Section: Orthopaedics

Review Article

CURRENT ADVANCEMENTS IN RESUSCITATIVE ORTHOPAEDICS AND TRAUMATIC SURGERIES: A FOCUS ON COMPUTER-ASSISTED ORTHOPAEDIC SURGERY (CAOS) SYSTEMS

Omar Usmani[1], Hamza Rayyan[2], Vatsal Kapoor[3], Saurabh Srivastava[4], Afroz Ahmed Khan[5], Sharique Ahmad[6]

[1,2,3]MBBS Intern, Era's Lucknow Medical College and Hospital, Era University, Lucknow U.P., India
[4]Associate Professor, Department of Otorhinolaryngology, Era's Lucknow Medical College and Hospital, Era University, Lucknow U.P., India
[5]Associate Professor, Department of Orthopaedics, Era's Lucknow Medical College and Hospital, Era University, Lucknow U.P., India
[6]Professor, Department of Pathology, Era's Lucknow Medical College and Hospital, Era University, Lucknow U.P., India

Received : 08/04/2025
Received in revised form : 26/05/2025
Accepted : 15/06/2025

Keywords:
Resuscitative Orthopaedics, Traumatic Surgeries, Computer-Assisted Orthopaedic Surgery, Medical technology.

Corresponding Author:

Dr. Sharique Ahmad,
Email: diagnopath@gmail.com

DOI: 10.47009/jamp.2025.7.3.197

Source of Support: Nil,
Conflict of Interest: None declared
Int J Acad Med Pharm
2025; 7 (3); 1018-1023

ABSTRACT

In recent years, surgery for trauma and orthopaedic procedures has advanced by using innovations that ensure better accuracy, safety and more positive results for patients. Relative to human hands alone, CAOS is a big improvement in trauma care since it uses advanced images, navigation and robots during surgeries. It reviews resuscitative orthopaedics by outlining its main procedures, common clinical uses and any recent changes in this area.

In CAOS, traditional imaging such as computed tomography and magnetic resonance imaging is used to build three-dimensional models for surgical planning. With the help of the system's navigation, doctors can locate each implant in the best position and precisely fix the fracture parts. Surgeons depend on robots to improve precision and control, mainly when they do complex or revision surgeries.

CAOS has been found to improve overall surgery outcomes, letting surgeons be less general and more precise with radiation and to prevent some injuries that can result from surgery or metal placement. Still, the financial cost, technological issues and the training needed make it essential for schools to offer particular courses for surgical residents through simulation. Even with issues, the addition of more work and new technology is making CAOS simpler and more rewarding.

AI, augmented reality visuals and telemedicine are set to make CAOS systems both user-friendly and adaptable. Developing solutions that work on mobile devices and are affordable may help more people overseas receive reliable trauma care.

In essence, CAOS introduces a new perspective in emergency orthopaedics and trauma surgery, bundling safety, accuracy and efficiency. It is important to have experts collaborate and have funding support to address the main issues and obtain the best outcomes from medical technology for trauma care.

INTRODUCTION

The mainstay of emergency medical care includes resuscitative orthopaedics and traumatic surgery. Their aim is to instantly treat the musculoskeletal injuries that pose the highest risk so that serious consequences and untreated wounds can be prevented, patients can heal better and their well-being is improved. During the last several decades, better results have come about thanks to improved surgical techniques, advances in biomedical engineering and improved care coordination.[1]

Until recently, orthopaedic trauma was managed by performing widespread, usually aggressive, early surgery. Though it occasionally worked quickly, ignoring the systemic inflammatory reaction in the patient led to failure. With greater knowledge of trauma physiology, medical staff are now using personalized, planned care based on the patient's strength and health. As a result, new approaches have appeared such as damage control orthopaedics

ISSN (O): 2687-5365; ISSN (P): 2753-6556

(DCO) that look for the right balance between intervening quickly and the possible effects on the whole body.[2]

How Technological Advancements Impact Accounting

Technology has greatly enhanced the way trauma is detected and treated with surgery. MDCT, portable radiography and intraoperative fluoroscopy provide clear information about the type and location of an injury.[3,4] Now, advanced imaging systems in operating suites mean that doctors can perform surgery without delay after seeing the patient's immediate test results, improving the flow and outcomes for patients.

