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SICHERE DYNAMISCHE VERNETZUNG  
IN OPERATIONSSAAL UND KLINIK

# Towards Communication Requirements in the Operating Room and Clinic IT

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# Agenda

- Motivation
- The OR.NET Project
- Methods
- Results and Discussion



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# Today's situation



- Mainly stand alone devices (e.g. due to legal requirements)
- Heterogeneous group of devices/systems: Medical Devices and hospital IT Systems
- Integration capabilities of devices (none, partial)
- Some vendor specific closed system solutions (OR1, Core, ...)



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# The OR.NET Project

- BMBF funded project  
(15 million Euros )
- 46 Project Partners and 23 Associate Partners
- Main goals:
  - Interconnect medical devices
  - Integration of medical devices with IT-Systems (HIS, PACS)
  - Standardized (HL7, DICOM)
  - ...
- [www.ornet.org](http://www.ornet.org)

Physicians and operators communication requirements are essential!!



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# Methods

1. Collect clinical and technical use cases
2. Develop a communication matrix
3. Cluster the communication requirements
4. Questionnaire survey on identified communication requirements



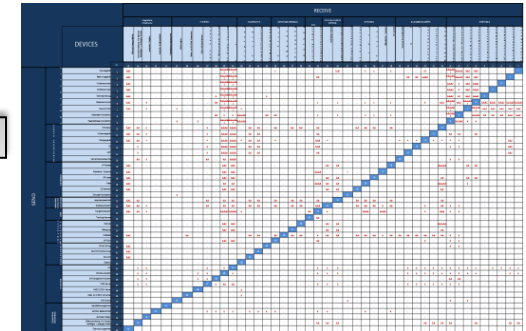
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# Methods

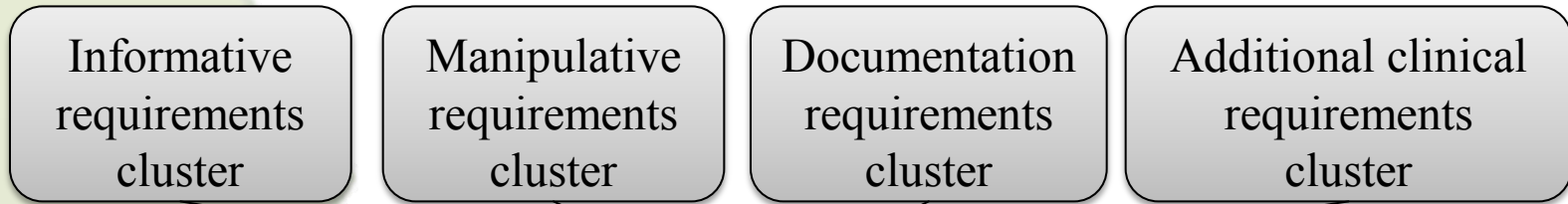
## Use Cases

Use Case ID	UC093
Gruppe	Klinische Dokumentation?
Übergeordnete Use Cases	
Untergeordnete Use Cases	
Verwandte Use Cases	UC092
Beschreibung	Import von Patienteninformationen aus dem KIS in die Navigation
Beteiligte Akteure (Systeme und Personen)	Navigationssystem, KIS, Anwender
Auslöser	
Voraussetzungen	<ul style="list-style-type: none"> <li>Navigation eingeschaltet</li> <li>Die Geräte sind vernetzt</li> <li>Die Navigation hat die Rechte auf das KIS zugreifen zu können</li> </ul>
Invarianten	
Nachbedingungen	Patientendaten sind in Navigation geladen
Standardablauf	<ul style="list-style-type: none"> <li>Navigation fragt beim KIS nach entsprechenden Daten</li> <li>Mögliche Datensätze werden in der Navigation in einer Liste angezeigt</li> <li>Anwender kann entsprechenden Datensatz auswählen</li> <li>Datensatz wird aus dem KIS direkt in die Navigation geladen</li> </ul>
Alternativer Ablauf	<p>1. Alternativer Ablauf</p> <ul style="list-style-type: none"> <li>Das KIS schickt die Daten an die Navigation</li> <li>Navigation empfängt Daten</li> <li>Datensatz wird aus dem PACS direkt in die Navigation geladen</li> </ul> <p>2. Alternativer Ablauf</p> <ul style="list-style-type: none"> <li>Daten müssen manuell im Navigationssystem eingegeben werden</li> </ul>

