

The background is a deep blue gradient. On the left side, there is a stylized, semi-transparent robotic arm or mechanical structure in a lighter blue/white color. Several thin, dark blue wavy lines, resembling sound waves or data paths, emanate from the left and curve across the upper portion of the image. The overall aesthetic is high-tech and futuristic.

# Streamlining Aseptic Dispensing Process with Robotics

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ISOPP 2023 Seville Spain



# Conflict of Interest Disclosure

- Carole Chambers does not have any conflict of interest to disclose



# Learning Objectives

- Describe a compelling case for robotic adoption in aseptic compounding
- Recognize important considerations when preparing a request for proposal (RFP)
- Identify aseptic process to be streamlined in a new operating model
- Discuss significant implementation challenges





- “Taking a risk in front of others”

Please raise your hand if you are involved in robotics



# Carole Chambers' Perspectives

- My documented journey began in 2007 when I visited Charing Cross Hospital in London England to see their robot



A blue-tinted photograph of a robotic arm, likely used in a pharmaceutical or laboratory setting for precise drug preparation. The arm is positioned vertically, with its joints and components visible. The background is dark and out of focus.


# Workplace contamination?

- Robot allowed preparation with low levels of environmental contamination and no measurable exposure of the technicians.
- “Environmental contaminating product contamination and worker exposure using a robotic system for antineoplastic drug preparation.”
- J Oncol Pharm Practice 2015: 21(2): 118-27
- Do we have any of the authors here today?

Compelling Case for Robotics – a new centre asks during Functional Planning – is there any new Technology to be adopted?








# Creating a Request for Proposal - RFP

- Robotic IV medication compounding: recommendations from the international community of APOTECA chemo users
- Am J Health-Syst Pharm 2017:28(2): 362-372
- Do we have any of the authors here today?
- Lita Chew, my co-presenter today is one of these authors



# Creating a Request for Proposal - RFP


- 35 recommendations— Item 7 to 17 were what robotic devices should meet as a minimum and safety mechanisms that should be included. Two examples:
  - 7. Maximum flexibility allowing both just in time and batch, in either patient specific or non-patient specific production...
  - 13 Recognition of drugs and base solution used in compounding via barcode identification and/or optical recognition

# Robots delivered to our new Calgary Cancer Centre









What are some of the methods we can share to ensure drugs are ready for patient's appointment time?

- Next day model – where patient is seen and assessed one day and returns on another day for treatment
- Dose banding
- Prewriting orders
- Pharmacy stability/sterility behaviours
- Outsourcing production
- One drug at a time versus batching



# Guidance around Automation

- Section 23- Automation
- ISOPP Standards for the safe handling of cytotoxics
- J Oncol Pharm Practice April 2022:28(3) suppl S88-91
- Who in the audience contributed to this section 23?

A blue-tinted photograph of a robotic arm in a laboratory setting, used for hazardous drug compounding. The arm is positioned on the left side of the frame, with its gripper holding a small white container. The background is a light blue gradient.

## ISOPP Section 23 - Automation

- Robots can be used for hazardous drug compounding. However, the risk of contamination must be assessed before putting such an operation in place.
- Automation and measurement are valuable tools for increasing efficiency and safety. The introduction of automation will alter workflow. To make the best use of automation the entire production system should be analyzed and adjusted after implementation



## Use : productivity

- Robotic chemotherapy compounding : a multicentre productivity report
- J Oncol Pharm Practice 2022: 28(2): 362-72
- Do we have any of the authors here today?





# Spanish Productivity article

- Cycle specific parameters – such as number of preparations, number of vials and total volume per cycle are independent variables in their mathematical model
- Cycles lasting 40 minutes or less has a high predictability using their model
- Workflow differences impact on the productivity of the automated process
- Algorithms are useful to help users plan cycles launched



## Use - productivity

- Increasing Pharmacy productivity and reducing turnaround time in an Italian comprehensive cancer centre by implementing robotic chemotherapy drug compounding
- J Oncol Pharm Practice 2022: 28(2): 353-61
- Do we have any of the authors here today?



