P13

Materials Management at the Hospital

E356 – Pharmaceutical and Bio-Chem Supply Chain

Diploma in Supply Chain Management

E356 Topic Tree

Pharmaceutical and Bio-chem Supply Chain

- Introduction to Pharma and Bio-chem
- Classification of Dangerous Goods
- Best Practices (GMP/GDP)
- Clinical Supply Chain
- Cold Chain Management

Import, Packaging and Distribution

- Import and Distribution of Medical Devices
- Import of Pharmaceutical and Bio-Chem Products
- Local Transportation of Pharmaceutical and Bio-Chem Products
- Packaging of Pharmaceutical DG for Air Transport
- Declaration of Pharmaceutical DG for Air Transport

Product Tracing, Recall and Disposal

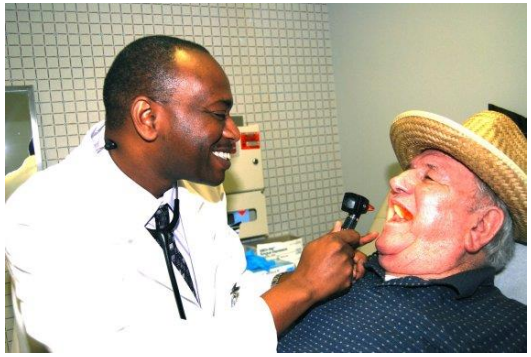
- Product Tracing (anti-counterfeit technologies)
- Drug Recall
- Disposal of Bio-chem Products in Hospital Logistics

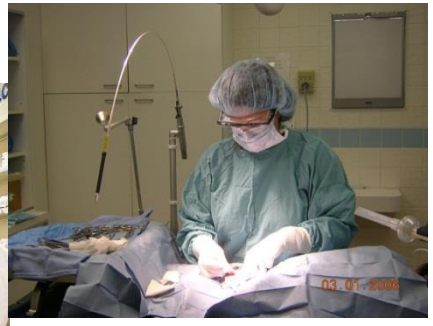
Point of Care for Hospital Inventory

Point of care is the location where items are used for patients

Hospital pharmacy – e.g. Panadol, prescription only medicine

Outpatient clinics - e.g. vaccines, surgical gloves, syringes





Operating theatres – e.g. Intravenous drip, syringes

Patient wards – e.g. Panadol, vaccines, syringes

Test / research labs – e.g. blood agar, reagent, syringes

Types of Hospital Inventory

- Medical Supplies
  - Pharmaceutical products – General drugs or prescription drugs
  - Consumables – e.g. Surgical gloves, masks, paper towel, disinfecting solution, syringes
  - Medical devices – e.g. stethescope, x-ray machines

- **Non-medical supplies**
  - Housekeeping – e.g. bed linen
  - Office supplies – Paper, pens
  - Food and beverages for patients

Classification of Supplies

- Pharmaceutical items - typically stored apart from other items in a hospital and managed by pharmacists; distributed to patients in wards, outpatient clinics and pharmacies upon request.
- Consumables - products that have to be purchased recurrently, items which "get used up" or discarded e.g. surgical gloves, bandages, syringes.
- Consignment Inventory – stocks held at site / hospital are owned by supplier, until the items are being utilised or consumed. Items are usually of high value and not common. E.g. Surgical heart stents
- Non-stock / direct purchase - usually highly customized items, ordered directly by specific departments from the purchasing department, which oversees the purchases as needed and delivers them upon receipt to the departments. These are generally not stored in the hospital stores. E.g. Prosthetic Limbs.

Overview of Healthcare waste

What are Healthcare wastes?

