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**IsoRay, Inc. (NYSE/ISR)**

July 1, 2019

**BUY: Cesium Blu: Reaching the Unreachable**

*IsoRay is using the radioisotope Cesium-131 for treating malignant tumors. Three key sectors: Prostate, Brain, and "surgical" (other recurrent tumors), are expected to make up the majority of the opportunity to establish Cs-131 as the isotope of choice in brachytherapy applications.*

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**Investment Highlights:**

**The Power of Blu.** On June 12<sup>th</sup>, 2019 IsoRay announced that they would be opening up a new campaign initiative called the "The Power of Blu". This launch took place at the ABS 2019 conference, held on June 13-15. The campaign plans to reintroduce IsoRay's Cesium-131, now known as Cesium Blu. This name change embodies the companies continued growth and awareness of the power of Cesium as an alternative option in the oncology community.

**Brachytherapy Back on the Throne.** Toward the end of 2018, Alex Azar, the United States Secretary of Health and Human Services publicly stated that the CMS, under Trump's Administration's advisement, plans on grouping radiation oncology therapy into the mandatory bundle payment model. When this takes effect at the end of the summer it should help drive market share back to prostate cancer - brachytherapy. Initiation of a capitated system (one fee for treatment) should drive hospitals to evaluate where they can achieve the best outcome for patients at the lowest cost. We believe, radiation therapy will be one of the answers. Recall that the cost of the Cs-131 seeds that IsoRay provides are covered outside the bundle.

**New Branding - Blu Build.** Earlier this year, Dr. David T. Marshall, a professor of Oncology and Urology at the Hollings Cancer Center, which is part of the University of South Carolina, performed the first prostate cancer surgery using the Blu Build real-time Cesium-131 brachytherapy delivery system. Dr. Marshall believes that the Blu Build technology can have a significant impact in the marketplace, stating, "No two patients are exactly alike. What Blu Build provides physicians is a real-time means to individually customize and deliver a precise placement of Cesium-131 brachytherapy seeds tailored to the patient's anatomy and cancer as the physician is seeing it in the operating room at the time of surgery." The main goal of the Blu Build model aligns perfectly with IsoRay's mission statement, "IsoRay advances innovative radiotherapeutic technologies that focus on the patient." The advantages of this system are all catered to the safety and efficacy of the patient. Cesium Blu introduces patients to a life of improved quality. It is able to directly target the tumor, minimizing damage to other tissue, as a result of the shorter half-life (Cesium-131) compared to the other radioisotopes on the market. With a competitive price and a customized procedure model, the stage is set for Blu Build to be an effective (efficacy & cost) treatment for not only prostate cancer, but also other hard to treat cancers in the brain, pelvis, gyn, head, neck, lung, colon, and rectal areas.

Current Price	\$0.42
Price Target	\$1.00

Estimates	F2019E	F2020E	F2021E
<b>Expenses (\$000s)</b>	\$ 12,794	\$ 13,859	\$ 15,687
1Q July	\$ 3,080	\$ 3,399	\$ 3,922
2Q October	\$ 3,356	\$ 3,432	\$ 3,922
3Q January	\$ 3,088	\$ 3,498	\$ 3,922
4Q April	\$ 3,270	\$ 3,530	\$ 3,922
	F2019E	F2020E	F2021E
<b>EPS (diluted)</b>	\$ (0.08)	\$ (0.05)	\$ (0.01)
1Q July	\$ (0.02)	\$ (0.01)	\$ (0.00)
2Q October	\$ (0.02)	\$ (0.01)	\$ (0.00)
3Q January	\$ (0.02)	\$ (0.01)	\$ (0.00)
4Q April	\$ (0.02)	\$ (0.01)	\$ (0.00)

EBITDA/Share	(\$0.08)	(\$0.05)	(\$0.02)
EV/EBITDA (x)	0.0	0.0	0.0

Stock Data			
52-Week Range	\$0.27	-	\$1.22
Shares Outstanding (mil.)	67.3		
Market Capitalization (mil.)	\$28		
Enterprise Value (mil.)	\$22		
Debt to Capital	0%		
Book Value/Share	\$0.19		
Price/Book	5.0		
Average Three Months Trading Volume (K)	60		
Insider Ownership	1.1%		
Institutional Ownership	7.3%		
Short interest (mil.)	1.0%		
Dividend / Yield	\$0.00/0.0%		



Initiation - July 1, 2019 - Buy - Price Target \$1.00

**A Key Collaboration Opportunity.** IsoRay Inc. has established an important connection with the Texas Oncology group, an independent oncology practice with over 210 locations in Texas and around 460 working physicians. This new training collaboration was announced on April 16, 2019, and will aid in public awareness of brachytherapy and the revolutionary capability of Cesium-131. The goal of this program is to help train the next generation of brachytherapists using several different approaches like case observations, practice on artificial prostates, physics planning, and real-time procedure methodology. These video tutorials can all be accessed through their webinar.

**New Leadership in Place.** Lori Woods was appointed Chief Executive Officer of IsoRay on December 17, 2018. She brings over 30 years of experience in both the healthcare and the medical device technology sectors. Ms. Woods has high expectations for the success of Cesium Blu in the brachytherapy marketplace. Her goals will be focused on raising awareness to the public of the efficacy of this proficient and revolutionary isotope. Several programs have recently been set in motion to carry this vision out. Jonathan Hunt is now the Chief Financial Officer. He brings 25 years of finance and accounting experience. His experience includes several Fortune 500 companies, where he successfully executed mergers, growth strategies, and turnarounds. Mr. Hunt has worked at IsoRay previously from 2006 to 2010, so he is in the perfect position to serve a leadership role for future growth opportunity. On the research side of the company, IsoRay named William A. Cavanagh, their Chief Research and Development Officer. Mr. Cavanagh has been at IsoRay since 2010. Originally, he served as the Vice President of Research and Development, and in 2016 he became the Chief Operating Officer and Chief Scientific Officer. Mr. Cavanagh is leading the team on product development and clinical strategy for prostate, head and neck, and brain cancers. Michael L. Krachon, the Vice President of Sales and Marketing, has over 20 years of experience in the medical industry and served as leader of the international brachytherapy commercial team.

