

White paper

# The impact of operative time on outcomes in orthopedic surgery



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## The impact of operative time on outcomes in orthopedic surgery

Orthopedic surgical volumes are projected to grow at a compounded annual rate of **7.9% from 2023 to 2030**, driven by an aging population and advancements in digital and robotic technologies<sup>1</sup>. As these surgical volumes increase, optimizing outcomes while minimizing complications is critical. One modifiable factor, operative time, is independently associated with risk of postoperative complications. The following key studies<sup>2-7</sup> examine the relationship between intraoperative time and outcomes in hip arthroscopy patients.

### Hip Arthroscopy Procedures: Intraoperative time and associated outcomes

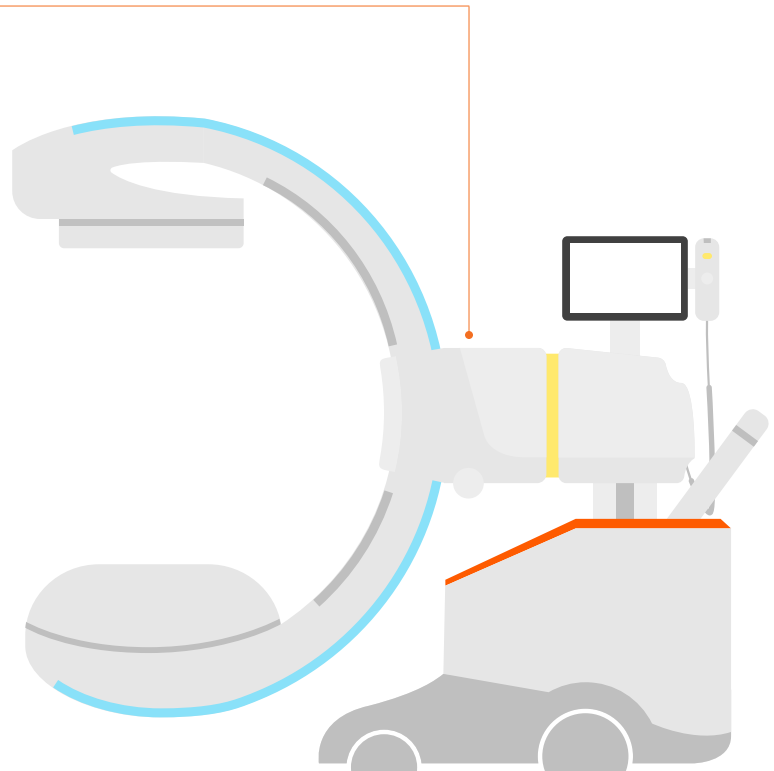
> 120 minutes	Operative time exceeding 120 minutes remained an independent predictor of any complication and wound complication, with each 30-minute increase in operative time beyond 120 minutes further increasing risk.
Per 15-minute increment	<b>An increase in operative time by 15 minutes increased the risk</b> of anemia (requiring transfusion) by 9%, wound dehiscence by 13%, renal insufficiency by 9%, sepsis by 10%, surgical site infection (SSI) by 9%, and urinary tract infection by 4%
> 75-80 minutes	<b>A clear linear relationship has been observed</b> between operative time and increased rates of readmission, reoperation, SSI, and transfusions, with these risks rising notably when operative times exceed 75-80 minutes.

### Improving efficiency in Intraoperative imaging with CIARTIC Move

Mobile C-arms are essential in orthopedic surgery for imaging. Typically, initial reference images are taken at the start of a procedure, and the C-arm is then moved away from the sterile field. During surgery, the C-arm often needs to be brought back in and repositioned to the exact initial position, a process called “fluoro hunting” that frequently involves multiple adjustments to achieve the optimal view.<sup>8</sup>

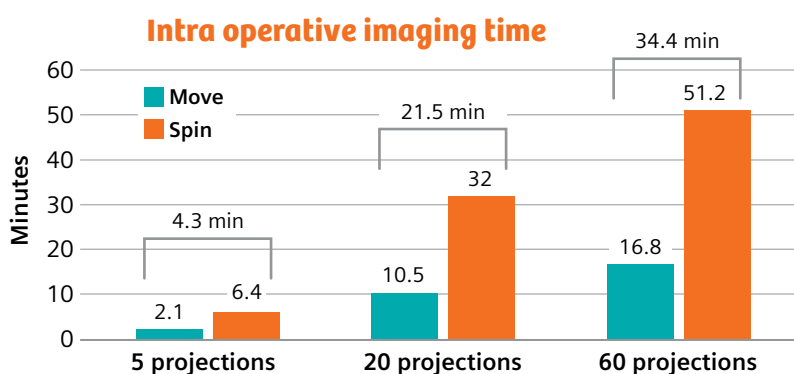
The CIARTIC Move, a self-driving mobile C-arm, eliminates the need for fluoro hunting by storing and automatically returning to pre-set positions. The system was designed to automate workflows through three main assist functions to streamline image reproducibility, save time and improve workflow efficiencies.<sup>9,10</sup>