The addition of computer-guided programs before, during and after surgery is changing how trauma surgery is performed. Thanks to these platforms, physicians can use detailed images and get live directions which helps them do the procedure with more confidence and fewer mistakes. Simulations, better views and more ergonomic situations in difficult operations are made possible today thanks to robotics, virtual reality (VR) and augmented reality (AR).[5]

Rising Influence of Computer-Assisted Orthopaedic Surgery in Trauma Care

With CAOS, precision in treating orthopaedic trauma is being revolutionized. Originally designed for treating joint arthroplasty and spinal conditions, CAOS is now also used in complex fracture care, deforming conditions and trauma reconstruction. Combining imaging technology, navigation resources and (in some situations) robots, makes correct reconstruction of anatomy achievable.[6]

Should accidental injuries cause anatomy to be masked, surgeons can depend on CAOS to visualize and manage these changed features. For this reason, pelvic rings often get good results in treating comminuted fractures or injuries. Recent evidence from clinical work suggests that CAOS improves how the bones line up, uses less radiation during the treatment and cuts down on the number of revision surgeries.[6,7]

Intent and Outline of This Overview

This review looks at significant recent changes in resuscitative orthopaedics and trauma surgery, mainly focusing on CAOS systems. It looks into the background of trauma paradigms, the expansion of CAOS into different orthopaedic procedures and the effects these changes have had on surgery and learning. Seven chapters focus on the key areas of orthopedics, covering work in arthroplasty, treating fractures, pediatric cases and educating surgeons.

The purpose is to show how CAOS is making resuscitative trauma surgery more precise, safer and focused on each patient's needs. It is stressed how it supports current treatment guidelines, may improve results and could play a role in future principles of orthopaedic care.

The progress of Resuscitative Orthopaedics and Trauma Surgery

Understanding the Drivers Behind Paradigm Shifts in Orthopaedic Trauma Care

Nowadays, orthopaedic trauma treatment is very different from the initial method for wartime care. In the late 20th century, the field moved toward the ETC model which advises immediate and complete management of bone fractures. Clinicians saw a rise in problems, like systemic inflammatory response syndrome (SIRS) and trouble with multiple organs, in severely ill patients who had early major surgery.

Because of this, the Damage Control Orthopaedics (DCO) model was introduced, aiming to quickly hold damages in place with methods such as external fixation. The purpose was to reduce the body's stress after injury and put off major surgery until the patient recovered somewhat. The change in thinking opened the door to catering to patients' needs and now surgeons only decide when and how much surgery to do based on the patient's health, not only the degree of the injury.

Damage Control Surgery: Integrating Hybrid Models for Optimal Trauma Management

DCO is strongly connected to Damage Control Surgery (DCS) which was first designed to treat abdominal injuries. Responding to rapid bleeding and managing possible contamination is the primary goal and then care is given through the ICU in stages. Its goal regarding orthopaedic trauma is to limit the time of the first operation and the impact it has on the patient's body.

Lately, a method called Early Appropriate Care (EAC) has been introduced. With EAC, certain patients whose blood and coagulation tests indicate they can manage surgery early are allowed quick, definitive treatment. These approaches reinforce how close attention to physiology and team approach are important in treating trauma patients.

Enhancements in Emergency Trauma Care: Building More Knowledge and Skills

The system for providing prehospital care has improved a lot. Because helicopters can transport patients quickly, more precise triage and fast use of drugs like tranexamic acid allow for swifter injure care. When blood is given and portable blood products are involved, casualties are rescued more quickly through massive transfusions.

