



## ► QUICK FACTS

- The **FDA** provided clearance for the CyberKnife in 2001

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- The **efficacy outcomes** of CyberKnife are comparable to other prostate cancer treatment outcomes at 5 years<sup>1</sup>

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- **Over 5,000 men** worldwide with prostate cancer have been treated with CyberKnife radiosurgery<sup>2</sup>

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- Compared to surgery, CyberKnife is a non-invasive procedure that does not require hospitalization

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- The entire CyberKnife treatment can be **completed within 4 – 5 sessions**

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- CyberKnife delivers stereotactic radiation – a proven, 30+ year-old technique – delivering high doses of radiation with **exacting sub-millimeter accuracy** by capitalizing on modern robotic technology that **saves healthy tissue**

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- CyberKnife utilizes real-time image guidance to **accurately and continuously target the prostate** that often moves during treatment and automatically corrects for this movement

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- Designed to avoid healthy tissue and critical anatomy, CyberKnife can **minimize quality of life side effects** with respect to sexual, urinary and bowel function

## CYBERKNIFE® INFORMATION GUIDE

### Prostate Cancer Treatment

#### INTRODUCTION

As a patient recently diagnosed with localized prostate cancer, it is important that you familiarize yourself with several treatment options. By proactively researching the various approaches to treating your prostate cancer, you'll be better equipped to arrive at a decision that is best suited for you. We encourage you to use this information guide to talk to your doctor and discuss whether CyberKnife® radiosurgery may be right for you.



Having clinical data to review is key to your decision process. To date, several hundred men have been part of various CyberKnife clinical studies where the outcome of their treatment was monitored and published in peer-reviewed medical journals. Results from some of those studies are referenced in this information guide.

#### WHAT EXACTLY IS THE CYBERKNIFE SYSTEM?

The CyberKnife System is a robot that delivers a unique form of Stereotactic Body Radiation Therapy (SBRT) also known as radiosurgery. It is the only radiation therapy technology that tracks tumor motion and automatically corrects the aim of the treatment beam when movement is detected. The CyberKnife Radiosurgery System delivers radiation with sub-millimeter accuracy through the use of continual image guidance and robotic mobility. As a result, the radiation is directed to where it counts most, the prostate, and the radiation dose falls off steeply around the healthy tissue that surrounds the prostate.

## Most Commonly Asked Questions and Patient Benefits:

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### Q1: Is the CyberKnife® treatment cleared by the FDA?

**A1:** Yes. In 2001 the CyberKnife System received 510K clearance from the FDA to treat anywhere in the body where radiation is indicated.

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### Q2. What criterion is used to determine if I am a candidate for CyberKnife treatment?

**A2:** Generally speaking, candidates for CyberKnife treatment fall into low to intermediate risk categories. The definition of risk used by the American Urological Association and based on a report from the American Joint Commission on Cancer<sup>3</sup> is as follows:

**Low risk:** PSA  $\leq$ 10 ng/mL and a Gleason score of 6 or less and clinical stage T1c or T2a

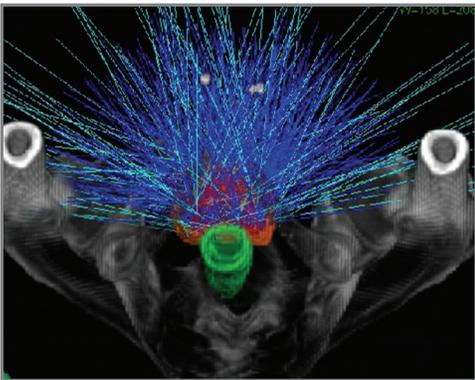
**Intermediate risk:** PSA >10 to 20 ng/mL or a Gleason score of 7 or clinical stage T2b

(These are guidelines only.)

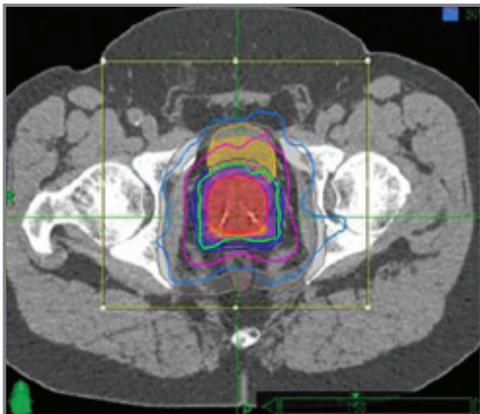
Patients with more advanced prostate cancer may qualify for CyberKnife treatment combined with other treatments and should consult their physician regarding their specific case.

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### Q3: What makes the CyberKnife System different from other radiation treatments and surgery?



**Fig. 1.** CyberKnife can deliver beams from hundreds of unique angles around the patient.



**Fig. 2.** CyberKnife System's three-dimensional imaging shows the highest concentration of radiation is being delivered to the prostate.

