

SMART Hospital

Lessons from the operating theatres !

Henry Ho

Chairman, Division of Surgery & Surgical Oncology

Chairman, Surgery Academic Clinical Program, Singhealth

Executive Director, National Healthcare Innovation Center

Senior Consultant Urologist, SGH

Adj. Associate Professor, DUKE-NUS medical school

Robotic oncology fellowship, University of Innsbruck, Austria

Endourology fellowship, Hamburg, Germany

Biodesign scholarship, Stanford University, USA



SURGERY





OUTLINE

1. Why SMART hospital ?
2. Why SMART Operating Theatres ?
3. Innovations : *Goldfinger, Gonazles*
4. Lessons learnt
5. Will AI/automation take my Job



Talent Pool

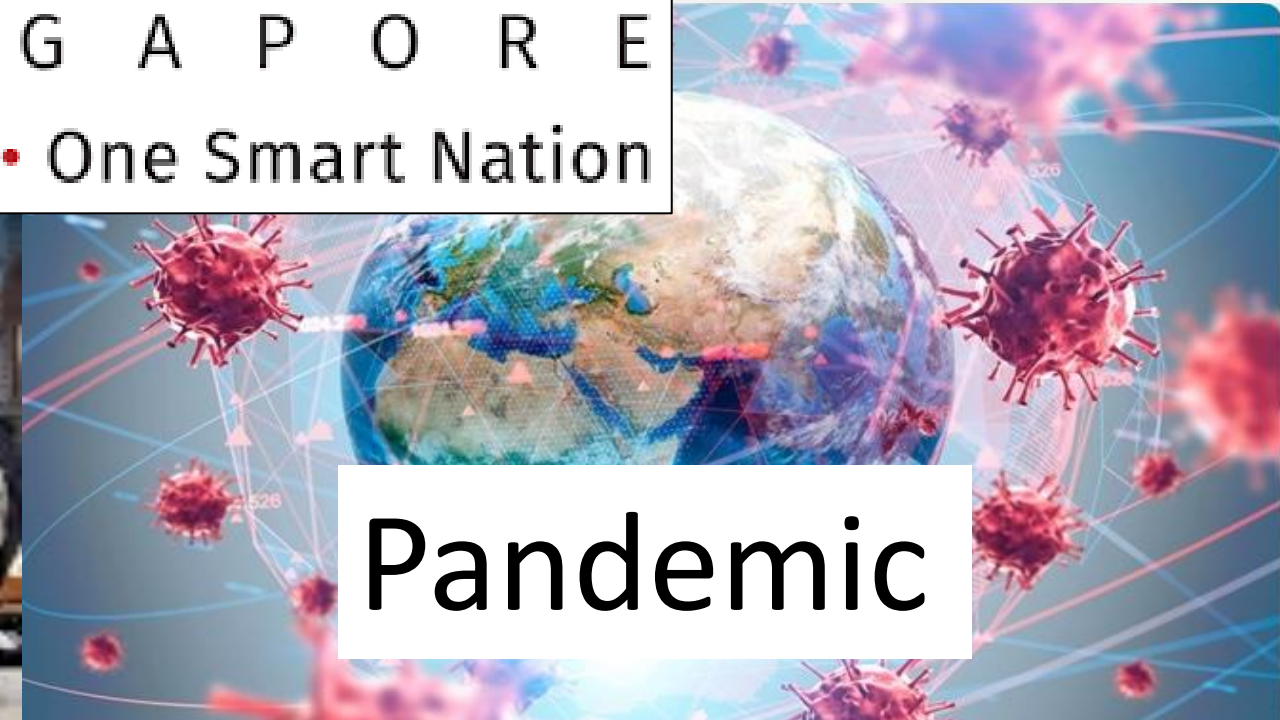
Cost



Smart Nation
S I N G A P O R E
Many Smart Ideas • One Smart Nation



Aging Population

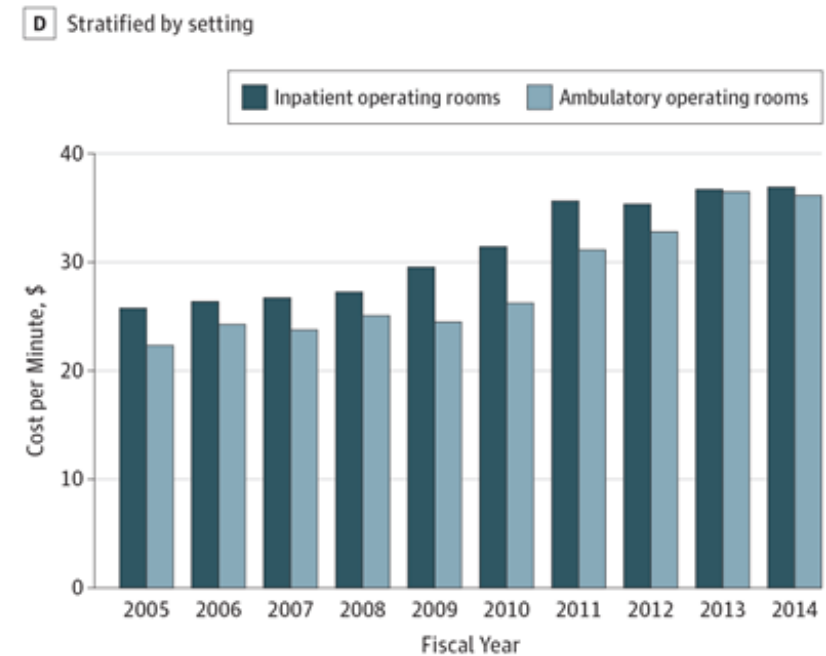
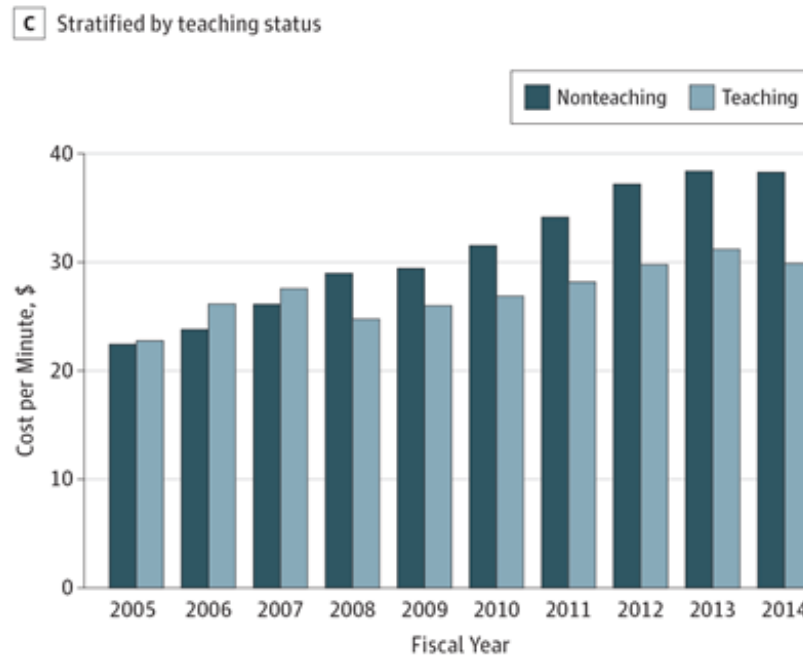
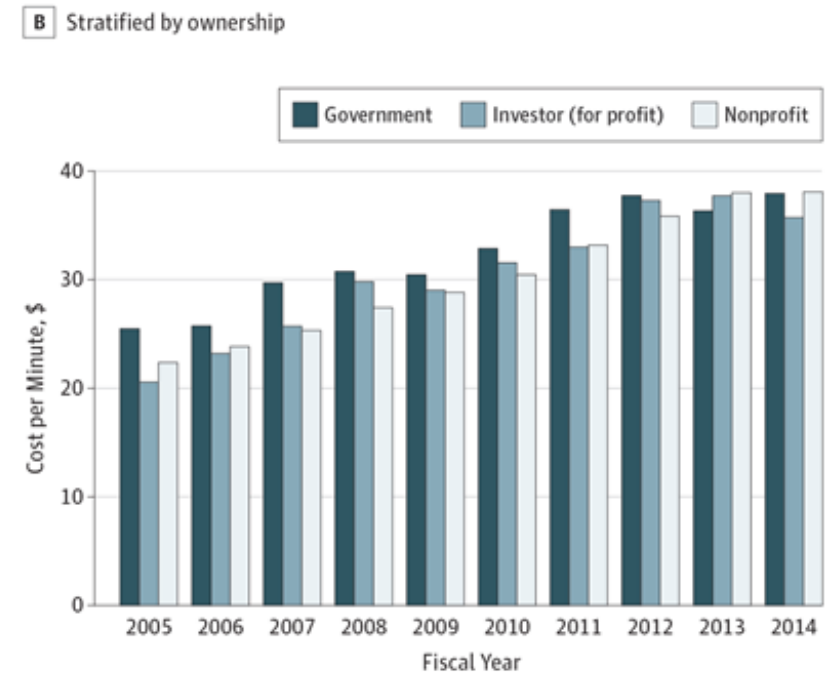
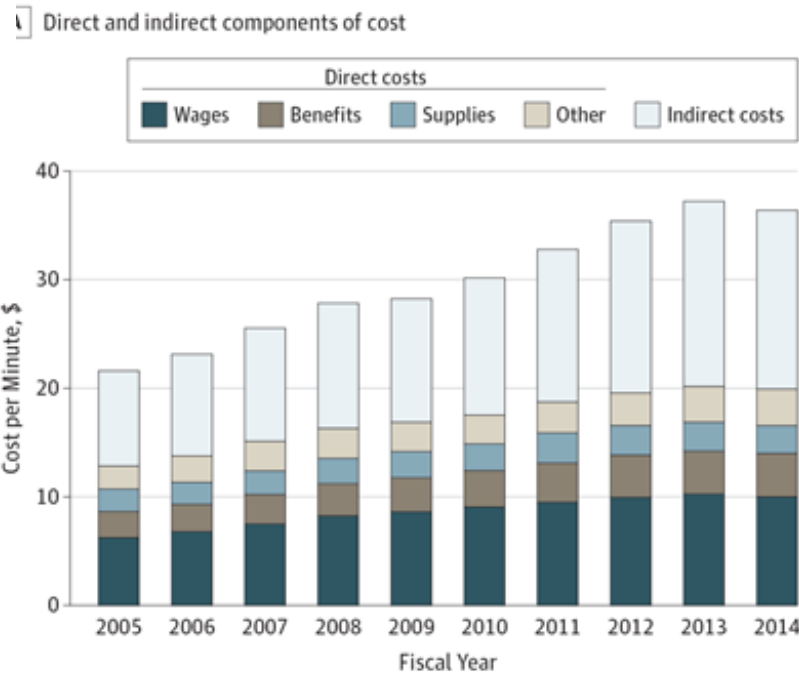


