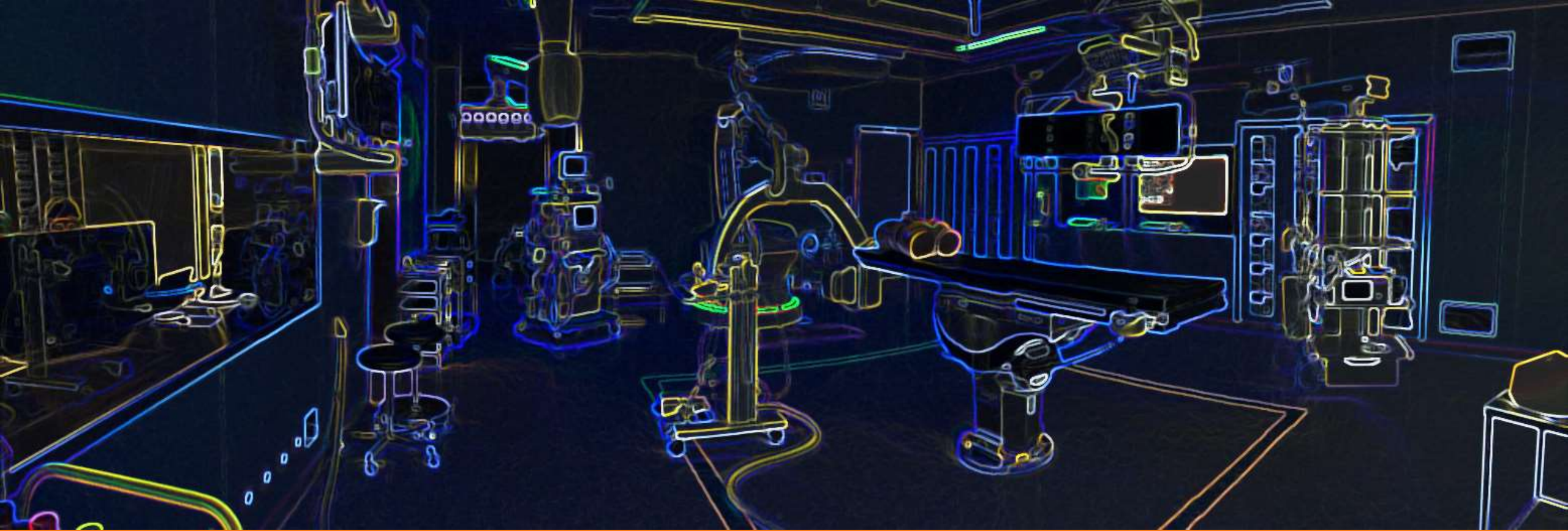
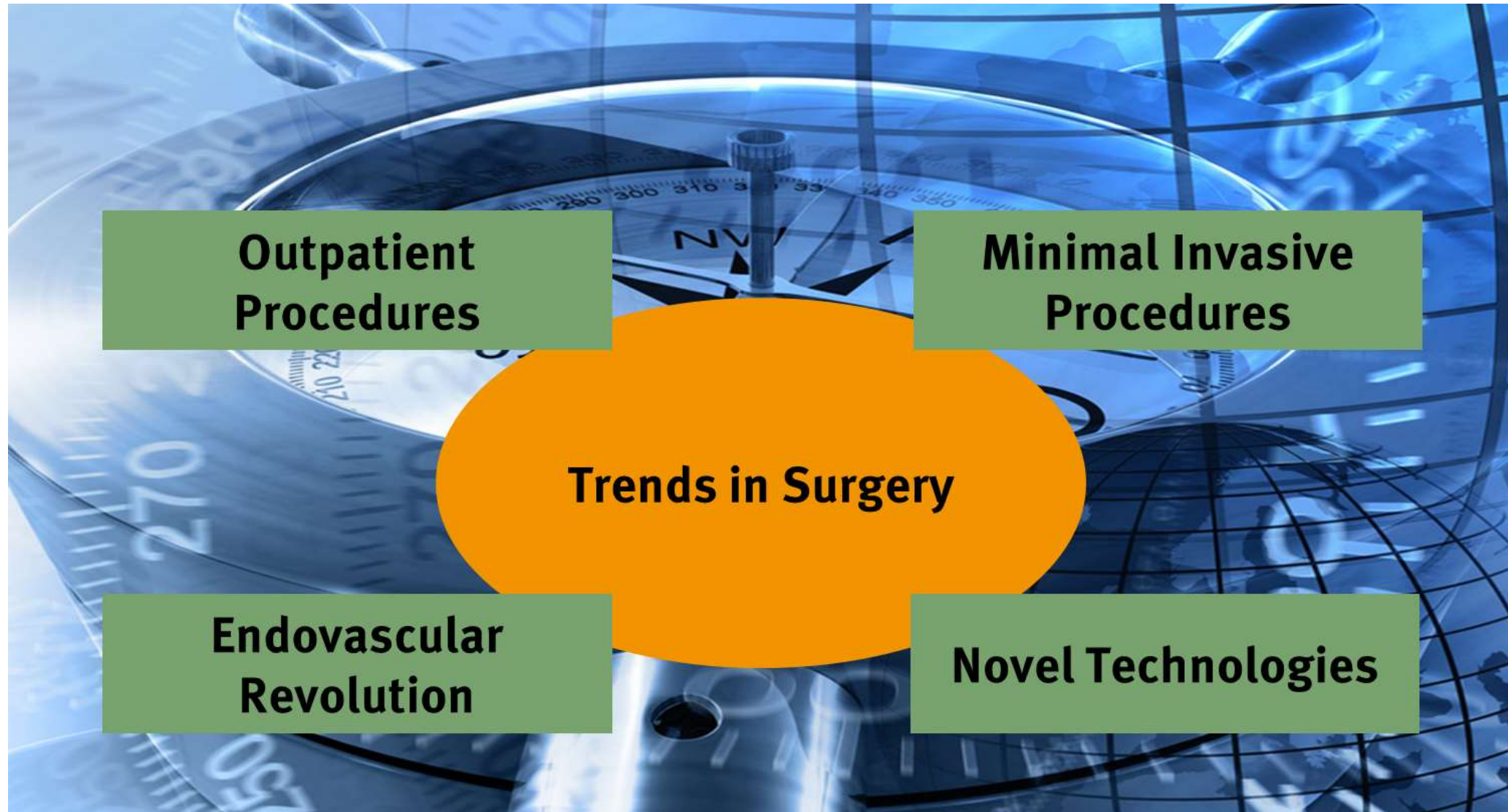




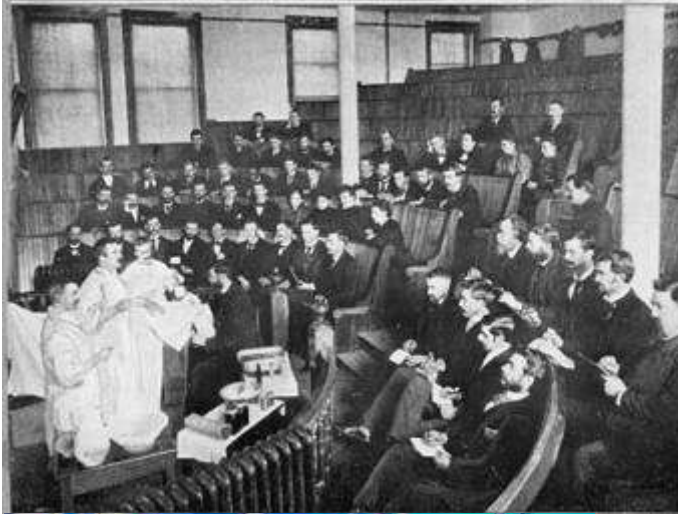
WORKFLOW DRIVEN OR DESIGN SUCCESS FACTORS FOR SAFE AND EFFICIENT SURGERY

Prof. Clemens Bulitta, MD

Novel trends change Surgery



No more “First Cut – Then See – Finally Act”

