The power of automation: Transition from manual to automated chemotherapy compounding: main issues to consider

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Conflict of interest: Nothing to disclose

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The power of automation
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Onkologikoa Foundation

- Cancer center
- Non profit private hospital owned by a foundation
- Agreement with Basque health service
- Building equipped with state of the art technology
- Technological development top priority
- Electronic patient records (paperless hospital) 2008

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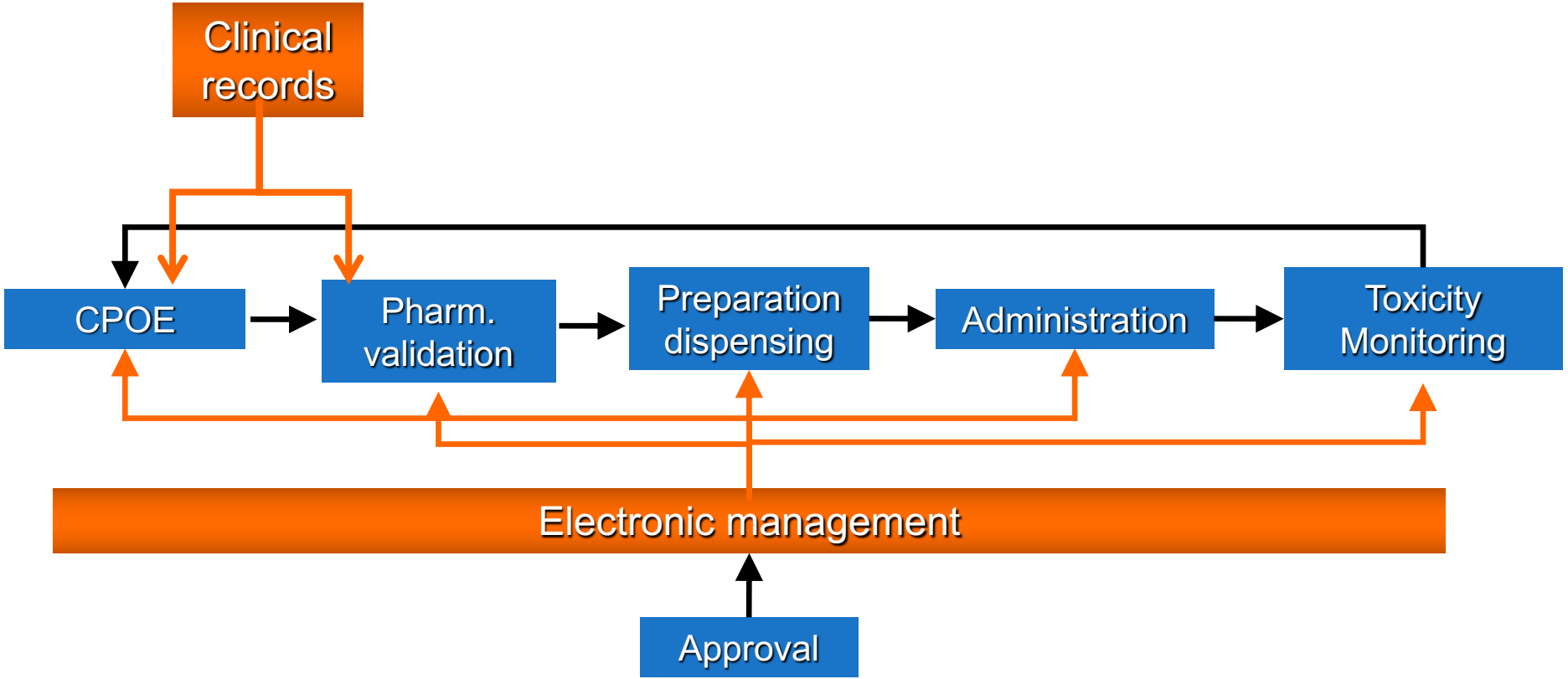
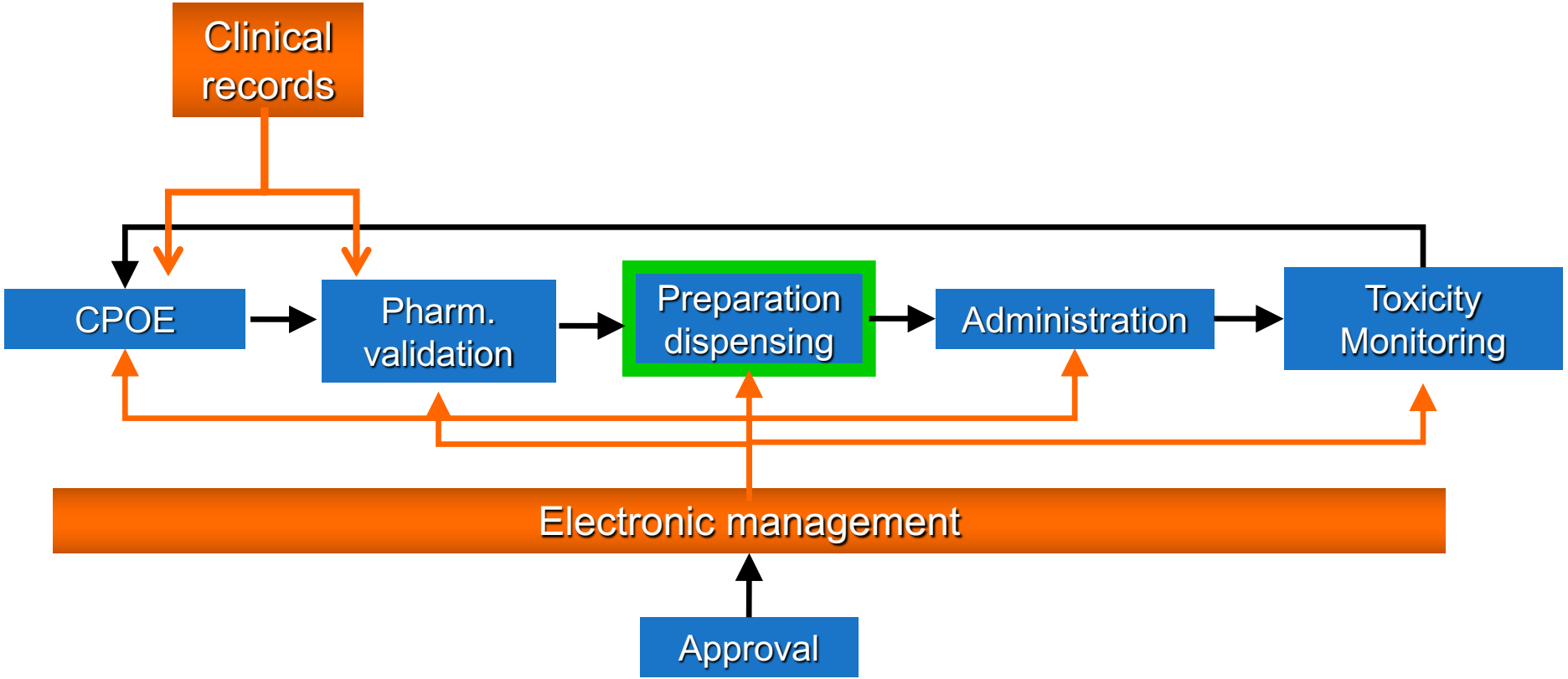