## Communication Matrix



## Communication Requirements



## Questionnaire survey

16 communication requirements

Requirements	
1.	<b>Informative Requirements</b>
1.1	Accessing patient data, findings and documents
1.2	Visualization of device data
1.3	Transfer of alerts and warnings
1.4	Image and video transfer within the OR
1.5	Accessing images and videos from the OR network, coming from the hospital IT systems
1.6	Telemedicine
2.	<b>Manipulative Requirements</b>
2.1	Manual control
2.2	Automatic control
2.3	Manual remote control
2.4	Remote maintenance
3.	<b>Documentation Requirements</b>
3.1	Clinical documentation
3.2	Image documentation
3.3	Video documentation
4.	<b>Additional Requirements</b>
4.1	Protocol transfer
4.2	Data, image and video fusion
4.3	Workflow control

6 German University Hospitals sorted the 16 com. req.:  
 1 = less important  
 16 = very important



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# Results

1. Informative requirements cluster
2. Manipulative requirements cluster
3. Documentation requirements cluster
4. Additional clinical requirements cluster



# Results

## 1. Informative requirements cluster

- Accessing patient data, findings and documents emerging from clinical IT systems in the OR
- Visualization of device data (centralized)
- Transfer of alerts and warnings
- Image and Video transfer within the OR
- Accessing images and videos from the OR network, coming from the hospital IT systems
- Telemedicine



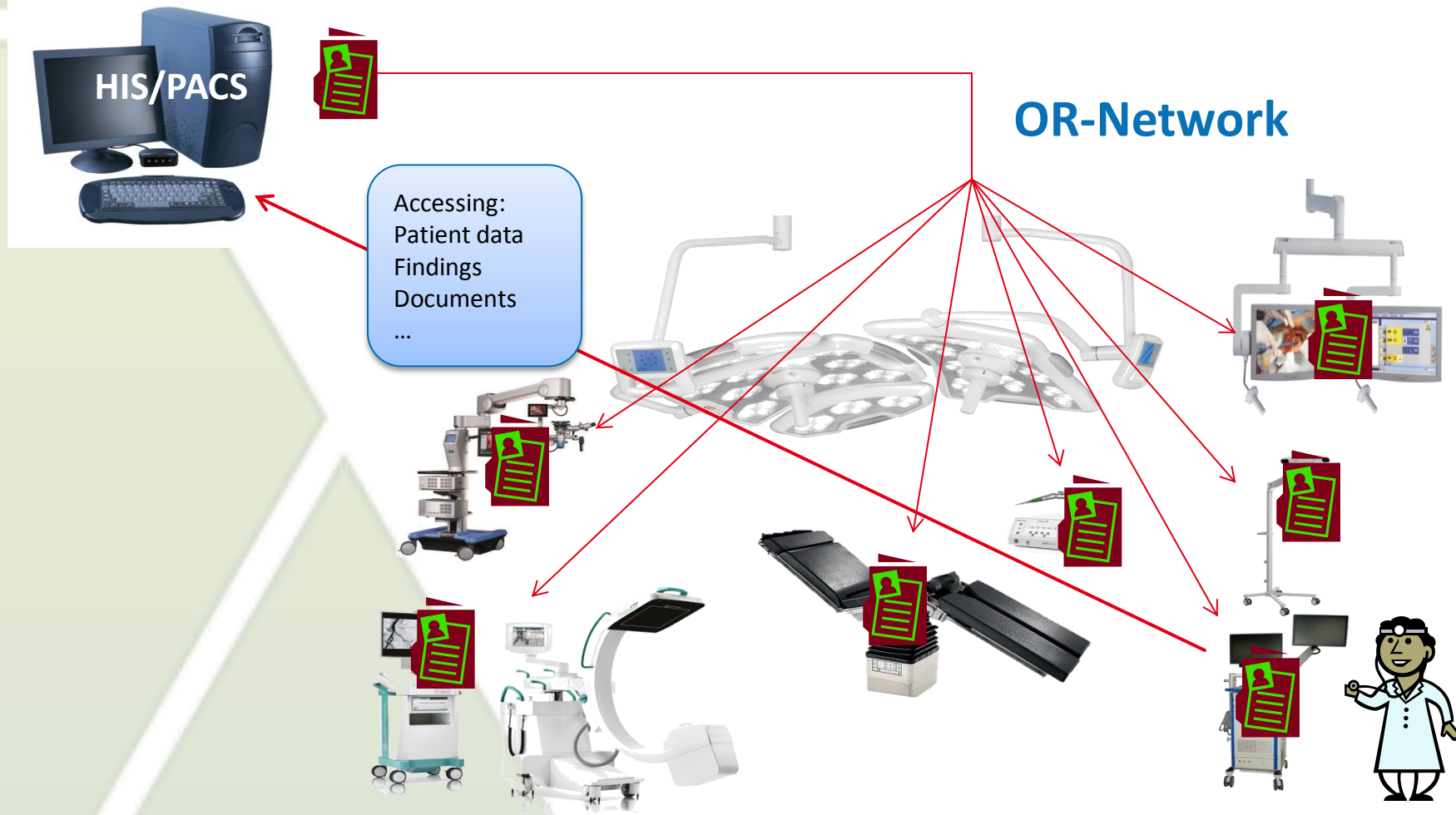
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# 1. Informative requirements cluster

