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## Toshiba's Smart Fusion: A Cost-effective Solution for Percutaneous Biopsy Guidance



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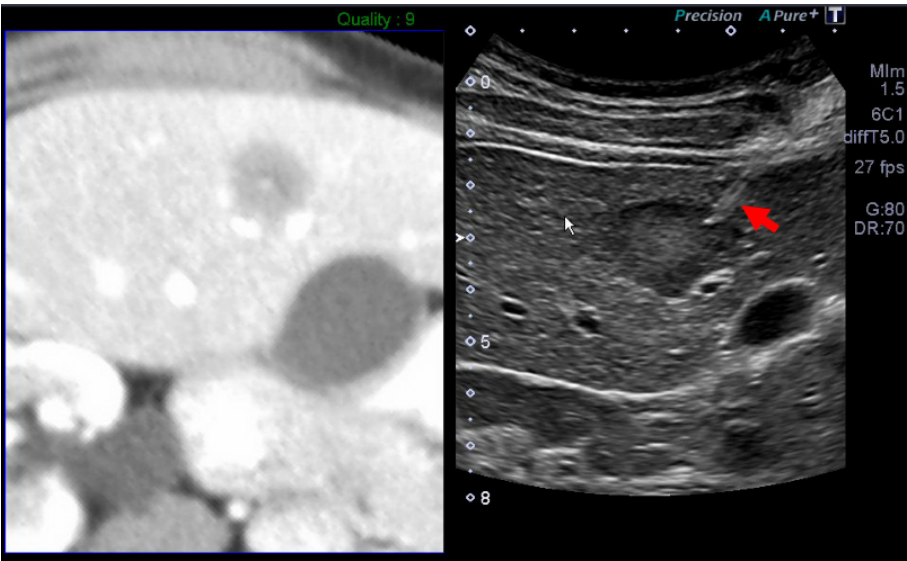
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Toshiba's Aplio™ 500 with Smart Fusion enables physicians to fuse live ultrasound with previously acquired CT or MR images. Smart Fusion technology helps locate hard-to-find lesions and improves confidence during ultrasound-guided biopsies. The technology reads 3D DICOM data sets from CT or MR systems and displays the corresponding images side by side with the live ultrasound image (Figure 1). Easy to use, Smart Fusion image registration is achieved in a simple two-step process.

A recent prospective clinical evaluation at St. Elizabeth Healthcare demonstrated that Smart Fusion delivered safe and accurate guidance for liver and kidney lesion biopsies [1]. Out of 35 consecutive biopsies guided by Smart Fusion technology, 34 biopsies successfully sampled the lesion of interest (97.1 percent). Compared to CT-guided biopsies, Smart Fusion delivered significant radiation dose savings to patients and physicians, while at the same time decreasing procedure times and improving the patient experience.



**Figure 1.** Synchronized CT image (left) and live ultrasound image (right) using Smart Fusion. The biopsy needle (red arrow) is clearly visualized entering the liver mass in the live ultrasound image.

**Cost-effective Solution**

U.S. healthcare reform is transforming healthcare delivery from a fee-for-service model to a value-based system. Healthcare providers are challenged to provide higher quality care with improved outcomes while lowering the cost of care. A cost benefit analysis for St. Elizabeth Healthcare was conducted to study the impact of performing Smart Fusion-guided percutaneous biopsies

instead of CT-guided procedures when clinically indicated. Procedure cost savings and opportunities for increased CT revenue make Smart Fusion biopsies an attractive value proposition.

**Cost Savings**

The average costs per procedure associated with CT and ultrasound guidance for needle biopsies were determined from 2012

Medicare Outpatient Prospective Payment System (OPPS) claims data for St. Elizabeth Healthcare [2]. CT biopsy guidance based on CPT code 77012 had an average cost of \$228 per procedure, while ultrasound biopsy guidance based on CPT code 76942 had an average cost of \$99 per procedure. So, for each biopsy procedure that can be moved from CT to ultrasound guidance, a net cost savings of \$129 can be achieved.