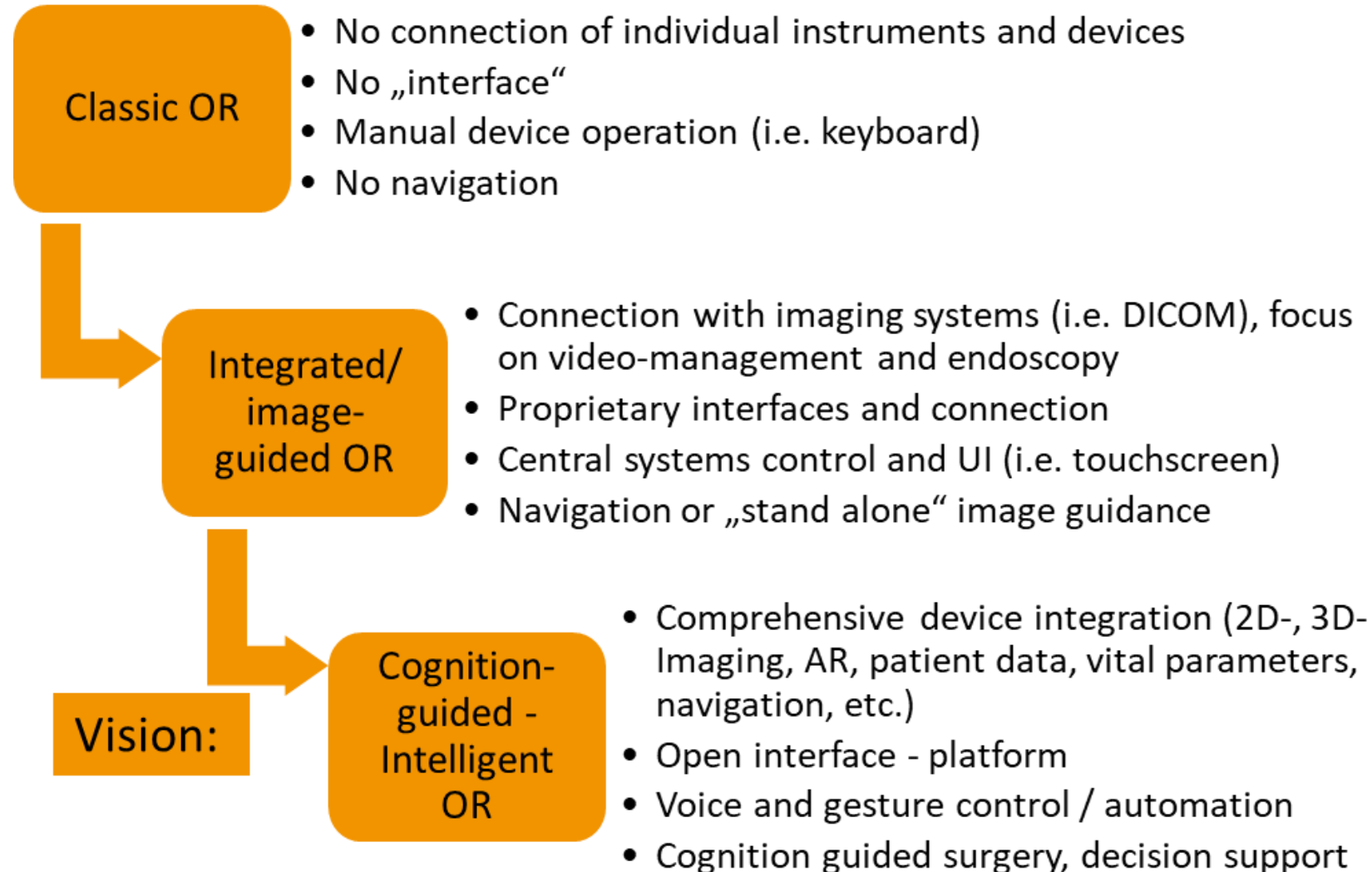


Rembrandt :
Anatomy of Dr.Tulp, 1632

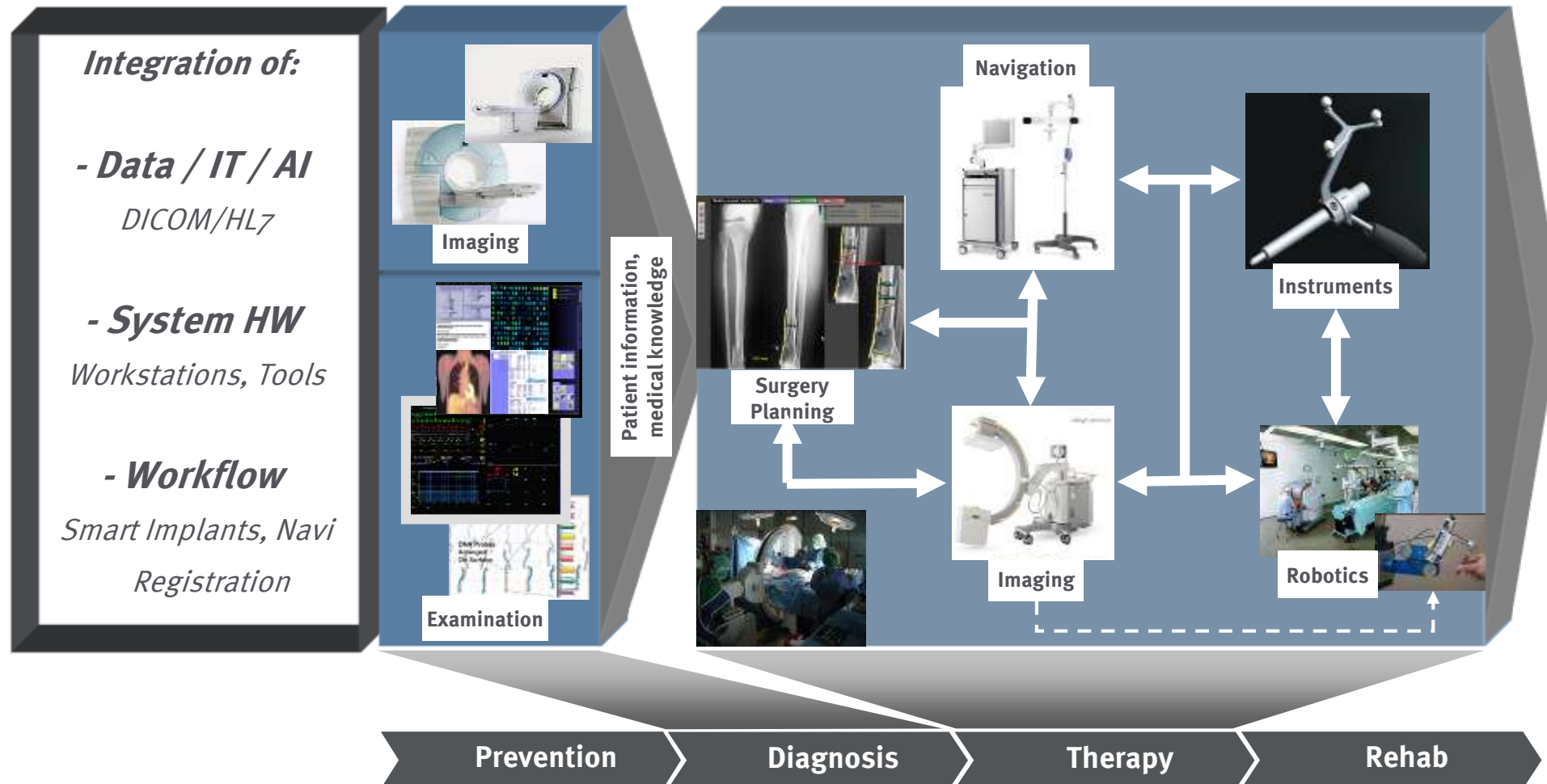


Pictures: Siemens AG

We are heading towards „Cognition Guided Surgery“



The Future is an Integrated OR System or better: The Future OR is an integrated System!