# Italian Productivity article

- This article showed us that with increasing patients and oncology drug workload increase the use of computerization and robotics are essential instruments to maintain and ensure high standards of quality.
- The medication turnaround time (MTAT) decreased by 24% despite an increase of patients by 16.5% and IV preparations increasing by 17.2%.



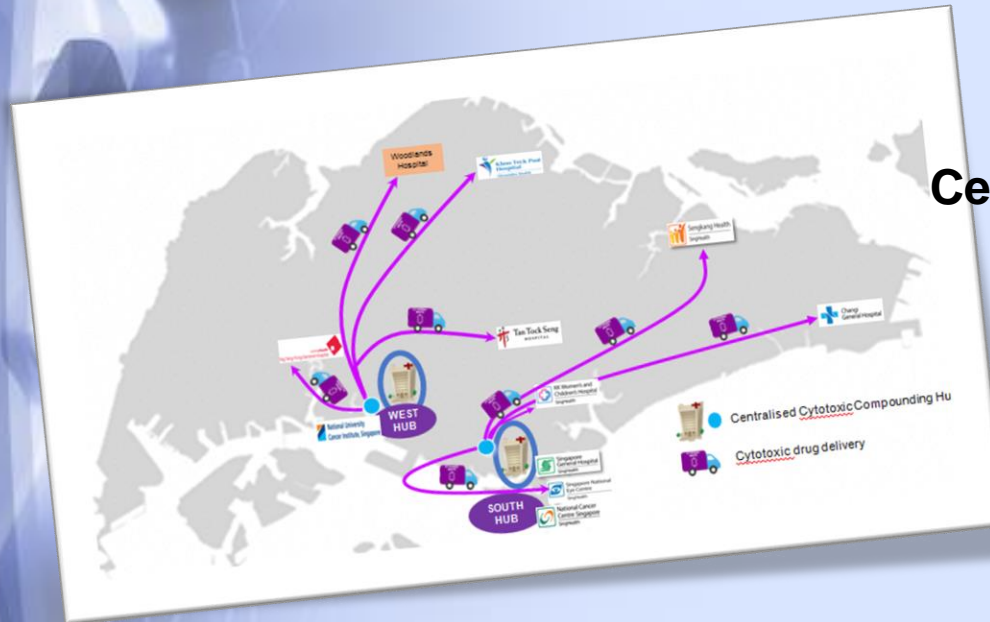




# Conflict of Interest Disclosure

- Lita Chew does not have any conflict of interest to disclose

# A compelling case for change - *Robotic adoption in aseptic compounding*



## Centralised Drug Compounding

HUB-and-SPOKE model – 2 HUBs for  
Cytotoxic Compounding

### System-wide Benefits

Improved medication  
safety with automation  
and GMP certified  
HUBs

Improved staff safety  
by leveraging on  
technology & reduce  
cytotoxic exposure

Build system  
resilience &  
continuity

Build up  
compounding  
capability for  
Singapore

# A compelling case for change -

## *Robotic adoption in aseptic compounding*

### Moving into our new home!

Jan 22

- Building TOP

Feb –  
Sept 22

- Inspections, Rectifications, testing, commissioning
- Handover in phases

Oct 22 –  
Feb 23

- Full dress rehearsals
- Soft opening of SOC Clinic F
- Big move!