Pandemic

Why OT ?

Most expensive asset in hospital

Rising cost of OT





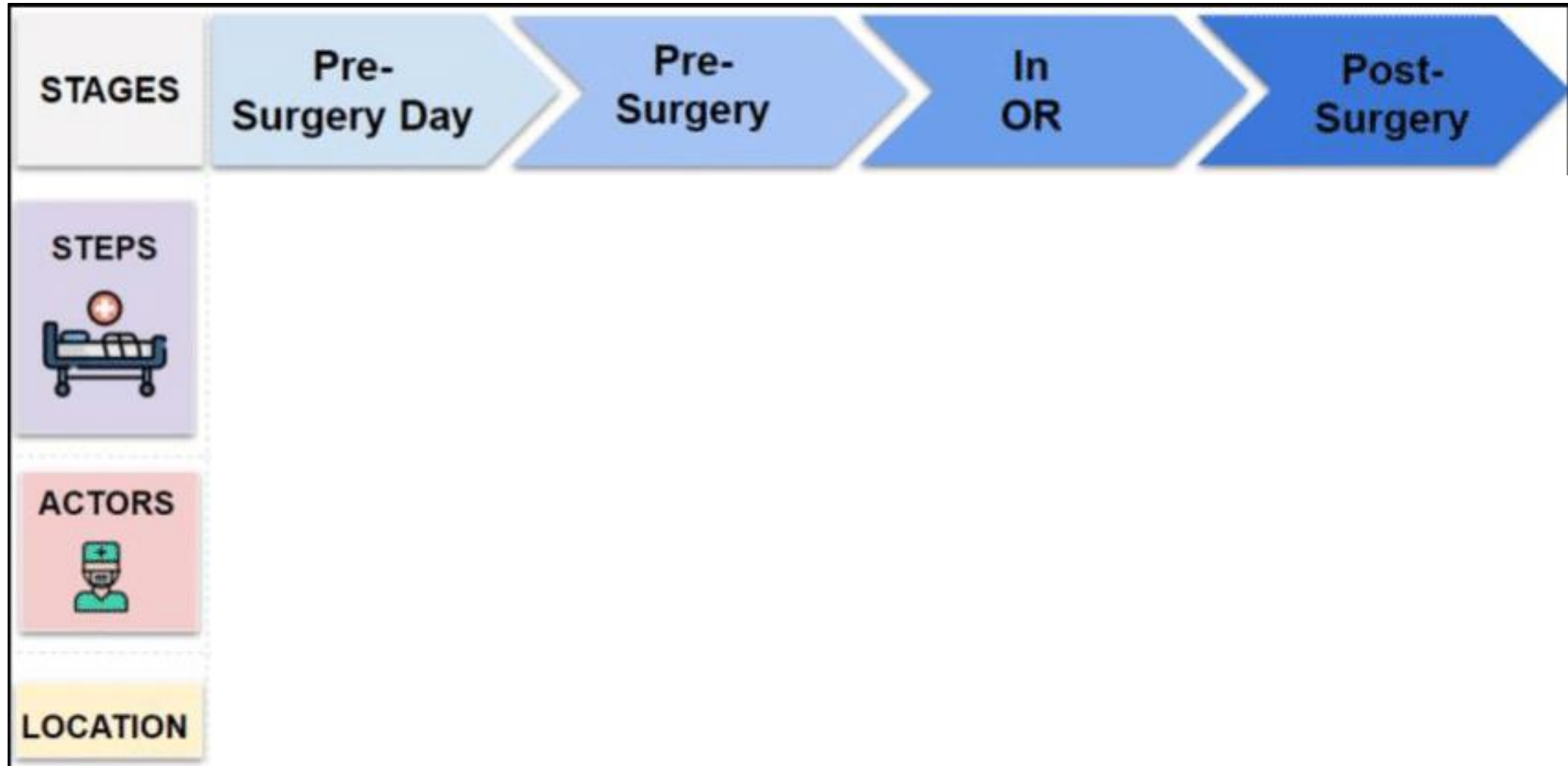
Why OT ?

- Highly specialized & complex environment
- Long talent training
- Vulnerable pipeline

