Int. J. Curr. Res. Med. Sci. (2026). 12(7): 14-18

International Journal of Current Research in Medical Sciences

ISSN: 3107-3743 (Print), ISSN: 2454-5716 (Online)
(A Peer Reviewed, Indexed and Open Access Journal)
www.ijcrims.com

Review Article

Volume 12, Issue 7 -2026

DOI: http://dx.doi.org/10.22192/ijcrms.2026.12.07.002

# What Designers and Surgeons Have in Common: A View from the Arthroscopy Suite

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## Abstract

Design and surgery are often thought of as two separate disciplines, existing in separate professional worlds. Traditionally, designers have been responsible for creating products, services and experiences. Surgeons have been entrusted to diagnose and treat disease. These professions seem very different, but the goal is the same. It is about solving human problems through observation, creativity, iterative refinement, and a deep understanding of the needs of the user. Arthroscopic surgery offers a unique view through which this relationship can be explored. Improvements in instrumentation, ergonomics, visualisation, workflow design and patient-centred care have driven the evolution of arthroscopy. Much of what underpins design thinking – empathy, observation, ideation, prototyping, testing and iteration – is commonly practiced in modern day surgery but often goes unrecognised. This position article argues that arthroscopy is a practical expression of design thinking, and that increased dialogue between the fields of design and surgery may foster innovation, improve patient experience and improve clinical outcomes.

**Keywords:** Design thinking, Arthroscopy, Innovation, Ergonomics, Human-centred design, Surgical education

## Introduction

Designers and surgeons seem to have little in common at first glance. One is associated with creativity, aesthetics and innovation, the other with anatomy, pathology and technical precision. Both, however, are fundamentally concerned with the solution of human problems.

Designers want to understand the needs of the user and design solutions that enhance function and experience. Similarly, surgeons find causes of pain, disability and dysfunction and formulate interventions aimed at achieving restoration of health and quality of life. In both cases success depends on knowing the individual, properly defining the problem, designing an effective solution and then iteratively refining the solution based on feedback and outcomes [1-4].

Perhaps one of the most obvious examples of design thinking at work in the surgical specialities is arthroscopy. The development of arthroscopic surgery has transformed orthopaedic practice, allowing minimally invasive treatment of complex joint disorders, while simultaneously requiring continuous innovation in instrumentation, visualisation, ergonomics and surgical workflow. In this article I discuss the similarities between design and surgery from the point of view of an arthroscopy surgeon and I suggest that many of the principles of modern design are already present in current surgical practice.

## The Arthroscopy Suite as a Design Studio

Every design project starts with a problem. A product designer may wonder why users are having difficulty with a certain task or why an existing solution is not working as well as it should. In the same way, every arthroscopic procedure starts with a question.

Why does the patient continue to be unstable after injury to the anterior cruciate ligament? What compromises shoulder function after a rotator cuff tear? Why does pain persist with conservative management?

The surgeon, like the designer, must define the problem before proposing a solution. If the source of dysfunction is misdiagnosed, the intervention will always be ineffective. Therefore, arthroscopic surgery starts not with instruments but with problem definition;a principle central to design thinking [1,2].

The operating theatre can be seen as a design environment in which surgeons are constantly thinking about constraints, alternatives and decisions that are specific to the situation. Every patient is different and no surgical plan can be totally maintained once pathology is visualised directly.

## Observation Before Intervention

Design and surgery are both based on observation. Designers will often spend a lot of time researching how people interact with products and environments before suggesting improvements. Likewise, surgeons depend on careful observation during the history, physical exam, review of imaging and intra-operative assessment.

Arthroscopy is essentially an observational technology. Before it became widely used, surgeons often relied on indirect evaluation of intra-articular pathology. The arthroscope did this by letting the surgeon see directly the structures inside the joint. Now surgeons could see pathology, not speculate.

This emphasis on observation is like a cornerstone of design thinking: understand the reality before trying to change it. Ability to see clearly often precedes ability to act effectively [1, 3].

## Empathy: The Hidden Skill Shared by Designers and Surgeons

Perhaps the most missed similarity between designers and surgeons is empathy.

Human-centred design starts with understanding the experiences, frustrations and needs of users. Successful products are not made by technological capability alone, but by true understanding of the persons for whom they are made [2,15].

In the same way, good surgical care is more than technical competence. Patients don’t usually come for treatment due to a torn tendon or a damaged ligament alone. They look for care because these conditions interfere with activities that are important to them. A recreational athlete wants to get back to sport, a labourer wants to return to work and an older adult wants to be independent in daily living.Table 1 lists the principles of design thinking and their surgical parallels.

Awareness of these goals guides decision-making throughout the course of treatment. In this sense, patient-centred care and human-centred design are not separate philosophies, but different expressions of the same principle: meaningful solutions start with understanding people [2,15].

