

Changing the Game: Spine Care in the Era of Artificial Intelligence and Deep Learning Algorithms

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Spine care has always been a very dynamic and innovative field. One of the biggest developments in recent years has been the presence of artificial intelligence and deep learning algorithms in spine care. Every scientific meeting of the past 1 to 2 years that prides itself as important and/or thought provoking has given lectures on this topic a prominent spot in the program and wide exposure. A recent PubMed Search combining “spine,” “artificial intelligence,” or “deep learning” has fetched 536 and 78 sources, respectively. The opportunity to generate new knowledge through the detection of previously unknown patterns in vast amounts of data has the potential to give all fields of spine care a giant leap forward.

One field of artificial intelligence and machine learning is focused on technical aspects. Image segmentation, increased accuracy in detecting and identifying anatomical structures will not only support diagnosis but also open new levels of precision and usability in areas such as surgical navigation or robotics. Surgical planning, individualized risk assessment, as well as education will all profit. While these aspects have the potential to facilitate treatments and improve safety and therefore must not be underestimated, the global impact on spine care will happen beyond the individual hospital or operating room.

The electronic assessment of patient-reported outcome measures, clinical and radiological data by surgeons or other health care providers, national or regional societies’ registries’ data, data pools from insurance companies, as well as national implant databases will inevitably be linked together in some form. While all this raises concerns about data privacy and all issues associated, some global regions will be more strict about data privacy than others. However, the global trend is irreversible.

The most interesting aspect is the fact that all stakeholders in this field have different and often diverging interests. Insurance companies, surgeons, hospitals, patients, implant manufacturers,

and pharmaceutical companies as well as researchers all have different views on what can be gained. And all may be right because their arguments in future discussions will be supported by more and better data than in the past.

However, this raises a number of questions. If there is an algorithm that predicts “perfect” outcome, will that be the standard of care? What if the individual patient’s outcome turns out less than optimal or predicted by the algorithm? Will this have financial impact, raise legal issues, or both? What happens to novel technology or treatments, unpredictable at the present day? What impact does this have on residents and fellows training and education? The relationship between surgeons and payors will change fundamentally. And more generally, the doctors’ medical autonomy might be significantly at stake, individualized treatments may become a thing of the past or at least of less regulated regions in the world.

Medical practitioners worldwide are faced with this discussion and advocacy groups alone cannot address this. This has to be addressed in every clinic and every Emergency room and every research lab as well as every courthouse.

So the old saying “3 doctors, 5 opinions,” especially true in spine care, may become a thing of the past. Maybe this is not all bad. These technologies certainly have the potential to elevate standards.

But spine care in general may be on the verge of the most fundamental change ever.

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