**GammaTile Set in Motion.** The first three patients have been treated with GammaTile Therapy for recurrent brain tumors, in February and March of 2019 at the University of Minnesota. Dr. Chen the operating physician at the University of Minnesota shared his clear expectations for the future of GammaTile Therapy stating, *"I am optimistic that GammaTile will impact the clinical outcome for our brain tumor patients, particularly when combined with appropriate medical therapy,"* GammaTile Therapy offers several advantages in its treatment of recurrent brain tumors compared versus other options. Among the first line therapies for the treatment of brain tumors is External Beam Radiation Therapy (EBRT), which requires daily treatment at the hospital for up to six weeks, and on the other side of the spectrum, GammaTile Therapy requires only one trip to the clinic, and the patient treatment is complete. Also, EBRT's side effects are serious enough that patients and physicians carefully must weigh risk versus benefits, resulting in many patients refusing treatment, (especially true in advanced tumors). The CEO of GT Medical has stated that plans are in place to initiate a full commercialization strategy for GammaTile this fall. For the purposes of our model, we apply a 10% probability of success that our assumed market share assumptions for GammaTile can be realized.

**Valuation:** We model Cesium Blu in both prostate and non-prostate cancer markets; however, we see the real driver as the prostate cancer marketplace. Adoption of GammaTile for brain cancer treatment should begin to increase over the next few years generating more Cs-131 seeds sales (to GT Medical), but for conservatism, we apply only a 10% probability of success that our market share estimates will be fully realized. Using these metrics, we model the market potential and discount back using a 15% rate in our FCF, discounted EPS, and sum-of-the-parts models to arrive at a \$1.00 price target. These metrics are dependent on our clinical assumptions.

**Risk Factors:** Investment Risk, Market Share Risk, Regulatory Risk, Commercial Risk, and Financial Risk

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## Company Overview

IsoRay produces the only handheld Cesium-131 customizable brachytherapy device, which expands internal radiation treatment for recurrent localized hard to treat cancers such as, prostate, brain, gynecological, lung, head and neck, esophageal, and abdominal wall cancers. Cesium-131 represents the first major contribution to the brachytherapy market in over 30 years. It's all about Cesium-131 (CS-131). Cs-131 has a higher average energy and far shorter half-life than competing brachytherapy isotopes on the market, mainly Iodine-125 and Palladium-103. This feature makes the product able to deliver a higher and more homogeneous dose of radiation to the targeted tissue, suggesting improved efficacy with fewer side effects. Cs-131 has several different applications and delivery systems; all branded "Cesium Blu." IsoRay's mission statement is to address the patient's needs, with the safest, efficacious, and direct process as possible. Cesium-131 or Cs-131, the "seed," is IsoRay's technology, which depending on the type of cancer being treated has several different treatment / delivery protocols. Blu Build represents an innovative delivery system which utilizes Cesium-131 in a disposable handheld device. The device provides real-time feedback for clinicians in the operating room to make any necessary adjustments for ideal seed placement at the patient's tumor. The Blu Build System creates a competitive advantage for IsoRay in the Prostate Cancer space, which represents greater than 25% of the total brachytherapy market. Beyond PC, we see the potential in brain cancer(s), and we are cautiously optimistic. GT Medical systems has partnered with IsoRay as their supplier of Cs-131 seeds to be used in their GammaTile product. GammaTile focuses mainly on recurrent brain tumors. Recently approved by the FDA, GammaTile is just beginning to enter the marketplace. IsoRay however, does not control the commercialization of GammaTile, thus our "caution" in terms of the market potential. Changing the treatment paradigm is likely to take a lot of marketing effort, marketing dollars as well as data.

## Exhibit 1. Catalysts

Product	Geography	Indication	Event	Timeline	Impact	Opportunity
CS-131 (Prostate)	U.S.	Solid tumors	Quarterly Prostate Cancer Sales	QTR	+	\$585 million
CS-131 (Brain)	U.S.	Brain tumor bed/post resection	Partnership with GT Medical Systems	2020	++	\$218 million
CS-131 (Surgical)	U.S.	Head, Neck, Lung, and GYN tumors	Launch and Commercialization	2H22	++	\$208 million
GammaTile	U.S.	CS-131 use for Barrow's Neurological Institute	FDA clearance on October 1, 2019	2020	++	\$100 millions

Source: Dawson James and IsoRay.

## Exhibit 2. Pipeline

Product	Indication	Development	Pre-clinical	Phase I	Phase II	Phase III	Marketed	Peak Sales (MM)
CS-131 (Cesium Blu)	PC							45
CS-131 (Cesium Blu)	Non-PC							27
GammaTile	Brain tumor bed/post resection							43

Source: Dawson James and IsoRay.

