ROBOTICS IN ONCOLOGY

Research

By

Clinical Care

Education

Wu Tuck Seng, Deputy Director
Pharmacy Department, NUH

A member of NUHS

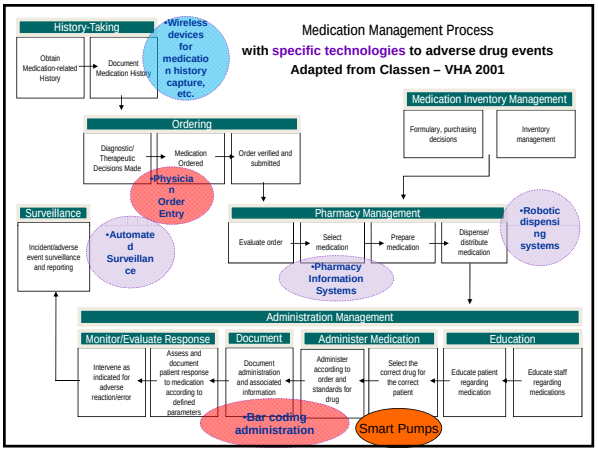
SCOPE

- Robotics and automation
- Quality , safety
- Impact of robotics in medication use process
- Cytotoxic robots
- Resources, critical success factors, KPI's and business case
- Beware

ROBOTICS

➢ Robotics continue to revolutionize the way we do things in all areas. This is driven by the rapid advancements in IT and consumer demands for *better, faster and cheaper goods and services*.

➢ Robots are now more useful, dependable and cost-effective.



What is Automation?

➢The use of computers/machine/engineering to perform work to achieve desired results (service or product)

➢Implement standardised set of standard operating /work procedures

➢Process that consistently achieves a set of desired results without variation or minimal variation

➢Process that eliminate & minimizes errors

What To Automate?

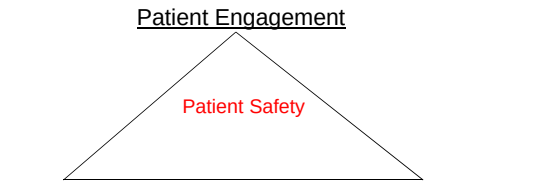
➢Routine, repetitive work

➢High volume work

➢Work that does not require professional input, thinking or judgement

➢Work that are high risk/high errors due to human factors

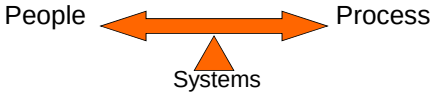
PATIENT SAFETY



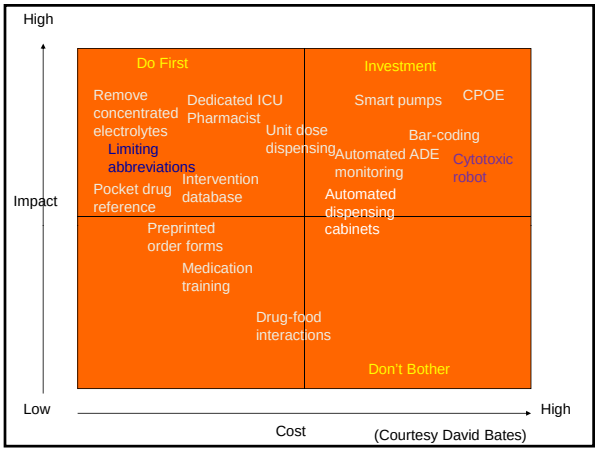
Healthcare Workers engagement (Drs, P'cists, Nurses)

Governance (e.g. JCI)

People, Process, Systems



Quality service and safety is about moving the efficiency to a higher level. Safety is the foundation on which quality is built

