



Cost-effectiveness of “Fast Computerized Tomography (CT)” in pediatric patients : the impact of general anesthesia

Lisa Wise-Faberowski MD MS¹, Recai Aktay MD², Nathalia Galeon-Velasquez MD³, Frandics Chan MD², Doff McElhinney MD³
 ,Departments of Anesthesia¹ Radiology² and Surgery³, Stanford University School of Medicine, California, USA



Background:

Anesthetic neurotoxicity is a continued concern. Efforts to limit anesthetic exposure is an objective goal for not only anesthesiologists but institutions as well. New generation computerized tomography “Fast CT” scanners allow faster imaging and increased success in imaging of uncooperative patients. As a result, they may decrease the use of sedation-general anesthesia and thus offset the cost of faster CT imaging devices. Our objective was to determine the cost-effectiveness of new generation “Fast CT” scanners versus conventional 64-slice CT scanners in reference to use of sedation-general anesthesia.

Methods:

Following IRB approval medical and administrative records of children age ≤ 8 years who underwent CT imaging between 2009 and 2015 on two different type of multi-slice CT scanners in an academic quaternary children’s hospital were retrospectively reviewed. Probabilities for undergoing sedation-general anesthesia and use of contrast material were calculated and used in a probabilistic cost-effectiveness model (Figure 1). Costs included hospital, professional, contrast material, and indirect cost elements from provider perspective with one episode of care time horizon. Sensitivity analyses were performed on key inputs including: probability of undergoing sedation-general anesthesia, costs of CT imaging using new generation “Fast CT” and conventional 64-slice CT scanner.

Results:

Rate of sedation-general anesthesia was 9% lower when imaging is performed with a new generation CT scanner. The probabilistic cost-effectiveness model calculated that in 1,000 CT imaging exams, 171 hours of sedation-general anesthesia would be saved at a decremented cost of \$308,884. With the incremental cost of a new generation scanner not included, the cost-effectiveness ratio (ICER) of new generation CT scanner is -\$1,844 per one hour of anesthesia time saved. At a willingness-to-pay of \$2,500 per anesthesia hour saved, imaging with a new generation CT scanner remains cost effective up to an average cost threshold of \$4,562 for a CT exam under sedation-general anesthesia (Figure 2).

Conclusion:

As more institutions consider new strategies to limit anesthetic exposure in children less than 3 years of age, many are faced with the costs of the new technology to achieve such goals. New generation “Fast CT” scanners reduce use of sedation-general anesthesia in CT imaging of children and saves resources with a favorable ICER. The ICER we report may be used as a tool to contrast the incremental cost incurred from acquisition of a new generation CT scanner and as a reference tool in procurement decisions. Since young age is a determining factor in the need for anesthesia/sedation for these procedures, institution selection by not only parents and referring physicians but also third-party payers to limit anesthetic exposure, may provide additional financial incentives for institutions to consider, as well.

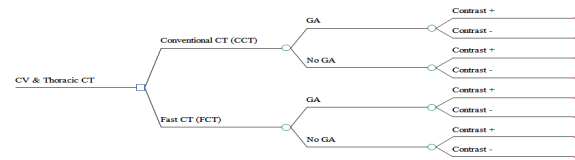


Figure 1. Probabilistic decision model for comparative cost-effectiveness analyses of pediatric CT imaging with new generation CT versus conventional 64-slice CT scanner in thoracic and cardiovascular applications. Abbreviations: CV, cardiovascular; CT, computerized tomography; GA, sedation/general anesthesia for CT imaging; Contrast +, iodinated contrast material is administered; Contrast -, contrast agent was not administered; FCT, fast CT imaging with a new generation CT scanner; CCT, CT imaging with a conventional 64-slice CT scanner.

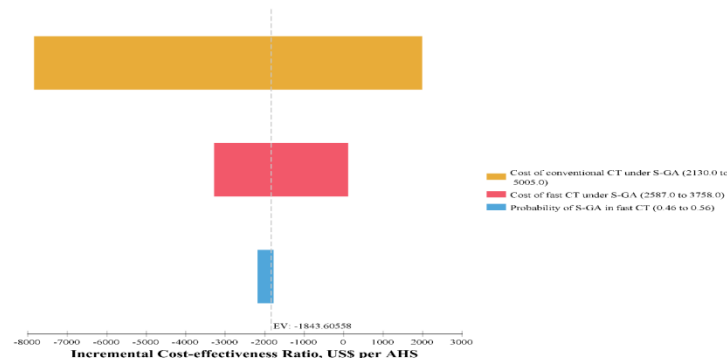


Figure 2: Sensitivity analyses demonstrating the effect of individual variable’s uncertainty on the cost-effectiveness ratio (ICER) within the clinically plausible ranges obtained from our analytic sample. The central vertical line shows the base-case analysis. All costs are given in 2015 US dollars. All analyses revealed cost-effectiveness ratios below \$2,500 per anesthesia hour saved (AHS). The spread of ICER values was much narrower for the cost of fast CT than for that of the conventional CT imaging. S-GA denotes sedation-general anesthesia. Fast CT imaging was performed with a new generation CT and conventional CT imaging with a conventional 64-slice CT scanner.

References:

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