime schedule and call, fellows will work no more than 80 hours in a given week. The overview provided here applies to each rotation at RIH/TMH although there is an expectation that clinical and technical skills will progress with each rotation experience.
but not limited to balloon angioplasty, atherectomy, intracoronary ultrasound and deployment of intracoronary stents. Trainees will also work towards obtaining competency in non-coronary cardiac and peripheral interventions. Heavy emphasis is placed on both pre- and post-operative evaluation and management. Also, each fellow is expected to participate in scholarly activity.

**Objectives:** During the one year interventional fellowship trainees are expected to achieve competency in the following areas.

I. **Patient Care**

1. **Fellows will demonstrate competence in the prevention, evaluation and management of both inpatients and outpatients with the following disorders:** a) chronic ischemic heart disease; b) acute ischemic syndromes; c) valvular and structural heart disease; d) bleeding disorders or complications associated with percutaneous intervention or drugs; e) use and limitations of intra-aortic balloon counterpulsation (IABP) and other hemodynamic support devices (as available); f) consultation and informed consent; g) care of patients in the cardiac care unit and emergency department; h) care of the patient before and after interventional procedures; i) outpatient follow-up of patients treated with drugs, interventions, devices, or surgery; j) use of antiarrhythmic drugs, including knowledge of pharmacokinetics and pharmacodynamics related to acute ischemic events occurring during and after interventional cardiac procedures; k) use of thrombolytic and antithrombolytic, antiplatelet, and antithrombin agents; and l) use of vasoactive agents for epicardial and microvascular spasm.

2. **Fellows will demonstrate competence in the performance of the following technical skills:**
   - a) coronary arteriograms; b) ventriculography; c) hemodynamic measurements; d) intravascular ultrasound; e) intracoronary pressure measurement coronary and fractional flow reserve; f) coronary interventions (i) Femoral and brachial/radial cannulation of normal and abnormally located coronary ostia; and (ii) Application and usage of balloon angioplasty, stents, and other commonly used interventional devices. g) Management of mechanical complications of percutaneous intervention, including but not limited to: (i) coronary dissection; (ii) thrombosis; (iv) perforation; (v) "slow reflow"; (vi) cardiogenic shock; (vii) left main trunk dissection; (viii) cardiac tamponade including pericardiocentesis; (ix) peripheral vessel occlusion, and retained components; and (x) pseudoaneurysm

II. **Medical Knowledge**

Fellows will acquire knowledge of the following content areas: 1. the role of platelets and the clotting cascade in response to vascular injury; 2. pathophysiology of restenosis; 3. the role and limitations of established and emerging therapy for treatment of restenosis; 4. physiology of coronary flow and detection of flow-limiting conditions; 5. detailed coronary anatomy; 6. radiation physics, biology, and safety related to the use of x-ray imaging equipment; 7. the role of randomized clinical trials and registry experiences in clinical decision-making; 8. the clinical importance of complete versus incomplete revascularization in a wide variety of clinical and anatomic situations; 9. strengths and limitations, both short- and long-term, of percutaneous versus surgical and medical therapy for a wide variety of clinical and anatomic situations related to cardiovascular disease; 10. strengths and limitations, both short- and long-term of differing percutaneous approaches for a wide variety of anatomic situations related to cardiovascular disease; 11. the role of emergency coronary bypass surgery in the management of complications of percutaneous intervention; 12. strengths and weaknesses of mechanical versus lytic approach for patients with acute myocardial infarction; 13. the use of pharmacologic agents appropriate in the postintervention management of patients; 14. strengths and limitations of both noninvasive and invasive coronary evaluation during the recovery phase after acute myocardial infarction; 15. understanding the clinical utility and limitations of the treatment of valvular and structural heart disease; and 16. the assessment of plaque composition and response to intervention.

III. **Interpersonal and Communication Skills**

Fellows will be able to:

1. Effectively communicate medical knowledge to supervisors, colleagues and other trainees in educational forum.
2. Effectively communicate as a member of an interdisciplinary team in the cardiac cath. Lab
3. Effectively communicate with consulting physicians
4. Provide appropriate informed consent to patients and families for elective and emergency procedures
5. Effectively communicate with patients and families regarding procedure outcomes and prognosis

IV. **Professionalism**

Fellows will be able to demonstrate a commitment to carrying out professional responsibilities, adherence to
ethical principles and sensitivity to a diverse patient population.