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**Bull Case.** IsoRay is the only company in their respective sector that utilizes the unique properties of Cesium-131 coupled with a specialized delivery device in brachytherapy. With the introduction of radiation oncology treatment into the Bundled Payments for Care Improvement model, the incentives to use brachytherapy may become more attractive for hospitals. Brachytherapy treatment for Prostate Cancer represents one of the lowest cost treatment options with superior results for tumor destruction. Also, we note that Cs-131 seeds themselves are reimbursed outside the PC bundle, increasing hospital profitability even further. We see Cesium-131 as an optimal choice for treating recurrent localized tumors. Cesium has a higher energy level than the competition, which means it can have greater coverage of the infected organ. Cesium also uses less radiation per dose and has a shorter half-life in the body than the other isotopes. New leadership at the helm too. IsoRay now has a dynamic leadership team with 20+ years of experience each in the brachytherapy market. Management is working to implement an organized multifaceted plan of action to drive market share. Part of the strategy includes "Cesium Blu," new product branding. IsoRay has partnered up with several institutions and private companies to raise awareness around the benefits of Cesium-131 in malignant tumor treatment. Amazingly, the global potential for Cesium-131 could be as large as a billion dollars. The prostate cancer marketplace alone is estimated to be over 550 million. IsoRay believes that Cs-131 could treat as many as two-thirds of all Prostate Cancers. Our market share assumptions for IsoRay's Cs-131 in PC are modest. We expect IsoRay can reach \$7M in revenues this fiscal year (June-2019) and grow those revenues to \$75M by 2030. We estimate IsoRay can achieve break-even status by fiscal 2022. We also conservatively model just a 10% probability that GT Medical can realize our estimated potential (3% market share of all recurrent brain cancers) which equates to 10% of \$86M or \$8.6M in additional seed revenues to IsoRay. Of course, the bull argument is that our estimates are too conservative and at 100% probability factor alone, in the brain, drives the valuation of IsoRay to over \$3.00 per share.

**Bear Case.** The number of new cancer treatments, especially biologic agents for PC, has grown sharply over the past decade. Brachytherapy is considered an "old" therapy at a time when the market is heading to more selective biologic agents with potentially higher efficacy and fewer side-effects. As such, brachytherapy itself is shrinking, and IsoRay lacks critical mass and financial resources to drive market share. In terms of GammaTile, GT Medical is a new player, also with limited resources. The complex nature of the recurrent brain tumor marketplace may make market share gains an uphill battle. IsoRay must rely on GT Medical for the distribution and implementation of GammaTile into hospitals, which puts one more significant confounding variable into IsoRay's operation chain. Also, the lack of more significant long term clinical data on Cesium-131, and reliance on relatively small sample sizes in clinical trials may not aid in attracting early adopters.

**Our Take.** IsoRay has been hard at work for the past decade to win market share in the competitive PC marketplace. We see changes in reimbursement as a new factor that could bring physicians back to brachytherapy. IsoRay management is working to raise awareness with ideas like the Blu Build (product branding) to both patients and clinicians around both the viability of brachytherapy and the attributes of Cs-131. Fundamentally we note IsoRay's eight consecutive quarters of double-digit year-over-year revenue growth as a positive factor. Our PC market share estimate is modest. Our assumptions for seed demand driven by GT Medical is modest (as we apply just a 10% success probability that the full revenue potential is realized). The combination of these assumptions suggests fair value at \$1.00. Given IsoRay's current price (below 0.50 cents), we see upside for investors.

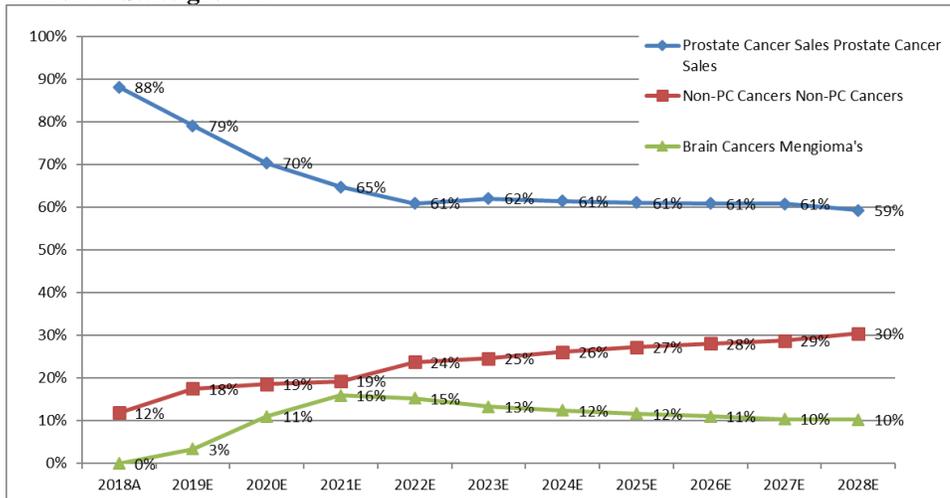
**Financials.** IsoRay closed the last reported quarter with just under \$5M in cash and equivalents, which based on our model assumptions represents a year of operating capital. Our model projects the company could reach break-even by late 2021, early 2022.

**Exhibit 3. Revenue 2016-2019**  
**Seven Quarters of Double Digit Revenue Growth ~ 2 Year CAGR of 22%**



Source: IsoRay

**Exhibit 4. Sales growth**



Source: Dawson James

**Exhibit 5. Cesium-131 device**



Source: IsoRay

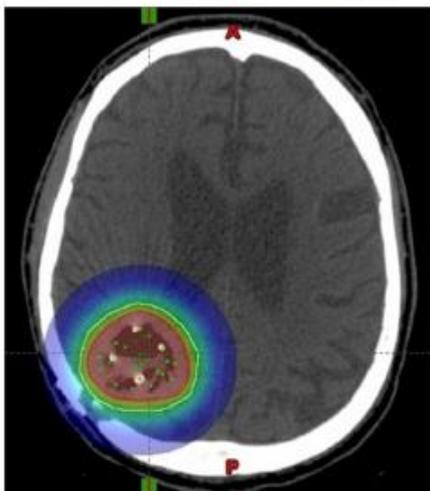
**Exhibit 6. Cesium-131 versus other players in the brachytherapy marketplace**