4 "S" Tenets



Why OT ? Clearer Care Segment



Solutions: Digital & AI, Robotic & Automation, Process innovation

Patient being checked
at Reception



Patient transferred
to operating table



Scheduling

Processing

Talents

Surgeon

Anaesthesia

Nurses

Radiographer

Patient



Cleaning
Preparing
Sterilizing
Delivery

Equipment

Processing



Patient

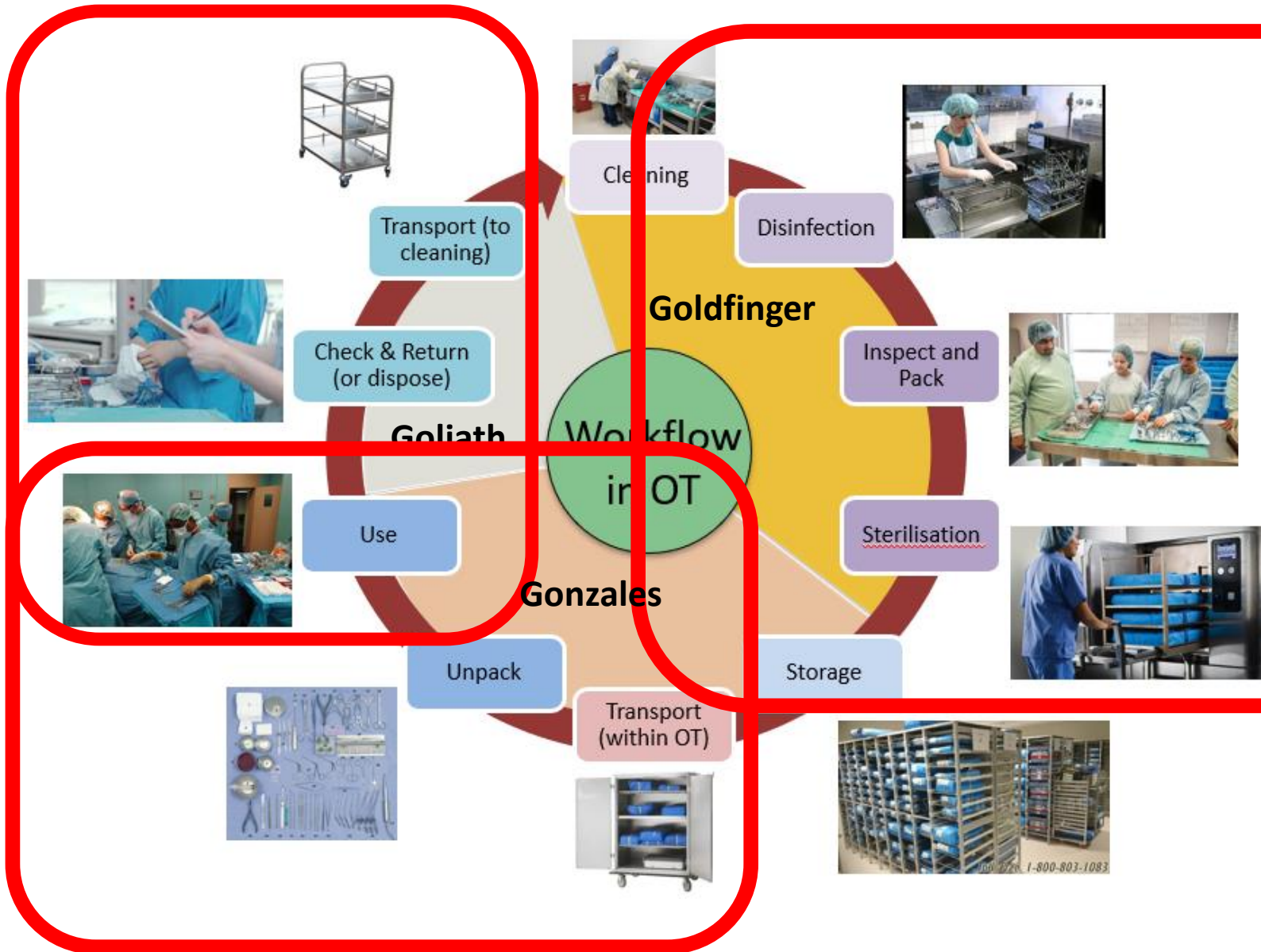
Cleaning
Preparing
Sterilizing
Delivery

Equipment

Integration of iSIM within surgical instruments flow in OT

Challenges faced:

1. Instrument ordering process is multi-factorial, dependant on surgeon profile, patient condition etc.
2. Additional time and resources required to retrieve adhoc instruments required during surgery.



Challenges faced:

1. Manpower performing repetitive and low value adding tasks.
2. Staff are vulnerable to strain injuries as they pick and pack instruments throughout their entire shift.

Expert operator

Young assistant

Anesthetist



Circulating nurse

Scrub nurse

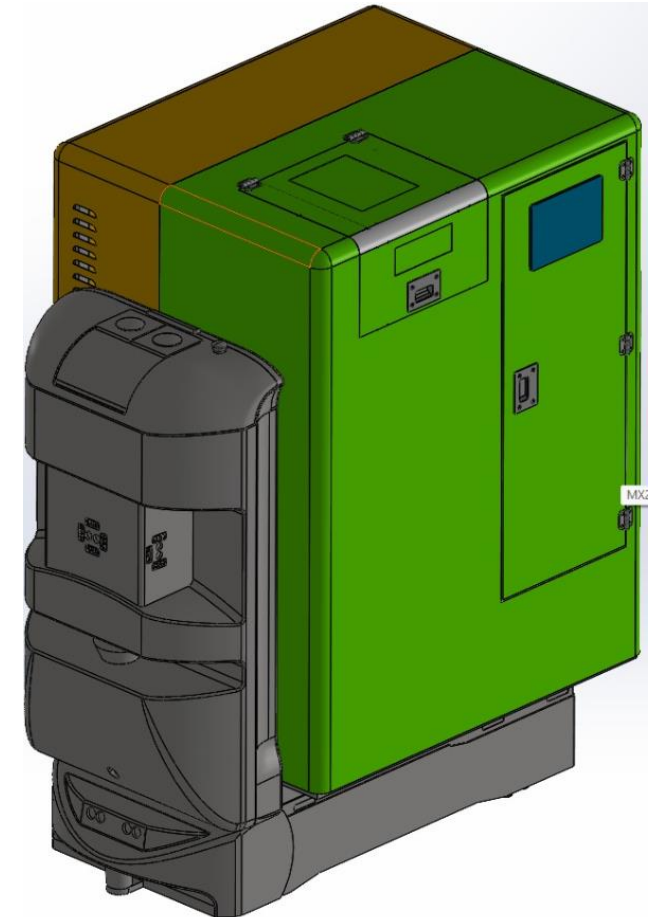
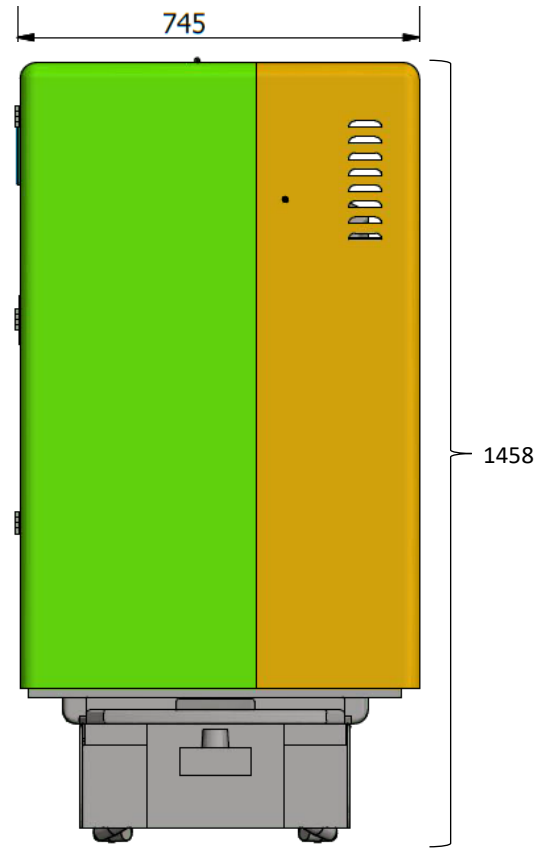
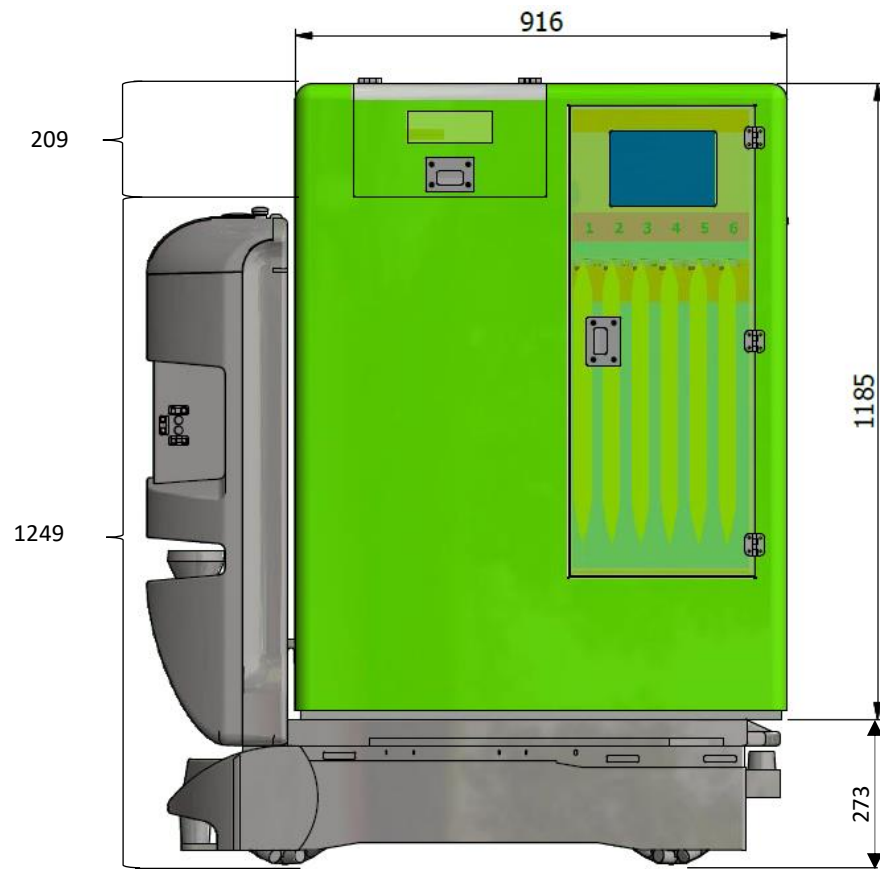
Video-camera assistant

