Echocardiography Simulator : Integrating Transesophageal Echocardiography into the Resident Curriculum

Ruma R. Bose, M.D.; Robina Matyal, M.D.; John Mitchell, M.D.; Feroze Mahmood, M.D.; Heather Ballard, M.D.
Beth Israel Deaconess Medical Center

Background: Transesophageal echocardiography (TEE) is a valuable tool for diagnosis and treatment of anatomical and functional abnormalities of the cardiovascular system. Its role in managing hemodynamically unstable patients has been well documented.

The prescribed TEE curriculum calls for an extensive year of training in intraoperative TEE combined with a cardiovascular fellowship . There is a pressing need for TEE instruction which can extend beyond the realm of the cardiac operating rooms

Needs Assessment: The performance of transesophageal echocardiography requires a certain level of psychomotor skill which comes with a steep learning curve. This can be challenging for a beginner in the pressured intraoperative setting to understand the basic TEE skills of image acquisition and structure identification. Moreover the training resources are available to a limited number of residents who are assigned to the cardiac operating rooms at a given time. These challenges motivated the development of a simulator based TEE curriculum

Curriculum Design: The goal of the echo curriculum is to teach the basic principles of echocardiographic image acquisition, anatomic correlation and probe manipulation using a simulator in a virtual setting free of the pressures and time constraints of the operating room.

The curriculum comprises of bimonthly didactic sessions lasting two hours each. It is available to all anesthesia residents regardless of prior experience in cardiac anesthesia.

Each session comprises of an audiovisual didactic lecture combined with an echo simulator session. The lecture focuses on cardiac anatomy and its echocardiography correlates .This is followed by a mentored session at the echo simulator where every resident practices probe manipulation and image acquisition.

Briefly, the simulator consists of a mannequin, a realistic TEE probe that can perform all the manipulations of a regular TEE probe and a computer with high-definition monitor. It was developed with the aim of teaching detailed cardiac anatomy and its echocardiographic correlates both in two dimension and three dimension. It is helpful in understanding the relationship of the TEE probe to heart and the corresponding image display which is one of the more challenging aspects during the earlier part of the training as an echocardiographer. An anatomically correct (surface and internal) three-dimensional (3D) model of a beating heart is used for the purpose of simulation. It has the capability of displaying intra-cardiac structures from multiple perspectives which are annotated with in-built text references.

The echo curriculum also includes a session of porcine heart dissection to better understand the anatomy and echocardiographic correlates. The final and most important element of the echocardiography curriculum is intraoperative TEE instruction which remains unchanged but the residents are better prepared to understand the more advanced concepts of echocardiography.

Conclusion: The application of TEE as a monitoring modality is gaining recognition and rapidly expanding into the field of non-cardiac surgery .Hence the need was felt to include basic echocardiography instruction into the resident curriculum. Factors like time and resources which precluded this in the past were overcome by the use of the echocardiography simulator . This made it possible for the residents to learn the basic tenets of echocardiography in a non pressured setting outside the operating room. The curriculum is still in its infancy and initial feedback is encouraging, more robust metrics are needed to measure its efficacy over time.

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TEE Probe Controls

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