Clinical records
CPOE
Pharm. validation
Preparation dispensing
Administration
Toxicity Monitoring
Electronic management
Approval



Manual → Semi-automated → Automated

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Manual ⟶ Semi- Automated preparation

- 2009: Starting point for semi-automation
- Aim:
  - **Patient safety**
  - **Efficiency** (productivity)
  - **Standardization** (quality)
  - **Clinical traceability** (information for outcomes)
- Product identification
- Gravimetry

Product identification based on location management

Product reception

SAFE linking between 2 bar codes:

- Bar code of the NC on the package
- Bar code of a location

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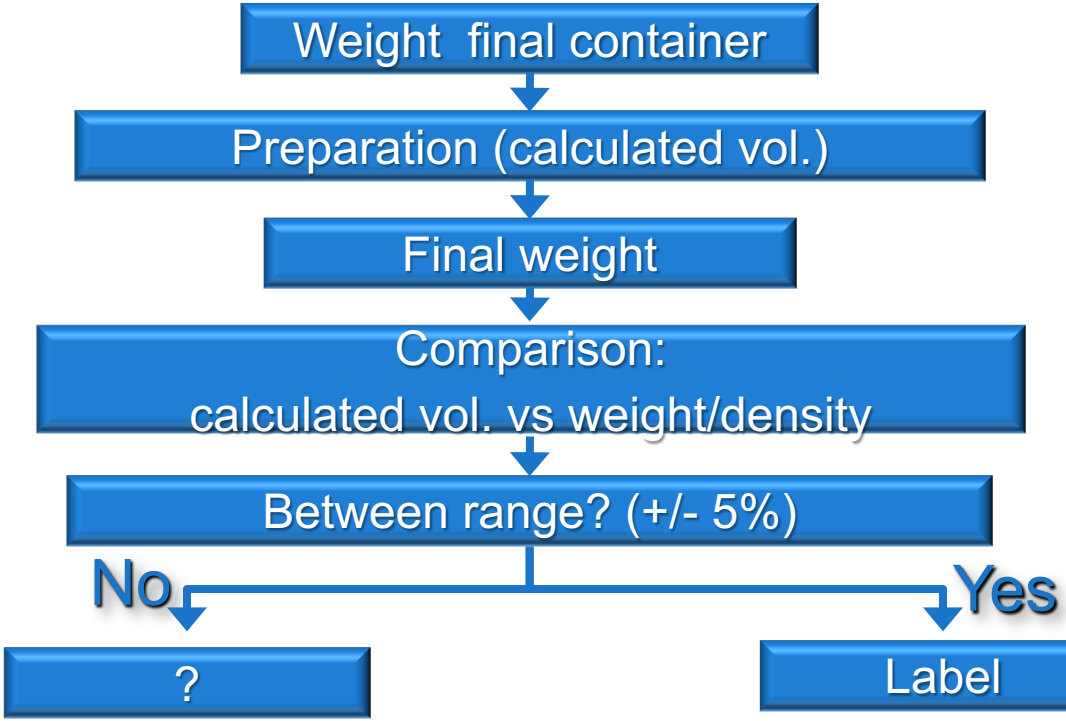
Gravimetric method flow



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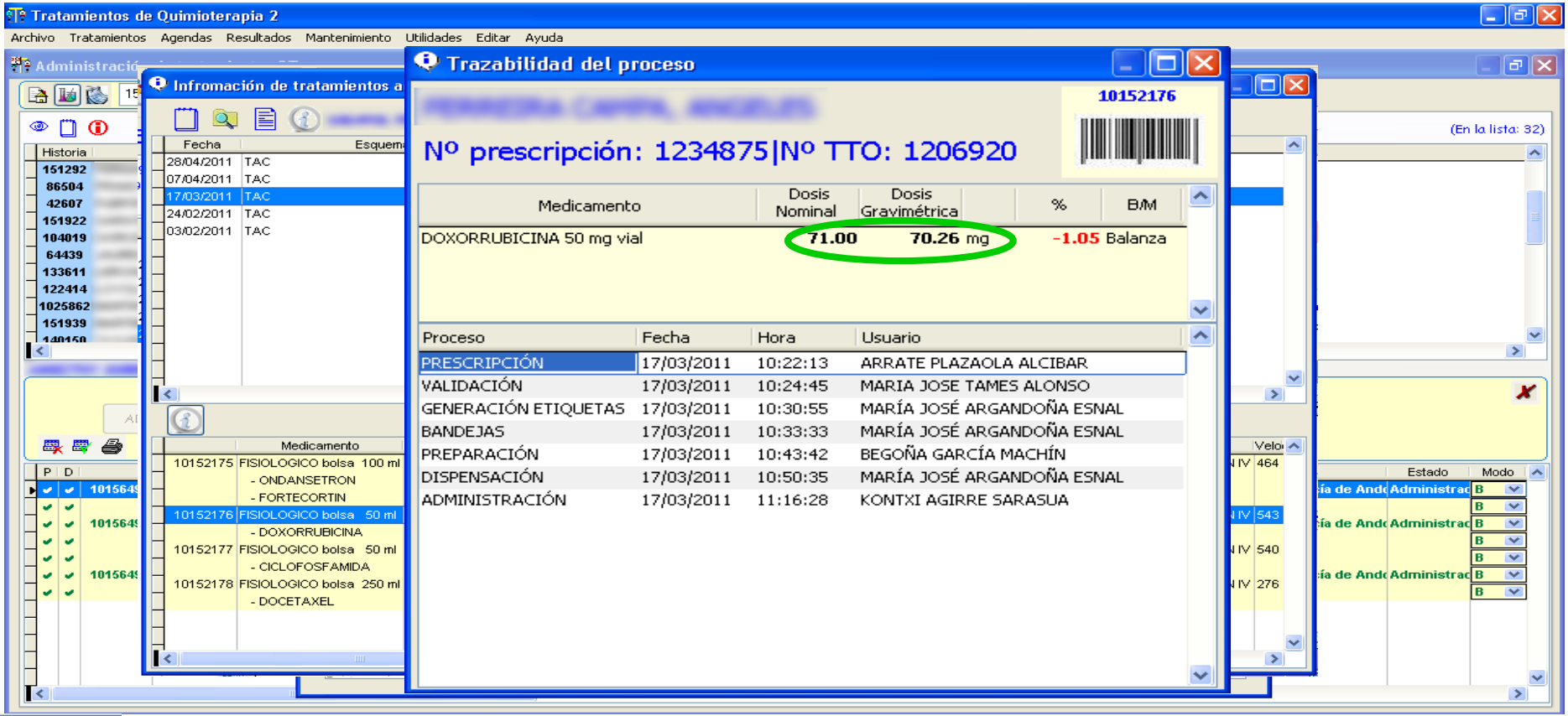
Traceability