# A compelling case for change -

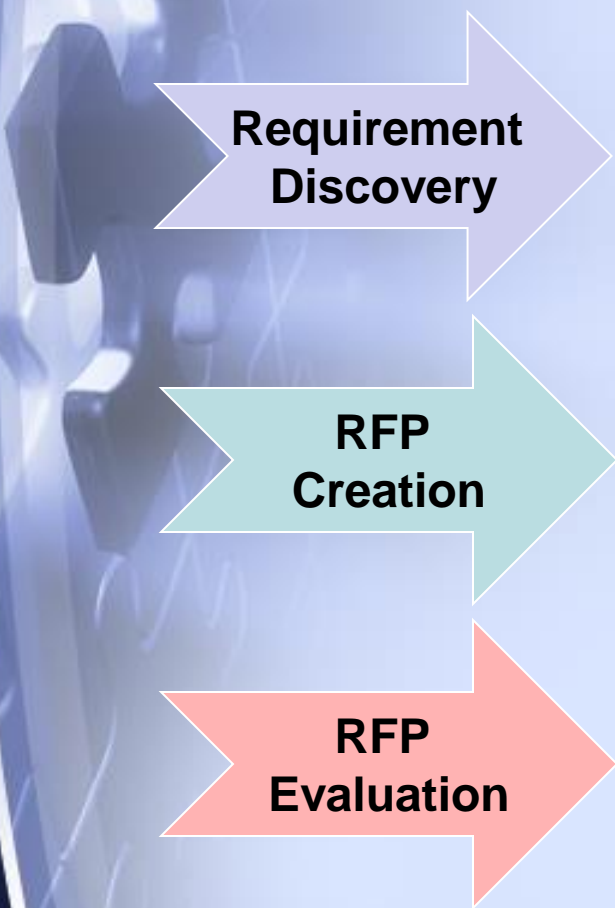
## *Robotic adoption in aseptic compounding*

### **Problem Statement:**

- With the current **manual workflow** in compounding units, documentations, procedures, and materials are all **manually tracked without any streamlined processes**.
- **Management of batches and batch expiry dates** of sterile compounded products are done **manually** and will be **prone to errors**.
- **Preparation** of compounded drugs are done by **manually** referring to printed worksheets, with a **lack of detailed audit trails**.
- **Tracking** of consumables is **not possible**, and fragmented information leads to difficulty in tracking back the use of materials in the event of any product recalls.



# Request For Proposal (RFP) – *Important consideration*



## Requirement Discovery

- Business needs identification
- Research
- Network & Engagement

## RFP Creation

- Procurement Professionals
- Begin with end in mind

## RFP Evaluation

- Auditable!
- Evaluation committee
- Scoring matrix, P vs Q

# RFP Evaluation –

## *Vendor Evaluation Criteria*

1. Vendor's Profile 10%
2. Compliance to Terms and Conditions 10%
3. Compliance to Specifications and Requirements 10%
4. System User Friendly 10%
5. System Reliability 10%
6. Accuracy – Drug Preparation 10%
7. Traceability 10%
8. Maintenance / Service Support 10%
9. Price 20%

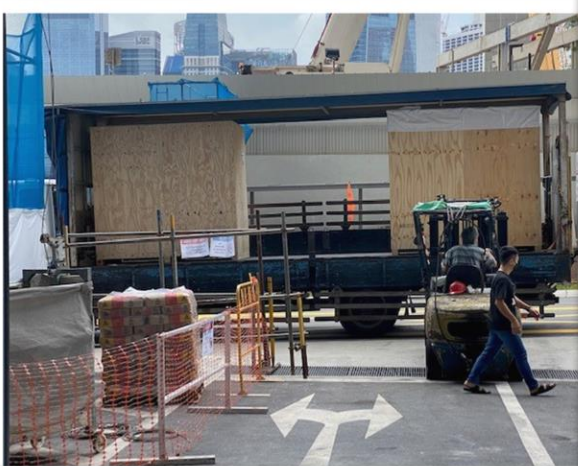
**P**

**X**

**Q**

**Weightage!**

# Robots delivered to our new National Cancer Centre



# A new operating environment – *Processes to be streamlined*

## Start the change conversation early ...



### Determining acceptance and perceptions of chemotherapy dose banding in an ambulatory cancer centre



Ho Jie Qi Britney <sup>1</sup>, Leow Jo Lene <sup>2</sup>, Peter Yap Pheng Aun <sup>2</sup>, Poh Lay Mui <sup>2</sup>, Lita Chew Sui Tjien <sup>1,2</sup>

<sup>1</sup> Department of Pharmacy, Faculty of Science, National University of Singapore