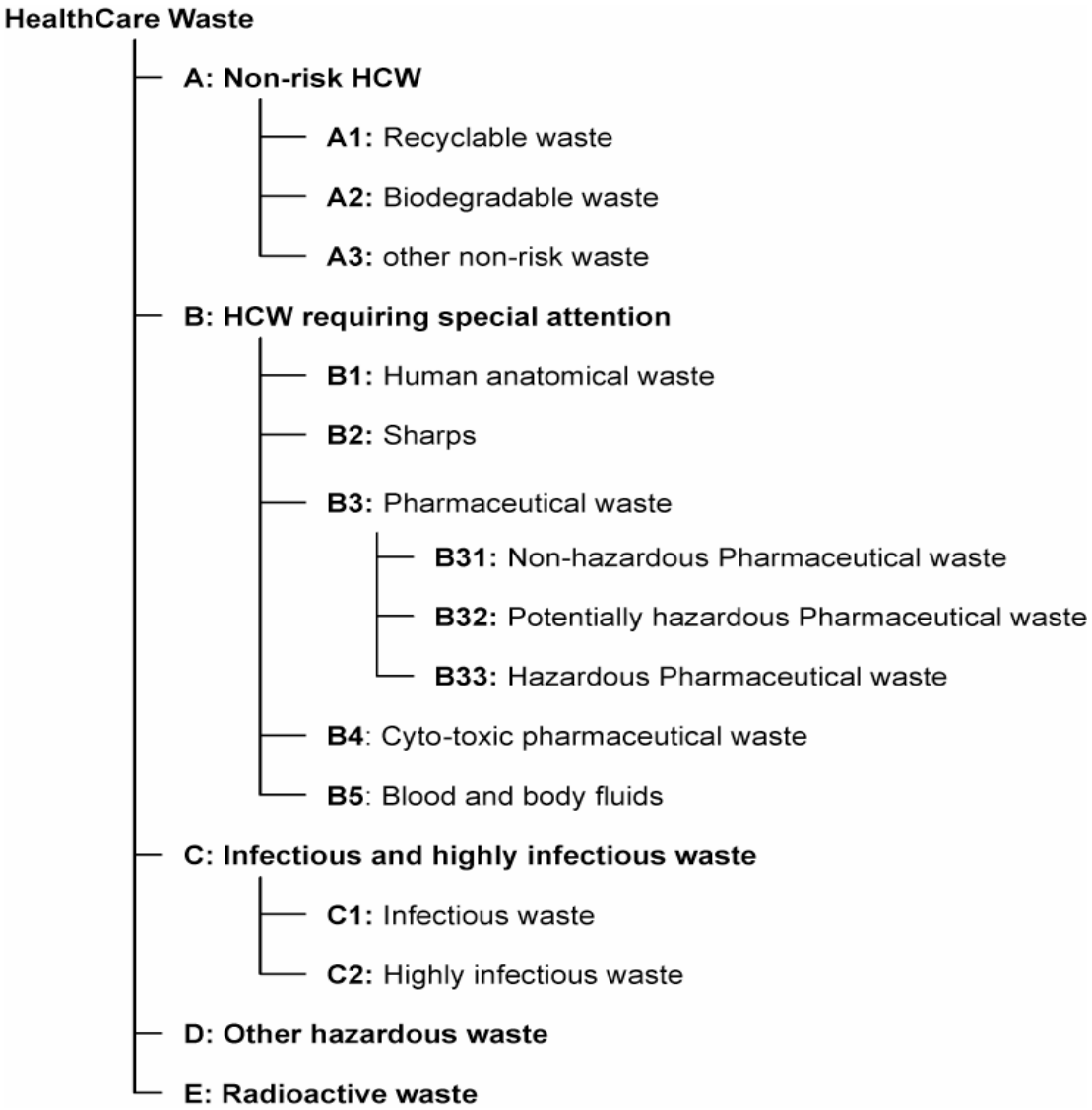
Infectious waste, pathological waste, contaminated sharps, routine clinical waste, cytotoxic waste, radioactive waste, pharmaceutical waste, chemical waste and general waste.

- **Biohazardous wastes - Infectious waste, pathological waste, contaminated sharps and other contaminated waste from treatment areas which need *special handling and disposal*.**
  - *Special Handling* –needs pre-treatment before it is disposed of
  - *Separate Disposal* –required to be disposed of by licensed hospital waste contractor