<b>Cesium-131</b> Introduced in 2004		
<b>9.7 Day Half Life</b> The amount of time for the radiation to half. A shorter half life means quicker to PSA baseline. (8, 12, 13)		
<b>30.4 Kev</b> The energy level of the isotope. Higher energy leads to greater coverage of the infected organ.	<b>Palladium-103</b> Introduced in 1986	<b>Iodine-125</b> Introduced in 1965
<b>33 Days for 90% Dose</b> Faster dose delivery rate.	17 Day Half Life	60 Day Half Life
<b>115 Gy Total Dose</b> The amount of dose. A lower dose means less total radiation used to treat your cancer.	20.8 Kev	28.5 Kev
<b>Detectable in the body for only 97 Days</b>	58 Days for 90% Dose	204 Days for 90% Dose
	125 Gy Total Dose	145 Gy Total Dose
	Detectable in the body for 107 Days	Detectable in the body for 600 Days
	<small>Armpilla C, Dale R, Coles I, et al. <a href="#">The determination of radiobiologically optimized half-lives for radionuclides used in permanent brachytherapy implants.</a> Int J Rad Onc Biol Phys 2003; 55:378-385.</small>	

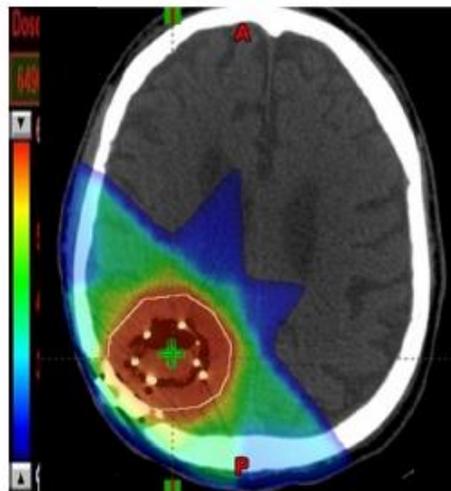
Source: IsoRay

**Exhibit 7. GammaTile compared to external beam radiation**

**Distribution and Intensity of GammaTile™ Therapy**



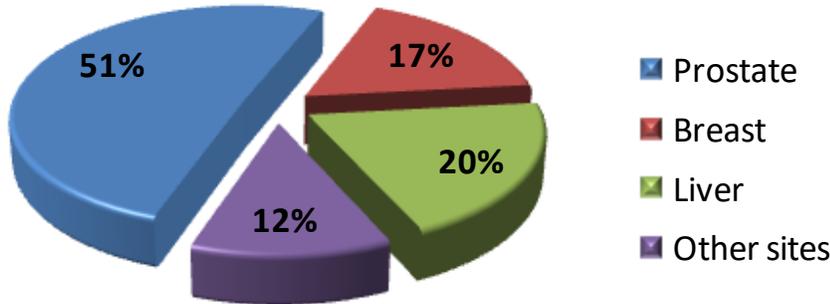
**Distribution and intensity of External Radiation**



Source: Dawson James and IsoRay

**The U.S. Brachytherapy Market.** It's estimated that domestic sales of the brachytherapy market to be around \$100 million, of which the largest sector of the market is Prostate (brachytherapy seeds). Over the past few years, the U.S. brachytherapy market has been gradually declining mainly due to the availability of newer treatments, e.g., cancer immune therapy, external beam radiation and robotic surgery, which were previously believed to have comparable efficacy and, or better Medicare reimbursement. These factors appear to be shifting back in IsoRay's favor.

**Exhibit 8: US Brachytherapy Market**



Source: Dawson James

**Exhibit 9: Differentiated Sectors of the Localized Brachytherapy Market Place**

<p><b>Prostate</b></p> <ul style="list-style-type: none"> <li>• Growing body of literature supporting outcome benefits of brachytherapy</li> <li>• Full solutions for localized disease</li> <li>• Increased opportunities for targeted delivery systems</li> </ul> <p><b>~\$585M</b> Opportunity with Cesium-131</p>	<p><b>Brain</b></p> <ul style="list-style-type: none"> <li>• Cesium-131 is emerging as an alternative to other isotopes</li> <li>• Partnership with GT Medical Technologies</li> <li>• Efficient delivery of radiation, starting at time of surgery</li> </ul> <p><b>~\$218M</b> Opportunity with Cesium-131</p>	<p><b>Surgical</b></p> <ul style="list-style-type: none"> <li>• Success in recurrent Gynecological cancer treatment</li> <li>• Expanding experience in Head and Neck cancers</li> <li>• Cancers with large unmet medical needs increasingly testing Cs-131</li> <li>• Highly concentrated dose to targeted tissue</li> </ul> <p><b>~\$208M</b> Opportunity with Cesium-131</p>
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Source: IsoRay

**Exhibit 10: Cesium-131 Market Opportunity**

Disease State	2019 Estimated Annual Diagnosis <sup>3</sup>	Potential LDR Patients*	Potential Revenue <sup>2</sup>
<b>Prostate Cancer</b>	<b>174,650</b>	<b>117,015</b> (67% Treatable with Cs-131)	<b>\$585M</b> @ \$5,000 per Treatment w/ Cs-131
<b>Brain Cancer</b> - Primary CNS Cancer - New Metastases - Recurrent Cancer	<b>188,820</b> 23,820 100,000 <sup>4</sup> 65,000 <sup>4</sup>	<b>62,311</b> (33% Treatable with Cs-131)	<b>\$218M</b> @ \$3,500 per Treatment w/ Cs-131
<b>Gynecological Cancers</b> - Uterus - Ovary - Cervix - Vagina & Other Genital - Vulva	<b>109,000</b> 61,880 22,530 13,170 5,350 6,070	<b>5,450</b> (20% Recurrence Rate) (25% Treatable with Cs-131)	<b>\$19M</b> @ \$3,500 per Treatment w/ Cs-131
<b>Head &amp; Neck Tumors</b> - Mouth - Pharynx - Tongue - Other oral cavity	<b>53,000</b> 14,310 17,870 17,060 3,760	<b>13,250</b> (25% Treatable with Cs-131)	<b>\$132M</b> @ \$10,000 per Treatment w/ Cs-131
<b>Lung Cancers</b>	<b>228,150</b>	<b>11,408</b> (5% Treatable with Cs-131)	<b>\$57M</b> @ \$5,000 per Treatment w/ Cs-131
<b>Total Opportunity</b>	<b>753,620</b>	<b>209,434 Patients</b>	<b>~\$1B</b>

Source: IsoRay

**Current Treatment.** The main types of treatments for Prostate Cancer right now are radiation therapy, chemotherapy, hormone therapy, and surgery. Most radiation therapies use external beam radiation, but brachytherapy utilizes internal radiation. The benefits of internal radiation versus external radiation are as follows: internal radiation provides a higher dosage in a limited area, which is more effective at destroying cancer cells while minimizing damage to nearby tissue. The way brachytherapy works is usually through a radioactive source, in IsoRay’s case Cesium-131, that is placed inside the body near the malignant tumor.