<sup>2</sup> Department of Pharmacy, National Cancer Centre Singapore



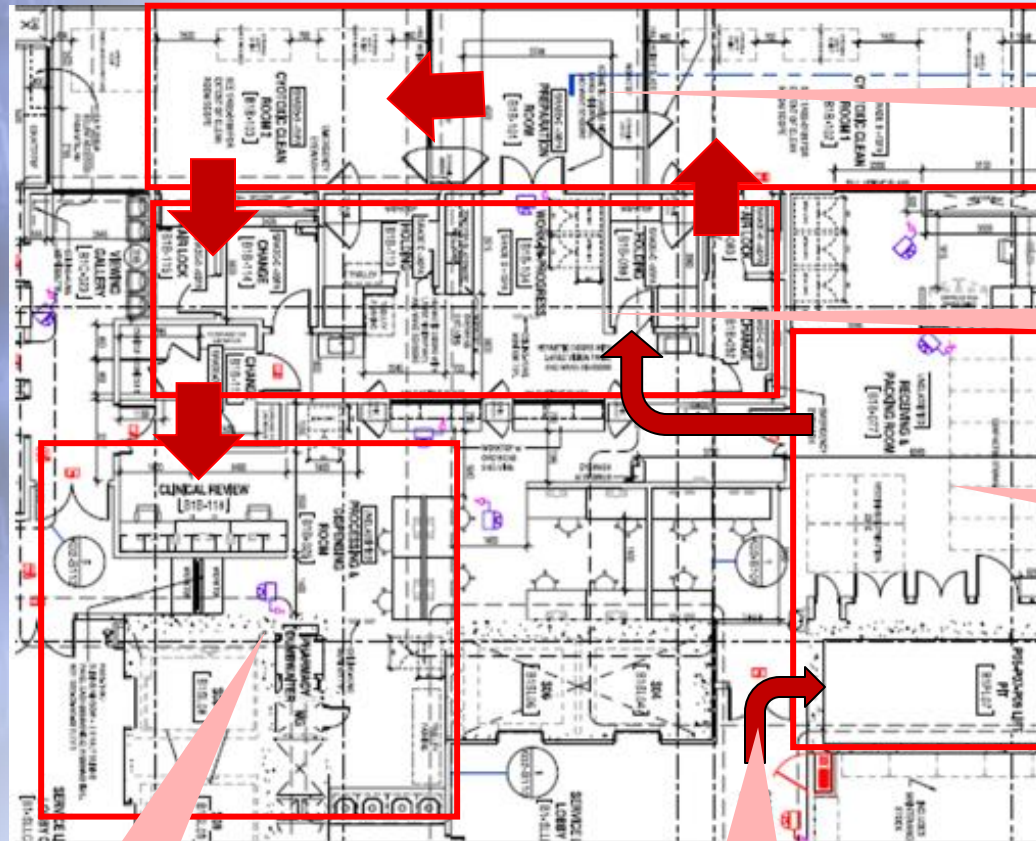
### Quantifying chemotherapy wastage and exploring the development of a chemotherapy wastage calculator in an ambulatory cancer centre

J. Q. Chan<sup>1</sup>, J. L. Leow<sup>2</sup>, L. M. Poh<sup>2</sup>, P. Yap<sup>2</sup>, L. Chew<sup>1,2</sup>  
<sup>1</sup>Department of Pharmacy, National University of Singapore  
<sup>2</sup>Department of Pharmacy, National Cancer Centre Singapore