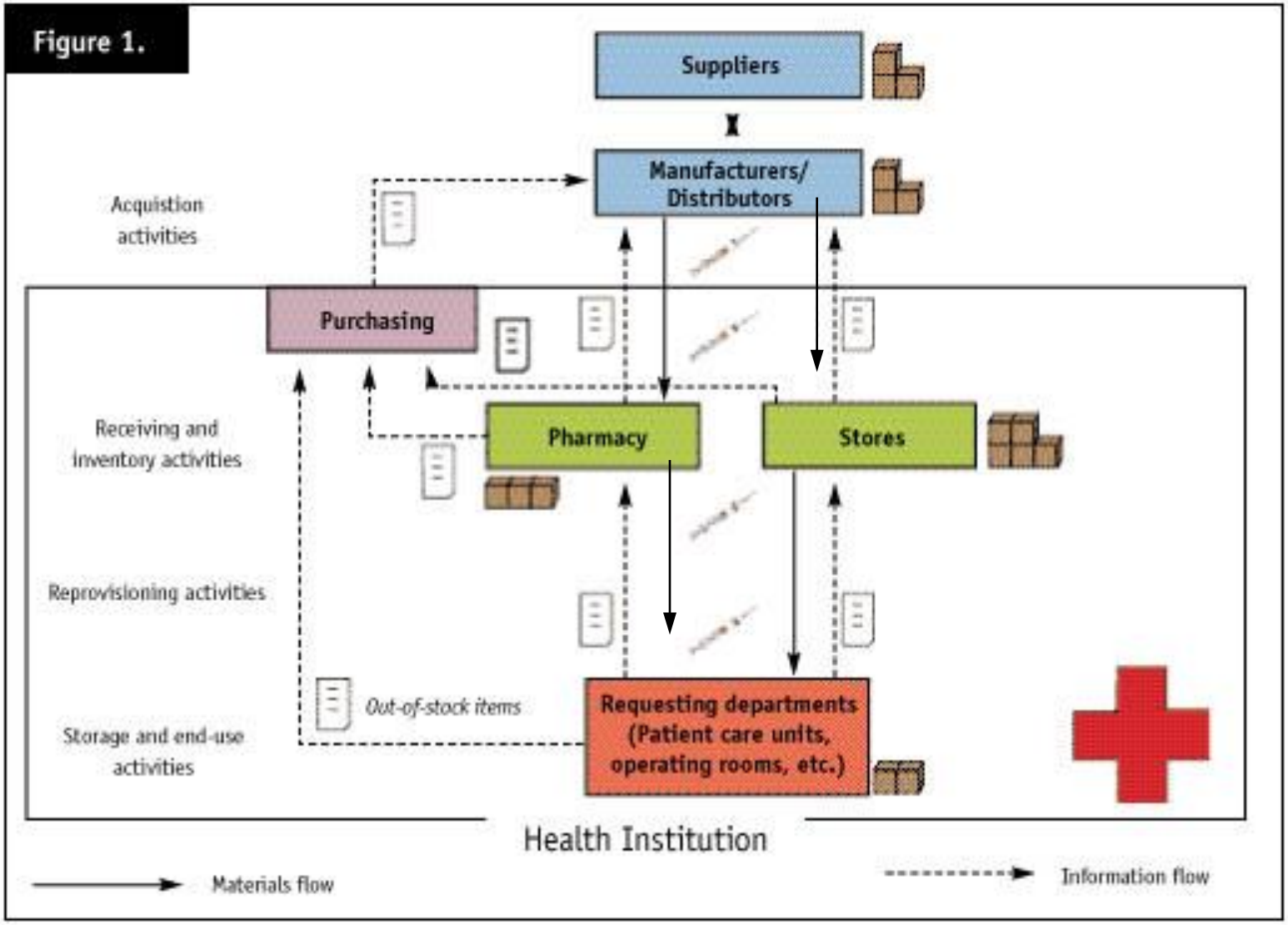
Authorities of Healthcare Waste and Biohazards Management

- **Global Authority**
  - World Health Organisation (WHO)
- **Local Authorities**
  - National Environment Agency
    - Environment Public Health Act
  - Ministry of Health (Clinical Research and Healthcare related issues)

