Hiring a software engineer or PhD student requires understanding precisely what they know—the notions and tools they have appropriated as part of their basic professional toolset. Applying a standard curriculum requires a specification for each topic. Writing a textbook requires a way to guarantee that readers learn enough to make them confident that they can master the essentials.

Considering the goals of an educational program from such a pragmatic perspective suggests that we decompose its topics into atomic elements, for which this discussion proposes the name testable, reusable unit of cognition or Truc.

Advances in health information systems and healthcare technology offer a tremendous opportunity for improving the quality of our healthcare while reducing healthcare costs.

Although advances in stand-alone diagnostic and treatment systems have been accelerating steadily, the lack of proper integration and interoperation of those systems produces systemic inefficiencies in healthcare delivery. This inflates costs and contributes to avoidable medical errors that degrade patient care.

The use of software that controls medical devices to overcome these problems is inevitable and will help ensure safe advances in healthcare delivery. A critical concern, however, is the cost-effective development and production of reliable and safe medical device software and systems.

The challenge for medical device manufacturers is to identify and mitigate the risks associated with embedding defective software in their devices. Unlike other types of components, identifying and quantifying the potential effects of defective software components is more difficult.

Consequently, it falls to device manufacturers to ensure, to the best of their ability, that software-based medical devices are safe and effective. Meeting this responsibility requires management commitment, familiarity with software safety, and the adoption of a risk management mindset.

Surgeons increasingly rely on dynamic, three-dimensional medical images for instrument guidance and clinical decision-making during minimally invasive procedures. The typical display combines images acquired before the intervention with graphical representations of the instruments and also can include intraoperative image updates of the anatomy. Tracking systems indicate the location of surgical instruments relative to the patient’s body, which helps guide the physician to the specific anatomical target.

The authors’ Image-Guided Software Toolkit contains the basic software components for developing an image-guided surgery system, including a component for controlling the tracker as well as a display component for overlaying images of patient anatomy and surgical instruments.

Existing or emerging healthcare wireless medical data networks address both business and clinical applications. Business-oriented examples include wireless bar-coded supply-chain management in areas like the pharmacy and operating room, patient charge billing automation, and voice over Internet Protocol communication.

The risks inherent in creating a verification and validation toolkit for clinical WMDN devices lie in the potential development and deployment of an inadequate or grossly inefficient toolkit.

A methods such as the US Food and Drug Administration need effective means for assuring that medical software is safe and reliable. The FDA has been striving for a more rigorous engineering-based review strategy to provide this assurance.

Although regulatory processes work reasonably well for device production processes, they’re insufficient for assessing software. To address this problem, researchers at the FDA’s Center for Devices and Radiological Health/OE Employee of Science and Engineering Laboratories (CDRH/OSEL) have been collaborating with university researchers to explore ways to use formal modeling methods and static analysis techniques to improve the review process. These techniques include developing usage models to aid premarket review and using abstraction-driven slicing techniques to facilitate postmarket forensic analysis.