# A new operating environment – *List of processes to be streamlined*



Production Area

In-process Area

Storage & Quarantine

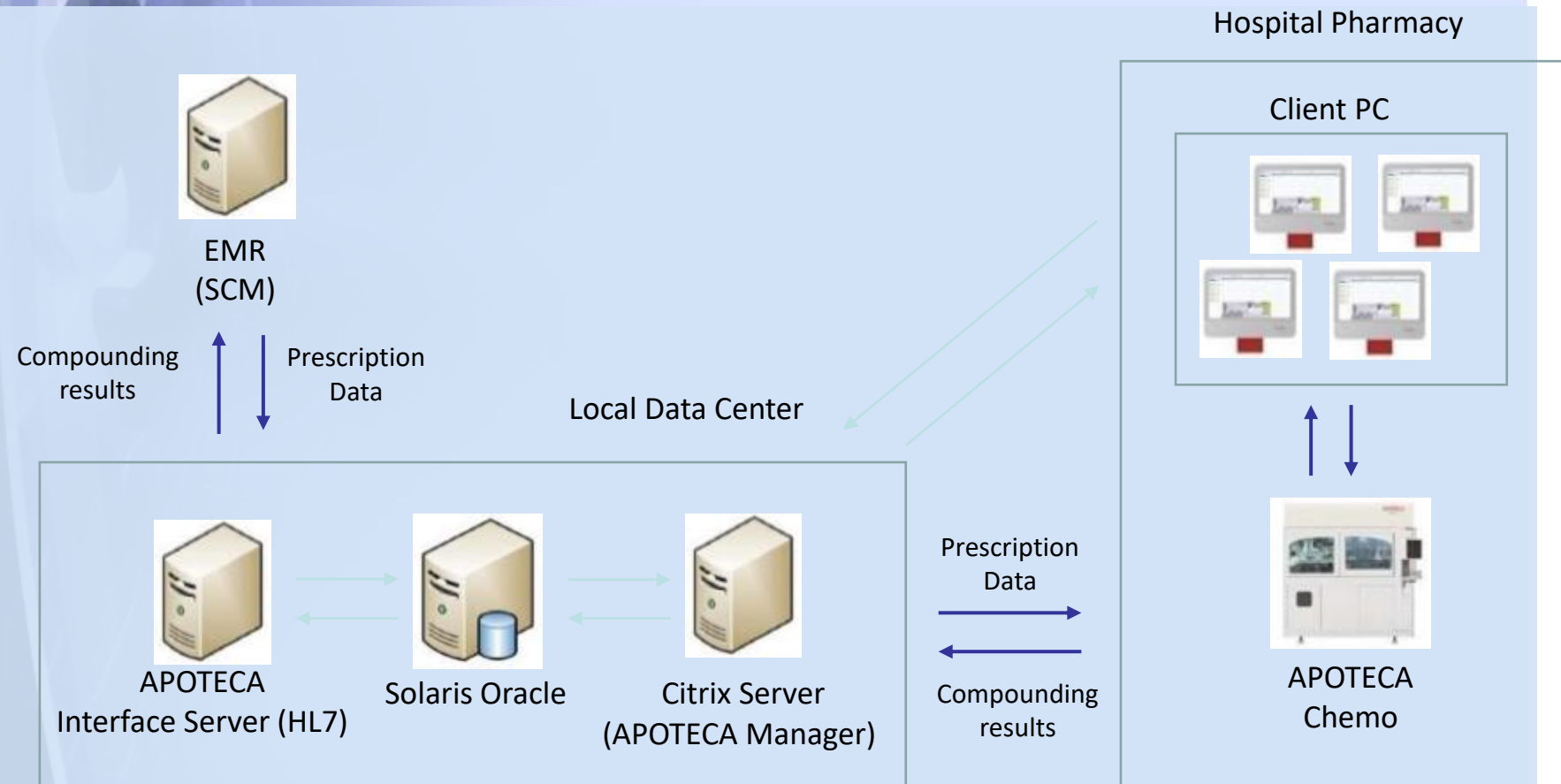
Dispensing Area

Goods receipt



# Understanding beyond workflow

## High Level Data Flow Diagram



A robotic arm is shown in a sterile compounding environment, likely a cleanroom or biosafety cabinet. The arm is dark and metallic, with a white protective shield at the end. It is positioned over a work area, and the background is a light blue, slightly blurred, suggesting a clean and controlled environment.