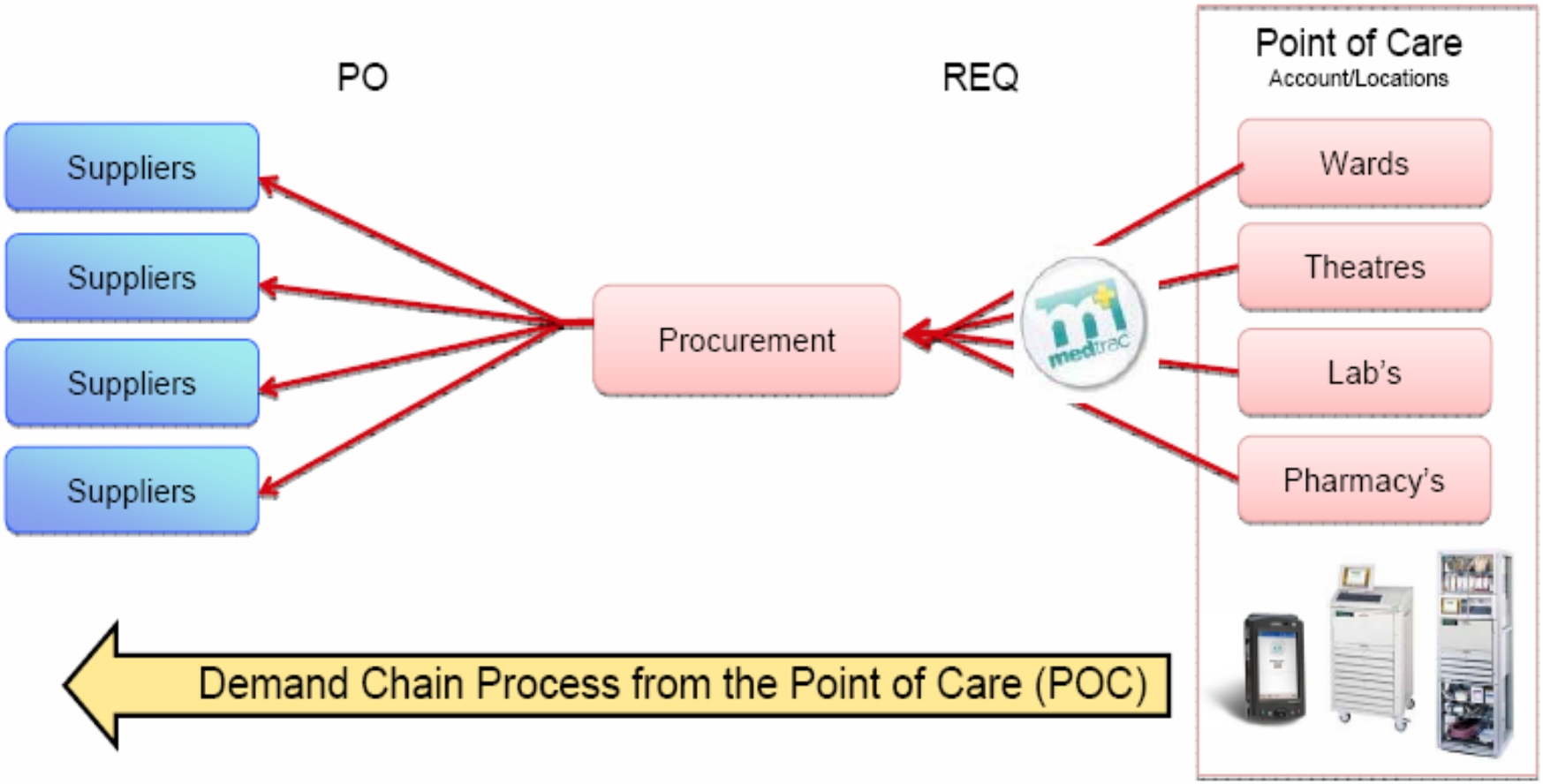
Classification of Healthcare waste by WHO