Accessing patient data, findings, documents

## Hospital IT-Network



# 1. Informative requirements cluster

Visualisation of device data (centralized)



# 1. Informative requirements cluster

## Transfer of alerts and warnings



# 1. Informative requirements cluster

## Image and Video transfer within the OR



# Hospital IT-Network





# 1. Informative requirements cluster

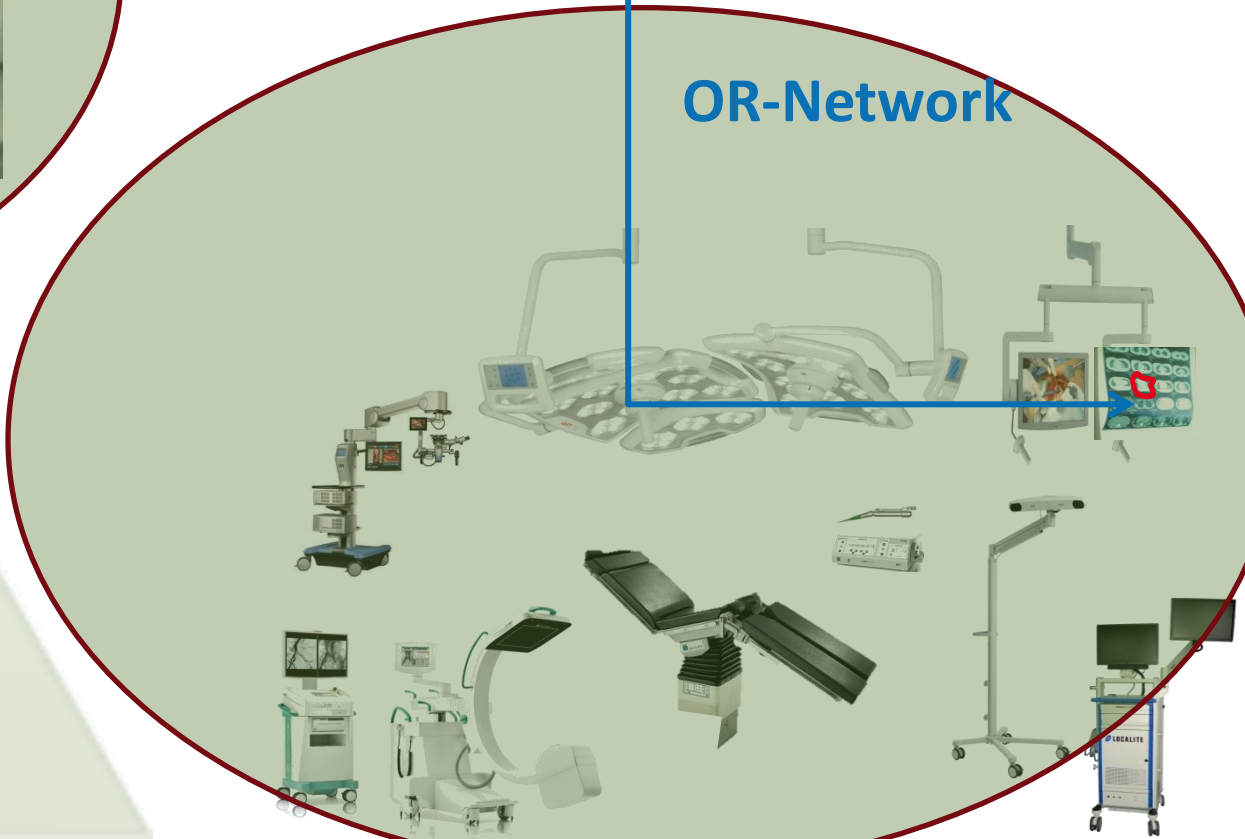
## Telemedicine

external-Network



Switch views and  
mark structures

OR-Network



# Results

## 2. Manipulative requirements cluster

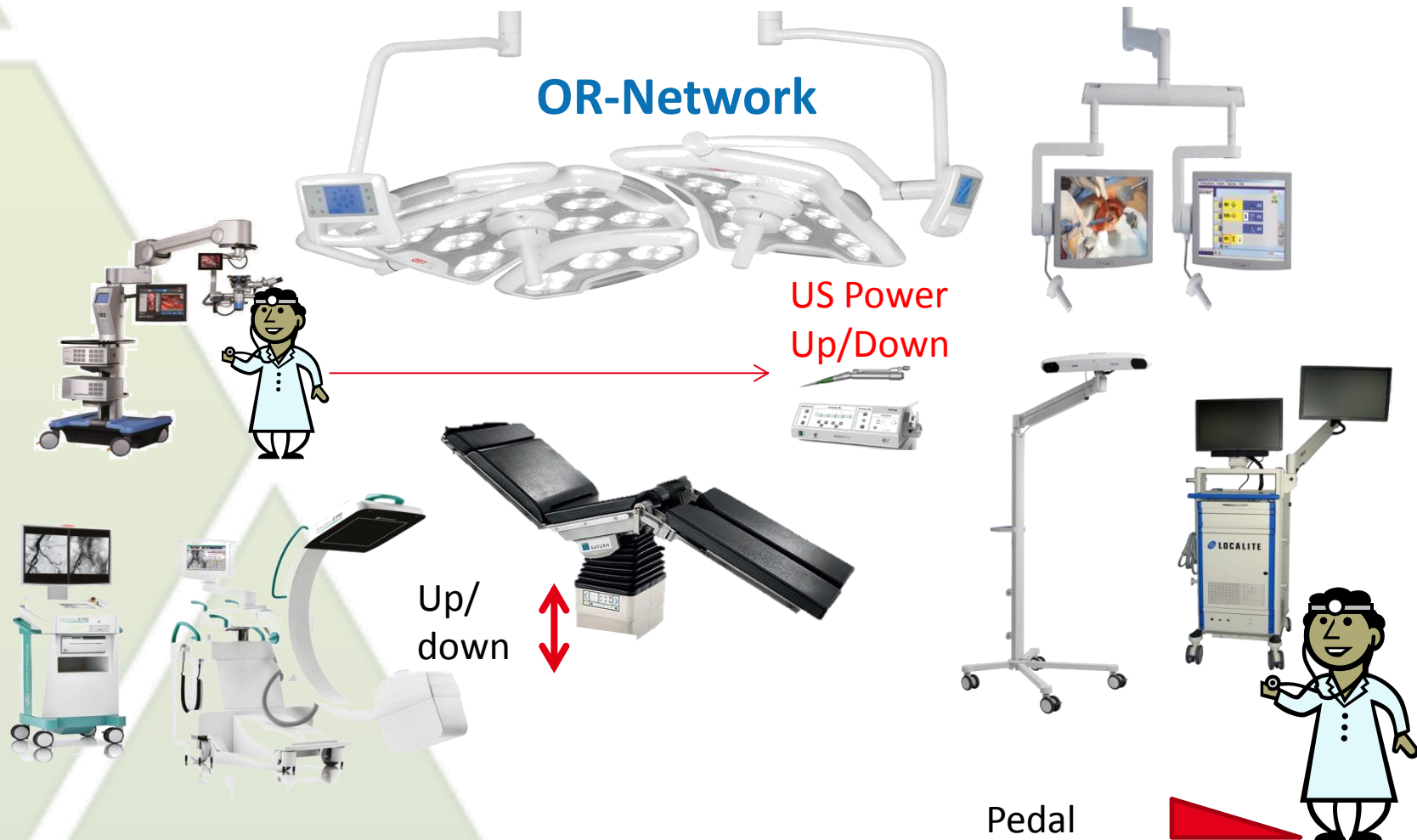
- Manual control
- Automatic control (real-time, no user interaction)
- Manual remote control (telemedicine)
- Remote maintenance





## 2. Manipulative requirements cluster

### Manual control



## 2. Manipulative requirements cluster

### Automatic control



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## 2. Manipulative requirements cluster