V. Practice based learning and improvement

Fellows will be able to conduct reviews of the medical literature on specific clinical topics, synthesize the relevant available information to address specific questions related to the topic and present this in a clear and concise fashion to supervisors, colleagues and other learners.

VI. Systems Based Practice

Fellows will be able to:

1. Make appropriate decisions regarding device selection acknowledging cost and individual patient healthcare system resources
2. Practice cost effective health care in use of procedural equipment

IV. TOPICS/TEACHING METHODS/MATERIALS USED DURING THIS ROTATION

Specific topics to be covered during this rotation: The content of the interventional fellowship program is detailed above under program objectives and it is expected that fellows will gain clinical experience, technical skills, participate in scholarly activity and receive formal instruction during each rotation. The rotation format remains constant throughout the one year fellowship but the level of supervision will decrease and expectations will increase as the fellows’ clinical and technical proficiency improves. There is no set timeline for achievement of proficiency in specific interventional procedures, however, proficiency in diagnostic procedures including coronary angiography, ventriculography, and right heart catheterization is expected in the by the completion of the second rotation. Invasive diagnostic modalities including intravascular ultrasound and coronary pressure measurement (FFR), placement of intra-aortic balloon pumps and temporary transvenous pacemakers should be mastered within 6 months. Proficiency in coronary interventions requires a minimum of 250 coronary interventions (a single coronary intervention being defined as all coronary interventions performed during one hospitalization) and for specific PCI devices (atherectomy, thrombectomy, etc) we will use volume standards if available and base decisions on the consensus of the faculty.

Principal teaching methods (see Section IX):

Clinical teaching (A)
Clinical experiences (B)
Performance feedback
   Monthly evaluations (C1)
   Semiannual evaluation (C2)
Conferences (D)

Educational materials provided/recommended to the fellow: A variety of text and electronic media are available in the cardiology fellow’s room as well as in the cath lab cine room. Specific reference texts suggested for this rotation are:
Cardiac Catherization and Interventional Cardiology Self-Assessment Program (CathSAP3)

V. EVALUATIONS

A. Evaluation of the fellow’s successful completion of the above goals will be carried out by the attending physicians, with additional input from additional members of the cardiac cath lab team (see section IX). Assessment methods may include:
   Clinical performance ratings (1)
B. Fellows will evaluate the rotation annually.

VI. RESPONSIBILITY OF ATTENDING ON ROTATION

The interventional attending will be responsible for the final interpretation of all studies and management decisions including the indication and appropriateness of coronary and non-coronary interventions performed in the cardiac catheterization lab. The attending will review each patient’s data, images, interventional equipment and techniques performed that day with the interventional fellow. Educational points of each case will be reviewed with an emphasis on technical aspects of interventional procedures and evidence-based medicine regarding indications for intervention, device choice, and adjunctive pharmacology. The attending will supervise the fellow in all technical aspects of cardiac catheterization and intervention and in the completion of medical records including the cath report. The attending will allow the fellow an increasing role in the care of the patient and technical aspects of interventions as warranted by demonstration of progression of skills each rotation.

VII. RESPONSIBILITY OF INTERVENTIONAL FELLOW ON ROTATION

The interventional fellows are expected to play a major role in the operation of the cath lab including consistent coverage during daytime hours and call responsibilities, coordination of efforts between the physician assistant, general and interventional fellows, and comprehensive patient care from the time of procedural scheduling through hospital discharge. The fellow will be responsible for the four major aspects of the procedure as follows:

1. Pre-cath evaluations-Once a patient is scheduled for a diagnostic or interventional procedure in the cath lab a pre-procedural evaluation should be performed. For inpatients this should be done on the day prior to the procedure when possible. This includes:
   a. A complete history, review of allergies, review of bleeding history and scheduled non-cardiac procedures, thorough physical examination including vascular exam, review of medications including antiplatelet and anti-thrombin therapy, review of pre-test laboratories, non-invasive testing, and prior cardiac catheterizations. Every effort should be made to obtain prior cardiac surgery operative reports and view prior angiograms.
   b. Pre-cath management for patients with contrast allergy, high risk for contrast nephropathy, anticoagulated with coumadin, and other conditions requiring special attention including but not limited to difficult vascular access and hematologic disorders such as heparin-induced thrombocytopenia.
   c. Explain the risks, benefits, and alternatives to the procedure and obtain informed consent.
   d. Participate in screening patients for clinical trials enrolling in the cardiac cath lab. The fellow is expected to complete Lifespan research training requirements during the first rotation of the year.