**Exhibit 11: Potential Side Effects of Different Cancer Treatments on the Market**

 Common side effect, occurring in 30–60 out of every 100 men (30–60% of patients)

 Likely side effect, occurring in 10–30 out of every 100 men (10–30% of patients)

 Possible side effect, occurring in 1–10 out of every 100 men (1–10% of patients)

Side Effect	Radical Prostatectomy	Keyhole Surgery (Laparoscopic Radical Prostatectomy)	LDR Brachytherapy	LDR Brachytherapy with External Beam Radiotherapy	External Beam Radiotherapy alone
<b>Impotence</b> Unable to get an erection 1 year after treatment					
<b>Urinary incontinence</b> 1 month after treatment 1 year after treatment	 	 	 	 	 
<b>Difficulty with urination</b> 1 month after treatment 1 year after treatment	 	 	 	 	 
<b>Diarrhoea and urgency of bowels</b> 1 month after treatment 1 year after treatment	 	 	 	 	 
<b>Time off work</b> Less than 1 week 1–4 weeks 4–12 weeks	  	  	  	  	  

Source: Source: [www.prostatebrachytherapyinfo.net](http://www.prostatebrachytherapyinfo.net)

**Modeling Assumptions:**

1. We assume continued growth of the patient incidence and prevalence of prostate cancer. We also assume that brachytherapy can become a larger part of the over-all prostate cancer therapy marketplace. We currently assume brachytherapy is under 10% and over the next decade and rise to 17%. Within the brachytherapy marketplace, Cs-131 has just a 5% market share. We assume that share can rise by 23% over the next decade.
2. Pricing. We assume on average \$70 per seed and 50 seeds per case in PC. Please see the market model below for our assumptions in non-prostate indications.
3. For IsoRay, and a result of the complexities of Isotope management, there may be a significant reduction in the cost of manufacturing associated with the volume.
4. GammaTile. We model the recurrent brain cancers marketplace (300,000 cases per year) and assume the market is based on the 75% of patients who may undergo tumor resection. At just 3% market share, \$150 per seed and 65 seeds on average, the market becomes significant at \$86M annually. We apply just a 10% probability that the full commercial opportunity can be realized based on GT Medical's ability to invest the needed capital to aggressively change the current treatment paradigm.

**Exhibit 11: Cs-131 Models in Prostate, Other and GammaTile.**

CS-131 sales (\$000)	2018A	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
<b>Prostate Cancer</b>	260,840	266,057	271,378	276,806	282,342	287,989	293,748	299,623	305,616	311,728	317,963	324,322	330,808
% Patients electing monotherapeutic brachytherapy	9.3%	9.4%	9.6%	9.8%	10.0%	12.0%	13.0%	14.0%	15.0%	16.0%	17.0%	17.0%	17.2%
Number of patients for brachytherapy	24,258	25,009	26,052	27,127	28,234	34,559	38,187	41,947	45,842	49,876	54,054	55,135	56,899
Market share	5.0%	6.0%	8.0%	10.0%	12.0%	14.0%	16.0%	18.0%	20.0%	22.0%	22.5%	22.7%	22.8%
Patients electing CS-131 (Over Iodine-125 or Palladium-103)	1,213	1,501	2,084	2,713	3,388	4,838	6,110	7,551	9,168	10,973	12,162	12,516	12,973
Price per seed	70	70	70	70	70	70	70	70	70	70	70	70	70
Seeds per patient	50	50	50	50	50	50	50	50	50	50	50	50	50
CS-131 sales (Prostate cancer) (\$000)	\$4,245	\$5,252	\$7,295	\$9,494	\$11,858	\$16,934	\$21,385	\$26,427	\$32,090	\$38,405	\$42,567	\$43,805	\$45,405
<b>Non-prostate cancers (Head &amp; Neck), Gyn., Lung Cancer</b>	254,000	259,080	264,262	269,547	274,938	280,437	286,045	291,766	297,601	303,554	309,625	312,721	315,848
% Patients receiving brachytherapy (monotherapy or combination)	10.0%	12.0%	13.00%	14.00%	15.00%	16.00%	17.00%	18.00%	19.00%	20.00%	21.00%	22.00%	23.00%
Number of patients for brachytherapy	25,400	31,090	34,354	37,737	41,241	44,870	48,628	52,518	56,544	60,711	65,021	68,799	72,645
Market share	0.3%	0.5%	0.8%	1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%	4.5%	4.9%	4.9%
Patients receiving CS-131 brachytherapy	76	155	258	377	619	897	1,216	1,576	1,979	2,428	2,926	3,371	3,560
Price per seed	115	115	115	115	115	115	115	115	115	115	115	115	115
Seeds per patients	65	65	65	65	65	65	65	65	65	65	65	65	65
CS-131 sales (Non-prostate cancer) (\$000)	\$570	\$1,162	\$1,926	\$2,821	\$4,624	\$6,708	\$9,087	\$11,777	\$14,793	\$18,153	\$21,871	\$25,199	\$26,608
<b>GammaTile (\$000)</b>													
<b>Brain cancer (cs/yr) - Candidates (new and recurrent)</b>	300,000	306,000	312,120	318,362	324,730	331,224	337,849	344,606	351,498	358,528	365,698	373,012	380,473
% Patients undergoing surgical resection	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%
Patients requiring treatment of tumor bed following resection	225,000	229,500	234,090	238,772	243,547	248,418	253,387	258,454	263,623	268,896	274,274	279,759	285,354
Market share	0.0%	0.1%	0.5%	1.0%	1.3%	1.5%	1.8%	2.0%	2.3%	2.5%	2.8%	3.1%	3.1%
Patients receiving wafer	0	230	1,170	2,388	3,044	3,726	4,434	5,169	5,932	6,722	7,543	8,673	8,846
Price per seed	\$150	\$150	\$150	\$150	\$150	\$150	\$150	\$150	\$150	\$150	\$150	\$150	\$150
Seeds per patients	65	65	65	65	65	65	65	65	65	65	65	65	65
Probability Factor	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Wafer sales (Meningioma's) (\$000)	\$0	\$224	\$1,141	\$2,328	\$2,968	\$3,633	\$4,323	\$5,040	\$5,783	\$6,554	\$7,354	\$8,456	\$8,625
Probability adjusted sales (\$000)	\$0	\$224	\$1,141	\$2,328	\$2,968	\$3,633	\$4,323	\$5,040	\$5,783	\$6,554	\$7,354	\$8,456	\$8,625
<b>Combined Revenues</b>	<b>\$4,815</b>	<b>\$6,638</b>	<b>\$10,362</b>	<b>\$14,643</b>	<b>\$19,451</b>	<b>\$27,275</b>	<b>\$34,796</b>	<b>\$43,244</b>	<b>\$52,666</b>	<b>\$63,112</b>	<b>\$71,793</b>	<b>\$77,459</b>	<b>\$80,638</b>