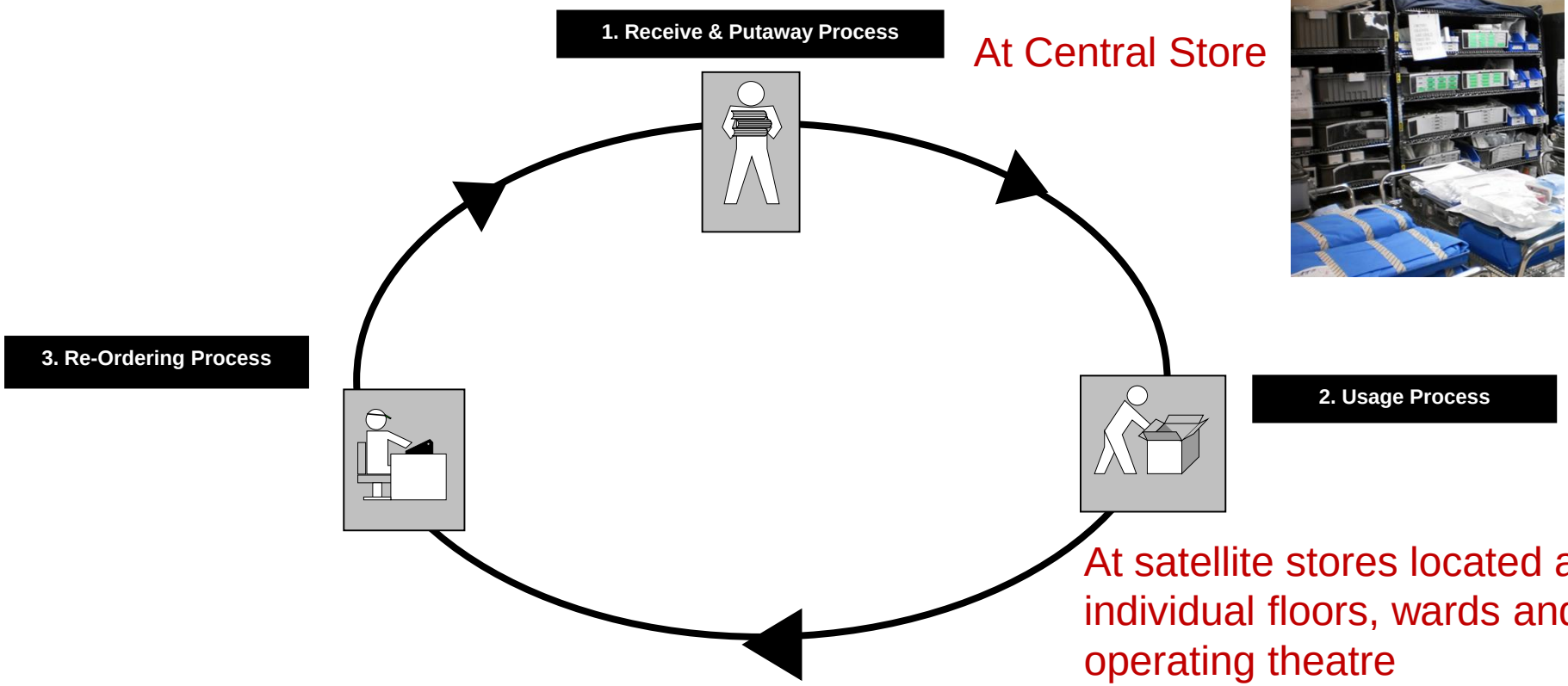
Overview of Materials and Info flow in a Hospital Setting



What triggers PO/ Requisition Process?



Overview of material flow at the hospital



At Central Store

At satellite stores located at individual floors, wards and operating theatre

- Satellite-stores are common in Hospitals and Hotels
- Consumable stocks are retrieved from the central store, delivered to the satellite stores and consumed at the patient wards.

Order Generation Process (Stock items)