At this stage, we have trauma systems and quality registries for every region, so we can see and assess the results from the various approaches being put to use. At the same time, orthopaedic trauma teams begin to train with simulations to handle complex injuries and make surgeries possible during limited time.

Merging Imaging and Surgical Processes Using Step-By-Step Methods

Modern imaging techniques have helped surgeons plan and decide on the right actions during an operation. Portable ultrasound, intraoperative CT and 3D fluoroscopy allow doctors to monitor organs during surgery and revise their approach during the

ISSN (O): 2687-5365; ISSN (P): 2753-6556

procedure. Now that diagnostic and surgical methods are linked, delays are reduced, accuracy increases and results are more accurate.

When all these trends are considered, adding CAOS to trauma care becomes straightforward and it focuses on what patients need from their data. In the next chapters, it becomes clear that CAOS leads the field of orthopaedic trauma treatment for individuals.

Applications of Computer-Assisted Orthopaedic Surgery in Trauma Care

Joint Reconstruction Before and After an Injury

At first, CAOS was broadly introduced in elective joint replacement and later used for joint problems caused by trauma. Patients with peri-articular fractures or trauma to their joints benefit from CAOS which improves planning and placement of prosthetic devices.[14,6] It becomes most important with difficult anatomy such as complex breaks in the acetabulum or where there is previous joint damage.[8]

Surgeons can use CAOS systems to plan implant position and placement before surgery and guide them while operating, making it easier to achieve correct alignment and preventing post-surgery complications such as dislocation or different leg-lengths. In cases where important structures are hidden by scar tissue, CAOS helps to restore the proper movement of the joint.

Precision in Aligning and Stabilizing Bone Fragments in Trauma Surgery

In fracture care, CAOS improves how accurately the bones are put in place and how the fixation works.[6-9] When following navigation-guided systems, doctors at Fractures Clinic reduce the chance of unintentionally injuring nerve or blood vessels while placing screws, plates or nails. Fluoroscopy is most needed for pelvic and acetabular fractures, since safe entry routes for the implants may be difficult to find with conventional techniques.

Researchers have found that CAOS make the process of fixation better and cause fewer complications related to the hardware used. By using robotic surgery, less radiation is used in the operation, so both doctors and patients are protected.[4]

Surgical and Non-Surgical Treatments for Misshaped and Unbalanced Limbs

CAOS is as successful in managing issues such as deformity after a trauma and the issue of limb length inequality. The use of 3D computer systems makes it possible for doctors to decide on a course of action for bone deformities.[10] Using cutting and drilling guides, the surgeon can place hardware and make cuts precisely as planned.

Almost perfect angles and sizes in limb reconstruction help the patient move with ease. Because of their supportive CAOS, patients experience solid and recoverable joint structures.

Trauma Surgery Using Minimally Invasive Approaches

Because CAOS is gentle, it helps reduce the potential risks of surgery for patients. When using navigation, the percutaneous implantation requires less soft tissue dissection.[7] Specially, it aids seniors and those with other health issues that may easily result in infection or slow wound healing.

Each of these strategies allows patients to go home quicker and lowers the amount of healthcare materials used.

Dealing with Pediatric Trauma and Safeguarding the Growth Plates

When growth is stopped during pediatric trauma, it can be very dangerous. With CAOS, surgeons can check for growth plates and epiphyseal zones which helps them avoid any damage to them. The outcomes for SCFE, fractures of the distal femur and severe forearm injuries have highlighted that growth and function are usually well preserved in these patients.[7]

Because of CAOS, adding new equipment is not a bother and pediatric trauma patients benefit (see Fig A).

Many clinical applications demonstrate that CAOS is now a main method in orthopaedic trauma surgery. The following sections will look at how we can use these technologies, train them and what we may experience from them in the future.