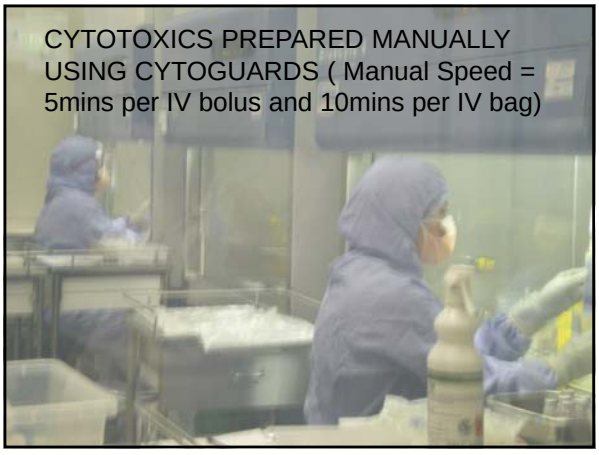


(Courtesy David Bates)

Medication Use Process Failure

	1	2
• Prescribing	39%	49%
• Transcription	12%	11%
• Dispensing	11%	14%
• Administration	38%	26%

[1] Leape et al, JAMA 1995, 274: 35-43
[2] Bates, D, J Qual. Clin Practice (1999), 19:13-17



CYTOTOXIC ROBOTS

1. Cytocare (Italy)
2. RIVA (Canada)

CYTOCARE ROBOT
(Health Robotics, Italy)

CYTOCARE ROBOT

- The robot operates in a closed system and performs the function of 2 pharmacy technicians operating within a chemotherapy biological hazard cabinet (cytoguard) and provides the following advantages over the current system:
- Substantially reduced occupational exposure to cytotoxic agents
- Substitutes for pharmacy technician workforce (a known and recognised area of workforce shortage)
- Improves product and patient safety (reduced medication errors) – Zero percent compounding errors
- Improved efficiency - improved TAT (18%), reduce wastage, ensure 100% sterility, can work continuously , 67% gain in productivity

Projected Savings (ROI)

- Medication savings [25%, precision + longer shelf life (sterile)] (major saving)
- Manpower (saved 2 PT) (major saving)
- Aseptic Dispensing Skills Training
- Compounding Errors
- Cleanroom construction (saved this)
- Cleanroom maintenance (saved this)
- Materials cost (tyvek gowns, masks, gloves, spillmats)
- Avoidance from needlestick injury (medical and lab fees and loss of work 2 days MC)

Projected Expenses (ROI)

- Consumables (syringes, needles)
- Depreciation
- Repair & maintenance
- Utilities

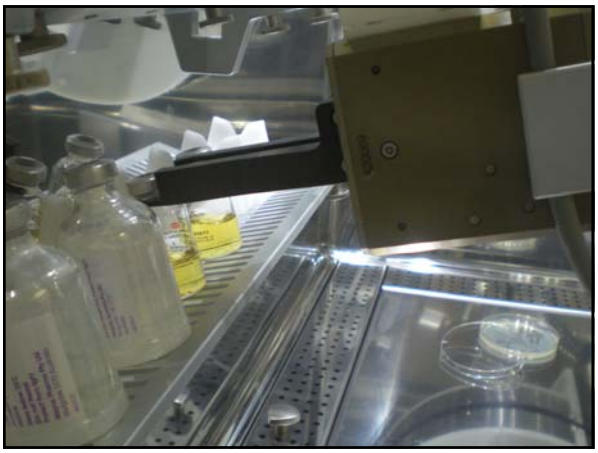
- Note :NUH - depreciate over 8 years. Cost recovered within74 months (positive NPV) i.e 6.2 years