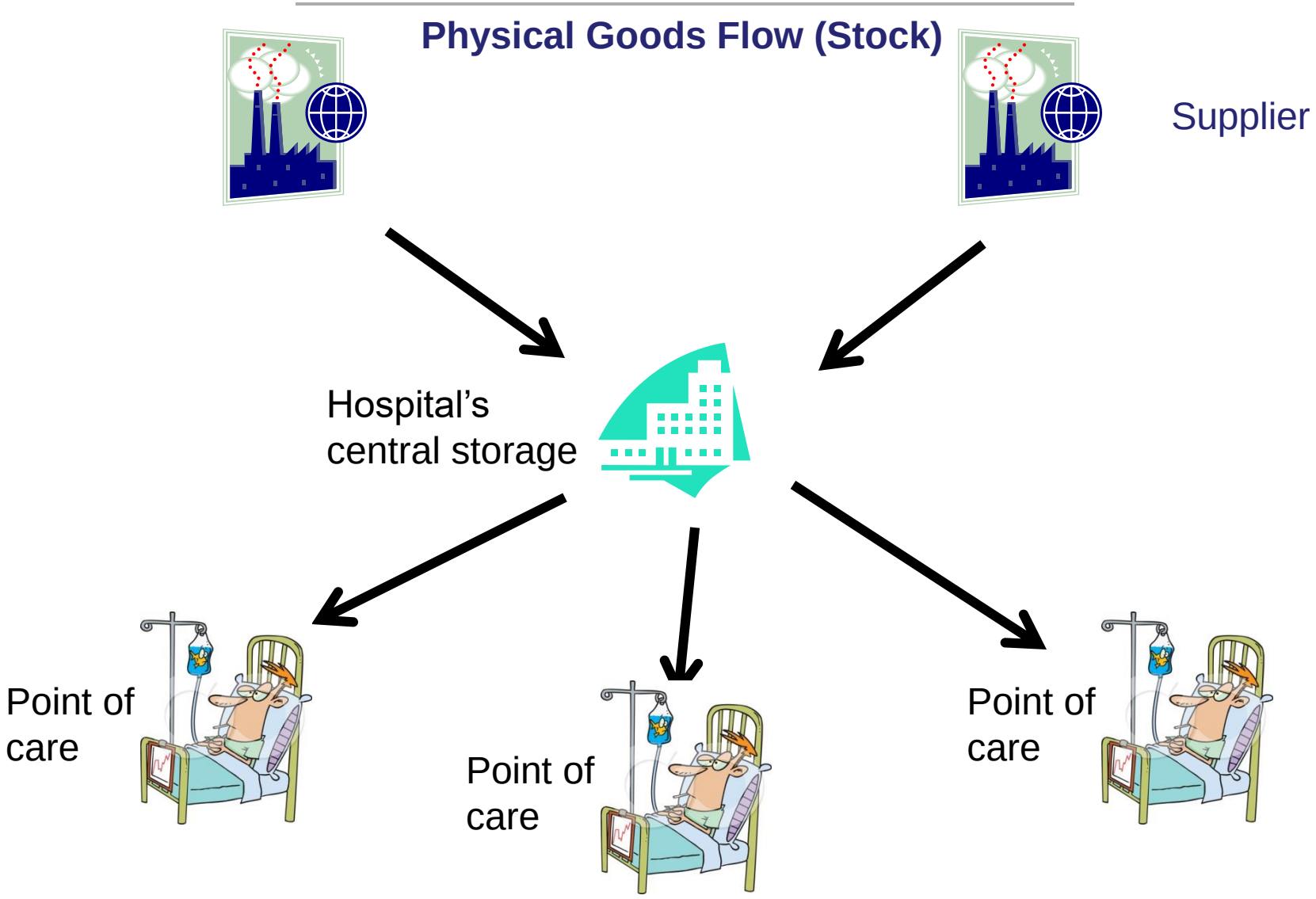
Stock Items: Stocks held at central storage

Point of care

Hospital's central storage

1) Run Suggested Order^ Report (Replenishment)
2) Approve Order (Replenishment)
3) Generate Warehouse Picking Order Report

Physical Flow – Stock items



Order Generation Process (Non-Stock items)

Non-Stock Items: Stocks not held at warehouse.