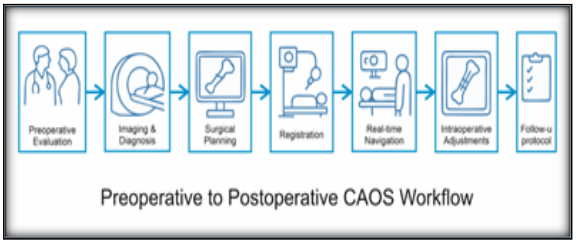

Figure A: Complete CAOS surgical journey from evaluation to follow-up.

Overview of the Hardware and Software Side of CAOS Systems

CAOS uses the latest hardware and software to make orthopaedic surgery safer, leaner and more precise. These interventions use three major components: devices for imaging, devices to monitor where to go and software for robotic or automated navigation.

Imaging Modalities: CAOS requires visibly accurate images to correctly identify a patient's structures. Usually, surgeons will use a computed tomography (CT) or a magnetic resonance imaging (MRI) scan in the preoperative stage.[10-11] These tests help create 3D pictures of the bone and its environment. A virtual model for surgical planning is created when imaging data are uploaded to the workstation in CAOS. Doctors are now using intraoperative imaging to update the navigation system in real time so that it can follow those changes happening during the surgery such as shifts in soft tissues or the removal of fractures.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Tracking Devices: To reconstruct the project plan in reality, CAOS relies on technologies that follow assets in real time. Infrared-light cameras are most widely used in tracking, with references consisting of markers on surgical tools and reference frames that show the surgeon's current position at all times.[12] Since electromagnetic trackers can be used in areas where surgeons cannot see well, these systems are often preferred in small or closed bodies.[13] They keep a watch on the alignment of instruments with the patient to guarantee the necessary accuracy.

Navigation Software: At the heart of CAOS is powerful software that combines imaging and tracking information to show surgeons an improved view of the surgical area.[6] Through this tool, 3D anatomy can be recreated, osteotomy and implant placement planning can be done ahead, screw routes evaluated and the ideal alignment is set. Throughout the procedure, the system uses graphics to guide the surgeon by showing how surgical instruments are placed around the anatomy. Advanced computers may be linked to robotic arms that make sure surgical procedures are performed with great accuracy and less chance of error from doctors.[1,14]

Workflow: The first action in the process is to take images before surgery and use them to plan the approach using computer simulations. A rigid connector is placed on the bone at the site of the surgery to give a reference for the process. Frequently, the navigation system understands where instruments are placed and pictures are taken in the operating room to prevent mistakes and help the doctor guide the surgery (as illustrated in Figure B). Through the navigation interface, surgeons are able to do accurate bone cutting, insert implants and place screws, with regular updates as they go. Its use reduces mistakes, need for imagination and the amount of radiation given in many fluoroscopy scans.

Advantages: Due to this, RIO surgery enables precise reconstruction of bones, mainly when the usual landmarks have been changed or when bones are widely broken. A precise workflow produces similar results and lowers the chances of intraoperative problems. Besides, CAOS can shorten surgery time and lower patient radiation doses when done by skilled staff.

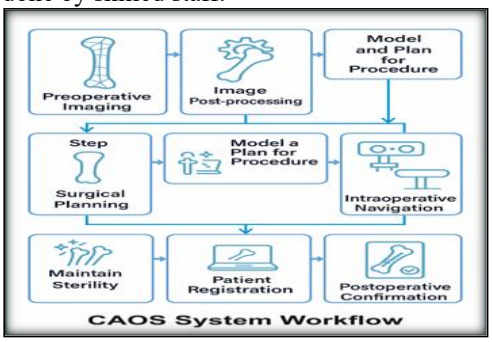

Figure B: Standard CAOS system workflow detailing imaging, planning, navigation, and postoperative stages.

Clinical Outcomes and Evidence Supporting CAOS Effectiveness

Evidence from clinical studies and systemic reviews suggests that CAOS makes orthopaedic trauma surgery safer, more accurate and leads to fewer problems for patients.