# On Productivity ...

- Robots do not work on their own
  - Robots cannot perform all types of preparation
  - Robots may be slower than human hands
- 
- ❖ Robotics in sterile compounding is an ongoing development
  - ❖ Robotics provides more optimized quality process

# On Productivity ...

“The use of TAWF was associated with an increased ability to detect preparation errors, a reduction in preparation time and costs, and increased satisfaction of pharmacy technicians and pharmacists.”

*Farcy, Elisabeth, Bui, Duc Tâm et al. Pharm Technol Hosp Pharm 2021; 6(1): 20210009*

“.. effort to satisfy an ever-increasing workload, computerization and automation are essential instruments to maintain and ensuring high standards of quality.”

*Capilli M, Enrico F, Federici M, Comandone T. J Oncol Pharm Practice 2022: 28(2): 353-361*

“Productivity of the robot was dramatically increased when the robot performed standardized preparations.”

“...the benefit and the limits have to be fully investigated by combining productivity and risk analysis assessment”

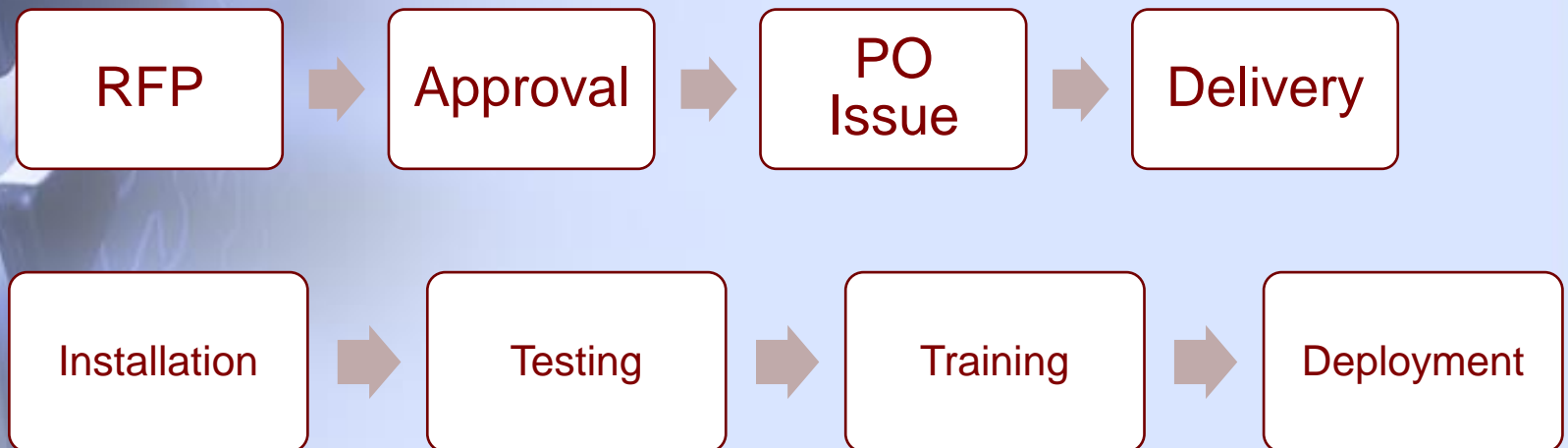
*J Heloury, G Bouguéon, T Deljehier. Pharm Technol Hosp Pharm 2019; 4(1): 15–28*

“... benefit of sharing experiences between different hospitals in the use of automated compounding technology to evaluate how application, workflow and human factors can determine different productivity outcomes.”

*Riestra AC, López-Cabezas C, Jobard M, et al. J Oncol Pharm Practice 2022: 28(2): 362-372*

# Implementation challenges ...

**Keep your mind focused!**



Others – Cybersecurity issues , OS version

# What are the challenges we had to manage...

- Pandemic causing uncertainty in equipment delivery timeline







*Last thoughts ...*

## **The power of ONE**

**“one project team, one project journey,  
one common goal”**

**O**ptimism

**N**etwork

**E**xceptionalism

THANK  
YOU!