

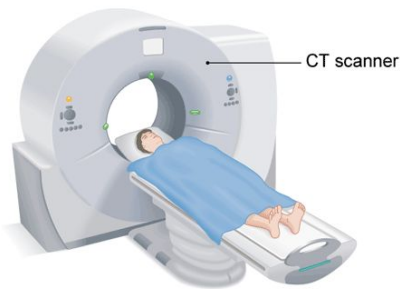
## **Statement 1: The ideal imaging system for image guided Orthopaedic surgeries**

Analyzing the pros and cons of different imaging modalities, we considered the best one for Orthopedics to be the usage of X-Rays in different ways.

Both conventional X-Rays and CT (Computed Tomography) take pictures of the internal body structures. CT represents an advancement in the conventional radiography, because it solves one of its biggest challenges – the overlapping of different anatomical structures, such as the ribs overlapping the heart and lungs, for example. Therefore, CT images allow radiologists to identify the internal structures of the body and see their shape, size, density and texture. All of this information can be used to determine if there is a medical problem, as well as the extent and exact location of the problem, alongside other important details.

CT scanning provides medical information that is different from other imaging modalities, such as ultrasound, MRI, SPECT, PET or nuclear medicine. The main advantages of CT consist of **quick acquisition of images, a lot of clear and specific information and a view of a large area of the body, as well as assisting medical professionals in:**

- determining when surgeries are necessary
- reducing the need for open surgeries
- improving cancer diagnosis and treatment
- reducing the length of hospitalizations
- treating common conditions such as injury, cardiac disease and stroke
- improving patient placement into appropriate areas of care, such as intensive care units (ICUs)



When patients enter an emergency room, once they are stable, they can be scanned quickly so doctors can rapidly assess their condition. Emergency surgery might be necessary to stop internal bleeding and CT images show the surgeons exactly where to operate. Without this information, the success rate of surgery would be significantly compromised.

Intraoperative, X-Rays can help imaging the body using a fluoroscopy C-arm. Such images allow the surgeon to perform minimally-invasive procedures by only making small incisions and continue guided by the successive images provided at high frame rates.



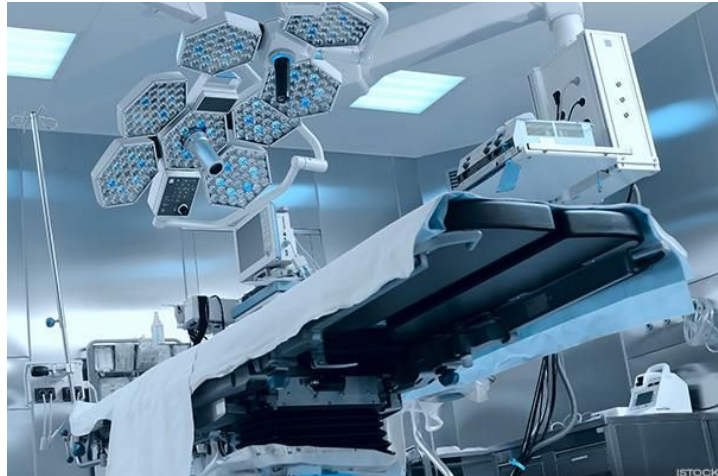
While the exposure to X-Rays represents a high risk, we could assume that in this case, it is very small in comparison to the benefits of a well-planned surgery and this modality comprises a higher number of advantages than any other.

## Statement 2: The minimum viable product for Orthopaedics

In the present, the solutions used predominantly require the surgeon to control the imaging system with their feet paddle while continuously looking at the screen and operating on the patient. There is, thus an area of **integrated coordination** that we find missing.

We propose a **Voice-Controlled Flexible imaging system**.

The surgeons could control the view and the placement of camera with their voice. This will free them of using the foot pedal thereby easing the operating comfort. Additionally, the imaging equipments need to be moved and adjusted at a better angle while the surgeons insert the guided K-wires through the incision and at the time of removing them after putting the screw. A **real-time Navigation System** could ease the process manifold while also improving the precision, reducing surgery time and increasing the overall success rate of the surgeries.



Another problem that the surgeons face is the **extended waiting time between two consecutive surgeries** on the same patient. The set-up of the C-arm manually in the perfect position is a trial and error method. It is also very time-consuming. We propose a novel method to automate this process. We can have a

**Positioning System** that will have the pre-surgery image data of the patient and can use that information to automatically read and adjust the equipments in minimal time.