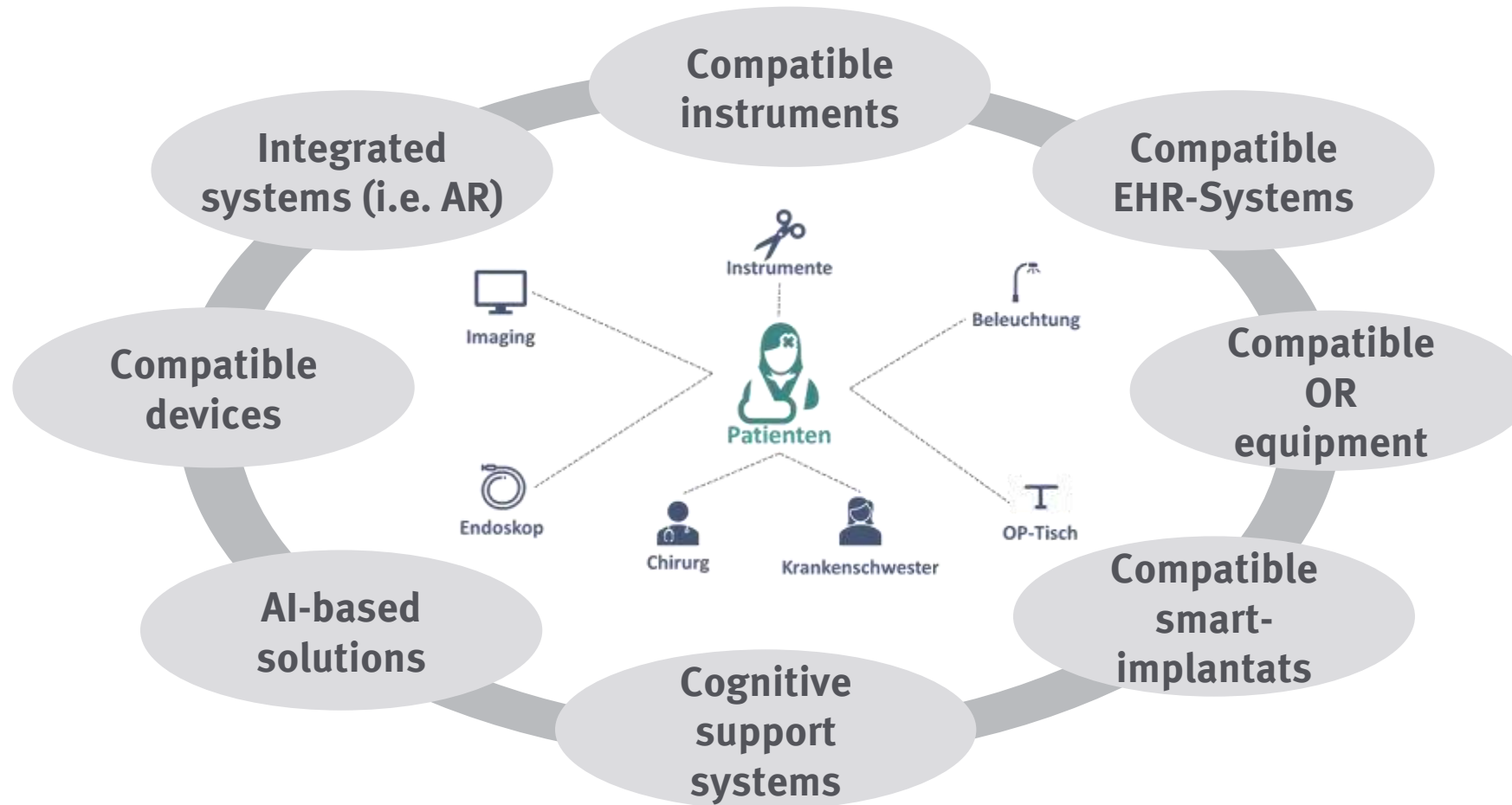


Multimodality Rooms

IHU Strasbourg



Key for Integration: Connectivity



Time for Novel Concepts, Ideas and Approaches



Surgery is a complex therapeutic field with different needs and requirements

Oral and Maxillo-facial Surgery



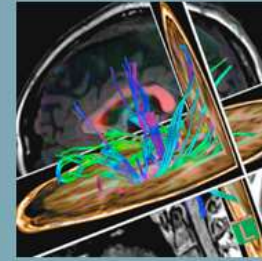
Gynecology



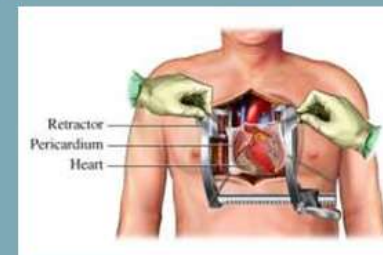
Urology



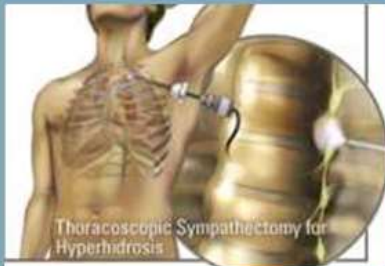
Neurosurgery



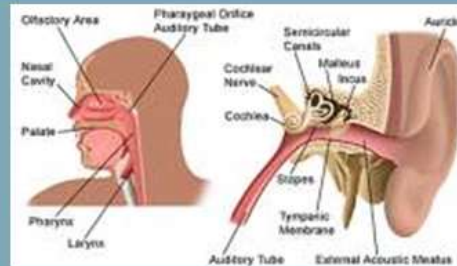
Cardiac Surgery



Thoracic Surgery



Ear, Nose, and Throat Surgery



General Surgery



Card-Vascular Surgery



