Risk Management

Insurance Considerations for Magnetic Resonance Imaging Installations

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MAGNETIC RESONANCE IMAGING: PROCESS AND RISKS

Medical diagnostics has made furious progress in recent decades. This development is one of the main reasons why a whole series of malignant diseases can now be identified at an early stage, thus considerably increasing the chances of recovery. Large arrays of apparatus are often required for this, not only in clinics, but also in the practices of the specialist physician.

Besides computer imaging, magnetic resonance imaging (MRI) is one of the most sophisticated diagnostic processes used on a large scale for routine examinations in medical diagnostics. Unlike computer imaging, magnetic resonance imaging does not use X-radiation. The patient is placed in a strong magnetic field in combination with a radio-frequency field. The physical effect of the nuclear spin resonance of hydrogen atoms in the tissue generates very weak signals in the receiver coil, which with the help of a special computer system are used to produce an image at a predetermined plane of the part of the body to be examined.

Enormous demands are placed on the apparatus for such examinations. The central part of a magnetic resonance scanner is a large, helium-cooled superconducting electromagnet, which can generate a magnetic field that is many thousand times as strong as the magnetic field of the earth. For this reason alone, this kind of apparatus must be installed in specially isolated rooms. For safety reasons, no movable metal objects may be allowed near the apparatus when it is in operation, because the magnetic field is strong enough to attract even heavy objects and propel them through the room. The entire system also warms up during operations and must therefore be actively cooled. Finally, a high-performance computer system is also needed to record and analyze the data.

The cost of purchasing an MRI system runs into the millions of dollars. In view of the sums involved, the operator of an MRI system will obviously take out property insurance, normally in the form of an electronic equipment insurance policy. But one risk remains that is not to be taken lightly: any damage that may occur usually has to be repaired on the spot because simply replacing large system components is out of the question. The electromagnet alone weighs several tonnes. The repair work itself and the subsequent job of calibration may well take many days. During this time, operations are at a standstill, and patients must be referred to other practices. Long downtimes may seriously threaten a specialist's very existence in economic terms.

For operators, this means that it is necessary to insure themselves not only against material damage, but also and in particular against losses caused by business interruption. The losses described below have been chosen to illustrate this necessity.

Magnetic Resonance Scanner Damaged by Water during Refurbishing

A large radiological practice had purchased a magnetic resonance scanner. Extra rooms had been rented and refurbished especially to accommodate it. About six months after the system had gone into operation, malfunctions began to occur for which no immediate cause could be determined. The quality of the images appeared to be impaired by electromagnetic interference.

The problem was referred to the firm that had installed the system. The outcome of the investigation was that the scanner's highly sensitive electronic system was apparently being affected by electromagnetic interference coming from the air-conditioning system. The cause was found to be an earth circuit in the electrical installation of the power supply, so that a galvanic separation of the air-conditioning system and the scanner was recommended.

An insulating plastic lining was installed in the water pipe system of the air-conditioning compressor system for this purpose. In order to keep the disruption of the practice to a minimum, the refurbishing work was started on a Friday afternoon. When the job was completed, the specialist firm commissioned with the work carried out a routine inspection of the piping system to make sure there were no leaks.

What they failed to consider, however, was that the water pressure generally rises at night on account of the low level of consumption. On the Saturday evening, this increase in pressure evidently caused the water pipe to detach from one of the insulation connecting pieces. During the night and the following day several thousand litres of water escaped unnoticed and flooded first the false floor in the electronics room and then the scanner room itself. On account of the system's enormous weight a room in the cellar was used to accommodate the scanner. Since there was no drain in this room, the fire brigade had to pump the water out. The walls and floor were soaked so badly that extensive repairs were necessary. The copper Faraday cage needed for insulation had to be replaced completely. To do so, the scanner had to be moved to a different part of the room.

It took a total of 33 working days to repair the damage to the scanner itself and to refurbish the treatment and waiting room, involving a cost of US$140,000. The practice had to remain closed the whole time. Even then business could not immediately return to full capacity as the imaging system had to be started up again first. During the interruption there was no choice but to refer patients to other practices. On the basis of the average daily turnover at the practice, the business interruption generated a shortfall of US$250,000.

A Fitter's Negligence Causes Major Damage to a Magnetic Resonance Scanner

One of the special features of the magnetic resonance scanner, the effect of which is often underestimated, spelled disaster for one operator. In order to generate the strong magnetic fields required, superconductive electromagnets have to be used. Unlike conventional magnets, superconducting magnets cannot simply be switched off. Once the magnetic field has been generated, it remains active until it is deactivated under defined conditions. This means that under certain circumstances there may be an extremely strong magnetic field in the vicinity of a magnetic resonance scanner even during maintenance work.

In the course of routine maintenance work, a number of components had to be replaced on a magnetic resonance scanner with such a superconducting magnet. For this purpose, large sections of the panelling had to be removed. Advantage was also to be taken of the downtime for maintenance of the air-conditioning system. The air-conditioning firm sent a technician specially to do the job. The operator of the system, a radiologist, informed the technician expressly of the dangers emanating from such a strong magnetic field.

Nevertheless, the technician entered the scanner room with a metal toolbox. In doing so, he exposed himself to the direct influence of the magnetic field. Although he was carrying the toolbox on the side of his body away from the magnet, it was torn out of his grip by the extremely strong forces of the magnetic field and was flung towards the system at high speed. When it hit the scanner, it broke in two and its contents flew into the unprotected parts of the scanner with great force. The system was severely damaged. As luck would have it, the maintenance engineer, who had been working on the scanner until a short time before, had just left the room. If he had not, he might have been killed by the tools flying through the room.

The damage to the inner coil of the scanner was so severe that it was impossible to repair it either on the spot or at the manufacturer's. The inner coil had to be replaced completely. The costs of material and repairs alone came to more the US$390,000, with the inner coil accounting for about US$280,000.

Repairing the scanner and starting it up again took five working days. The policyholder maintained that the examinations of patients planned for this time could not be carried out at a later date. On the basis of appointments made for the period in question, the policyholder filed a claim for US$125,000. HQ

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