Precision in Implant Positioning: Using CAOS, the team has found that screws and plates placed in complex fractures such as pelvic, acetabular or peri-articular fractures are almost always in the right position.[6-9] Misplaced screws may harm nerves, blood vessels or penetrate joints, with bad outcomes ensuing. Thanks to navigation-guided surgery, risks are reduced because doctors get visual guidance and accurate positioning of instruments.

Less Radiation Is Given: In typical trauma surgery, a lot of fluoroscopic images are required to place implants properly. CAOS allows surgeons to work without fluoroscopy and exposes patients, doctors and staff members in the operating room to much less radiation. A number of studies show that fluoroscopy time can be cut by half, resulting in safer surgeries without affecting accuracy.[4]

Surgical Time and Efficiency: At first, introducing CAOS to surgeries meant that surgeons had to set it up and register before trimming time.[15] The good news is, new hardware, friendly software and organized workflows have made the learning process much easier and faster. The available findings indicate that if surgeons undergo training, they may carry out CAOS procedures faster than usual and enjoy better results than with traditional methods.

Complication Rates: By using CAOS, the instances of intraoperative misplaced hardware, harm to blood vessels and nerves and improper bone positioning are less likely.[16,7] Improved positions of implants can cut down on changes during surgery, lower infections and make for better functioning joints. For trauma patients, who could be experiencing a lack of reserve, these improvements are very significant.

Patient-Reported Outcomes and Long-Term Benefits: Technical improvements measured in the short term are well recorded, but it is still early to see how CAOS affects patients' long-term function.[9] Ongoing studies imply that when anatomical reduction and reliable fixation are achieved, joint function is better and there is less risk of arthritis later. Studies that continue over many years will give us additional details about these benefits.

Complex Injuries and Complex Scenarios: For problems like multiple bone crushing, injuries to the pelvic ring and repeat surgeries, CAOS is more effective than traditional methods that struggle with altered anatomy.[8] Because of navigation, both the position of the implant and the quality of reconstruction can be improved.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Limitations and Drawbacks in Trauma Surgery Settings and Workflow

Despite being advantageous, CAOS adoption runs into a number of barriers preventing it from being used in trauma surgery more widely.

Cost and Resource Allocation: A big initial expense for CAOS comes from paying for equipment, software licenses, maintenance and necessary materials which can make it hard for large tertiary centers to get access. Because operating rooms have to fit large equipment, the cost of buying new equipment increases.[17] Moreover, the equipment and imaging systems needed for surgical navigation are both costly and hard to fit into a standard operating room.

Technical Limitations and Reliability: It's important for CAOS to match patient anatomy perfectly with the digital versions. Improper registration or motion of frames of reference may create mistakes. When staff or equipment blocks the path of optical trackers, interference from electromagnetism in certain areas or when equipment fails, navigation might become disrupted and risks might increase.[18]

Learning Curve and Training: Proper use of CAOS depends on everyone in the surgical team learning and training together.[19] To do their job, surgeons have to understand how to set up the system, acquire images, register with it and interpret what the navigation tool provides. A lack of proper training raises the chance that surgical errors will occur. Such programs, along with simulation and experience under supervision, should be used, but they take hard work and investment.

Patient Selection and Surgical Indications: Not all patients with trauma are good candidates for CAOS. Getting the right images and registering them in emergency situations can often take too long.[2] Those affected by unsteady blood pressure, major soft tissue injuries or extremes in obesity often present technical issues. CAOS works most effectively when a great deal of accuracy is needed and you are not worried about the time it takes to set up a case.

Cost-Effectiveness and Evidence Gaps: Improved results are expected to be cost-saving since they can avoid extra procedures, but solid cost-effectiveness reporting is not widely available.[17] To be supported by funding, health systems must present evidence on long-term results, quality-adjusted life years and rates at which systems are used.