Circulating Nurses (Scrub)

- Check list
- Documentation
- Fetch ad-hoc equipment / supplies



Robot development- Gonzales Design





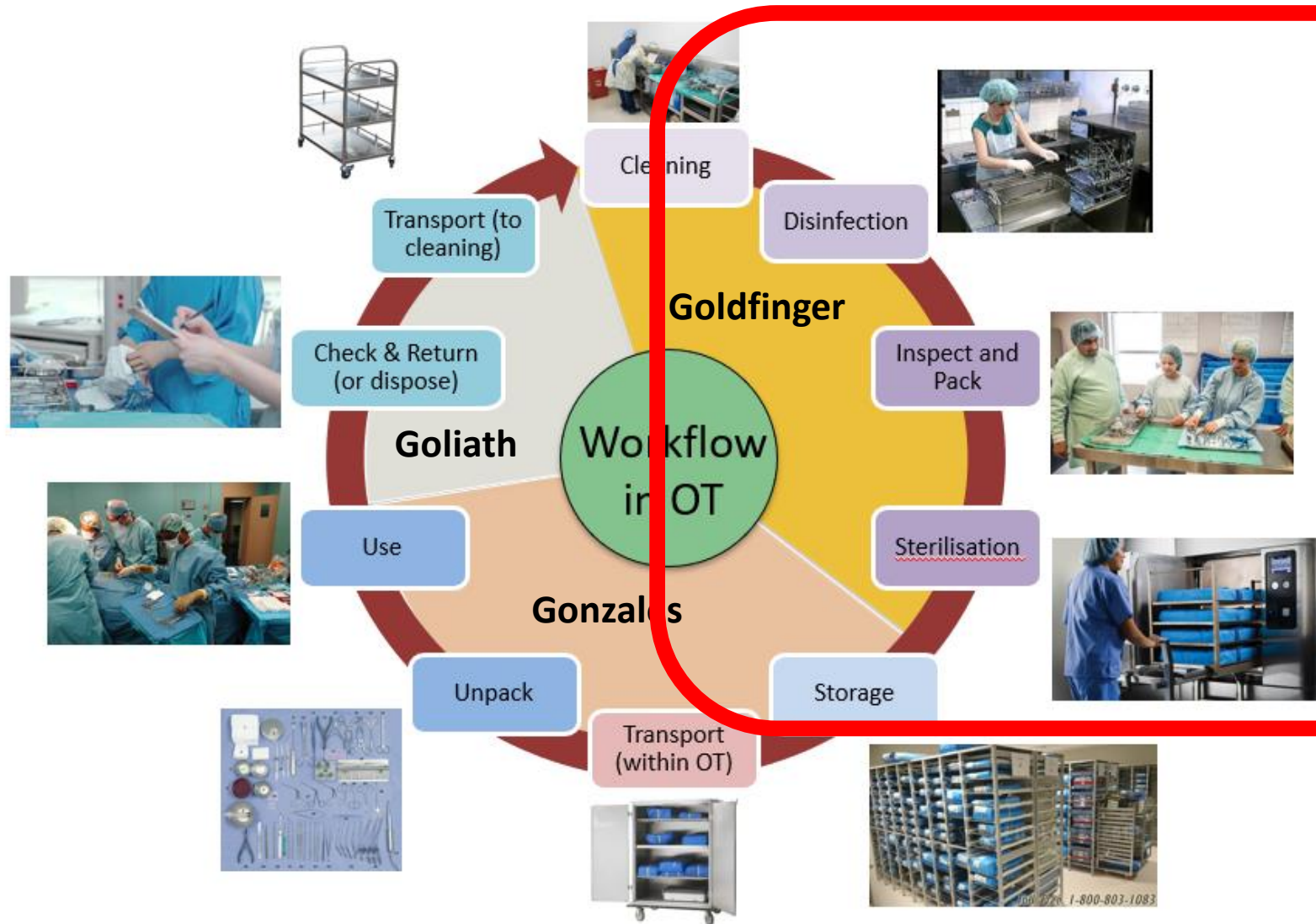
SingHealth aims to use Artificial Intelligence to predict the type of equipment required and Smart Robotics to deliver ad-hoc instruments during Surgery.

- 1) AI to predict instruments for a specific surgery
- 2) Smart Robotics to deliver ad-hoc instruments for Surgery

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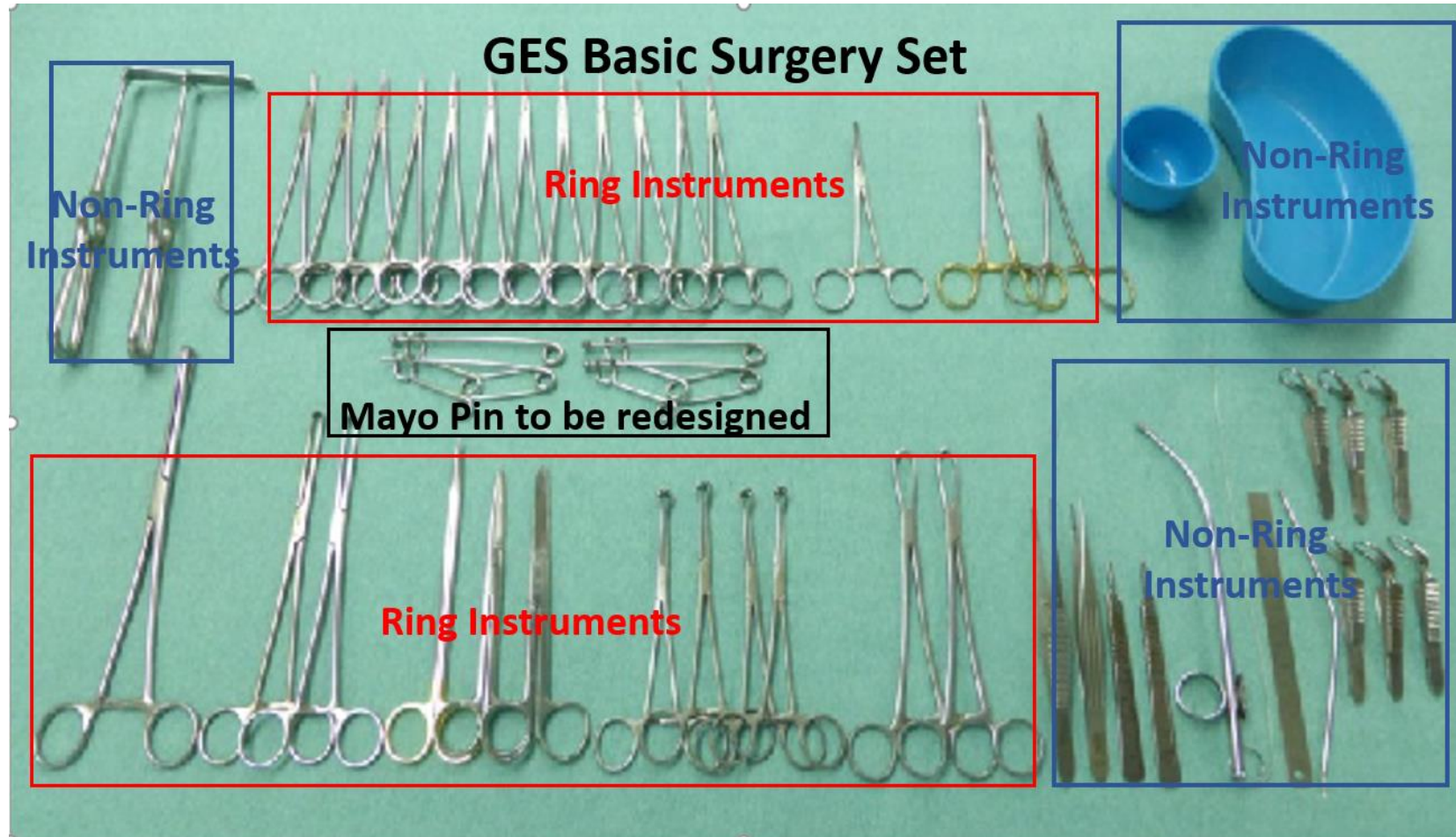