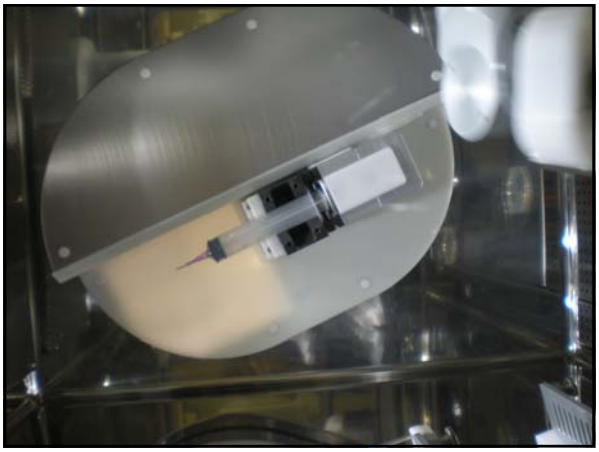
CYTOCARE ROBOT

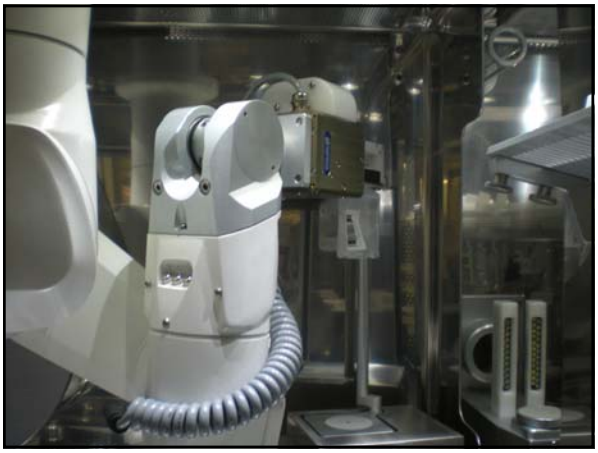
- One vial multiple preparations
- Use Baxter ViaFlo bags (up to 1 L bags) and B Braun Ecoflac plastic bottles
- 9 doses (IV bolus and bags) in half an hour (3.33 mins per dose)
- Uses bar code technology
- Negative pressure
- Uses 16G vented needles
- Unit Cost – SGD 1,112,000 (including installation), maintainance : SGD173,750 per year

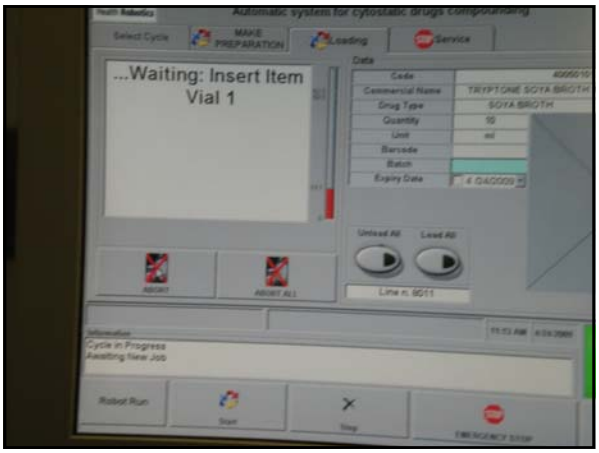
CYTOCARE ROBOT

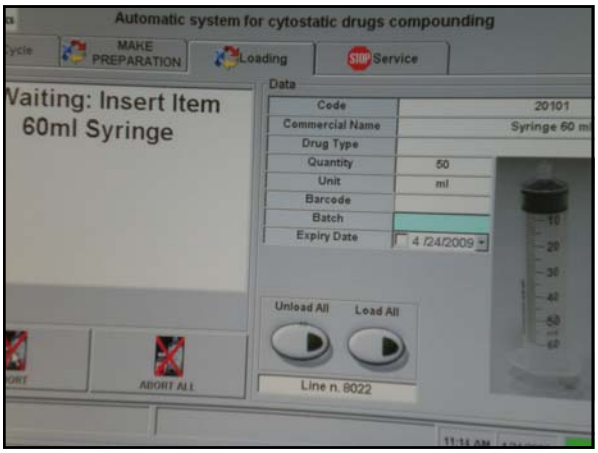
- Cytocare cannot handle : IT injections, ampoules, powdered cytotoxics, cytotoxic pumps
- Based on NUH inventory and workload, it can only manage 60% of the load
- Coverage: Cytocare robots implemented in Italy, Europe, USA, Australia, UK, Malaysia











Intelligent Hospital Systems Ltd, Canada

RIVA ROBOT

- **RIVA is the standard in IV admixture compounding.**
- Robotic IV Automation (RIVA) is a medical device developed by Intelligent Hospital Systems Inc
- Used by hospital pharmacies to automatically and accurately prepare IV syringes and bags. By automating the preparation of IV syringes and bags
- RIVA addresses the issues of safety for the patient and the pharmacy technician, efficiency and effectiveness in the pharmacy and the challenges of a changing regulatory environment.