Point of care

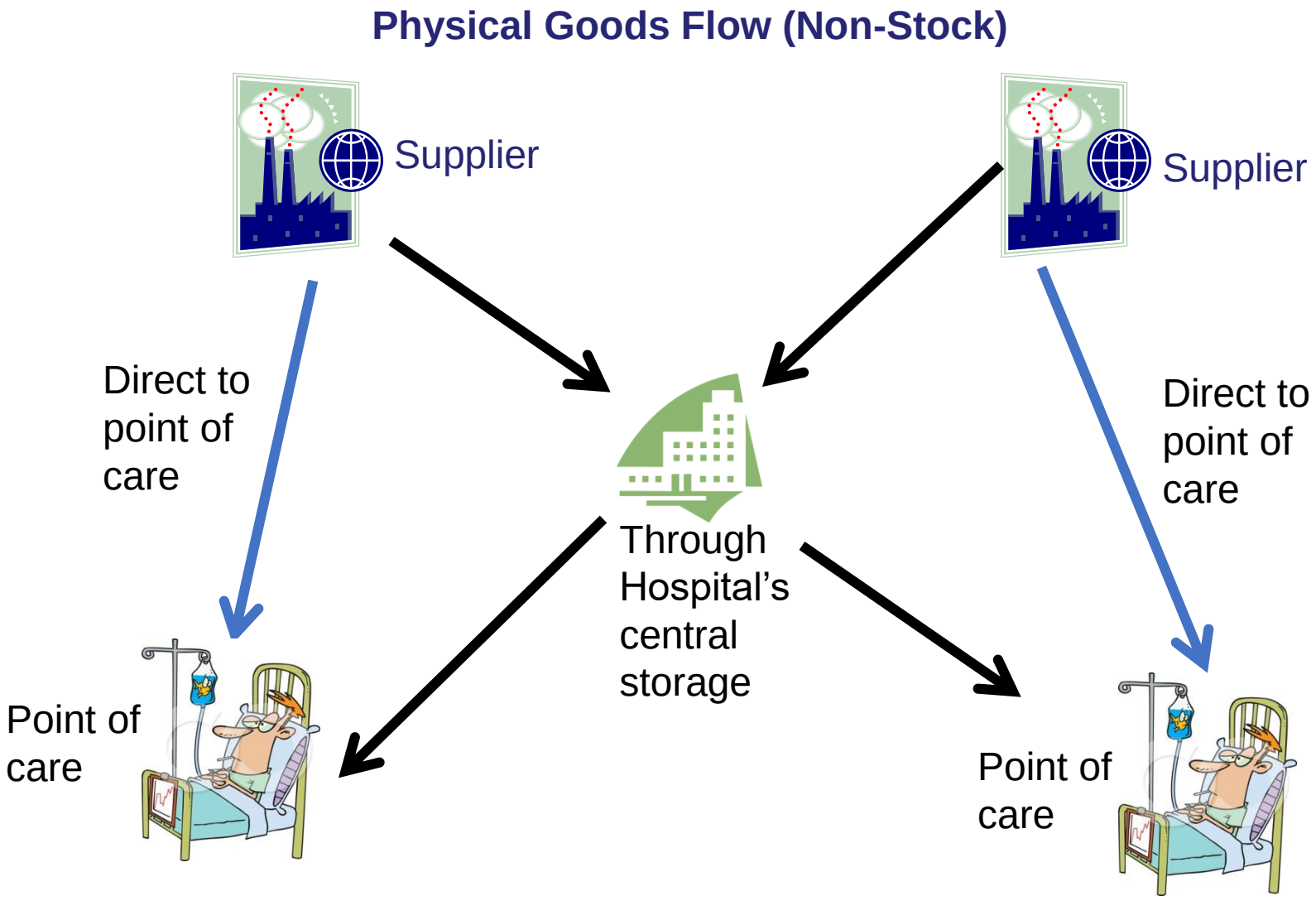
Hospital's central storage

Supplier

What the materials management team at hospital central storage do:

1) Run Suggested Order Report
2) Approve Order
3) Generate Order to Warehouse Report
4) Generate Consolidated PO to Supplier

Physical Flow – Non-Stock items e.g. Surgical Stents



Current situations in Hospitals

- Daily consumption and replenishment / requisition by users / staff nurses
- Staff nurse at individual wards is responsible for satellite store/ wards requisition/ inventory replenishment process.

Challenges involve:

- routine daily manual/ visual count of inventory at central stores and satellite stores
- Requires manual and dutiful update of Stock card/ sheet to reflect updated inventory status

✘ Replenishment signal not obvious

✘ May not be performed timely and Stock cards/ sheets are not updated timely to reflect real inventory status.

✘ Prone to human error and non-timely update

- Rampant stock-outs may be due to time lag and delayed in inventory replenishments/ requisitions.

Practices for Pharmaceutical Waste

First fundamentals of Health care waste

- **Need clear supervision and management structure**
  - Proper training and commitment of all
  - New staff must be clear of the implications of job and safe practices.
  - Must be properly managed and supervised on a regular basis.

How Pharmaceutical wastes are managed:

- general pharmaceutical waste
  - E.g.vitamin tablets, paracetamol tablets, creams and ointments etc
  - can be disposed of as general refuse
- special pharmaceutical waste
  - E.g. antibiotics, vaccines, other immunological products, and controlled drugs such as cocaine.
  - needs special disposal by medical waste incineration.