**Table 1. Design Thinking Principles and Their Surgical Parallels**

| Design Thinking Principle | Arthroscopic Surgery Equivalent |
|---|---|
| Empathy | Understanding patient goals and expectations |
| Observation | Clinical examination and arthroscopic visualization |
| Problem Definition | Diagnosis and treatment planning |
| Ideation | Selection of surgical strategy |
| Prototyping | Modification of techniques and implants |
| Testing | Clinical outcomes and follow-up assessment |
| Iteration | Continuous refinement of surgical practice |

## Ergonomics: The Invisible Design of Surgery

Many innovation in arthroscopy are ergonomic innovations.

The evolution of arthroscopic instruments, camera systems, operating room layout and portal configurations has been driven not only by the desire to improve patient outcomes but also by the need to improve the interaction between surgeon and technology [5-10].

Poor ergonomic design has been associated with increased fatigue and musculoskeletal strain, as well as reduced performance among surgeons [5,11]. Minimally invasive surgery presents unique physical demands on operators, driving increased focus on instrument design, handle configuration, monitor positioning, and workflow optimisation [6-10].

There are also additional ergonomic challenges with arthroscopy. Surgeons often have to look at the two-dimensional monitor and not directly at the operative field. Precision requires the coordination of visual and motor skills, spatial orientation and the efficient use of instruments. Therefore, the design of arthroscopic systems has a significant effect on surgical performance and surgeon well-being.

Another important link between designers and surgeons is pointed out by the relationship between ergonomics and surgery. Both professions know that the key to the success of any activity is not only what is being done, but how people are interacting with the tools at their disposal.

## Iteration and the Evolution of Arthroscopic Surgery

Few surgical inventions come fully formed. Most go through cycles of experimentation, feedback, refinement, reassessment.

This is exemplified by the history of arthroscopy. Arthroscopic procedures were initially hampered by crude visualisation systems and primitive instrumentation. Within the joint, improvements in optics, fluid management, fixation devices, suture anchors and rehabilitation strategies have transformed what is possible over time.

The history of anterior cruciate ligament reconstruction, rotator cuff repair and meniscal preservation shows that surgical innovation often parallels the iterative processes of product design. New techniques are introduced, evaluated, modified, and then accepted or rejected based on the outcome [12-14].

The IDEAL framework provides a structured paradigm for this evolution and stresses the need for systematic assessment throughout the innovation process [12-14]. This system embodies a principle well known to designers: progress comes in iterative cycles of testing and refinement, not in isolated breakthroughs.

## Designing Recovery

The success of the surgery is not decided in the operating theatre, but in recovery.

Designers think about the whole user journey, not just one interaction. Similarly, surgeons must think about the patient experience before, during and after treatment.

Design is the rehabilitation pathways, the follow-up schedules, the educational materials, the pain management strategies, the return-to-activity programmes. These processes influence results and influence patient experience as much as the technical aspects of surgery itself.

From this perspective, rehabilitation is a continuation of the design process rather than a separate phase of care.

### What Designers and Surgeons Can Learn from Each Other

Designers and surgeons have a lot in common but there are still great opportunities for cross-disciplinary learning.

Designers could learn from the surgeon's approach to decision-making in the face of uncertainty, precision and risk management. However, the application of user experience design, systems thinking and iterative improvement may be advantageous for surgeons. Table 2 shows what designers can learn from surgeons and vice versa.

The increasing complexity of healthcare systems suggests that future innovation may rely less on discrete technical advances, and more on collaborative approaches that integrate diverse viewpoints.

**Table 2. What Designers and Surgeons Can Learn from Each Other**

| What Designers Can Learn from Surgeons | What Surgeons Can Learn from Designers |
|---|---|
| Precision and attention to detail | Human-centred thinking |
| Decision-making under uncertainty | User experience design |
| Risk assessment and management | Systems thinking |
| Adaptability in dynamic environments | Structured innovation processes |
| Outcome-focused problem solving | Iterative design methodology |

### Position Statement

Arthroscopy should never be considered as a purely technical discipline. It is a working expression of design thinking, where observation, empathy, human factors, innovation and evolution come together to solve human problems. Understanding these similarities can help foster productive collaborations between designers and surgeons, leading to innovations that enhance patient experience and clinical outcomes.

## Conclusion

The link between design and surgery is by no means confined to the operating theatre. Both fields are about understanding people, defining problems correctly, and designing solutions that make life better. Good illustration of design thinking in clinical practice is arthroscopy when it comes to observation, ergonomics, innovation and iterative improvement. The tools and environments may be different, but the mindset behind it is surprisingly similar. Every successful arthroscopic procedure, like every successful design, begins with a simple question: How can we improve the human experience?

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| DOI: 10.22192/ijcrms.2026.12.07.002 | |

How to cite this article:
Jeff Walter Rajadurai OR. (2026). What Designers and Surgeons Have in Common: A View from the Arthroscopy Suite. Int. J. Curr. Res. Med. Sci. 12(7): 14-18.
DOI: http://dx.doi.org/10.22192/ijcrms.2026.12.07.002