RIVA ROBOT

- RIVA allows hospital pharmacies to compound sterile preparations in a United States Pharmacopeia (USP) 797 environment while outputting admixtures in either syringes or bags.
- The automation of repetitive and complex tasks reduces the incidence of errors and contamination. RIVA can prepare both chemotherapeutic and non-chemotherapeutic doses.

How does RIVA work?

- RIVA represents the final piece of automation in the hospital pharmacy environment. RIVA prepares IV admixtures using standard, off the shelf, sterile syringes and IV bags of many sizes, offering almost unlimited dose preparation options.
- RIVA can accept two types of drug orders: Verified, patient-specific orders imported from the pharmacy computer system and batch - or non patient-specific orders - entered manually by touch screen or user station.

How does RIVA work?

- RIVA software directs operators where to load consumable items and start the production run.
- RIVA's technology has been designed to prepare both chemotherapeutic and non-chemotherapeutic preparations
- For hospitals that use RIVA for both chemo and non-chemo preparations, this means training and service are leveraged and total cost of ownership decreases.
- RIVA stores all dose and production run data within a system database. Pharmacists can run reports using stored data for audit or verification purposes.

RIVA ROBOT

- RIVA – 3 installations right now in the US – they are all doing non-chemo in pediatric hospitals.
- First chemo-only RIVA to Australia in March 2010.
- 10 units to customers who have signed contracts in 2010 – and of the 10 – more than half of them are for cytotoxic compounding

RIVA ROBOT

- Throughput typically - 25 to 27 doses per hour (2.22 mins per dose) & up to 300 doses per day.
- That includes cleaning, loading etc. Customised.
- The cost for contracts signed in 2010 installation is $1,200,000 USD.(SGD 1,680,000)
- Service costs per RIVA unit for each of 5 years is approximately $200,000 (SGD 280,000) per year. This includes all labor, all parts, software updates, training, installation, integration to your pharmacy system etc…

Resources required

- Financial investment
- Manpower – sizing, reduce & redeployment (where applicable)
- Workload capacity forecast
- Workflow changes (not easy), adapt, re-engineer processes
- Do pilot study or proof of concept – to ensure it works!
- Change management (most difficult)

Critical success factors for business automation

- Right choice of work to automate (right problem)
- Right technology for work to be automated (right tool)
- Details – start-up, maintenance, cost of consumables
- Can convince management to invest money (need return of investment proposal that give a positive net present value, NPV)
- Automation integrated well into workflow
- Change management successful (before, during and especially AFTER implementation)
- Leadership, determination & perseverance

Executive summary checklist

1. How the equipment or system will meet the identified service need
2. Alignment of the acquisition to the service objectives of the health service, as well as Ministry of Health and government strategic directions
3. The options considered for meeting the service need
4. The short-listed options and the basis for the short listing
5. Rationale for the preferred option based on fitness for purpose, costs, benefits and risks

Executive summary checklist

6. Readiness to implement and timeframes for implementation
7. The life cycle costs associated with the preferred option
8. The budgetary implications for the acquisition – both recurrent and non-recurrent – and how it will be funded
9. Planning for implementation including project management and governance, procurement strategy, post-implementation assessment and project risk management
10. The ROI and NPV for the business case

Monitoring key performance indicators

- Safety - error rates
- Efficiency/effectiveness – clinical outcomes, waiting time for medications/service
- Productivity - revenue, manpower costs, inventory value, cost of wastes (e.g. expired drugs, reworks, service recovery)

Things to be aware of

- Employing robotics or automation is NOT the solution to all problems
- Automation cannot work if workflow does not change
- There are limitations in automation
- To look out for continuous development i.e technology can be outdated

Failure is the opportunity to begin again, more intelligently

- Henry Ford

THANK YOU