- **Position Assist:** Store/recall up to 12 specific C-arm positions and imaging parameters
- **Iso Assist:** Automatic adjustment of the patient-detector distance
- **Park Assist:** Automatically parks the C-arm away from the sterile field



### Pre-clinical findings on time savings with CIARTIC Move

Pre-clinical data quantified the potential time savings achieved with the CIARTIC Move compared to a traditional 3D mobile C-arm. Fourteen surgeons performed pelvic procedures, using 5 projections (AP, lateral, inlet, outlet and obturator) on 10 cadavers for each C-arm. Intraoperative Imaging Time (IIT) time was defined as the total time taken to move the system from the park position to the selected projection and back to park. Results showed a significant reduction ( $p < 0.001$ ) in the median IIT for the CIARTIC Move (172.5 sec) versus the reference C-arm (385 sec).<sup>9</sup>



Orthopedic procedures typically require multiple projections. Most orthopedic fracture or joint replacement cases require over 5 projections to complete. Procedures like femoral nailing, tibial plateau cases, and external fixation fractures may need around 20 projections, while complex pelvic ring fractures may exceed 40. The following graph estimates the IIT (in minutes) for the CIARTIC Move and for a traditional C-arm (Cios Spin), illustrating notable time savings across different procedural requirements.<sup>9</sup>

Reducing intraoperative imaging time not only optimizes workflow but reduces procedure time which translates into potential cost savings.

With an average OR cost of approximately \$46 per minute<sup>11</sup> time saved through reduced imaging adjustments and positioning errors could result in substantial financial savings per procedure, particularly across high-volume orthopedic practices.

### Enhancing communication and reducing strain on technologists

Automated workflows, as demonstrated by the CIARTIC Move, are expected to ease the communication burden between the surgeon and the technologist, which is often a source of strain in traditional workflows. In conventional setups, surgeons must rely on technologists to interpret their requests and position the C-arm according to specific views—often requiring repeated adjustments. This process can lead to frustration on both sides, as the surgeon may struggle to communicate precise positioning, while the technologist works to approximate the requested view.

With CIARTIC Move's Position Assist, surgeons and technologists can save and retrieve specific, pre-set positions instantly, eliminating guesswork and reducing the need for back-and-forth adjustments. This not only improves efficiency but also enhances team collaboration, allowing the technologist to focus more effectively on other critical tasks and reduces stress in the OR.

### Reducing non-productive wait times with surgeon independence

When technologists are short-staffed, or responsible for multiple ORs, delays may occur if they need to be paged to reposition the C-arm.

With CIARTIC Move's assist functions, the surgeon or OR staff can quickly and precisely reposition the system and capture images via remote control, reducing time

spent waiting for a technologist. This enhances workflow efficiency for both the surgeon and technologists covering multiple ORs, potentially increasing OR capacity over time by shortening procedure times and reducing intraoperative imaging delays.

### Conclusion

**Managing operative time is essential in orthopedic surgery to reduce the risk of complications.** Studies demonstrate a relationship between prolonged operative times and increased postoperative care, underscoring the value of efficient workflow and time-saving techniques. Technologies like the CIARTIC Move, which reduce intraoperative imaging time, have the potential to improve operating room efficiency and support smoother workflows, which may ultimately contribute to better patient outcomes. As surgical volumes continue to grow, adopting such technologies can help healthcare teams meet the increasing demand for precise, efficient, and effective care.



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#### Siemens Healthineers Headquarters

Siemens Healthineers AG  
Siemensstr. 3  
91301 Forchheim, Germany  
[siemens-healthineers.com](http://siemens-healthineers.com)

#### USA

Siemens Medical Solutions USA, Inc.  
Healthcare  
40 Liberty Boulevard  
Malvern, PA 19355-9998, USA  
[siemens-healthineers.us](http://siemens-healthineers.us)