Source: Dawson James

**VALUATION**

We see IsoRay as an established company that has commercialized an approved product that has strong product attributes. Revenue today are small at just \$6M annually, but we believe these revenues, with our modest assumptions, can grow over the coming decade. For these reasons, we apply a 15% risk rate. Typically for early stage companies with no approved products which possess a lot of clinical risks we use a 30% risk rate and for established companies with more predictable revenues and typically cash flow positive we apply a 10% risk rate. We model the company's revenues (and expenses) out to 2030. We consider the need to raise capital, and as such, we use a future projected share count. We then apply these metrics to our free cash flow to the firm (FCFF), Discounted earnings (dEPS) and the sum of the parts (SOP) model, which are equal weighted, averaged and rounded to the nearest whole number. This method results in a \$1.00 price target for IsoRay.

**Exhibit 12. FCFF Model**

IsoRay Medical, Inc.

Average	\$	1.1
Price Target	\$	1.1
Year		2019

**DCF Valuation Using FCF (mln):**

units ('000)	2018A	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
EBIT	(6,700)	(5,612)	(3,497)	(1,044)	1,323	5,861	10,148	15,135	20,860	26,751	31,396	34,840	36,467
Tax Rate	0%	0%	4%	7%	9%	11%	14%	16%	17%	18%	19%	25%	29%
EBIT(1-t)	(6,700)	(5,612)	(3,357)	(971)	1,204	5,216	8,727	12,713	17,314	21,936	25,430	26,046	25,789
CapEx	-	-	-	-	-	-	-	-	-	-	-	-	-
Depreciation	-	-	-	-	-	-	-	-	-	-	-	-	-
Change in NWC	-	-	-	-	-	-	-	-	-	-	-	-	-
FCF	(6,700)	(5,612)	(3,357)	(971)	1,204	5,216	8,727	12,713	17,314	21,936	25,430	26,046	25,789
PV of FCF	(7,705)	(5,612)	(2,919)	(734)	792	2,982	4,339	5,496	6,509	7,171	7,229	6,438	5,543.20
Discount Rate	15%												
Long Term Growth Rate	1%												
Terminal Cash Flow	186,050												
Terminal Value YE2030	39,990												
NPV	77,224												
NPV-Debt	-												
Shares out (thousands)	70,325											2030E	
NPV Per Share	\$ 1.1												

Source: Dawson James

**Exhibit 13. Discounted EPS Model**

Current Year	2019
Year of EPS	2030
Earnings Multiple	10
Discount Factor	15%
Selected Year EPS	\$ 0.37
NPV	\$ 0.80

		Discount Rate and Earnings Multiple Varies, Year is Constant					
		2030 EPS					
Earnings Multiple		5%	10%	15%	20%	25%	30%
		2	\$0.43	\$0.26	\$0.16	\$0.10	\$0.06
5	\$1.09	\$0.65	\$0.40	\$0.25	\$0.16	\$ 0.10	
10	\$2.17	\$1.30	\$0.80	\$0.50	\$0.32	\$ 0.21	
15	\$3.26	\$1.95	\$1.20	\$0.75	\$0.48	\$ 0.31	
20	\$4.35	\$2.61	\$1.60	\$1.00	\$0.64	\$ 0.41	
25	\$5.43	\$3.26	\$2.00	\$1.25	\$0.80	\$ 0.52	
30	\$6.52	\$3.91	\$2.40	\$1.50	\$0.96	\$ 0.62	
35	\$7.61	\$4.56	\$2.80	\$1.75	\$1.12	\$ 0.73	

Source: Dawson James

**Exhibit 14. Sum of the Parts Model**

IsoRay, Inc.	LT Gr	Discount Rate	Yrs. to Peak Mkt	% Success	Peak Sales MMs	NPV
CS-131 (Prostate cancer)	1%	15%	5	100%	\$45	\$324
NPV						\$0.69
CS-131 (non-prostate cancer)	1%	15%	5	100%	\$27	\$190
NPV						\$0.40
GammaTile	1%	30%	3	50%	\$86	\$297
NPV						\$0.29
Net Margin						30%
MM Shrs OS (2028E)						70
Total						\$1.4

Source: Dawson James

**Risk Analysis:**

**Investment Risk:** IsoRay is a small capital company, which can translate into high volatility and risk for investors. The company's revenues depend on one product with multiple applications. Prostate cancer treatment accounted for greater than three-fourths of product sales, and the prostate cancer market has been declining.