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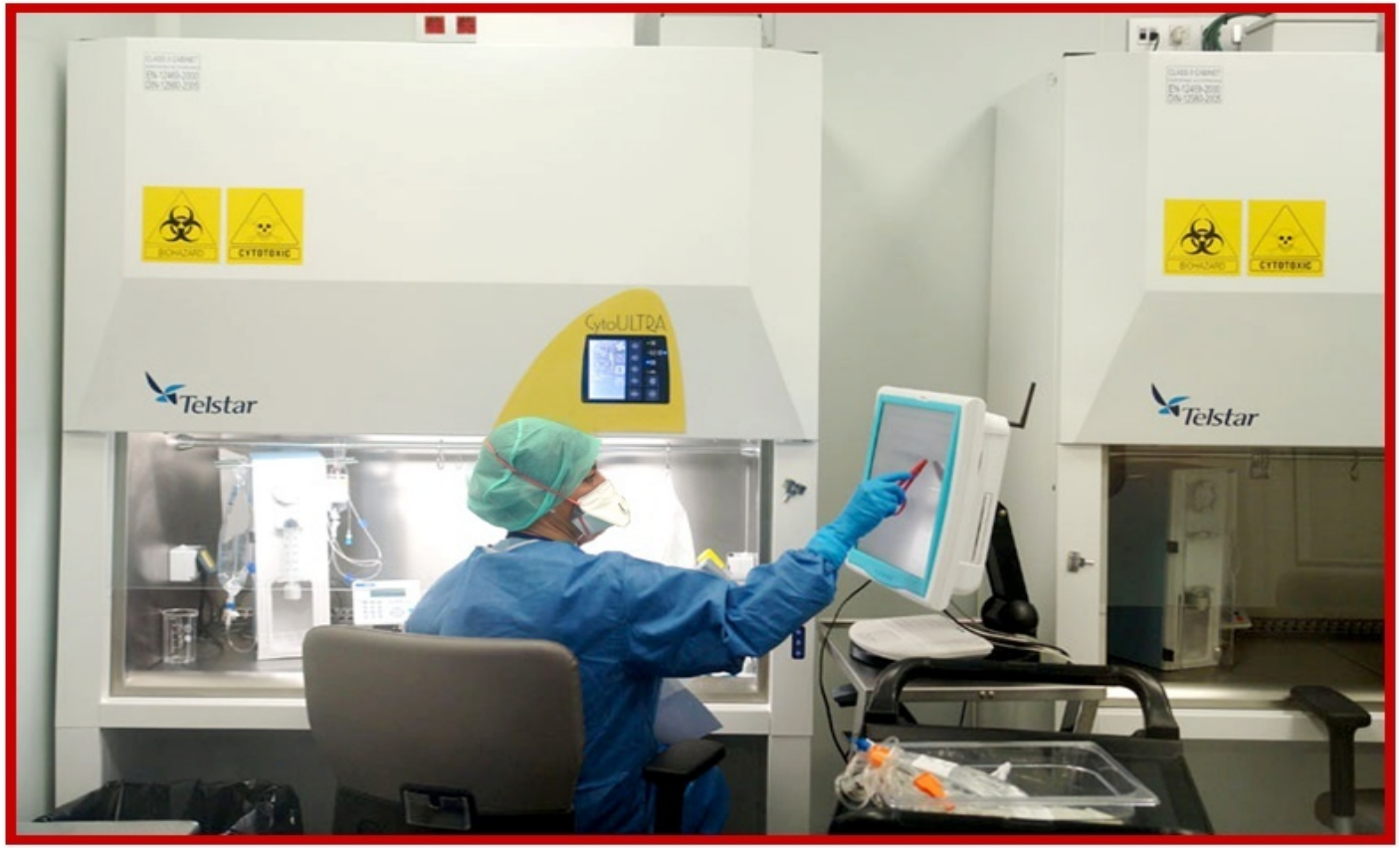