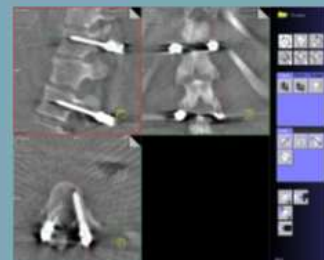
Pediatric Surgery



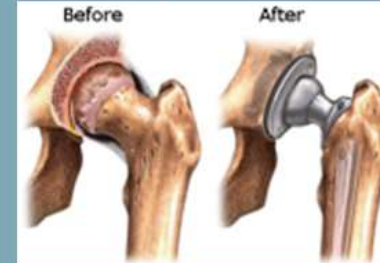
Plastic Surgery



Spine Surgery



Orthopedics



Traumatology

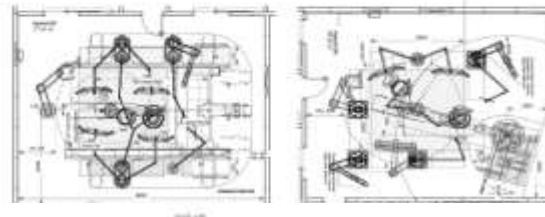


Room Planning goes further than most people expect

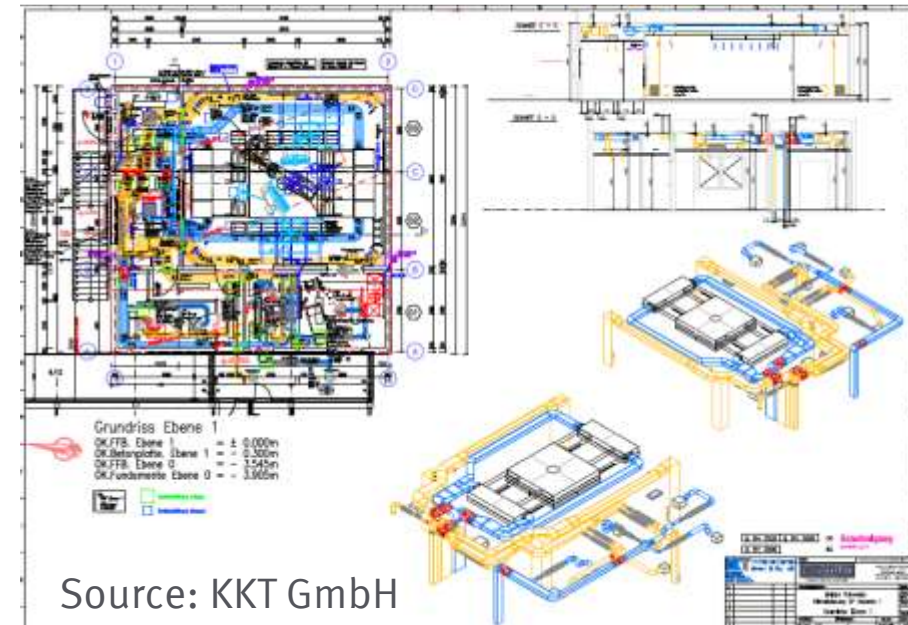
Quellen und Forschung zur Medizintechnik und Hygiene

Hybrid-Operationssaal mit Angiographiesystem

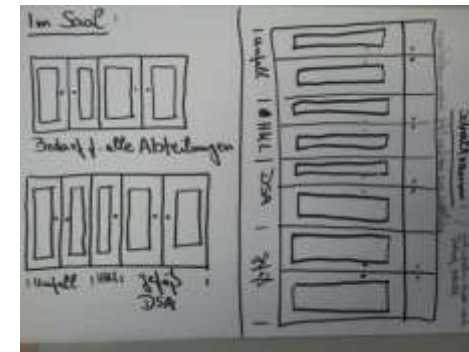
- Planungshilfe -



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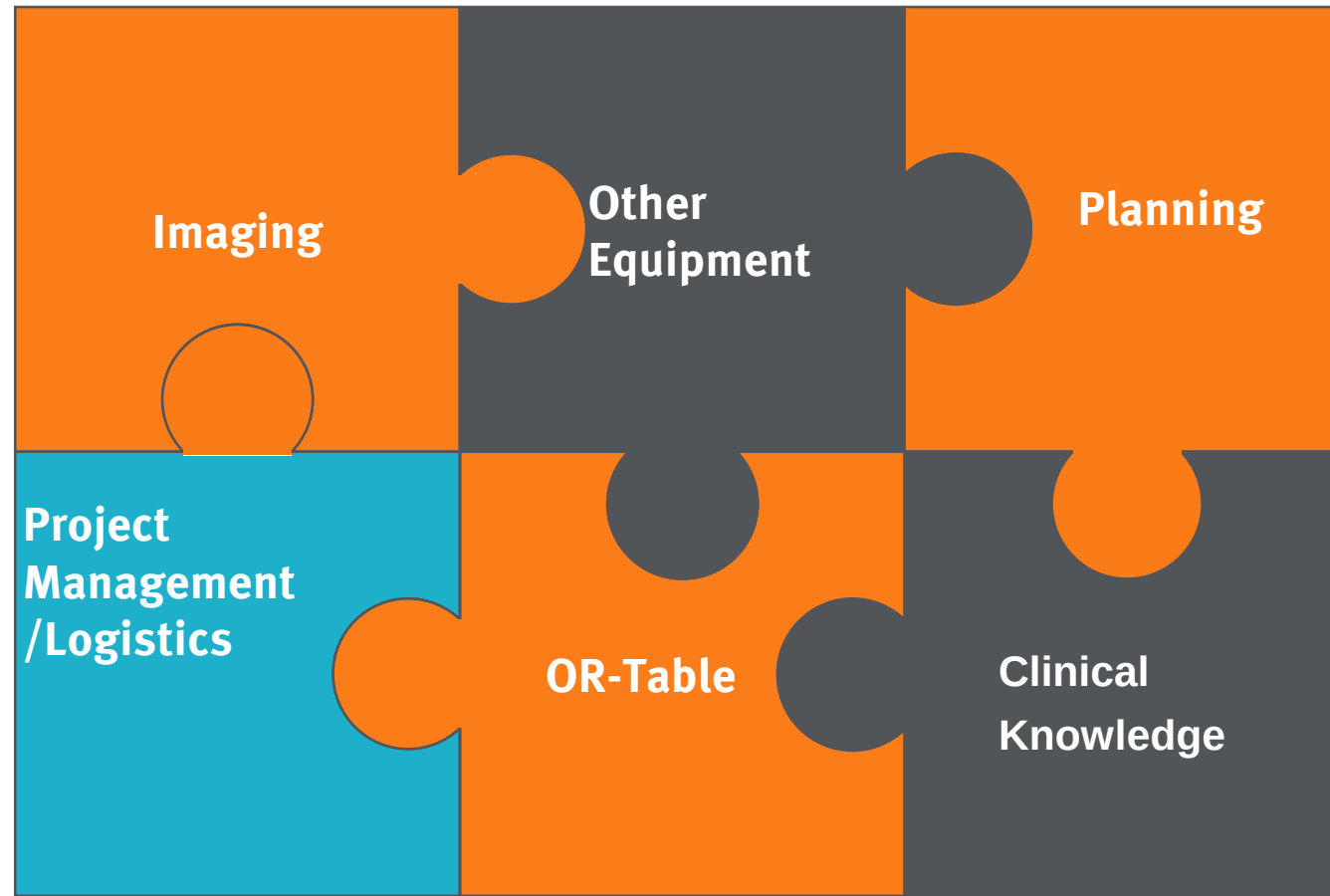
Source: KKT GmbH