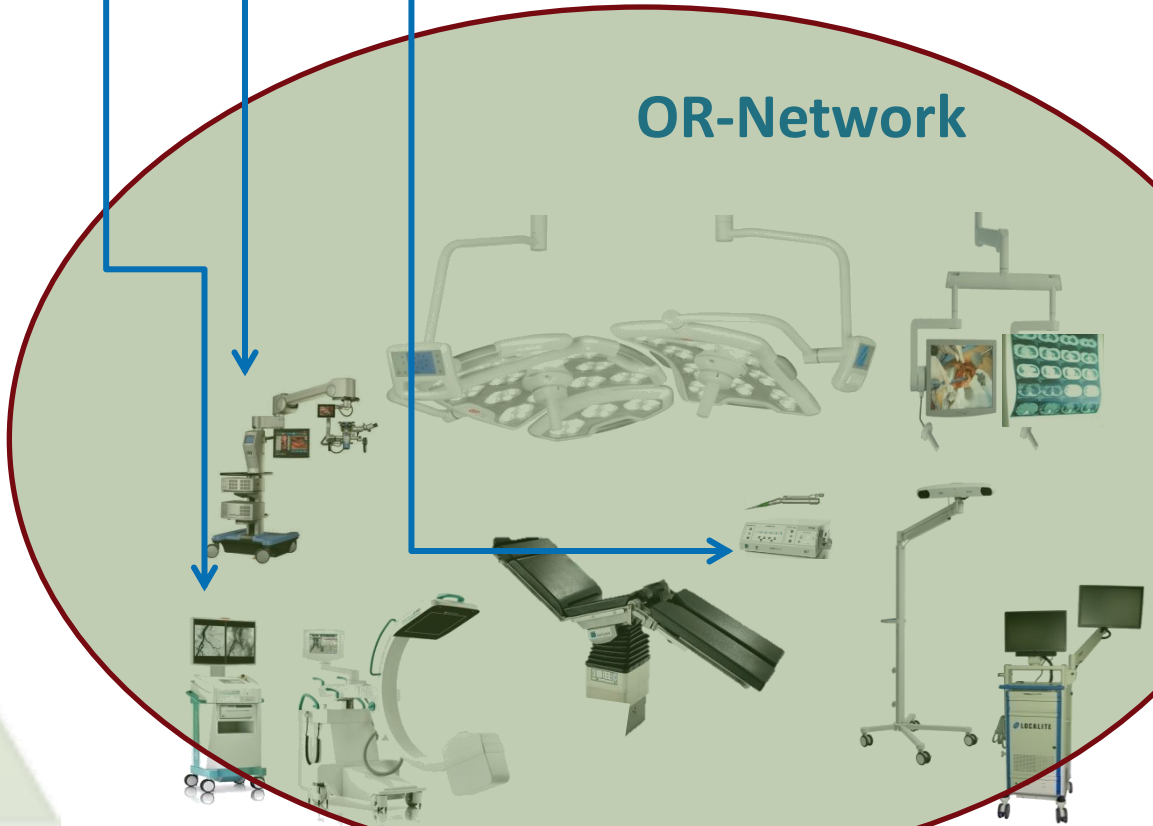
### Manual remote control

#### External Network



Change device data

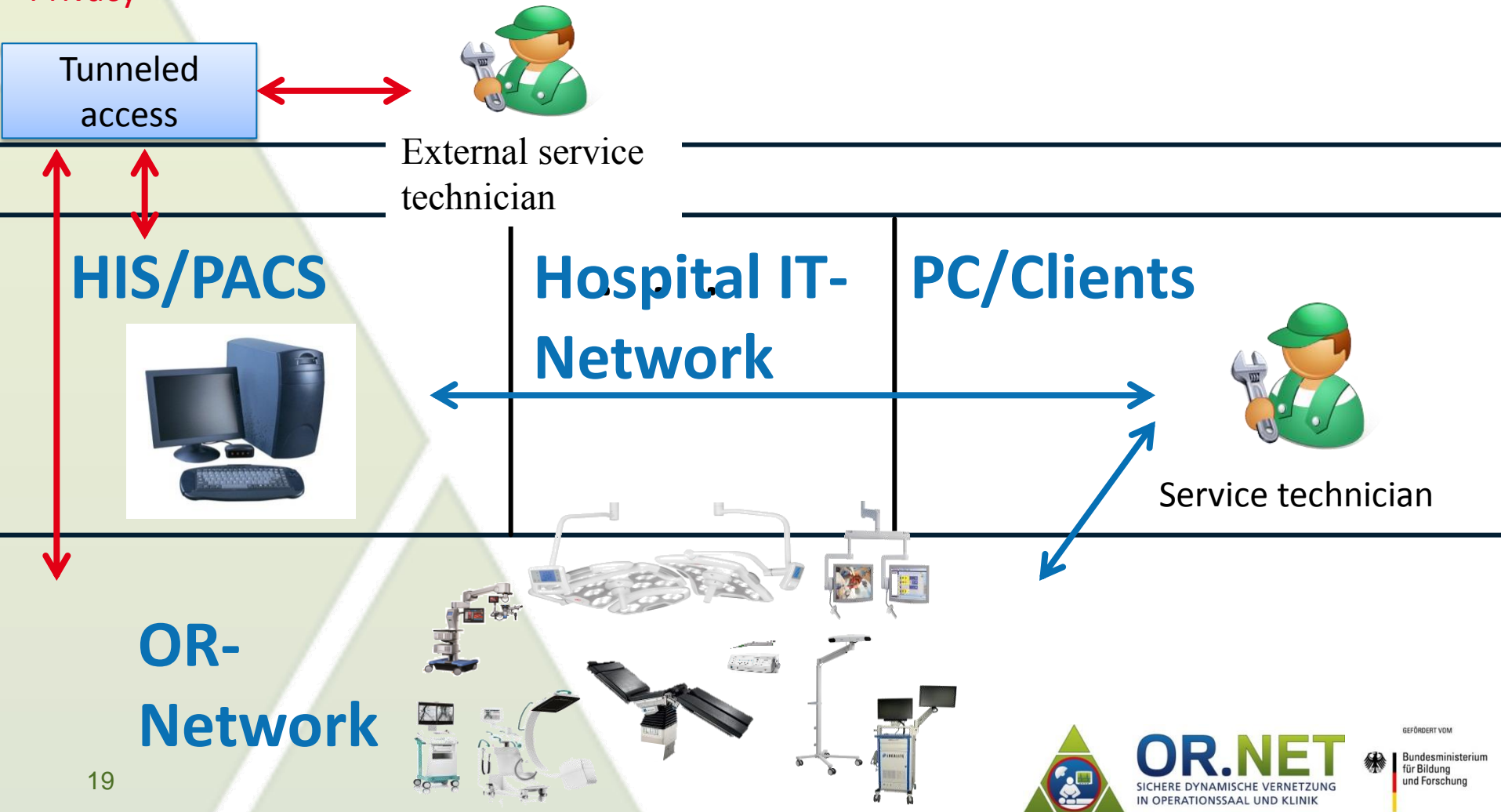
#### OR-Network



## 2. Manipulative requirements cluster

### Remote maintainance

Safety  
Security  
Privacy



# Results

## 3. Documentation requirements cluster

- Clinical documentation
- Image documentation
- Video documentation



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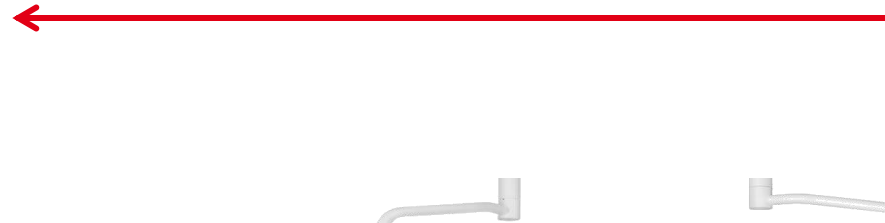
# 3. Documentation requirements cluster