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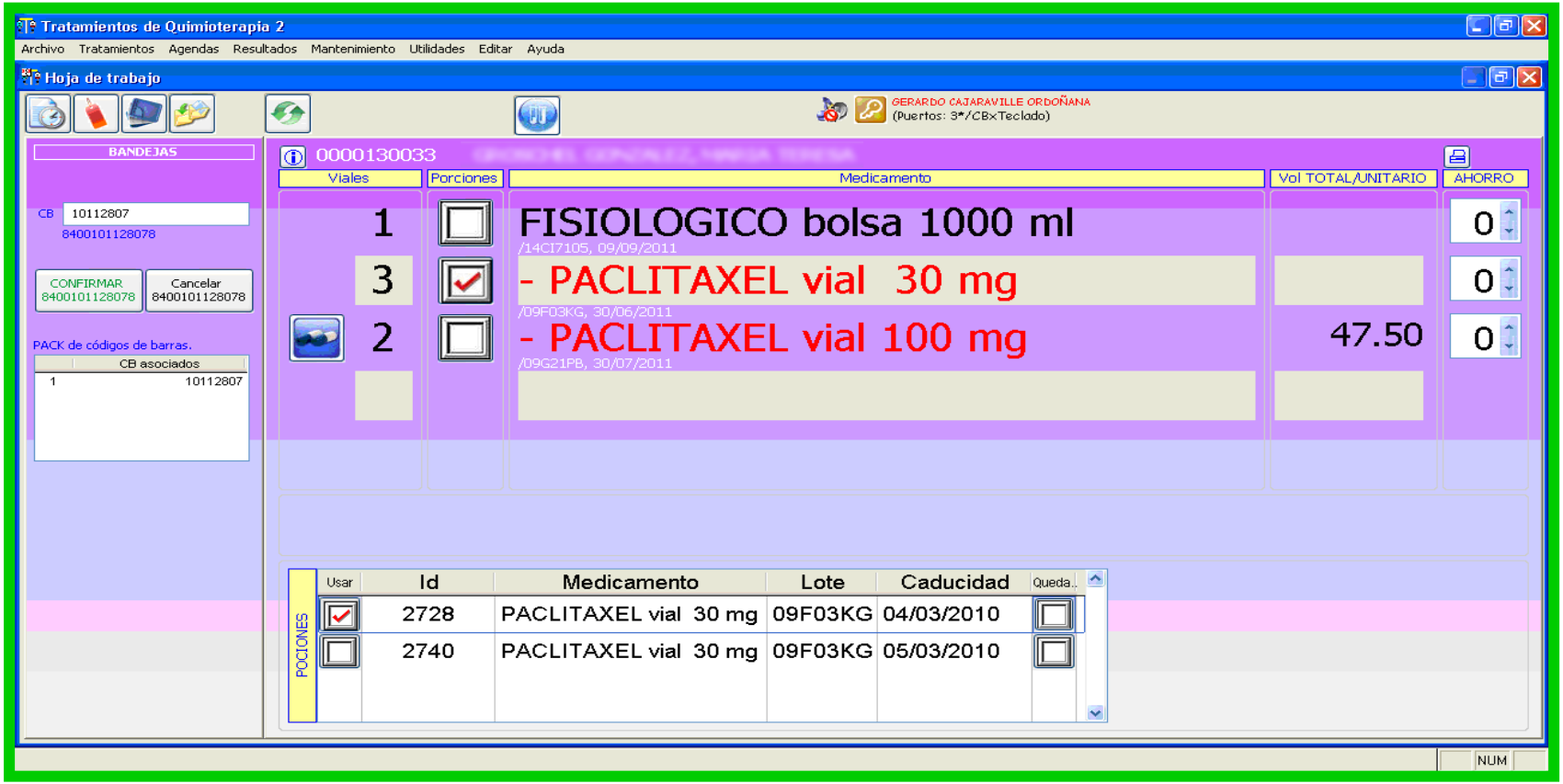

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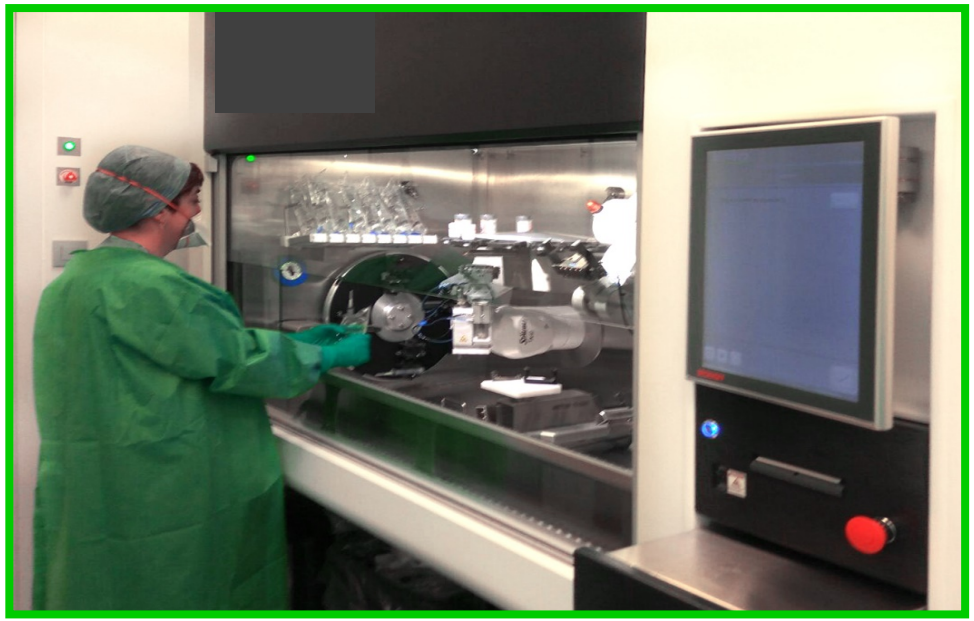
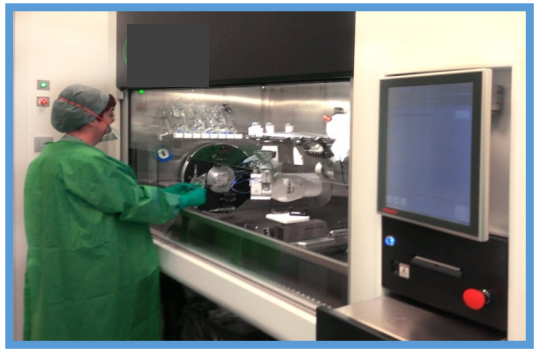
Semi - Automated → Automated



Automated compounding added-value

Patient safety
Operator safety

Traceability



Accuracy

Microbiological quality

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Productivity

- Relative term
- Open-minded approach
- Look at productivity considering other issues

Compounding time of a Technician ??