OR Projects are Solution Business



OR Projects are Solution Business

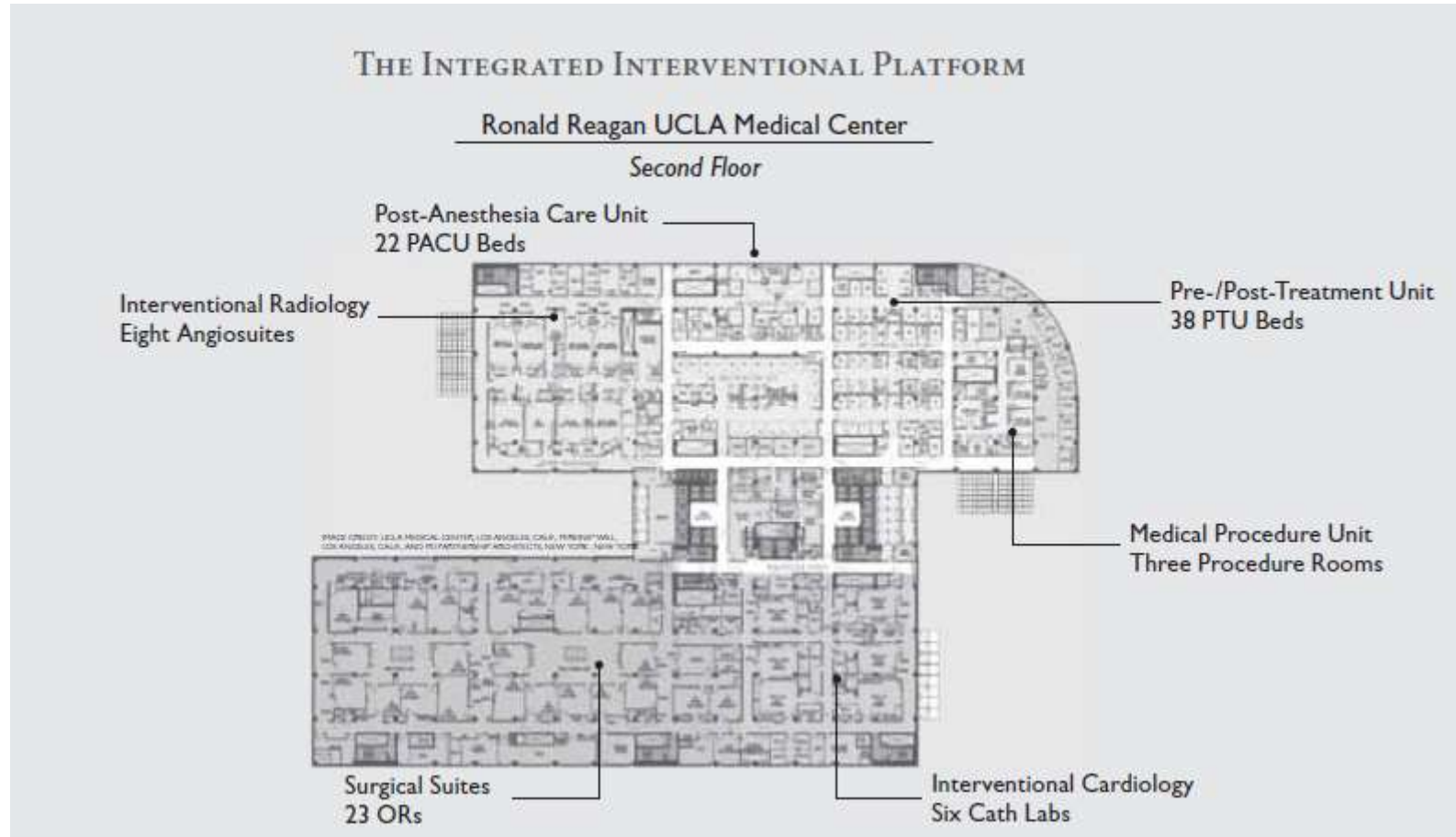


The Room is the SYSTEM!!!

**Workflow
is key !**



Collocating Procedures

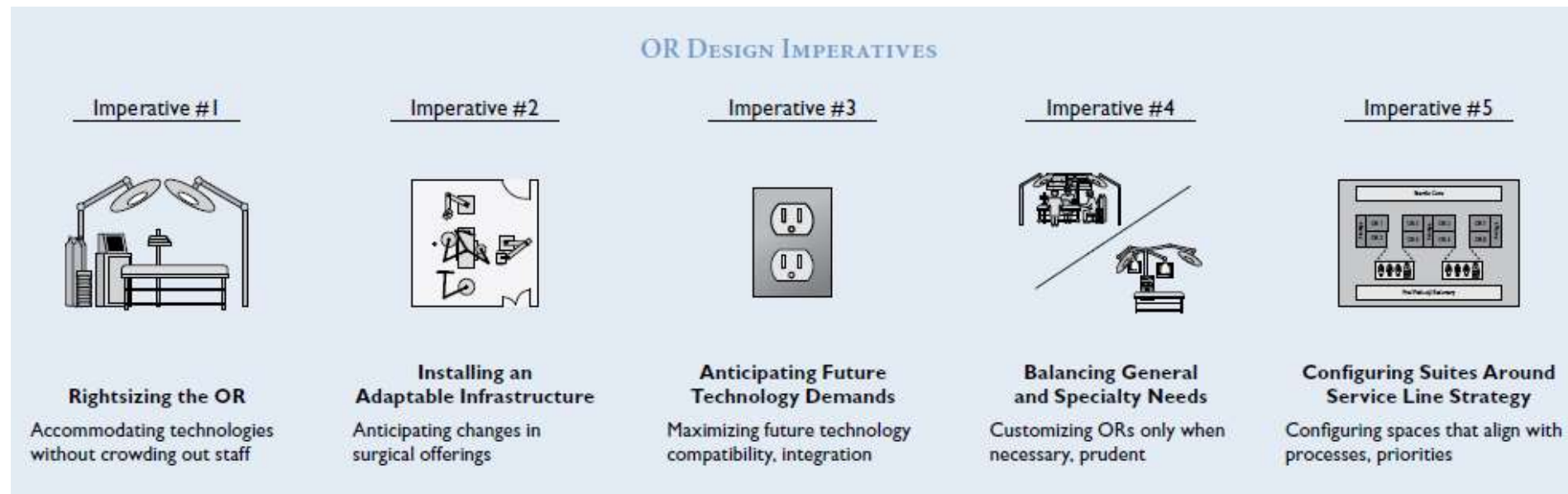


Source: Advisory Board Company

Collocating Proceduralists

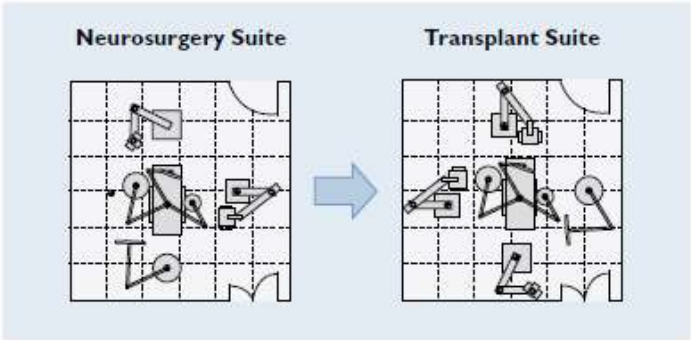
MULTIPURPOSE INTERVENTIONAL ROOM					
The Hybrid Endovascular Suite					
					
PHOTO COURTESY OF CHILDREN'S HOSPITAL OF PHILADELPHIA, KARY STORZ ENDOSCOPY, CLAWSON, CA, PHILADELPHIA, PA.					
Specialists	Neurosurgeon	Vascular Surgeon	Cardiac Surgeon	Adult Interventional Cardiologist	Pediatric Interventional Cardiologist
Hybrid Room Procedures	• Aneurysm coiling	• Abdominal aortic aneurysm repair • Thoracic aortic aneurysm • Peripheral stenting	• Hybrid MIDCAB/ stent procedures • Hybrid valve repair/ stent procedures • Percutaneous valve replacement/repair	• Peripheral stenting • Hybrid MIDCAB/ stent procedures • Hybrid valve repair/ stent procedures • Percutaneous valve replacement/repair	• Structural heart interventions • Hybrid Stage I procedure for HLHS²

Source: Advisory Board Company



Flexible OR - Versatility

OR CONVERSION CASE EXAMPLE



Two Options for Conversion

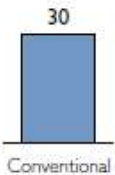
Option #1: Conventional

- Tear out plaster and drywall ceiling to access boom mounts
- Pull out mounts and reattach according to new room configuration
- Shift hoses, electrical wiring to new boom locations
- Mount equipment, lighting, screens on reconfigured booms