**A3:** There are **four principal patient benefits** that distinguish CyberKnife from other prostate cancer treatments:

#### **Advanced Robotics:**

The CyberKnife System is a linear accelerator mounted to a robotic arm that is specifically designed to deliver stereotactic radiation from hundreds of different angles. Unlike other radiation devices, the robot is not fixed; it moves in multiple directions throughout multiple planes, without interruption, to precisely target the prostate. This is a significant departure from *gantry style* systems traditionally limited to 7-9 radiation delivery angles. This means that the CyberKnife System can avoid healthy tissue and deliver a highly conformal and individualized treatment for the prostate. In other words, creating a prescription dose that conforms closely to the shape of the prostate gland while minimizing inclusion of the surrounding tissues based on your personal anatomy (see Figure 1). Given this robotic maneuverability, less healthy tissue is affected and higher doses targeting the prostate can be delivered exactly where it counts most. (see Figure 2).

#### **Compensating for Prostate Movement:**

The prostate gland can move unpredictably throughout the course of treatment that makes the ability to track, detect and correct for motion critically important. Unlike any other radiation treatment, the CyberKnife System *continually tracks and automatically corrects for the movement* of the prostate in real time. This enables the system to *correct the beam direction* so that it is focused on the prostate throughout the entire treatment. The robot constantly monitors and aligns the real time location of the prostate to ensure any adjustments in the beam

delivery match the prepared treatment plan while automatically correcting for any movement during a treatment by relaying critical logistical information to the system software. Safety mechanisms are in place to ensure that the beam of radiation is 'locked on' to the intended target should your prostate move out of acceptable range. For example, if a gas bubble is moving through the rectum or the bladder starts to fill during treatment, a system correction compensating for movements of the prostate automatically occurs.

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### **Reduced Treatment Time:**

Compared to alternative treatments that can take up to 8 - 9 weeks (including relocation in some cases) or 40 - 45 sessions of radiation therapy, an entire CyberKnife® treatment plan can be completed in 4 to 5 sessions. Each treatment session is typically completed in one hour or less. CyberKnife is designed to treat with a higher per-fraction dose given its superior accuracy. This substantially reduced treatment timeframe is advantageous for busy men seeking the least amount of disruption to their daily lives.

### **A Non-Invasive Procedure:**

Aside from the placement of tiny gold markers called fiducials inside of the prostate, a pre-treatment procedure that assists the imaging system to more accurately target tumors, the CyberKnife treatment process is completely non-invasive. No incisions, anesthesia or hospitalization are required. The CyberKnife robot moves quietly around a patient who lies comfortably on the treatment table. The robot will move in nearly every direction to fully deliver the prescribed treatment dose.

This is in contrast to laparoscopic surgery or a traditional prostatectomy that involves incisions and associated risks. Surgical procedures usually involve general anesthesia which may last up to several hours. As with any surgical procedure, potential risks include bleeding and infection and, depending on a patient's overall health condition, other complications including incontinence and/or erectile dysfunction. In addition, surgery requires mandatory hospitalization and catheterization.

And compared to High-Dose-Rate brachytherapy (HDR) the CyberKnife delivers the same dose of killing radiation to the prostate, but does so *without the insertion of multiple catheters*. HDR typically involves a hospital stay, over a 24 hour period, and places 15-20 catheters into the prostate, through the perineum. Through these catheters a machine pushes a single highly radioactive iridium seed into the catheters one by one.

Low-Dose-Rate, or LDR brachytherapy (also known as seed brachytherapy) is also an invasive procedure in which dozens of radioactive seeds are permanently implanted in the prostate with needles inserted through the perineum to deliver radiation over many weeks.

### **Radiation Therapy Differences**

	<b>CyberKnife</b>	<b>HDR</b>	<b>LDR</b>	<b>IMRT</b>	<b>3-D CRT</b>	<b>Proton</b>
<b>Continual image guidance throughout treatment</b>	√	√	√			
<b>Non-invasive</b>	√			√	√	√
<b>Treatment time - 5 treatments or less</b>	√	√				
<b>Does not require anesthesia</b>	√			√	√	√
<b>Does not require operative procedure</b>	√			√	√	√

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#### **Q4: What are the side effects of the CyberKnife System compared to other radiation treatments and surgery and how effective is the treatment in killing the prostate cancer?**

**A4:** To date the efficacy outcomes of CyberKnife treatment for prostate cancer have been comparable to other treatment outcomes at five years. Certain outcomes, such as bladder incontinence have been greatly improved with the CyberKnife treatment as compared to surgery and other invasive prostate treatments. The CyberKnife has also been shown to preserve erectile function in a majority of men in reported studies.<sup>1,4-5</sup>