Variable. Depends on several factors:

- Training and individual capability of each technician
- Work organisation
- Semi-automated systems (identification/gravimetry)
- Close systems usage
- GMPs application level
- Preparation complexity (reconstitution, large volumes, large vials number)

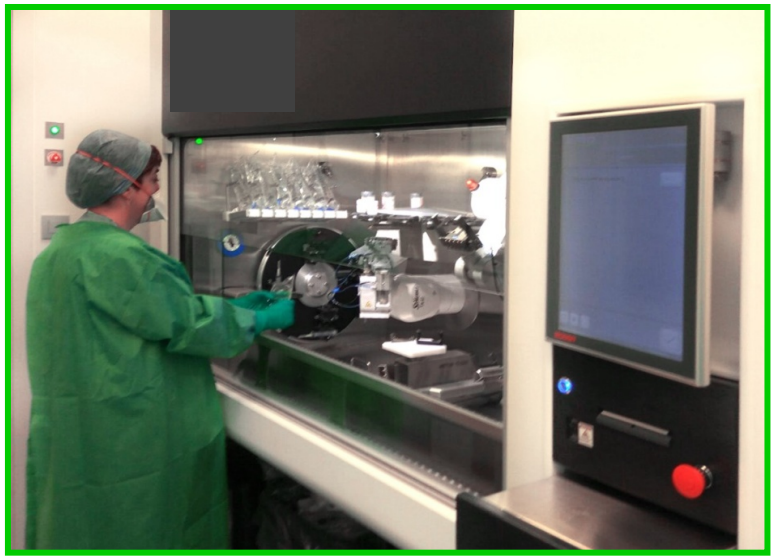
Compounding time of a Robot ??

Variable. Depends on several factors:

- System configuration: different options
- Preparation complexity
  - Reconstitution
  - Volume
  - Number of different drugs/cycle
  - Number of vials
  - Final product (syringe, bag, elastomeric pump, etc.)

Organisation of the preparation cycles
preparations selection

Increase final products/minimize robot tasks



- Increase capacity of vials-carousel
  - Multi-dose vials
  - Preparation by drug
- Reuse syringe for same drug
- Final product conditions
  - If possible don't remove volume

- Productivity: Mean **preparations/ hour = 9** (for cycles ≥6 prep)

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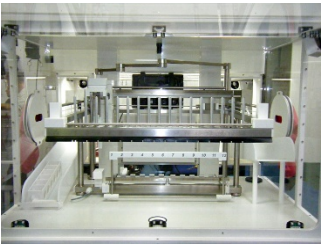
Robots are not appropriate to meet demand at peak times. Production has a constant rhythm

- Robotic compounding requires a rethinking of compounding workflow
- Preparation “in advance” (before administration)
  - “Prescriptions for the following day”
  - Preparation by batches (Dose banding)
  - Anticipated reconstitution
  - Anticipated preparation (before prescription)



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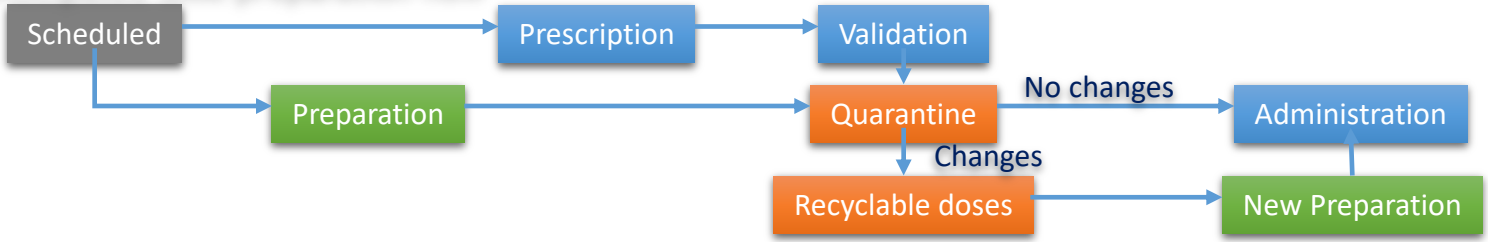
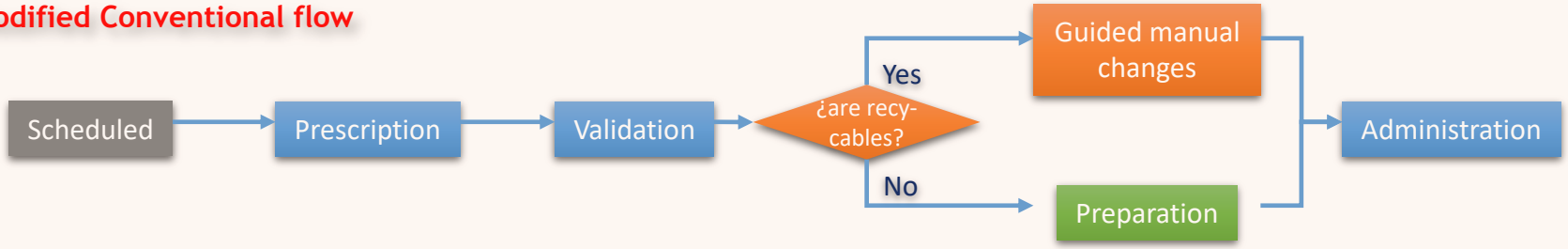
Conventional flow

Anticipated dose preparation flow



Modified Conventional flow



We only discard 3,2% of anticipated preparations

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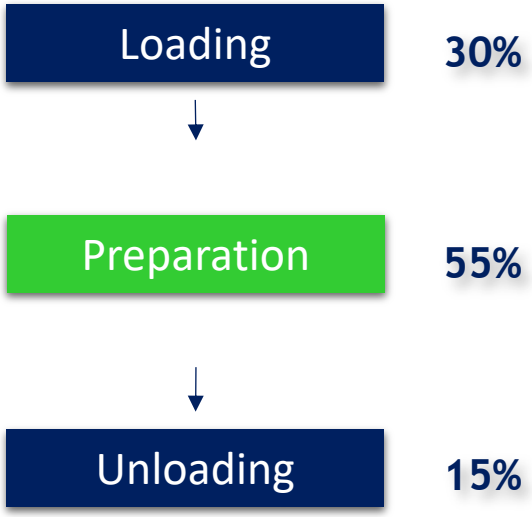
What is the impact in human resources??