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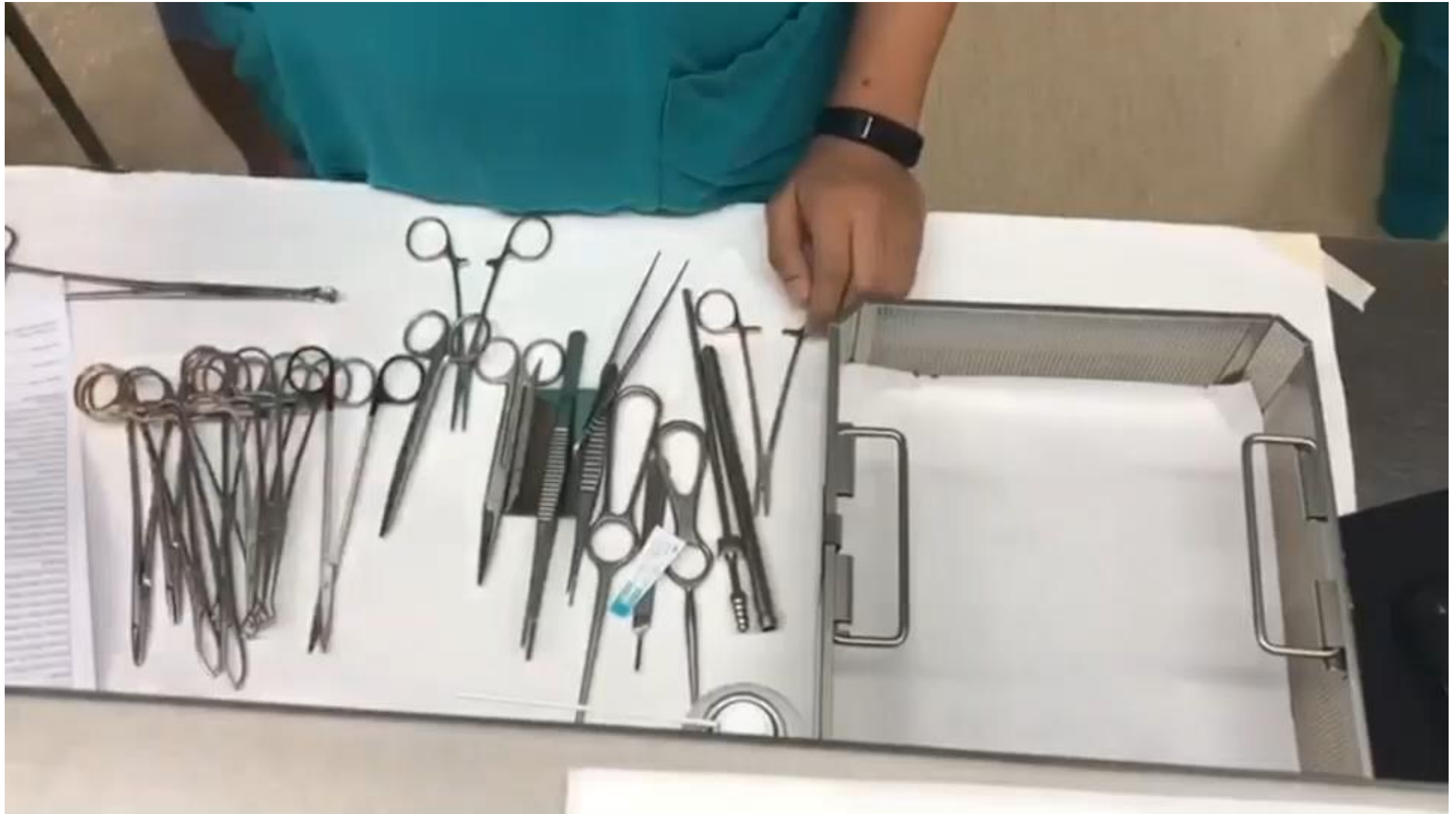
Project scope- Goldfinger

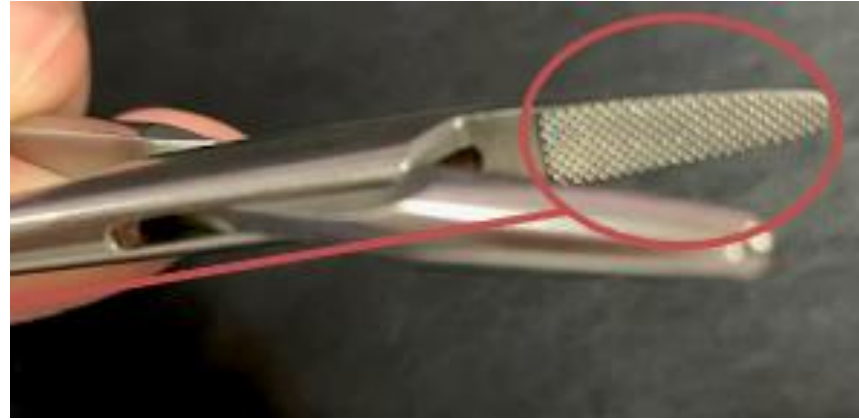
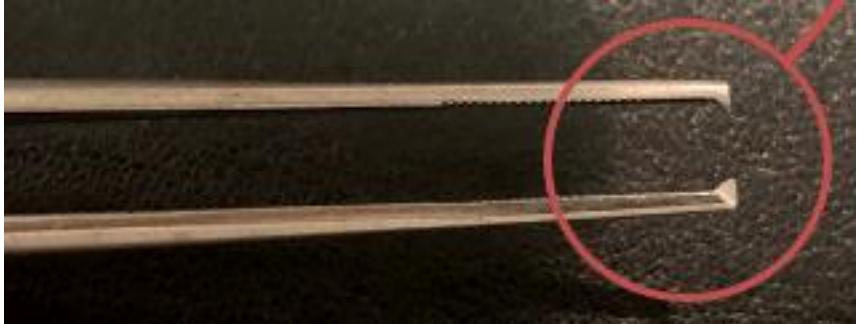
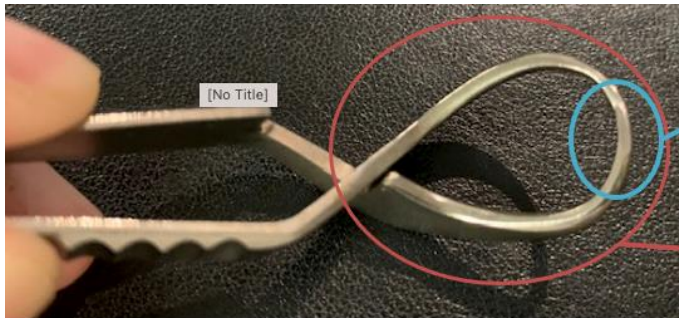
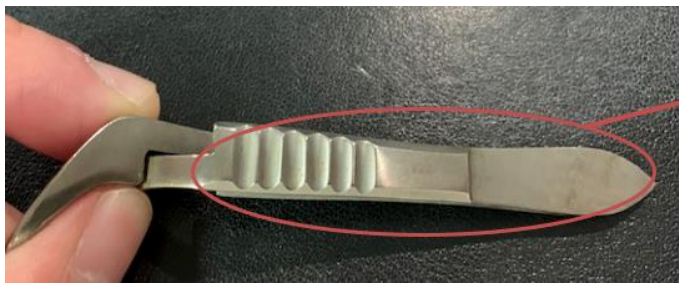
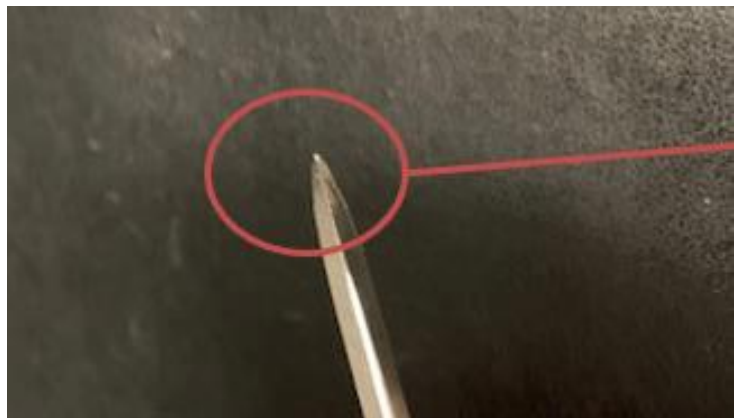
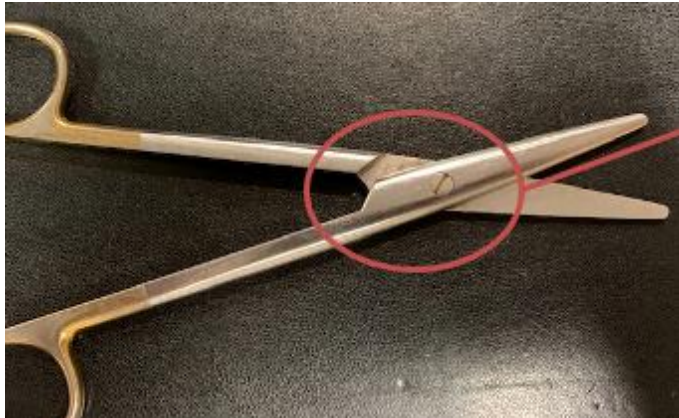
Basic surgical sets – about 50% of the total instrument volume