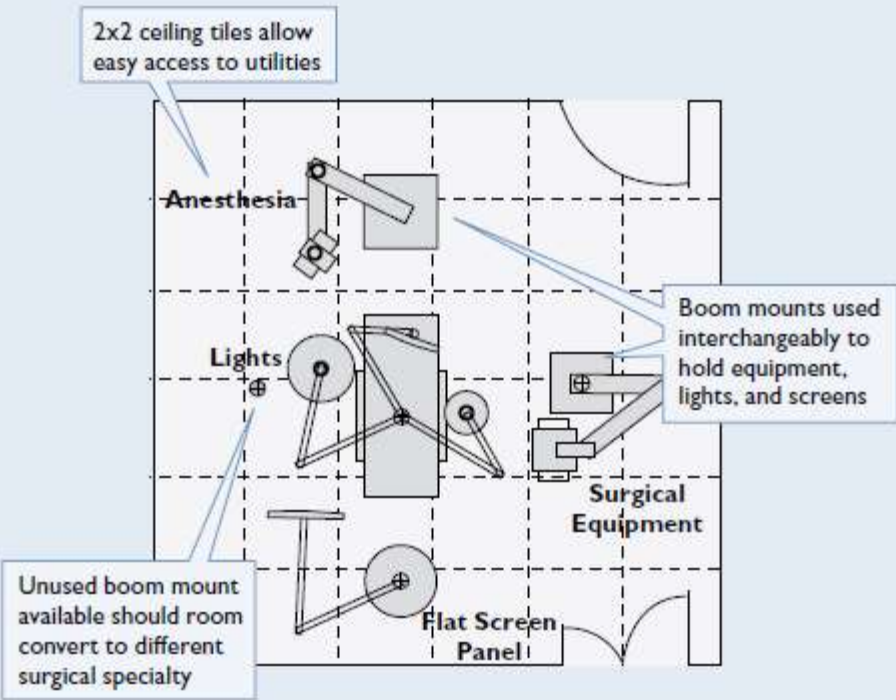
Option #2: Extra Boom

- Temporarily remove ceiling tiles
- Shift hoses, electrical wiring to new boom locations
- Mount equipment, lighting, screens on reconfigured booms

OR Downtime, Days

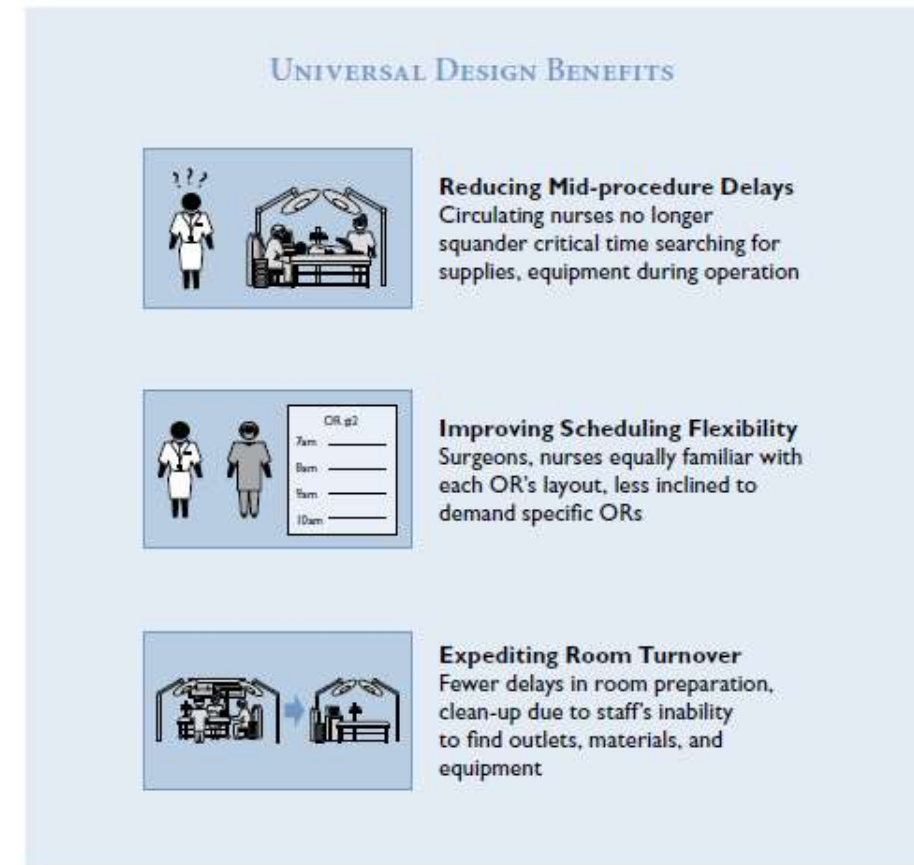
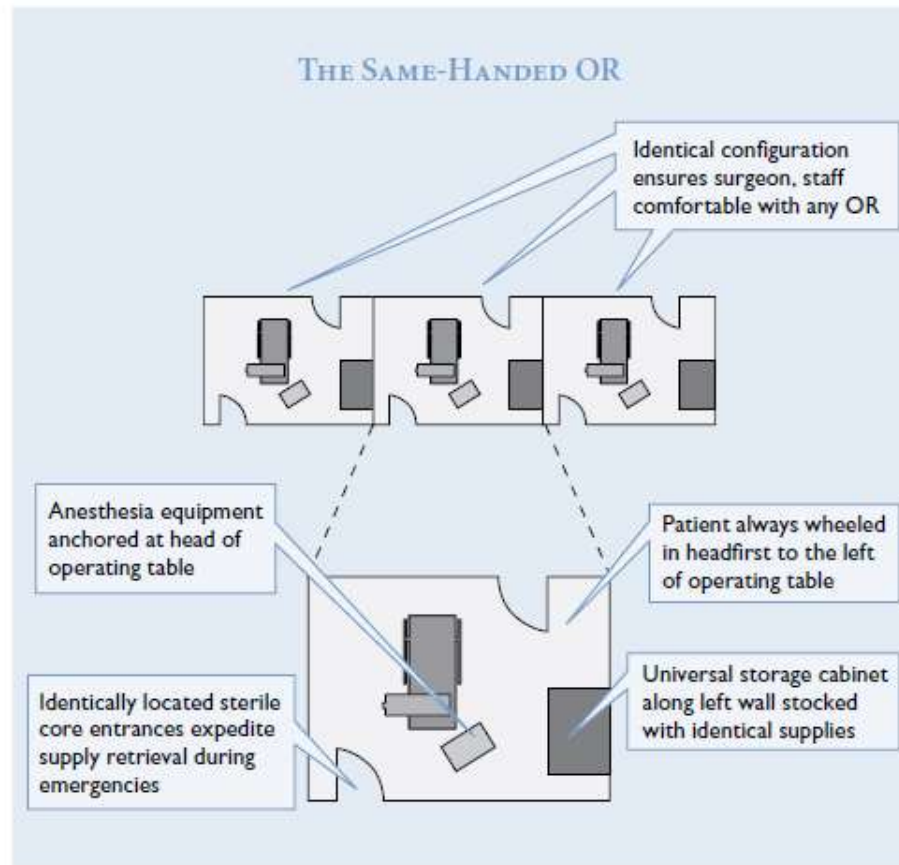