**Market Share Risk.** IsoRay faces well-entrenched competition within the brachytherapy marketplace as well as outside the marketplace from well-capitalized large pharma and biotechnology companies.

**Regulatory Risk:** Barium is the main raw material used to make Cesium-131. IsoRay relies heavily on the production of Barium. The main supplier of Cesium-131 is in Russia, so the majority of the production of Cesium is dependent on U.S. - Russian relations. The manufacturing facilities all need to pass certain standards of operation in order to be functionally running.

**Commercial Risk:** End consumers may believe that there is a lack of product doses for Cesium 131, and radiation therapy represents a complication for some providers.

**Financial Risk:** IsoRay is likely to have additional capital raises before the company can be self-sustaining.

**Exhibit 15. Income Statement**

Isoray™ Medical, Inc.: Income Statement (\$'000)	6.2017	July-Sept	Oct-Dec	Jan-Mar	Apr-Jun	6.2018	July-Sept	Oct-Dec	Jan-Mar	Apr-Jun	6.2019	July-Sept	Oct-Dec	Jan-Mar	Apr-Jun	6.2020	July-Sept	Oct-Dec	Jan-Mar	Apr-Jun	6.2021	6.2022	6.2023	6.2024	6.2025	6.2026	6.2027	6.2028	6.2029	6.2030	
Isoray™ Medical, Inc.: YE Jun 30	2017A	1Q18A	2Q18A	3Q18A	4Q18A	2018A	1Q19A	2Q19A	3Q19A	4Q19E	2019E	1Q20E	2Q20E	3Q20E	4Q20E	2020E	1Q21E	2Q21E	3Q21E	4Q21E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	
Cs-131 Prostate Cancer	4,761	1,111	1,400	1,438	1,420	5,369	1,208	1,260	1,366	1,418	5,252	1,678	1,751	1,897	1,970	7,295	2,374	2,374	2,374	2,374	9,494	11,858	16,934	21,385	26,427	32,090	38,405	42,567	43,805	45,405	
Cs-131 Seeds (non-prostate - non-brain)		100	136	135	135	506	267	279	302	314	1,162	481	481	481	481	1,926	705	705	705	705	2,821	4,624	6,708	9,087	11,777	14,793	18,153	21,871	25,199	26,608	
Gamma Tile							51	54	58	60	224	285	285	285	285	1,141	582	582	582	582	2,328	2,968	3,633	4,323	5,040	5,783	6,554	7,354	8,456	8,625	
<b>Total Product Sales</b>	<b>4,761</b>	<b>1,211</b>	<b>1,536</b>	<b>1,573</b>	<b>1,603</b>	<b>5,923</b>	<b>1,562</b>	<b>1,904</b>	<b>1,924</b>	<b>1,792</b>	<b>7,182</b>	<b>2,445</b>	<b>2,518</b>	<b>2,663</b>	<b>2,736</b>	<b>10,362</b>	<b>3,661</b>	<b>3,661</b>	<b>3,661</b>	<b>3,661</b>	<b>14,643</b>	<b>19,451</b>	<b>27,275</b>	<b>34,796</b>	<b>43,244</b>	<b>52,666</b>	<b>63,112</b>	<b>71,793</b>	<b>77,459</b>	<b>80,638</b>	
<b>Expenses</b>																															
Cost of productsales (prostate)	3,923	870	920	900	1,100	3,790	938	1,000	900	1,125	3,963	1,100	1,133	1,199	1,231	4,663	1,464	1,464	1,464	1,464	5,857	7,586	10,092	12,526	15,135	17,907	21,458	24,410	25,562	26,611	
COGS % of revenue	82%	78%	60%	57%	77%	68%	60%	79%	66%	63%	67%	45%	45%	45%	45%	45%	40%	40%	40%	40%	40%	39%	37%	36%	35%	34%	34%	34%	33%	33%	
Cost of productsales (non-prostate)	-	76	85	64	3	291	100	139	145	75	459	153	153	153	153	613	257	257	257	257	1,030	1,518	2,068	2,882	3,363	4,115	4,941	5,845	6,731	7,047	
COGS % of revenue	20%	7%	6%	4%	2%	5%	8%	42%	40%	20%	28%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	
Sales and marketing expenses	2,310	614	674	692	680	2,660	649	702	645	660	2,656	677	677	677	677	2,709	691	691	691	691	2,763	2,819	2,875	2,932	2,991	3,051	3,112	3,174	3,238	3,302	
S&M % of revenue																															
General and administrative expenses	3,918	841	965	783	1,556	4,165	973	1,101	1,099	1,100	4,273	1,090	1,090	1,090	1,090	4,358	1,111	1,111	1,111	1,111	4,446	4,535	4,625	4,718	4,812	4,908	5,007	5,107	5,209	5,313	
G&A % of revenue																															
Research and development	965	362	340	473	571	1,746	420	414	299	310	1,443	379	379	379	379	1,515	398	398	398	398	1,591	1,670	1,754	1,789	1,807	1,825	1,843	1,862	1,880	1,899	
R&D % of revenue	(48)																														