Comparison with manual production

- Case by case analysis: variable efficiency, human redundancy (safety)

Compounding cycle times



Steps depending on the user

Autonomous step

One hour of robot provides 33 free min. to the user

more than 3.5 hours /day

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Additional considerations include

- Range of final containers offered: syringes, bags, elastomeric pumps, cassettes…
- Flexibility on disposable brands, preparation types and configuration options
- Simultaneous automatic compounding and material management tasks (waste disposal, partially used vials…) to increase productivity
- Technical support from the provider company
- Ease of integration into the cleanroom
- Connectivity with hospital systems (interfacing)
- Cleaning & decontamination procedures: feasibility of implementation

Conclusions

- Chemotherapy robotic compounding is a novel technology that is here to stay and is evolving continuously.
- It offers clear advantages to manual and semi-automated compounding
- Robotic productivity definitely improves if we optimize the circuit and readapt our workflow processes.
- The selection of a specific robot requires a thorough analysis
- A cost minimization analysis alone, might not be a fair and proper approach in its implementation

Thanks for your attention

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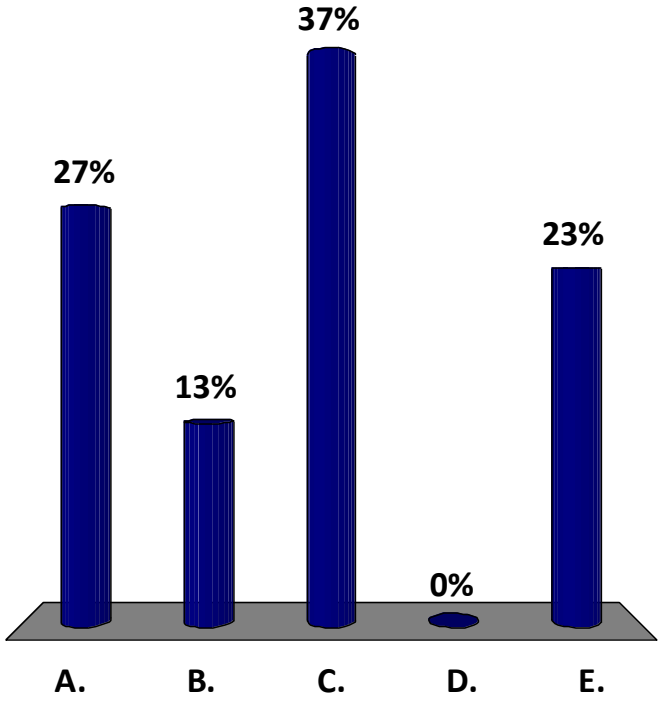
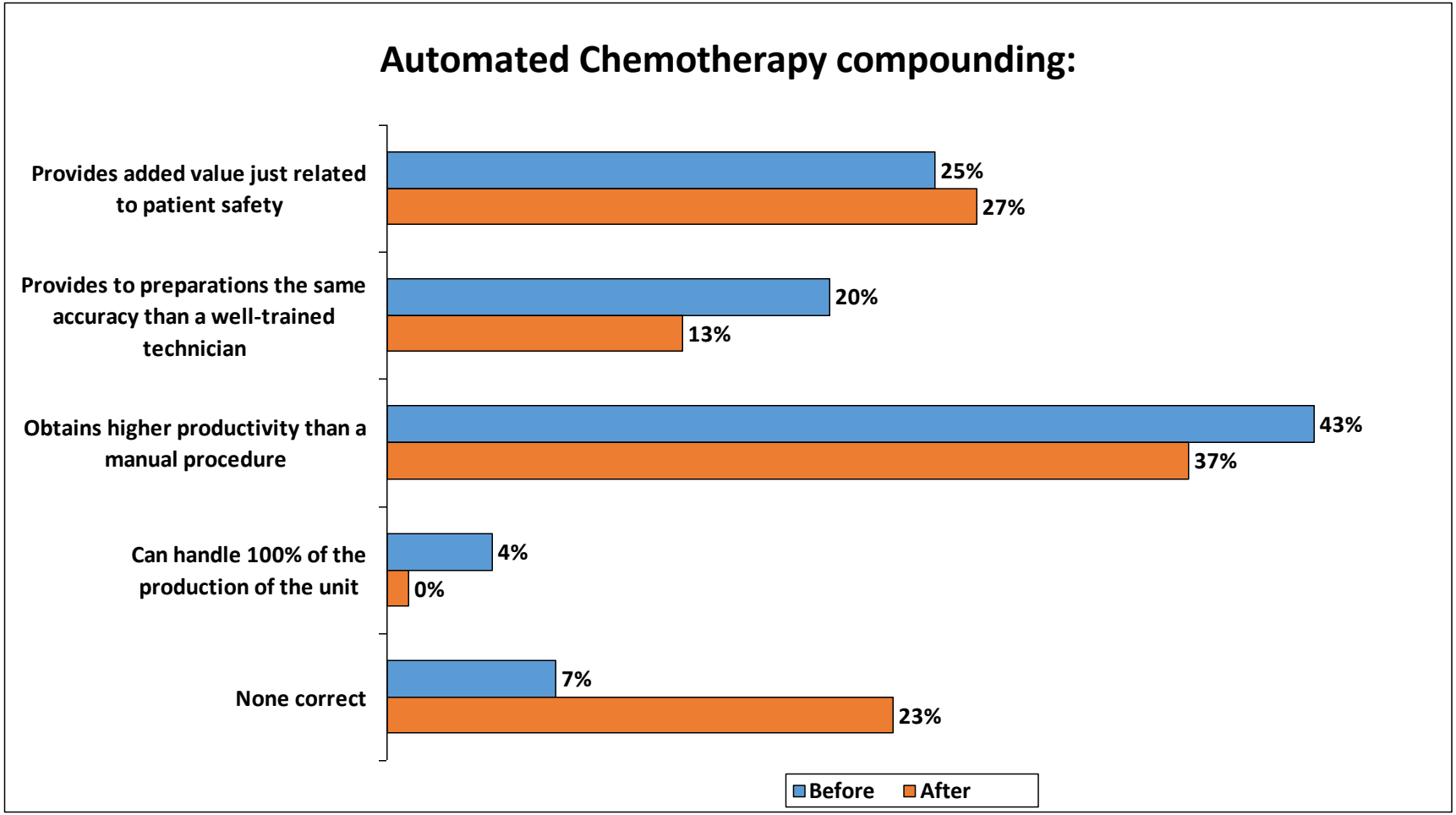
Automated Chemotherapy compounding:

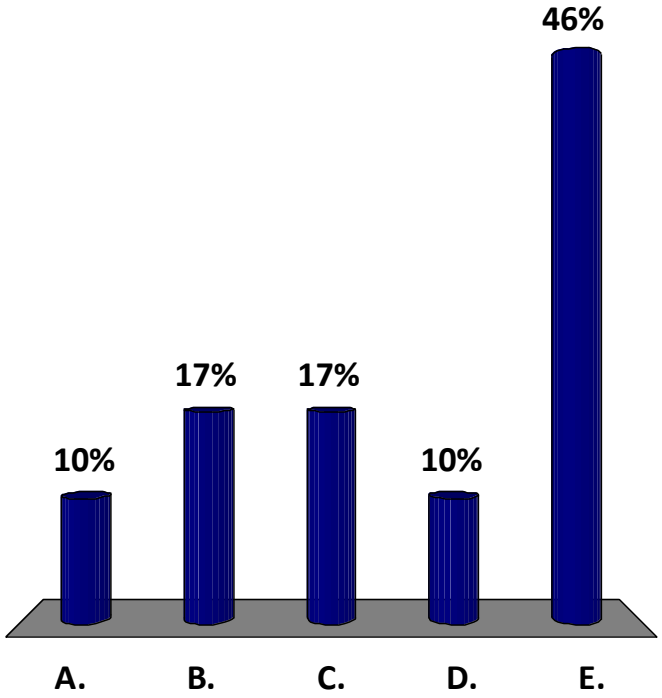
A. Provides added value just related to patient safety
B. Provides to preparations the same accuracy than a well-trained technician
C. Obtains higher productivity than a manual procedure
D. Can handle 100% of the production of the unit
✓ E. None correct

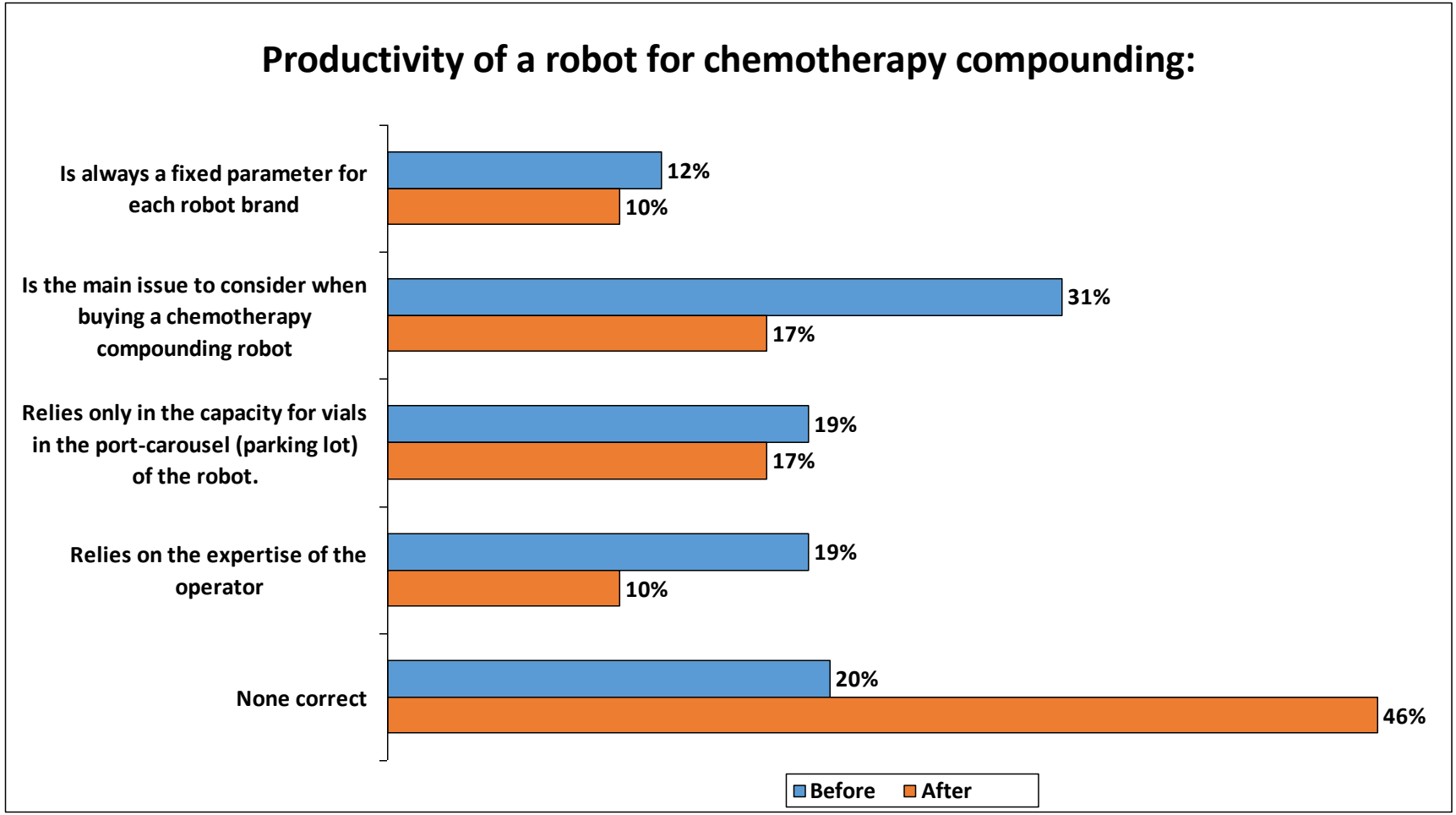



Automated Chemotherapy compounding:
Provides added value just related to patient safety
25%
27%
Provides to preparations the same accuracy than a well-trained technician
20%
13%
Obtains higher productivity than a manual procedure
43%
37%
Can handle 100% of the production of the unit
4%
0%
None correct
7%
23%
Before
After

Productivity of a robot for chemotherapy compounding:

A. Is always a fixed parameter for each robot brand
B. Is the main issue to consider when buying a chemotherapy compounding robot
C. Relies only in the capacity for vials in the port-carousel (parking lot) of the robot.
D. Relies on the expertise of the operator
✓ E. None correct




Productivity of a robot for chemotherapy compounding:
Is always a fixed parameter for each robot brand
12%
10%
Is the main issue to consider when buying a chemotherapy compounding robot
31%
17%
Relies only in the capacity for vials in the port-carousel (parking lot) of the robot.
19%
17%
Relies on the expertise of the operator
19%
10%
None correct
20%
46%
Before
After