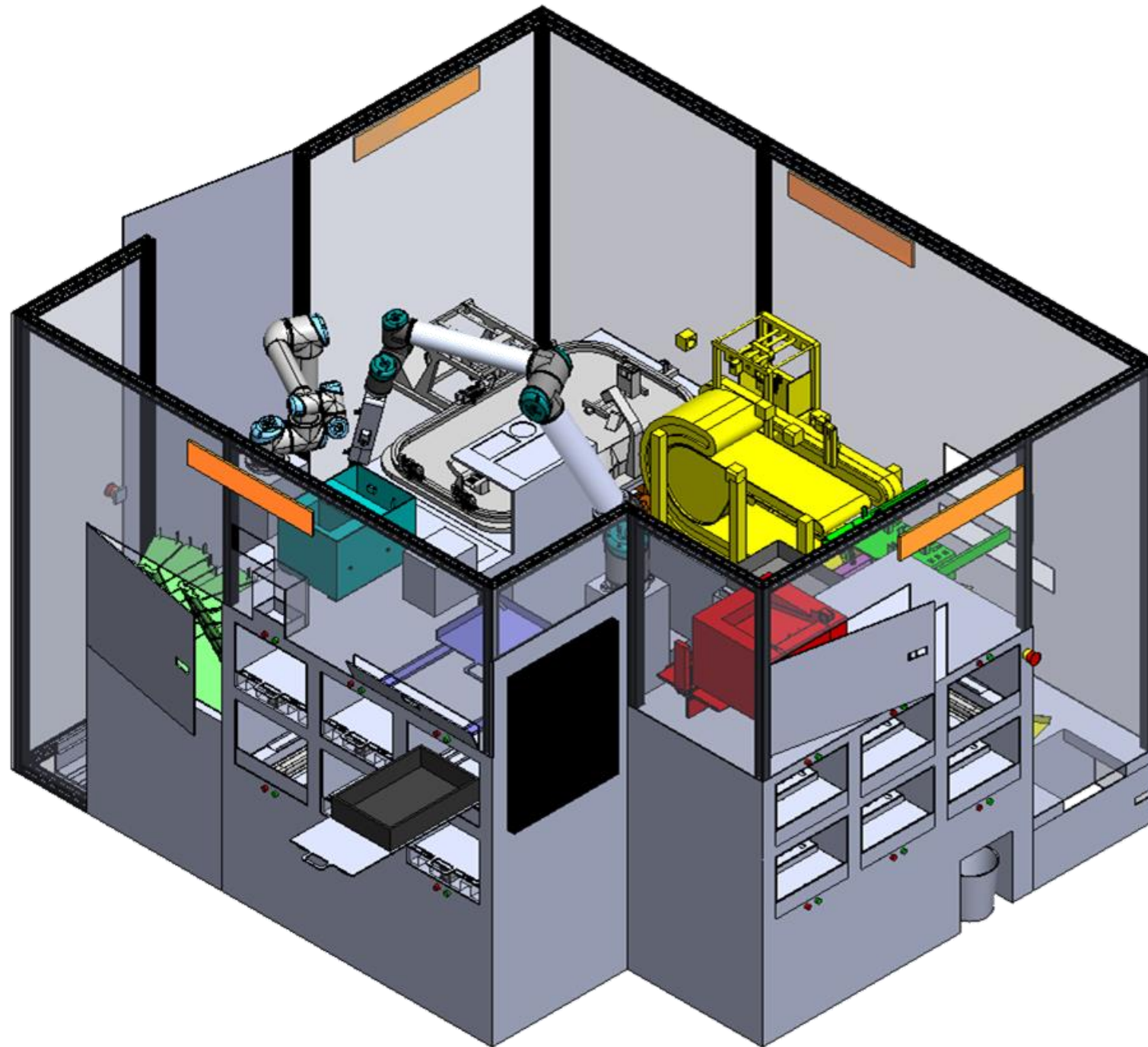
Restricted, Sensitive (Normal)

Talent – instrument technician





Inspection



Approved Design
(January 2020)

Big Box @ SGH SSU

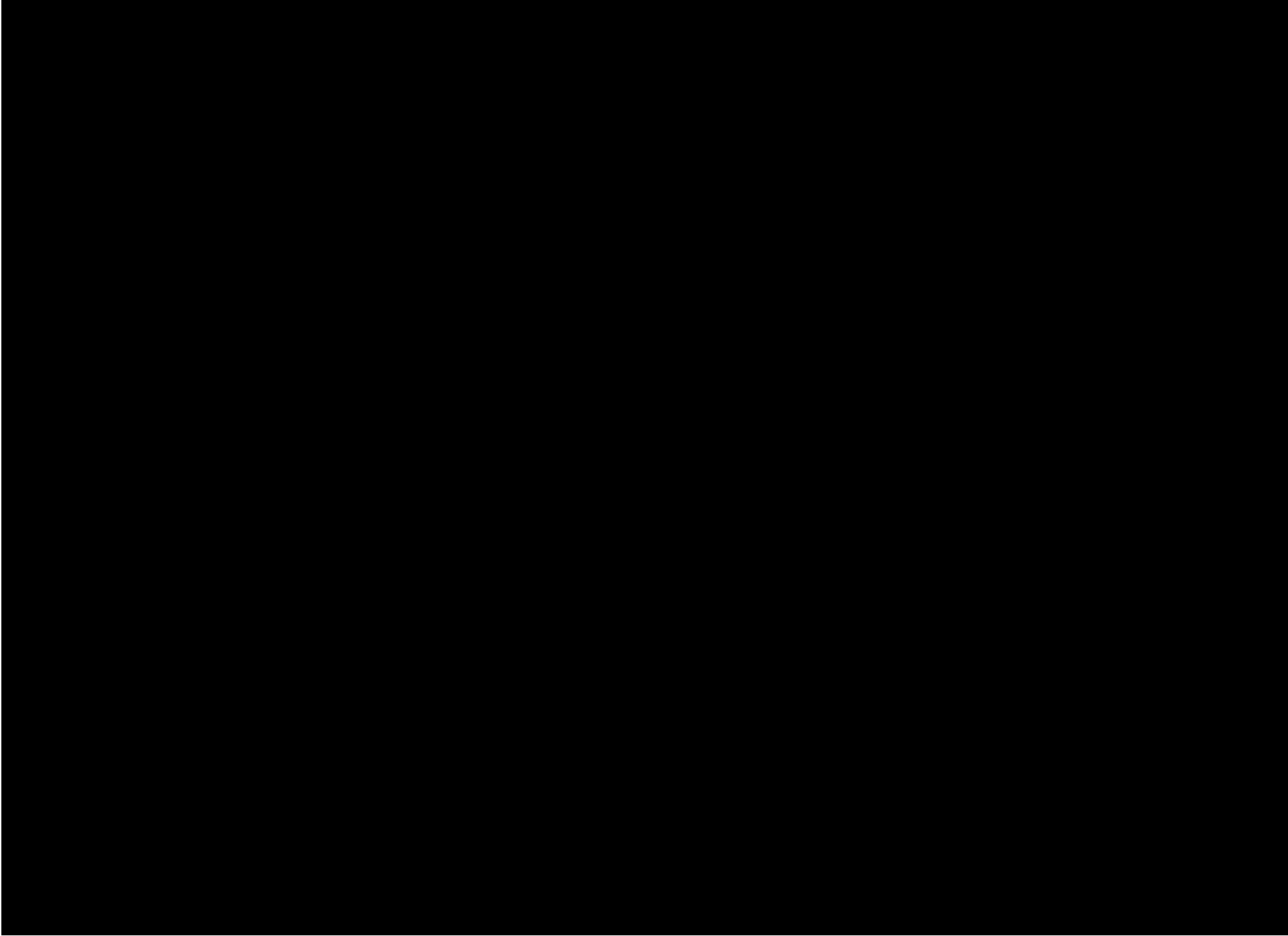
- Bigbox was shifted to SSU on 2nd Apr 2022
- Demonstration of the robot on 10th & 11th May 2022
- Unfinished Modules:
 - Wrapping Bay,
 - Non-ring Spare Bay3C
- Brought back to HandPlus office to continue the development of unfinished modules and to improve reliability and repeatability



Restricted, Sensitive (Normal)

BIG BOX SYSTEM
(as installed at SGH, May 2022)