Image guidance for needle biopsy	HCPCS/CPT Code	Cost per procedure
CT guidance	77012	\$228
Ultrasound guidance	76942	\$99
Net cost savings per procedure		\$129

To project the total cost savings, the estimated number of CT-guided biopsies that could instead utilize ultrasound Smart Fusion technology was determined. All CT biopsy procedures at St. Elizabeth Healthcare were logged over a two-month period to record the biopsy types, procedure times and radiation doses. Based on this data, 31 out of 86 CT-guided biopsies were performed on the liver and kidney (36.1 percent), which projects to 186 liver and kidney CT biopsies in a given year. Based on the experience with Smart Fusion at St. Elizabeth Healthcare, nearly all liver (95 percent) and kidney (90 percent) CT biopsies can be performed safely and accurately using ultrasound guidance. So, the estimated number of CT biopsies that could utilize ultrasound Smart Fusion guidance at St. Elizabeth Healthcare is 173 procedures per year. At a net cost savings per procedure of \$129, the projected cost savings per year is \$22,317.

Estimated number of CT biopsies moved to Smart Fusion per year	\$173
Net cost savings per procedure	x \$129
Projected Smart Fusion cost savings per year	= \$22,317

**Increased CT Revenue**  
The shift of liver and kidney biopsies from CT guidance to the more cost-effective ultrasound Smart Fusion guidance presents an opportunity for better utilization and increased revenue of the CT scanner. At St. Elizabeth Healthcare, CT-guided biopsies are scheduled in 60-minute time slots, while diagnostic CT imaging sessions are scheduled in 30-minute time slots. So, on average, each CT-guided biopsy that is moved to Smart Fusion guidance can be replaced with two CT imaging sessions. This represents an estimated increase in annual CT volume of 346 cases by utilizing Smart Fusion technology for biopsy guidance. These additional CT studies present a significant opportunity for increased revenue. Based on 2012 Medicare OPPS data claims, the average payment for a non-contrast CT scan (APC 0332) at St. Elizabeth Healthcare was \$181 [2]. Consequently, the projected increase in annual CT revenue is \$62,626, assuming an average payment of \$181 per study.

Estimated increase in CT volume per year by utilizing Smart Fusion-guided biopsies	346
Average payment for non-contrast CT (APC 0332)	x \$181
Projected incremental CT revenue per year	= \$62,626

**The Bottom Line**  
In this case study, the annual financial benefit of utilizing Smart Fusion technology, including cost savings per procedure and increased CT revenue, is \$84,943. If we assume an 8 percent cost of capital with fixed costs per procedure and APC payments over a five year period, the cumulative discounted cash stream is \$339,153. If we assume the cost of purchasing an Aplio 500 ultrasound system with Smart Fusion is \$150,000, then the break even time is less than 23 months, which indicates a strong opportunity for return on investment and a short payback period.

Projected Smart Fusion cost savings per year	\$22,317
Projected incremental CT revenue per year	+ \$62,626
Projected benefit stream per year	= \$84,943
Cost of capital	8%
Five-year cumulative discounted cash stream	= \$339,153

**Patient Satisfaction**  
The Affordable Care Act has introduced significant changes to healthcare economics and payment models. Patient satisfaction is increasingly important to hospitals now that patient satisfaction surveys impact Medicare payments. Although the previous cost-benefit analysis ignores the influence of patient satisfaction on Medicare payments, it is worth noting the impact of Smart Fusion on the patient experience. Smart Fusion delivers the accuracy needed for physicians to confidently biopsy the lesion of interest, even in difficult to reach locations, so that patients can avoid more invasive, open-surgical biopsies and unnecessary complications. Biopsies guided by Smart Fusion offer shorter procedure times to provide a more comfortable and less stressful experience. Smart Fusion biopsies can be performed in a more calming environment than CT-guided biopsies, and patients appreciate that no additional radiation is needed using ultrasound guidance. Together, these factors can help to improve patient satisfaction during a procedure that is often associated with significant stress and anxiety.

Conclusions

Toshiba’s Aplio 500 with Smart Fusion is a valuable tool for percutaneous biopsy guidance. Smart Fusion increases physician confidence in their ability to biopsy small lesions accurately and safely. It is easy to use and offers shorter procedure times, while significantly reducing the radiation dose to patients and physicians compared to CT-guided biopsies. In today’s value-based healthcare environment it is critical to provide better quality care at lower costs. Smart Fusion is a cost-effective solution for biopsy guidance that improves the quality of care and patient experience.

REFERENCES

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