Infrastructure and Workflow Integration: Collaboration and Workflow Changes: Implementing CAOS means that the operations of surgeons and departments such as radiology, engineering and IT need to be united. Imaging acquisition, maintaining the system and staff scheduling can all be complicated. If different systems are not properly connected, this can lead to delays and lower how efficiently a business works.[18]

The Future of and New Developments in CAOS

The field of Computer-Assisted Orthopaedic Surgery is heading toward major changes as technology, artificial intelligence and openness increase.

Robotic-Assisted Orthopaedics: Almost all orthopedic surgeons are becoming interested in merging CAOS with robotic surgical platforms.[14] Surgeons are able to define the steps for each surgery and robots can carry them out with unique accuracy and reduced risk of error. It is widely used in elective joint replacement while being tested for drilling and implant placement in trauma surgery.

Artificial Intelligence and Machine Learning: Many AI algorithms are being used to help detect fractures, automate image division, plan surgeries effectively and decide on procedures while the operation is ongoing.[20] Using data from many patients, machine learning systems can estimate risks, advise on how to treat them and shape a surgical plan which could lead to better results.

AR and VR helicopters: AR puts directions right on top of what the doctor sees, so she/he doesn't have to look at other screens.[5] You can project implant paths and key points on the body by wearing AR or VR glasses at the top of your head. Using VR, surgeons can practice different procedures and plan steps directly in front of the computer screen.

Enhanced Imaging and Real-Time Feedback: Better imaging and instant feedback are set to be added to future CAOS systems which may provide continuous images of soft tissues using ultrasound or new types of imaging agents. This makes it safer by allowing the system to recognize important neurovascular parts (see Fig C). Having haptic feedback devices in surgical tools could allow surgeons to experience tissue types from a distance, making minimally invasive procedures even better.

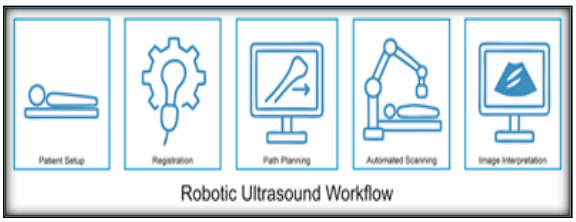

Figure C: Workflow of robotic ultrasound systems integrated with CAOS for automated imaging and interpretation.

Accessibility and Global Implementation: Solutions are being created to ensure CAOS is accessible to many people such as simple, cheaper systems and mobile devices with planning options using the Internet.[21] By using open-source software and online modules, training can be fairer and higher quality for all people globally.[22]

Integration with Telemedicine and Remote Assistance: The use of Telemedicine supports

ISSN (O): 2687-5365; ISSN (P): 2753-6556

remote advice for CAOS procedures which allows beginning surgeons to safely conduct complex surgeries with the help of others through video.[23]

CONCLUSION

Interactive orthopaedic systems have greatly improved the field of resuscitative orthopaedics and traumatic surgery. CAOS is an important improvement because it gives more control in surgery, lowers risks and results in better outcomes when standard procedures are not enough.

With the use of powerful imaging, instant monitoring and leading robotics or navigation, CAOS systems help surgeons control complex surgeries within a few thousandths of a meter.[6,14] This becomes very important in pelvic and acetabular fractures, peri-articular injuries and revision surgeries, as freeing the anatomy from distortion troubles regular techniques. Before the surgery, figuring out the best cuts and placement and having that path during the surgery increases the accuracy of the alignment and improves long-term health. Studies have found that CAOS achieved more accurate implant placements, reduced radiation for the surgeon, shortened the operative period for some and decreased surgery complications and rates of revision surgery.[6,7] However, it still faces problems like high costs, logistical issues, a challenging amount of cases to deal with and few emergency uses.[17][18] Step-by-step improvements, increased training and changes in expense can help these techniques become more common.[21-23]

With the passing of time, computer-aided operations will be mainly about progress in robotics, artificial intelligence and augmented reality. Robotics allows us to act precisely and AI helps with each stage of planning and decision making. augmented reality helps surgeons to view operations clearly and, thanks to technology, surgery is getting safer and more accurate. Making CAOS platforms less expensive, lighter to carry and easier to operate, together with virtual learning and telemedicine, have helped increase the spread and equality of trauma care around the world.