Lessons from SMART
Operating Theatres

Data

Infrastructure
Connectivity

Lessons from SMART
Operating Theatres

Value
Proposition

Workflow

Data is not enough

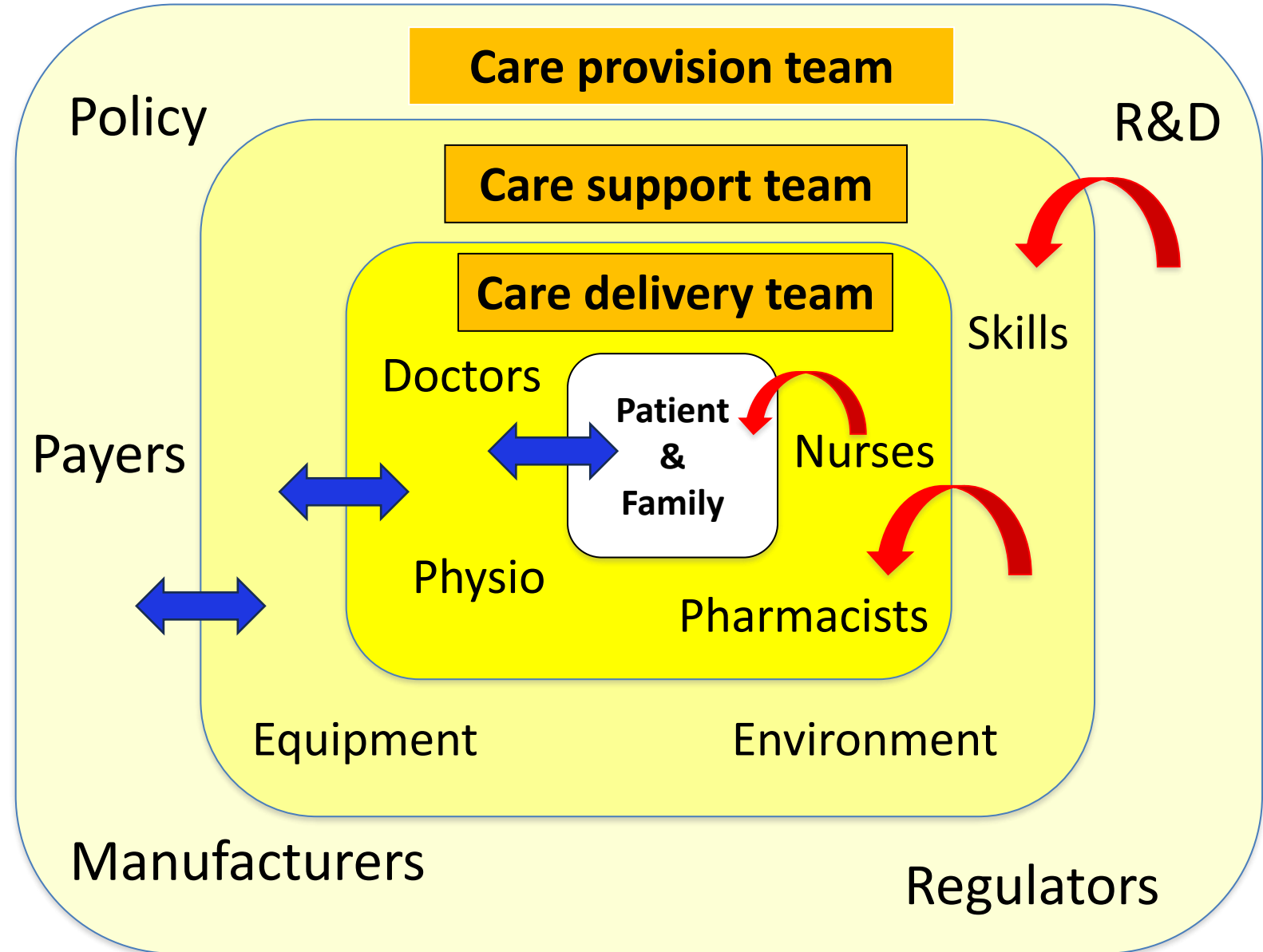
Clinical Data is not enough

Clinical Data is not Smart enough

The healthcare stakeholders

Data flow

- Wrong type
- Not linked
- Not relevant at that segment
- Not collected



- Floor loading
- Corridor width & Turning angle
- Equipment payload
- Charging point and duration

- Lift / door opening

Staff X Time = Care delivery

Susceptible group

- Long training period
- Long & unpredictable work hours
- Complex environment
- Repetitive tasks
- Sub-optimal remuneration