2. Procedure performance-The day of the procedure the fellow should communicate to the staff the planned access site and any special circumstances of the procedure. The fellow is expected to:
   a. Perform the diagnostic procedure as primary operator under the supervision of the attending including vascular access, angiography of normal and variant coronary arteries, graft angiography, right heart catheterization and non-coronary interventions. As deemed appropriate by the attending based on demonstration of skills, the interventional fellow may act as the secondary operator overseeing the general cardiology fellow in diagnostic cases.
   b. Perform percutaneous coronary and non-coronary interventions under the supervision of the attending including equipment and device selection, selection of adjunctive pharmacology, technical aspects including guide catheter, guidewire, and device manipulation, and decisions regarding access site management and hemostasis technique. The fellow will be given progressively more responsibility each rotation as his/her skill progress in order to obtain
competency as a primary operator in interventional procedures.

c. Review the hemodynamic and angiographic findings, interventional techniques, and device selection with the attending cardiologist following the procedure.

3. Post-cath assessment- The fellow should follow all patients undergoing interventional procedures until hospital discharge in order to assess the clinical response to interventions, monitor the arterial and venous puncture sites for complications, and participate in the treatment of cardiac cath and access complications. The fellow on call is responsible for evaluating patients off-hours. The fellow that is not on call should sign out his/her patients to the on-call fellow.

4. Reporting and conferences- The fellow will complete the procedural report in a timely fashion accurately reflecting the diagnostic findings and interventional procedures and outcome. The fellow is expected to document in the patients’ chart when care is provided such as sheath removal, or if there has been a change in the patients’ status or treatment plan. The interventional fellow will prepare clinical cases for presentation at the weekly peripheral vascular and cardiac catheterization conferences. Procedures should be entered into the electronic procedure log and include the following information: supervising attending, procedure performed (stent, atherectomy, IVUS, etc), procedural results, and complications.

VIII. CONFERENCE AND CLINIC SCHEDULE SPECIFIC TO THIS ROTATION

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<th>Monday</th>
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<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
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<tbody>
<tr>
<td>AM</td>
<td>Vascular conference (weekly)</td>
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<td>Intervventional Didactic conference (weekly)</td>
<td>Cardiology Division Conference (weekly)</td>
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<td>PM</td>
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<td>Clinical Cath conference (weekly)</td>
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<td>PM</td>
<td>Intervventional Research Conference (monthly)</td>
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<td>Cardiology Division Research Conference (monthly) Journal Club (monthly)</td>
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IX. CORE COMPETENCY CURRICULUM

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<thead>
<tr>
<th>Competency Category</th>
<th>Specific Goals</th>
<th>Cath Lab (RIH, TMH)</th>
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<tbody>
<tr>
<td>Medical Knowledge</td>
<td>Demonstration of investigatory and analytical thinking relevant to interventional cardiology</td>
<td>A,B,C,D -- 1,2,4</td>
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<td></td>
<td>Acquisition the appropriate background relevant to interventional cardiology</td>
<td>B,C -- 1,2,4</td>
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<tr>
<td>Patient Care</td>
<td>Knowledge of the appropriate indications for diagnostic and therapeutic cardiology procedures</td>
<td>A,B -- 1,2</td>
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<tr>
<td>Practice-Based</td>
<td>Procedural/Technical Skills (Progression/competency)</td>
<td>A,B,C -- 1,2,4,5</td>
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<tr>
<td>Learning &amp;</td>
<td>Demonstration of self-critical thinking and motivation to improve</td>
<td>B,C -- 1,2,4</td>
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<tr>
<td>Improvement</td>
<td>Commitment to professional responsibilities, development and ethics</td>
<td>B,C -- 1,2,34</td>
</tr>
<tr>
<td>Professionalism</td>
<td>Commitment to developing effective relationships with referring clinicians, hospital services, and colleagues</td>
<td>A,B,C -- 1,2,3</td>
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<tr>
<td>Interpersonal &amp;</td>
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<tr>
<td>Communication</td>
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