## Comparison of Radiation Therapy Clinical Outcomes

	Treatment Option	Late Toxicity <sup>††</sup> (Grade 3 or higher)	Disease Free Survival
External Beam Radiation Therapy (EBRT)	3-D CRT <sup>‡</sup>	3-13%	84-97% (5-year)
	IMRT	0-8%	81% (10-year, low risk); 78% (10-year, intermediate risk); 62% (10-year, high risk)
	Proton	Not reported	73% (10-years)
Stereotactic Body Radiation Therapy (SBRT)	CyberKnife	0-2%	93% (5-years)
Brachytherapy <sup>†</sup>	HDR	0-3%	89% (5-years)
	LDR	0-3%	88% (5-years)

<sup>†</sup>Brachytherapy section includes HDR, High-Dose-Rate brachytherapy; LDR, Low-Dose-Rate brachytherapy

<sup>‡</sup>3-D CRT: Three Dimensional Conformal Radiotherapy

<sup>††</sup>Severe and undesirable adverse event or side effect

The CyberKnife<sup>®</sup> Coalition, a group of healthcare professionals that ensure patient access to the CyberKnife treatment is open and protected, created the chart above which represents current published studies for prostate cancer.<sup>1,4-14</sup> What this data suggests is that CyberKnife SBRT has the same incidence of late toxicity side effects and has similar biochemical disease free survival rates compared to other radiation therapies.

### Q5: Is CyberKnife/SBRT covered by private insurance and Medicare?

**A5:** As of the publishing date of this information guide, SBRT treatment for prostate cancer is covered in the great majority of states, including the District of Columbia. If you live outside of the United States then typically your nearest CyberKnife center can answer coverage questions.

In addition, several private insurance payers cover SBRT treatment for prostate cancer. It's always best to review your insurance policy and if applicable, be sure to review your employee contract if your insurance coverage benefits are limited.

### Q6: What do prostate cancer patients have to say about their CyberKnife experiences?

**A6:** In a CyberKnife Coalition survey conducted between February – March 2011, 304 participants were asked why they chose CyberKnife SBRT over other treatment options. Here is what they said:

<b>84%</b>	Most comfortable with risk/side effects
<b>81%</b>	Seemed like the best options among my choices
<b>66%</b>	Offers the latest technology
<b>59%</b>	Convenience
<b>59%</b>	Most likely to eradicate/eliminate the cancer
<b>36%</b>	Least amount of time away from work
<b>18%</b>	Not a surgical candidate

Additional results of this survey found that:

<b>99%</b>	of patients described their treatment as successful
<b>93%</b>	of patients indicated that SBRT did not interrupt their normal life routine
<b>98%</b>	of patients indicated they would recommend SBRT treatment to others
<b>99%</b>	of patients indicated they would choose to be treated with SBRT again

## Published literature quotations

“...SBRT, combined with enhanced technologies, including the CyberKnife®, allows the beam to be targeted more precisely to the prostate, while exposing the rectum and bladder to the smallest possible dose...”

“...Low toxicity and encouraging biochemical control support the use of SBRT in early-stage prostate cancer...”

*Bolzicco et al. Image-Guided Stereotactic Body Radiation Therapy for Clinically Localized Prostate Cancer: Preliminary Clinical Results. Tech Cancer Research Treatment. 2010; Vol 9;5:473-477.*

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“...SBRT for early stage prostate cancer...can be performed with low acute toxicity...”

“...SBRT is less costly (by roughly \$15,000) than IMRT while being much less inconvenient for the patient than a 45-day course of IMRT...”

*Katz et al. Stereotactic Body Radiotherapy for Organ-Confined Prostate Cancer. BMC Urology. 2010; Vol 10;1.*

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“...Erectile function was assessed using question #2 of the SHIM (ability to achieve an erection adequate for intercourse). Of 50 patients reporting erections sufficient to achieve penetration ‘at least half the time’ prior to treatment, 41 (82%) retained their erectile function at 1 year. At 2 years, 29 of 36 (81%) and at 3 years, 9 of 11 (82%) patients retained erectile function...”

*Friedland et al. Stereotactic Body Radiotherapy: An Emerging Treatment Approach for Localized Prostate Cancer. Tech Cancer Research Treatment. 2009; Vol. 8; 5:387-392.*

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“CyberKnife SBRT is an accurate image-guided method for delivering quantitative radiation distribution to a precisely defined three-dimensional target volume, creating very steep surrounding dose gradients. This facilitates that safe use of biologically potent, large dose-per-fraction, hypofractionated radiation dose schedules to the prostate, similar to those delivered by means of HDR brachytherapy.”

*Fuller et al. Virtual HDR CyberKnife Treatment for Localized Prostatic Carcinoma: Dosimetry Comparison with HDR Brachytherapy and Preliminary Clinical Observations. Int J Radiation Oncology Biol Phys. 2008; Vol 70; 5:1588-1597.*



**For more information about the CyberKnife® System or to request a clinical presentation for a physician or patient group, please contact Accuray Patient Relations at +1.408.789.4301 or toll free 1.800.522.3740 x4301, [PatientInfo@accuray.com](mailto:PatientInfo@accuray.com), or visit our website at [www.CyberKnife.com](http://www.CyberKnife.com).**

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