This means that CAOS is bringing about important changes from how resuscitative orthopaedics and traumatic surgery were practiced before. With future scientific developments and collected data, CAOS will help achieve better results for trauma patients.

REFERENCES

1. Jaffray DA, et al. Computer-assisted navigation and robotics in orthopaedic surgery. Clin Orthop Relat Res. 2018;476(11):2207–16.
2. Seifert J, et al. Indications and contraindications for navigation in trauma surgery. Injury. 2020;51 Suppl 2:S17–23.
3. Hecht N, et al. Cone beam CT in orthopaedic surgery. Eur J Radiol. 2018;99:32–8.
4. Berven SH, et al. Radiation exposure in orthopaedic trauma surgery. Spine. 2016;41(18):E1062–9.
5. Chen J, et al. Augmented reality in orthopaedic surgery. J Orthop Surg Res. 2021;16(1):127.
6. Lonner JH, et al. Accuracy of computer-assisted pelvic fracture fixation. J Bone Joint Surg Am. 2017;99(3):231–9.
7. Yoon RS, et al. Functional outcomes of navigation-assisted orthopaedic trauma surgery. J Orthop Trauma. 2020;34(8):e300–7.
8. Van den Bosch EW, et al. Navigation in acetabular fracture surgery. Injury. 2019;50 Suppl 3:S25–31.
9. Hanschen M, et al. Computer-assisted surgery for complex fractures. Injury. 2020;51(5):1004–11.
10. Sugano N, et al. Three-dimensional imaging in orthopaedic surgery. J Orthop Sci. 2017;22(2):123–9.
11. Richter M. MRI and CT in Orthopaedics: A Clinical Guide. Springer; 2016.
12. Paul O, et al. Optical tracking for surgical navigation. Clin Orthop Relat Res. 2019;477(3):496–504.
13. Smith J, et al. Electromagnetic tracking systems in orthopaedics. J Biomech. 2020;102:109652.
14. Lonner JH, et al. Robotic assistance in orthopaedic surgery: current status. Orthop Clin North Am. 2021;52(2):143–51.
15. Cho HS, et al. Learning curve of computer-assisted orthopaedic surgery. Clin Orthop Surg. 2019;11(1):29–34.
16. Haaker RG, et al. Reduction of complications with navigation in pelvic and acetabular surgery. Clin Orthop Relat Res. 2018;476(10):2001–11.
17. Clement ND, et al. Cost-effectiveness of computer-assisted orthopaedic surgery. Bone Joint J. 2018;100-B(4):499–505.
18. D'Isidoro F, et al. Challenges and limitations of navigation systems in orthopaedic trauma. Eur J Orthop Surg Traumatol. 2019;29(4):733–40.
19. Aram M, et al. Training requirements for computer-assisted orthopaedic surgery. J Surg Educ. 2021;78(1):12–9.
20. Liu H, et al. Artificial intelligence in orthopaedic trauma surgery. Injury. 2022;53(6):1533–40.
21. Hofer M, et al. Portable navigation systems in orthopaedics. Orthop Traumatol Surg Res. 2020;106(4):705–10.
22. Wang H, et al. Global access and affordability of CAOS. World J Orthop. 2022;13(3):172–80.
23. Patel A, et al. Telemedicine integration in orthopaedic navigation. J Telemed Telecare. 2021;27(6):345–51.

ISSN (O): 2687-5365; ISSN (P): 2753-6556