Implementation of a robot in the chemotherapy compounding process:

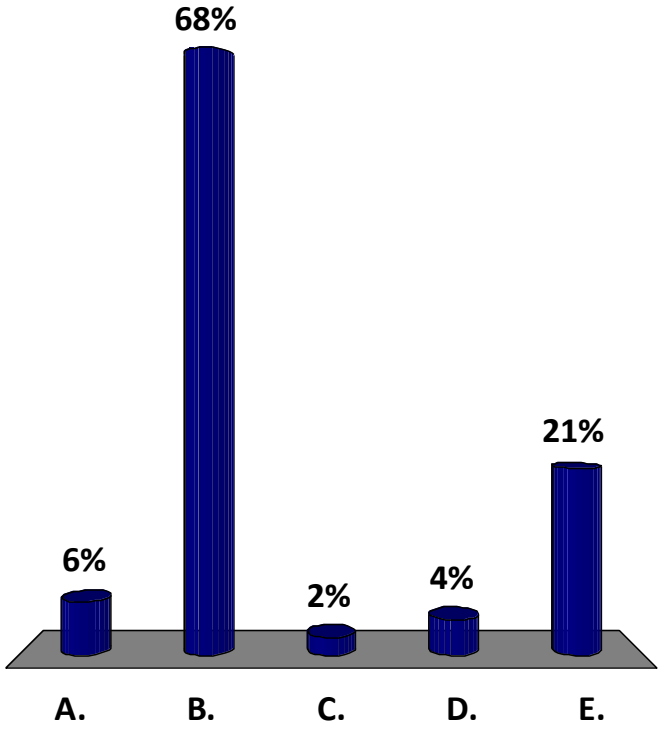
A. Will help to deal with high demand in the outpatient clinic at peak times

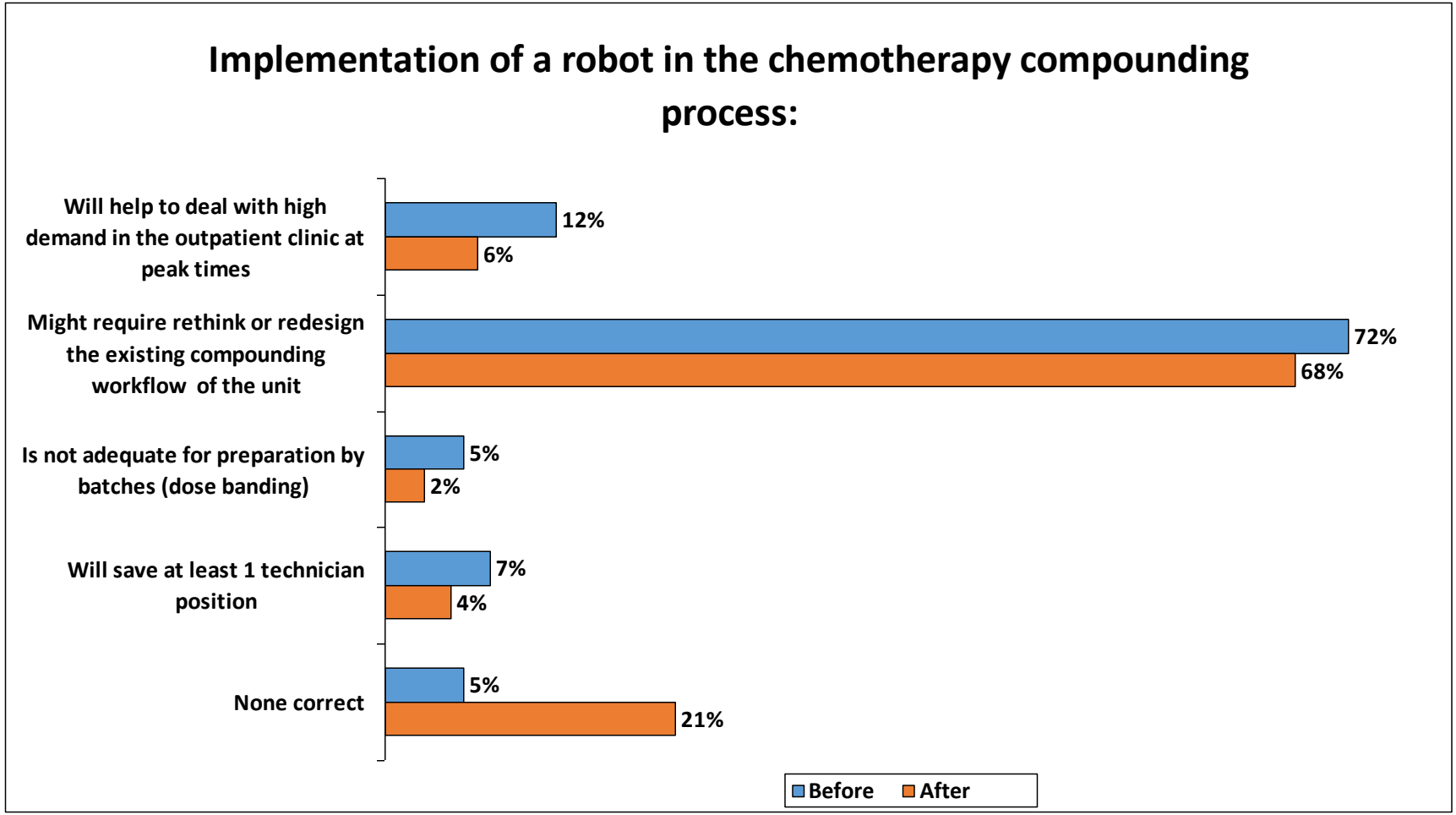
✓ B. Might require rethink or redesign the existing compounding workflow of the unit

C. Is not adequate for preparation by batches (dose banding)

D. Will save at least 1 technician position

E. None correct




Implementation of a robot in the chemotherapy compounding process:
Will help to deal with high demand in the outpatient clinic at peak times
12%
6%
Might require rethink or redesign the existing compounding workflow of the unit
72%
68%
Is not adequate for preparation by batches (dose banding)
5%
2%
Will save at least 1 technician position
7%
4%
None correct
5%
21%
Before
After