- Human + robot interaction
- Change management
- Schedule and routine

Will

A.I. / Automation

take my **JOB**

Will

A.I. / Automation

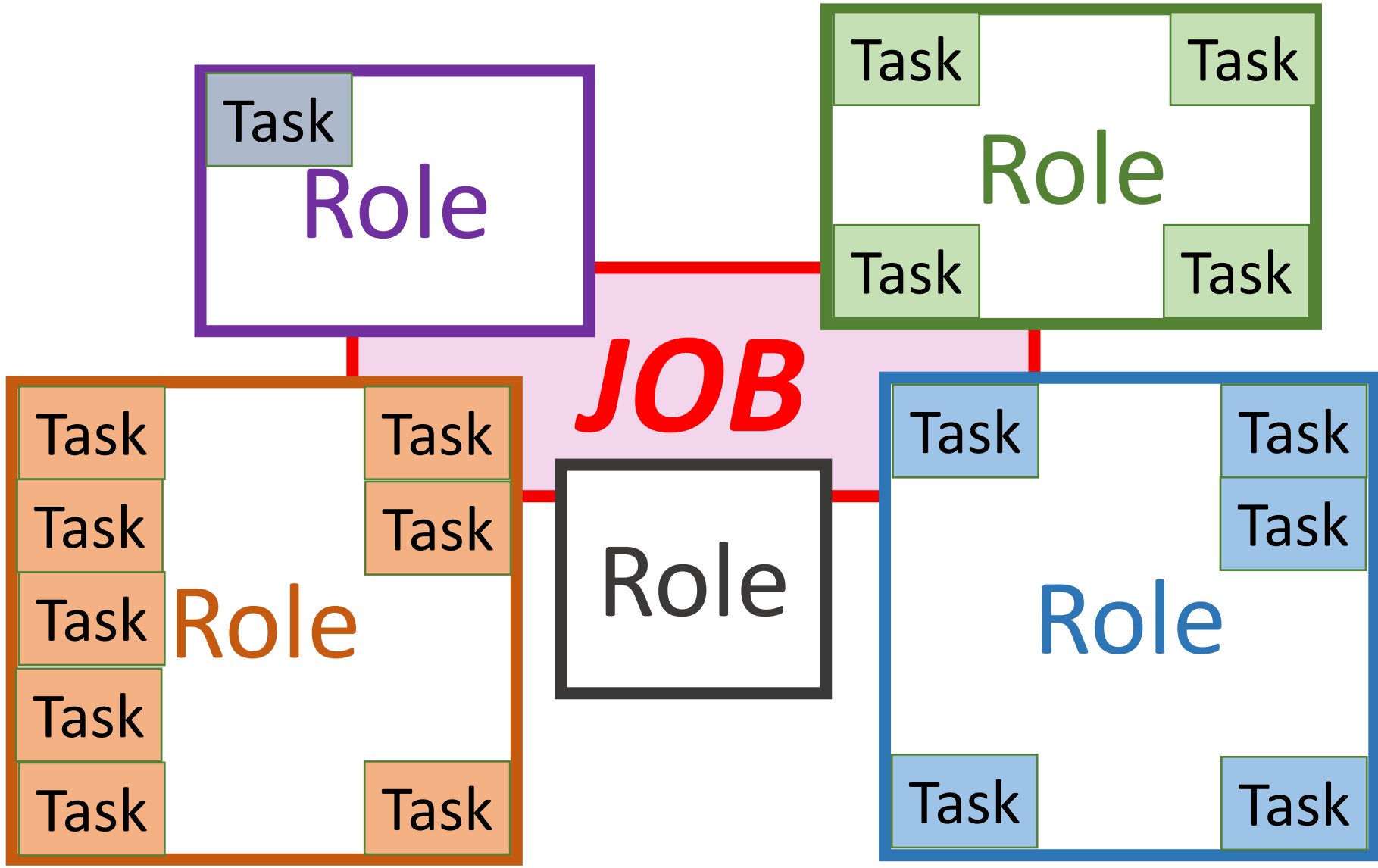
take my **JOB**

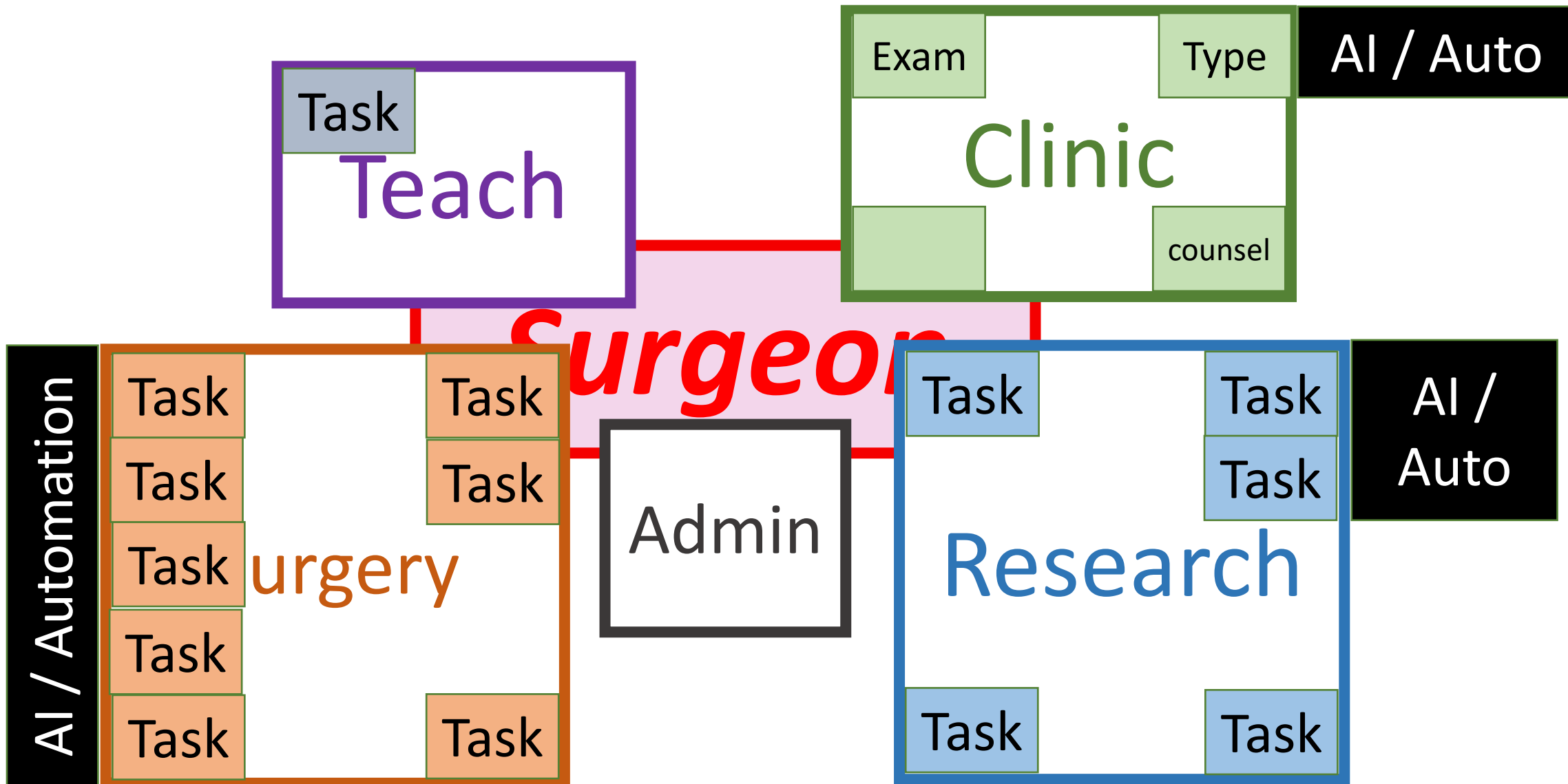
to a higher level

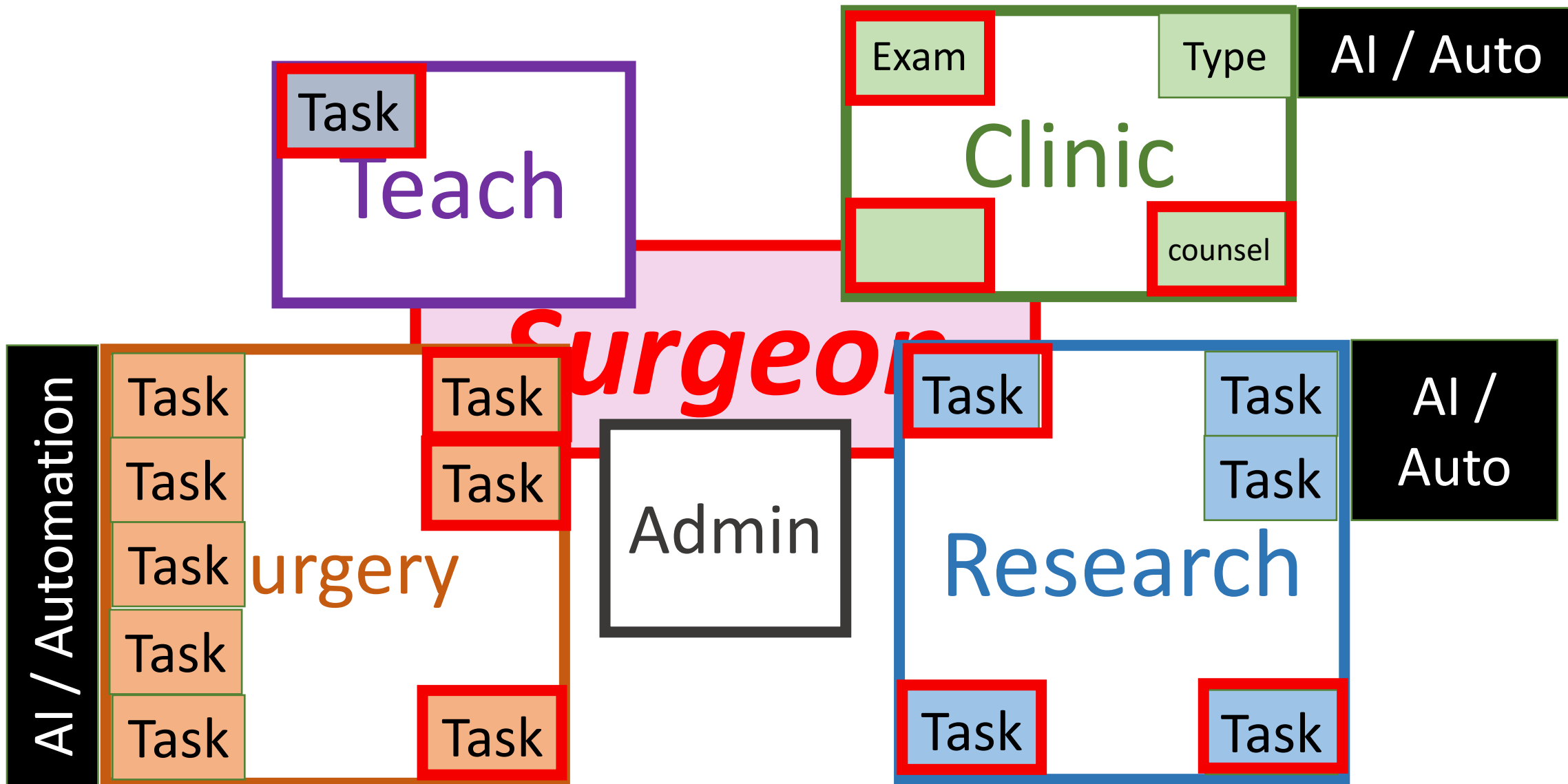
Will

A.I. / Automation

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Will

A.I. / Automation

take my **JOB**

to a higher level

Yes ! Develop it Together NOW !

Everyone wants a SMART hospital.

- ***Start NOW & Start SMALL !***
- To start; choose a Segment of care that traverse ***clinical, operations, financing, staff training and scheduling***
- Readiness lessons from SMART OTs
 - ***Data : Type, Acquisition, Resultant action***
 - ***Infrastructural***
 - ***Connectivity***
 - ***Workflow interaction with existing staff***
- 4 “S” Core tenets : ***Safety, Synchrony, Sustainability, Social***

SG Healthcare Assistive Robotics Programme (SHARP)

Nanyang Technological University (NTU)
HandPlus Robotics
ST Engineering & Aerospace Solutions (STEAS)

SGH Future Health Systems (FHS)
SGH Sterile Supplies Unit (SSU)
SGH Major Operating Theatre (MOT)
SHHQ Medical Technology Office (MTO)
SHHQ Health Services Research Centre (OST)
SHHQ Office of Service Transformation (HSRC)



We have just started ...