## Clinical, image, video documentation

### Hospital IT-Network



Images/Videos, findings, documents



### OR-Network



# Results

## 4. Additional clinical requirements cluster

- Protocol transfer
- Data, image and video fusion
- Workflow control



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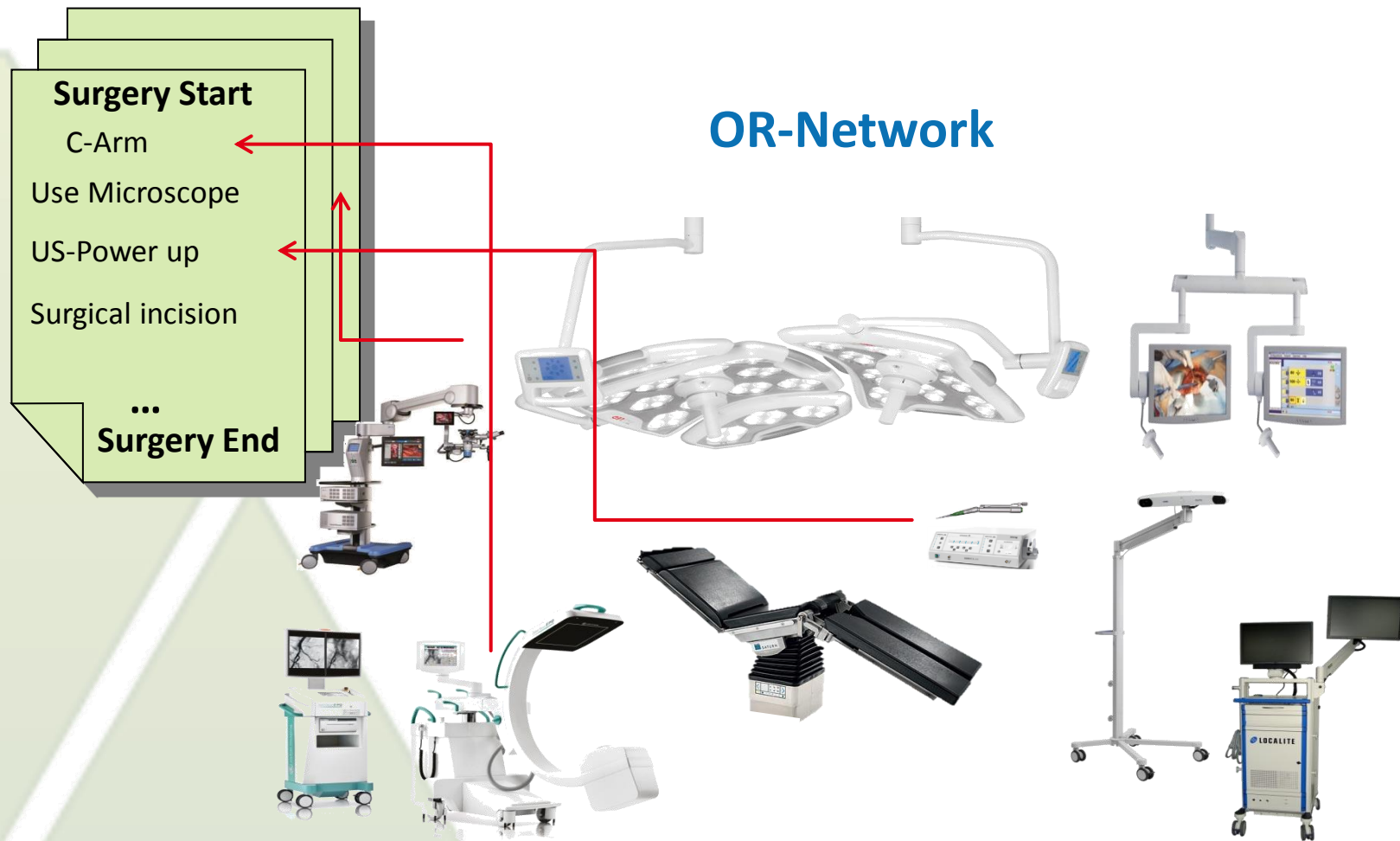
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## 4. Additional clinical requirements cluster

### Protocol transfer

# Protocol



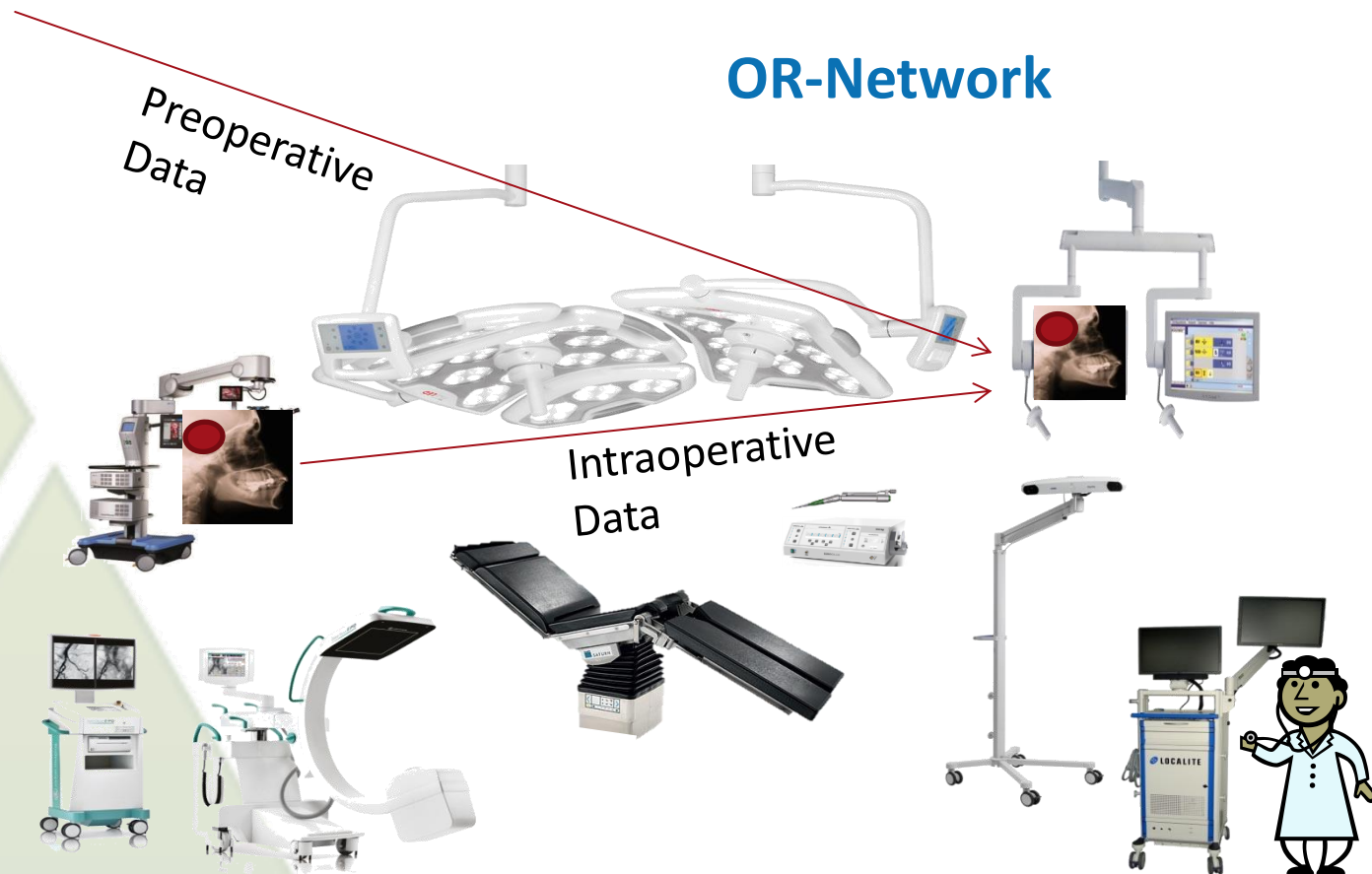
# 4. Additional clinical requirements cluster