ADAPTABLE OR CEILING ELEMENTS



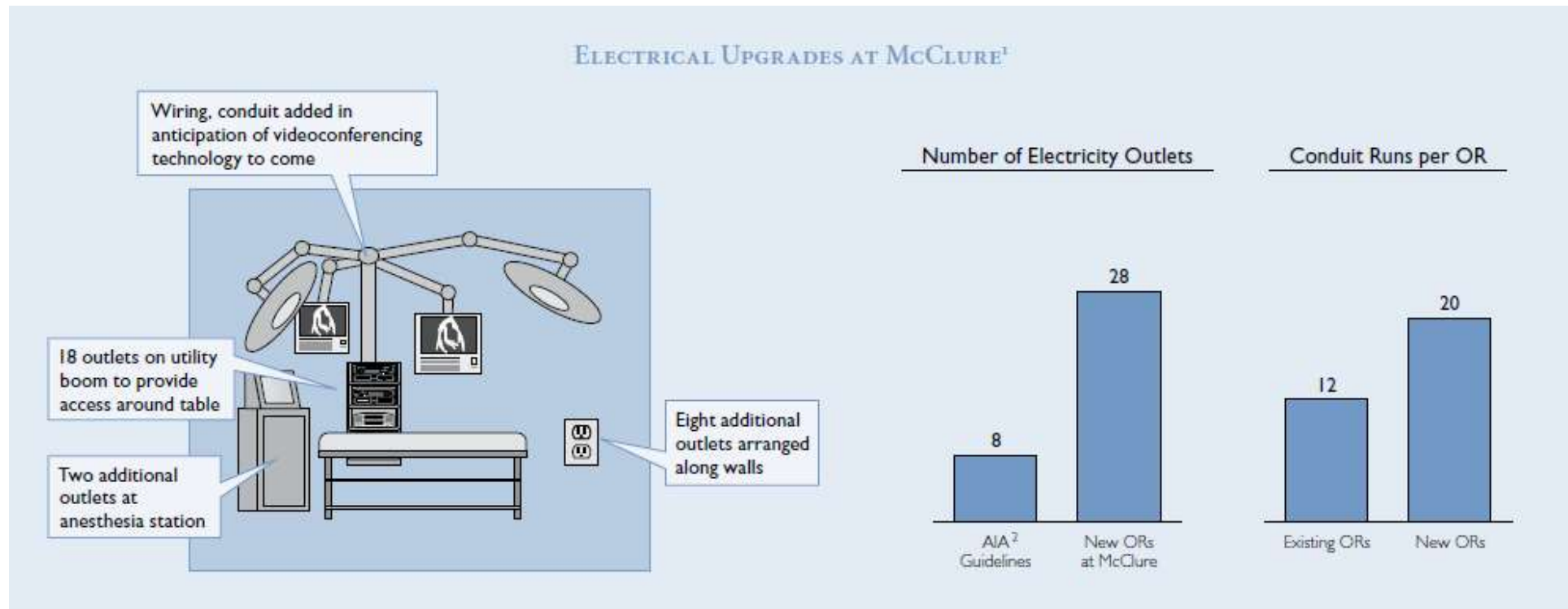
Source: Advisory Board Company

Standard Design



Source: Advisory Board Company

„Overwiring“



Source: Advisory Board Company

“OVERWIRING” THE WALLS

New construction projects and renovations should incorporate reserve IT capacity to allow maximum flexibility in accommodating future technologies. Although one day wireless technology may reduce the wiring burden entirely, for now hospitals should plan to install extra electrical conduit, data transmission lines, and CAT 6 cabling to enable greater amounts of data to be transmitted over networks.

TROUBLESHOOTING WIRELESS ACCESS

With the proliferation of electronic records and order entry, seamless wireless signal coverage is essential, which may be especially problematic in older buildings as signal penetration is difficult through older plaster and metal walls. In addition, a facility-wide RFID infrastructure requires an increased number of wireless hubs since objects are located by triangulation, meaning the object must be “seen” by several wireless points.

Two “MUST-HAVE” INVESTMENTS



Reserve Capacity

- Ample number of electrical outlets required to support future applications and technology additions
- Sufficient electrical capacity needed to handle up to six times current load
- Power supply flexibility essential and expensive to retrofit in the future



Continuous Wireless Access

- Ethernet backbone, such as ubiquitous CAT 6 cabling, essential to support hospital-wide wireless system
- Dead spots must be identified, resolved to ensure seamless signal coverage as signal penetration difficult through metal, older plaster walls
- Precautions required to guard against interference with clinical data integrity being wirelessly accessed or transmitted

OTHER IMPORTANT CONCERNS



RFID Infrastructure
Increased number of wireless hubs required for triangulation needed to identify locations

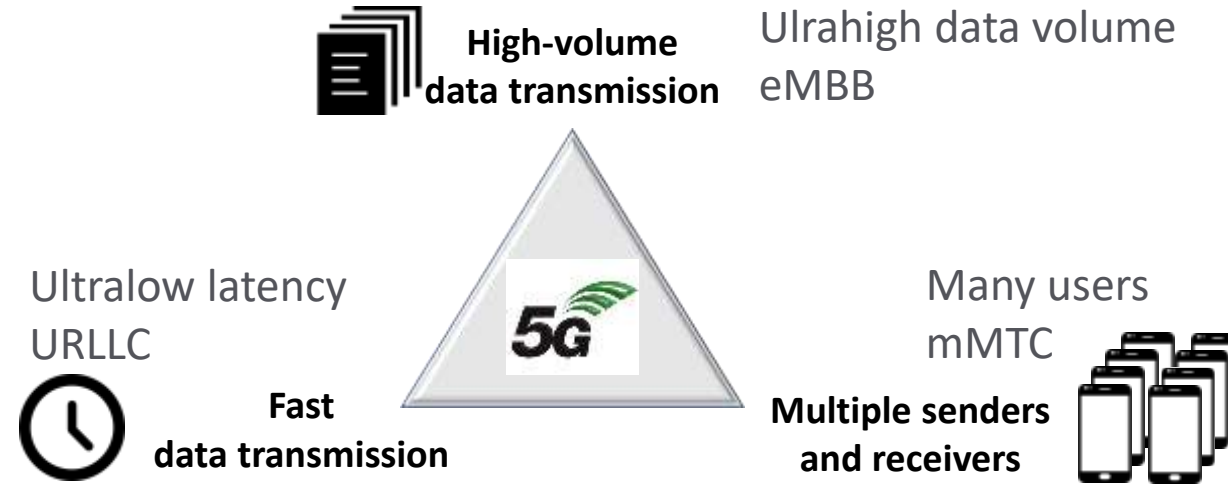


Data Protection
Data redundancy, disaster recovery planning necessary with increased reliance on clinical systems

Data Storage
Off-site data storage centers maximize use of hospital-grade space

Source: Advisory Board Company

Connectivity – Radio Technology – 5G



1

_Enhanced Mobile Broadband (eMBB): Providing both extreme high data-rate and low latency communications, extreme coverage – well beyond that provided by 4G. Connectivity and bandwidth are more uniform over the coverage area, and performance degrades gradually as the number of users increases.