<b>Total Expenses</b>	<b>11,068</b>	<b>2,763</b>	<b>3,004</b>	<b>2,912</b>	<b>3,910</b>	<b>12,652</b>	<b>3,080</b>	<b>3,356</b>	<b>3,088</b>	<b>3,270</b>	<b>12,794</b>	<b>3,399</b>	<b>3,432</b>	<b>3,498</b>	<b>3,530</b>	<b>13,859</b>	<b>3,922</b>	<b>3,922</b>	<b>3,922</b>	<b>3,922</b>	<b>15,687</b>	<b>18,128</b>	<b>21,414</b>	<b>24,648</b>	<b>28,109</b>	<b>31,806</b>	<b>36,361</b>	<b>40,397</b>	<b>42,619</b>	<b>44,172</b>	
Operating income (Loss)	(6,307)	(1,552)	(1,468)	(1,339)	(2,332)	(6,729)	(1,518)	(1,429)	(1,163)	(1,478)	(5,612)	(955)	(914)	(834)	(794)	(3,497)	(261)	(261)	(261)	(261)	(1,044)	1,323	5,861	10,148	15,135	20,860	26,751	31,396	34,840	36,467	
Interest income	117	6	5	7	11	29	10	15	34																						
Change in fair value of warrant derivative liability	27																														
Financing and interest expense	-																														
<b>Total other income</b>	<b>144</b>	<b>6</b>	<b>5</b>	<b>7</b>	<b>11</b>	<b>29</b>	<b>10</b>	<b>15</b>	<b>36</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Pretax Income</b>	<b>(6,163)</b>	<b>(1,546)</b>	<b>(1,463)</b>	<b>(1,332)</b>	<b>(2,359)</b>	<b>(6,700)</b>	<b>(1,508)</b>	<b>(1,414)</b>	<b>(1,127)</b>	<b>(1,478)</b>	<b>(5,612)</b>	<b>(955)</b>	<b>(914)</b>	<b>(834)</b>	<b>(794)</b>	<b>(3,497)</b>	<b>(261)</b>	<b>(261)</b>	<b>(261)</b>	<b>(261)</b>	<b>(1,044)</b>	<b>1,323</b>	<b>5,861</b>	<b>10,148</b>	<b>15,135</b>	<b>20,860</b>	<b>26,751</b>	<b>31,396</b>	<b>34,840</b>	<b>36,467</b>	
Income Tax Benefit (Provision)	-	-	-	-	-	-	-	-	-	-	-	(38)	(37)	(33)	(32)	(140)	(18)	(18)	(18)	(18)	(73)	119	645	1,421	2,422	3,546	4,815	5,965	8,794	10,678	
Tax Rate	0%											4%	4%	4%	4%	4%	7%	7%	7%	7%	7%	9%	11%	14%	16%	17%	18%	19%	25%	29%	
<b>GAAP Net Income (loss)</b>	<b>(6,166)</b>	<b>(1,549)</b>	<b>(1,466)</b>	<b>(1,335)</b>	<b>(2,359)</b>	<b>(6,711)</b>	<b>(1,511)</b>	<b>(1,416)</b>	<b>(1,130)</b>	<b>(1,478)</b>	<b>(5,612)</b>	<b>(916)</b>	<b>(878)</b>	<b>(801)</b>	<b>(762)</b>	<b>(3,357)</b>	<b>(243)</b>	<b>(243)</b>	<b>(243)</b>	<b>(243)</b>	<b>(971)</b>	<b>1,204</b>	<b>5,216</b>	<b>8,727</b>	<b>12,713</b>	<b>17,314</b>	<b>21,936</b>	<b>25,430</b>	<b>26,046</b>	<b>25,789</b>	
Preferred stock dividends	(11)	(3)	(3)	(3)	(2,00)	(11,00)																									
<b>GAAP-EPS</b>	<b>(0.11)</b>	<b>(0.03)</b>	<b>(0.03)</b>	<b>(0.02)</b>	<b>(0.04)</b>	<b>(0.12)</b>	<b>(0.02)</b>	<b>(0.02)</b>	<b>(0.02)</b>	<b>(0.02)</b>	<b>(0.08)</b>	<b>(0.01)</b>	<b>(0.01)</b>	<b>(0.01)</b>	<b>(0.01)</b>	<b>(0.05)</b>	<b>(0.00)</b>	<b>(0.00)</b>	<b>(0.00)</b>	<b>(0.00)</b>	<b>(0.01)</b>	<b>0.02</b>	<b>0.08</b>	<b>0.13</b>	<b>0.18</b>	<b>0.25</b>	<b>0.32</b>	<b>0.36</b>	<b>0.38</b>	<b>0.37</b>	
Non GAAP EPS (dil)	(0.11)	(0.03)	(0.03)	(0.02)	(0.04)	(0.12)	(0.02)	(0.02)	(0.02)	(0.02)	(0.08)	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	0.02	0.08	0.13	0.18	0.25	0.32	0.36	0.38	0.37	
Wght Avg Shrs (Bas) - '000s	55,016	55,017	55,056	55,100	55,464	55,159	66,147	67,331	67,333	67,400	67,053	67,468	67,535	67,603	67,670	67,569	67,738	67,806	67,874	67,941	67,840	68,111	68,384	68,658	68,933	69,209	69,487	69,765	70,045	70,325	
Wght Avg Shrs (Dil) - '000s	55,016	55,017	55,056	55,100	55,464	55,159	66,147	67,331	67,333	67,400	67,053	67,468	67,535	67,603	67,670	67,569	67,738	67,806	67,874	67,941	67,840	68,111	68,384	68,658	68,933	69,209	69,487	69,765	70,045	70,325	

Source: Dawson James and Company Reports

Companies mentioned in this report

GT Medical (private)  
Centers for Medicare and Medicaid Services (Federal Agency)

Important Disclosures:

**Price Chart:**



Price target and rating changes over the past three years:

Initiated – Buy – July 1, 2019 – Price Target \$1.00

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Ratings Distribution	Company Coverage		Investment Banking	
	# of Companies	% of Total	# of Companies	% of Totals
Market Outperform (Buy)	37	84%	10	27%
Market Perform (Neutral)	7	16%	0	0%
Market Underperform (Sell)	0	0%	0	0%
<b>Total</b>	<b>44</b>	<b>100%</b>	<b>10</b>	<b>23%</b>

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