## Data, image and video fusion

### Hospital IT-Network



### OR-Network



## 4. Additional clinical requirements cluster

### Workflow control



# Results

- Physicians and operators from 6 German University Hospitals prioritized the communication requirements (1=less important, 16=very important) :
  - University Hospital Aachen (UHA)
  - University Hospital Leipzig (UHL)
  - University Hospital Tübingen (UHT)
  - Rhön Hospital (RH)
  - University Hospital Heidelberg (UHH)
  - University Hospital Schleswig-Holstein (UHSH)

Requirements	
1.	Informative Requirements Cluster
1.1	Accessing patient data, findings and documents
1.2	Visualization of device data
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1.5	Accessing images and videos from the OR network, coming from the hospital IT systems
1.6	Telemedicine
2.	Manipulative Requirements Cluster
2.1	Manual control
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3.	Documentation Requirements Cluster
3.1	Clinical documentation
3.2	Image documentation
3.3	Video documentation
4.	Additional Requirements Cluster
4.1	Protocol transfer
4.2	Data, image and video fusion
4.3	Workflow control

Requirements	UHA	UHL	UHT	RH	UHH	UHSB	Avg.
<b>1. Informative Requirements</b>							
1.1 Accessing patient data, findings and documents	16	14	3	14	16	16	13.16
1.2 Visualization of device data	15	13	12	10	11	15	12.66
1.3 Transfer of alerts and warnings	5	7	16	13	15	10	11
1.4 Image and video transfer within the OR	13	4	11	16	9	13	11
1.5 Accessing images and videos from the OR network, coming from the hospital IT systems	14	10	10	12	10	5	10.16
1.6 Telemedicine	3	3	9	11	1	3	5
<b>2. Manipulative Requirements</b>							
2.1 Manual control	12	11	15	1	8	12	9.83
2.2 Automatic control	4	8	14	2	7	2	6.16
2.3 Manual remote control	1	2	13	3	2	7	4.66
2.4 Remote maintenance	2	1	2	6	3	8	3.66
<b>3. Documentation Requirements</b>							
3.1 Clinical documentation	9	12	6	9	14	14	10.66
3.2 Image documentation	8	16	8	8	13	11	10.66
3.3 Video documentation	7	15	7	7	12	9	9.5
<b>4. Additional Requirements</b>							
4.1 Protocol transfer	6	5	1	15	5	6	6.33
4.2 Data, image and video fusion	10	9	4	4	4	4	5.83
4.3 Workflow control	11	6	5	5	6	1	5.66

# Results and Discussion

Avg. rank	Requirements
13	1.1 Accessing patient data, findings and documents
13	1.2 Visualization of device data
11	1.3 Transfer of alerts and warnings
11	1.4 Image and video transfer within the OR
11	3.1 Clinical documentation
11	3.2 Image documentation
10	1.5 Accessing images and videos from the OR network, coming from the hospital IT systems
10	2.1 Manual control
10	3.3 Video documentation
6	4.3 Protocol transfer
6	2.2 Automatic control
6	4.1 Data, image and video fusion
6	4.2 Workflow control
5	1.6 Telemedicine
5	2.3 Manual remote control
4	2.4 Remote maintenance





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