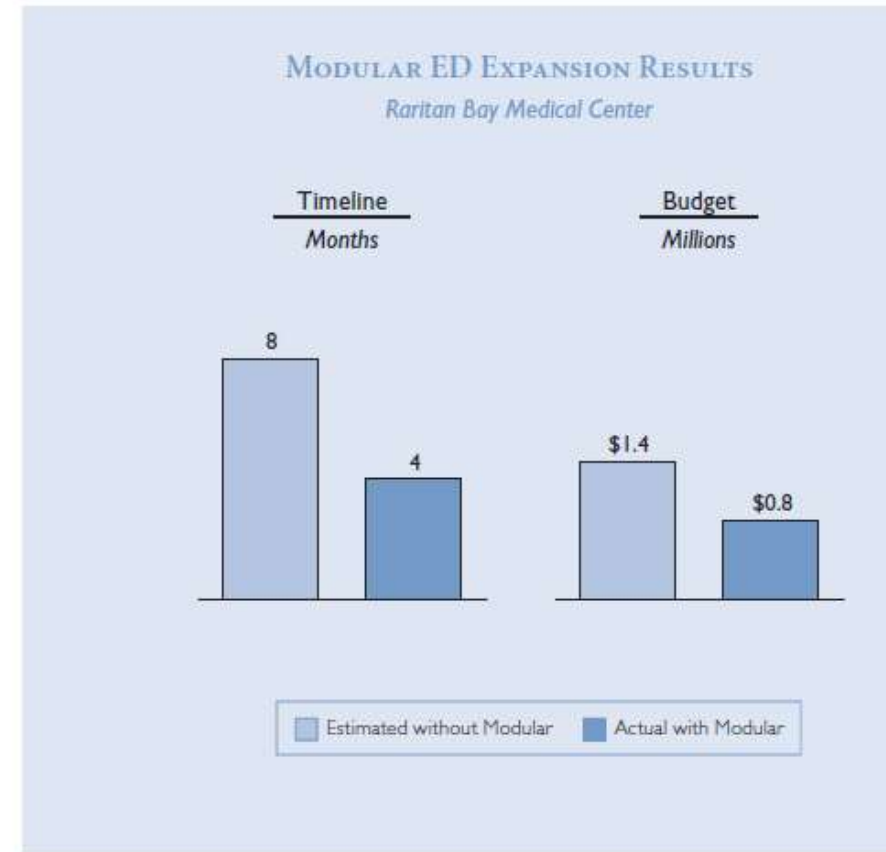
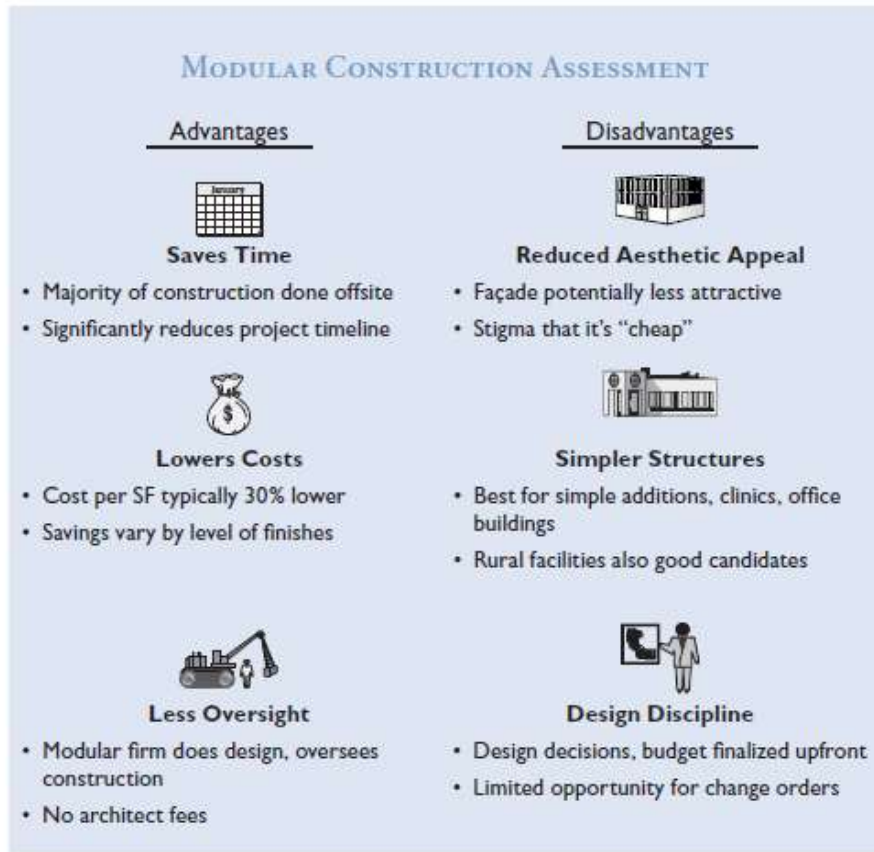
2

_Massive Machine Type Communication (mMTC): wide area coverage and deep penetration for hundreds of thousands of devices per square kilometer of coverage. An additional objective of mMTC is to provide ubiquitous connectivity with relatively low software and hardware complexity and low-energy operation..

3

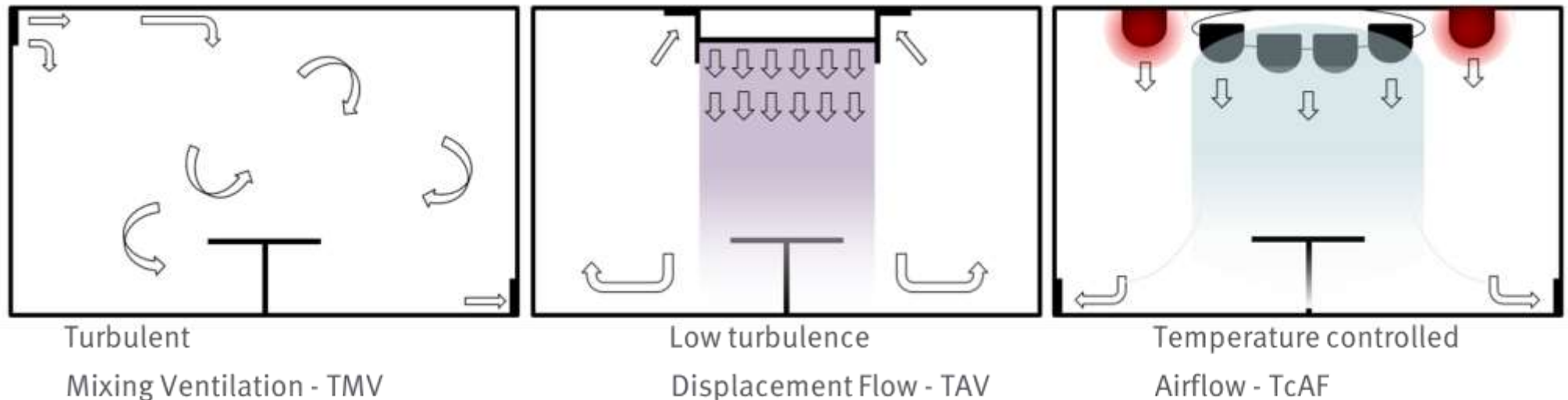
_Ultra-Reliable and Low-Latency Communication (URLLC): Critical IoT. In this type of application, monitoring and control occur in real time, E2E latency requirements are very low (at millisecond levels), and the need for reliability is great.

Modular Construction



Source: Advisory Board Company

- **Multiple impacting factors**
- **Complex thermodynamic system**
 - Staff behavior - Human Factors
 - Changing „environment“



The Importance of Communication & Scope Definition

What the
customer
explained



What sales
ordered



What
engineering
designed



What
marketing
advertised



What was
delivered



What the
customer
really
needed



know how means,

comprehension of clinical operations:

- Clinical and operational processes
- process interfaces as well as technical interfaces and application of the various technologies

➔ Who – What – How – By what means

The steps to success:

- Requirement and Workflow Assessment

- Planning and Design

- Project Management and Controlling

- Education and Training

- Standardized Use



Involve all stakeholders as early as possible in the project for workflow and requirement assessment



Discuss layout/concept with all involved parties on hospital and vendor side

Involved parties include but are not limited to:

- Surgeons
- Cardiologists
- Interventionalists
- Technical director
- Hygienist
- Anesthetist
- Scrub nurses
- Radiographer
- Project Managers
- Vendor representatives
- Medical Equipment Planners
- Consultants

....

-
- Build a „**business case**“
 - **Clearly define your workflow(s) and establish workflow standards**
 - Engage **ALL** end-users in decision making
 - The more people involved the better
 - Design the room to accommodate future innovations (and those that budget does not allow at this time)
 - **No detail is unimportant**
 - Educate yourself (Visits – Showrooms)
 - Hightech and Hybrid OR projects are about “**Trade-Offs**”
 - Follow a rigorous process
 - **Getting started requires training**
 - **The journey never ends**
 - **The room is the system!**

Never forget: It is a TEAM effort



DIN 91422 (6/2025) – Standardized Approach

Requirements for planning and safety in the multifunctional high-tech working environment surgical theatre/interventional suite

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HOSPITAL ENGINEERING TRENDS

Architecture meets Technology

<http://www.oth-aw.de/hospital-engineering-trends>

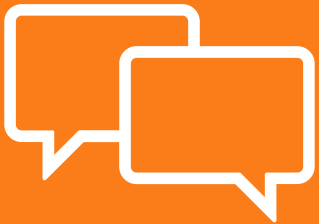


14.-16. September 2026

Amberg, Germany

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THANK YOU!