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Radiosurgery

Dear Client,

Radiosurgery is a well-established and non-invasive mode of treating brain tumours and other lesions, especially in patients for whom open-brain surgery might not be a practical option.

Claims professionals can benefit from a greater understanding of the role and efficacy of radiosurgery, particularly when used for conditions with complex neurological causes and in cases that might formerly have been deemed untreatable.

Best wishes,

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What Is Radiosurgery?

Radiosurgery is a type of radiation-based treatment primarily used for brain, head and neck cancers, other abnormalities such arteriovenous malformations (AVMs), and even for certain mental health conditions. It is not "surgery" in the strict sense of the word as it does not involve any cutting implements, but is considered a type of surgery due to the precision with which the "knives" of radiation beams are deployed.

Radiosurgery treatment plans are developed by neurosurgeons and radiation oncologists who use various types of scans (computed tomography, magnetic resonance imaging, positron emission tomography and ultrasound) to determine the precise locations of targets and calculate proper radiation dosages.

The treatments, which consist of precisely calibrated and targeted high doses of radiation aimed at tumours or lesions, have the advantage of low risk to surrounding healthy tissues due to low scatter.

The radiation does not remove the cancers or lesions; rather, it changes them so that they can no longer grow. In cancers, for example, radiosurgery distorts the DNA of the tumour cells so that they lose their ability to reproduce or retain fluids. Radiosurgery used to treat blood vessel lesions such as AVMs causes blood vessels to thicken and close off. Over time, radiosurgery-treated cancers and lesions regress and may eventually resolve.

Most radiosurgery is done in a single treatment, although some conditions will require multiple or "fractionated" treatments. The treatments can last between 10 and 70 minutes and are generally performed on an outpatient basis, enabling patients to return home after a period of observation – usually the same day – and resume normal activities almost immediately.

The main advantage of radiosurgery is its safety profiles. With no incision, there is neither risk of hemorrhage, infection or cerebrospinal fluid leakage, nor is there any need for long post-operative hospital stays. As the radiation of the treatment is highly focused on the abnormal tissue, there is also very limited risk of collateral damage to the surrounding healthy brain tissue.

The risks of side effects is lower than for conventional surgery, but are not non-existent. Gamma Knife® procedures, for example, risk hair loss near the treated area, seizures, weakness, loss of balance and vision problems. With CyberKnife,® some patients experience mild fatigue or nausea after a treatment, however, specific additional side effects can occur depending on the organ being treated. Proton therapy is considered to have the fewest side effects of any form of radiosurgery, but some

patients have experienced fatigue, irritation of the skin in the path of the proton beam, and hair loss around the area being treated.

Three types of radiation are delivered in radiosurgery treatments:

- **Gamma rays** (cobalt 60-based photons). These are delivered by units such as The Gamma Knife® and are used to target small to medium-sized brain lesions and tumors in a single treatment.
- **X-rays** (photons). These are delivered via medical linear accelerators (LINAC) such as CyberKnife® and are used to treat larger cancerous and non-cancerous tumours and other lesions over several sessions.
- **Protons** (or particles). Proton therapy, which delivers large and highly targeted doses of protons to brain tumours, is used to treat brain cancers in a single session. It can also be used for ocular tumors.

Radiosurgery Today

Radiosurgery is an excellent example of where a multidisciplinary skillset of radiation oncologists, neurologists, biomedical engineers and biophysicists have worked together to devise a treatment modality that has broken away from the traditional view of surgical treatment and significantly reduced mortality and morbidity in patients for whom the outlook was previously less favourable.

Today, it is used to treat a variety of brain conditions, including benign tumours such as acoustic neuroma and meningiomas, cerebral metastases, cavernous sinus tumours, glioblastoma multiforme (GBM), AVMs, pituitary adenomas, glomus jugulare tumours, and disorders such as trigeminal neuralgia, Parkinson's disease and multiple sclerosis (specifically for the tremor), as well as ocular impairments such as advanced glaucoma and age-related macular degeneration.

Radiosurgery may also be recommended in cases where a past surgical resection was incomplete or where a surgical procedure might cause significant deficits on a person's function. With cavernous sinus tumors, for example, as the region contains cranial nerves III, IV, V (branches V1 and V2) and VI as well as the internal carotid artery, conventional invasive surgery has risks that may be avoided by opting for radiosurgery. Conventional surgery also poses a high risk of neurological deficit if used to treat AVM in the brain stem, basal ganglia or other sensitive areas. Radiosurgery may be, in certain of these cases, the only prudent treatment option.

The statistical outcome, safety profile and absence of morbidity of radiosurgery is exceptional, and certainly a major factor in facilities acquiring such a device. Statistics on AVM patients treated with radiosurgery, for example, show 70% to 90% of AVMs being completely eradicated within three years.

It is important to note that radiosurgery's use is not restricted to cranial conditions. It has been deployed to treat cancers of the liver, adrenal gland, pancreas, spine, prostate and lung, and is even being used during conventional surgeries to decrease the risk of cancer recurrence.

Cases of malignant ventricular tachycardia that has been refractory to standard treatment options including catheter ablation have been treated with CyberKnife® in patients who were not suitable candidates for surgical intervention. While a minimal rise in the serum level of Troponin T was noted, no other toxicity was observed.

The future of radiosurgery is exciting. Studies are currently under way to determine applicability for clinical depression and cardiac disease. Research is also being conducted into possible efficacy for epilepsy, obsessive-compulsive disorder, headaches, chronic pain and for severe pain in patients with end-stage cancer.

Underwriting Considerations

Any upcoming surgery should be disclosed, as it is materially relevant to an insurer's assessment of whether to accept a particular risk (if at all), and if so, on what terms. Radiosurgery has a significant advantage over traditional open surgery in that morbidity risks and recovery times are substantially reduced. It therefore would likely allow an underwriter to defer an application for a shorter period of time and reach a decision sooner. Keep in mind, the underlying diagnosis must primarily drive the underwriting process; however, the response and outcome of the particular condition might be altered because of the radiosurgery.

Claims Considerations

When assessing a claimant's functional capacity after a radiosurgery treatment (or treatments), the safety profile of radiosurgery and reduction of complications resulting from traditional surgery must be considered. Claimants who were previously either untreatable or who might have suffered significant side effects from traditional open-brain surgery may return to some form of work (if not their pre-disability occupation) sooner.

Given the number of radiosurgery units worldwide, access to this form of therapy should be reviewed by an insurer considering whether it is clinically appropriate and meets the policy definition of "medically necessary."

The cost of this type of treatment will often be significantly higher than other, more traditional treatments, especially when the technology is first introduced into a market. Insurers looking to verify that its costs meet "reasonable and customary" definitions may need to extend significantly the geographical area in which they perform a cost analysis. If a radiosurgery unit is newly introduced into a particular geographic region, this might even include looking at radiosurgery costs overseas and then adjusting benefits in accordance with what would be considered "reasonable and customary."

Equally important is the potential for extension of life through radiosurgery. This is particularly so in claims for malignant brain tumours that might ordinarily have resulted in early mortality. Such a consideration is relevant in the assessment of life, terminal illness (particularly where a time frame is crucial) and disability claims, particularly where claims assumptions are made on the course of palliative treatment without radiosurgery.

Conclusion

Underwriters and claims analysts will benefit from understanding the fundamental principles of radiosurgery and its applications. These procedures are likely to be performed more frequently in the future, and they will inevitably impact the insurance industry in ways that will need to be understood and quantified. ◆