WHO proposed steps of Healthcare Waste Management

step	location	healthcare waste stream	key points
0		*waste minimization*	*purchasing policy; stock management; recycling of certain types of waste…*
1	in medical unit	**generation**	
2		**segregation at source**	*one of the most important steps to reduce risks and amount of hazardous waste*
3	in health facility	**collection + on-site transport**	*protective equipment; sealed containers; specific easy to wash trolleys*
4		**on-site storage**	*lockable easy to clean storage room; limited storage time of 24-48 hours*
5		**on-site treatment / disposal**	*adequate storage room; limited time of max 48 hours*
6	outside of health facility	**off-site transport**	*appropriate vehicle and consignement note; HCF is informed about final destination*
7		**off-site treatment / disposal**	*appropriate vehicle and consignement note to ensure…*

Step 1- Generation of waste

- ***Healthcare waste are very costly to dispose due to the need for pretreatment prior to disposal. So it is best to reduce it at point of generation where possible.***
- **Waste minimization and recycling**
  - Investigate how to reduce production of waste
  - Recycle if possible, taking in consideration the risk of possible contamination
  - Train staff to reduce waste

Step 2- Segregation of waste

- **Waste Segregation**
  - Separate general waste from hazardous waste and pack into correct coloured waste bags and containers.
    - Yellow - biohazardous and sharps wastes.
    - Purple – cytotoxic wastes
    - Red - radioactive wastes
    - Black - general wastes

Note: *The colour code may vary among countries. E.g. red may be used for non contaminated sharps in some countries.*

Step 2- Segregation of waste

- **Marking and Labeling**
  - Hazard type must be clearly marked and use labeled
  - Examples:
    - Biohazard label,
    - Radio active label, or
    - any other relevant hazard label i.e.
      - “Danger! Contaminated sharps, do not open!”




Step 2- Segregation of waste, Biohazard Waste Equipment

- Sharps Containers
  - Plastic or fiberboard
  - Disposable
  - Strong enough to prevent sharp penetrating under normal use

- Bio-hazard Bags
  - Air tight bag used to contain biohazards

Step 3 - Collect & On-site handling

- **Collection of waste**
  - Regular collection
  - Specific routes to be followed to reduce contact
  - Loading and unloading should be easy
  - No sharp edges that can tear the bags
  - Equipment should be easy to clean later
- **On-site handling**
  - Protective clothing to be worn when necessary
  - Handle with care
  - Take extra care when handling sharps.

Step 4 - On Site Storage

- **On site storage provides temporary storage that should not exceed 24 hours**
- **Do not store with non-hazardous and general waste to avoid cross contamination.**
- **Hazardous waste storage should not be near food stores or food preparation.**
- **Limit access to only authorized personnel**
- **Ensure clean, good lighting and ventilation**
- **Prevent rodent, insects or birds from entering.**

Step 5 - Off-site transportation

- **This step involves the movement to high temperature medical incinerator.**
- **Waste must be clearly marked and labeled as per UN Recommendation in case of accidents:**
  - UN number e.g. UN 3291,
  - Proper shipping name e.g. Infectious waste,
  - Total Quantity
  - Date of collection
- **Transportation properly documented and vehicle should carry consignment note at all times.**
- **Vehicle used for carrying this waste should never be used for other purposes.**
- **No sharp edges on the vehicle, easy to load and unload by hand, easy to clean/disinfect, fully enclosed to prevent spillage.**

Step 6 – Treatment and Disposal

- **Biohazard can be:**
  - Treated so that it can be disposed as general waste, or
  - directly disposed as biohazard using high temperature medical incinerator.
- **Biohazards can be treated:**
  - on-site if facilities are present, or
  - offsite in a treatment facility.

- **On Site Treatment, with on-site high temperature medical incinerator:**
  - Works best where roads are too poor to transport and/or hospital is far from treatment plant
  - Reduced risk of exposure
  - Costly to operate
  - Difficult to monitor by authorities
  - Poor compliance with standards, and increased pollution

- **Off-Site Treatment, where medical incinerator is not at location.**
  - Works best with good transportation
  - Higher efficiency and lower cost
  - Easy of monitoring by governmental bodies
  - Better equipment
  - Lower pollution

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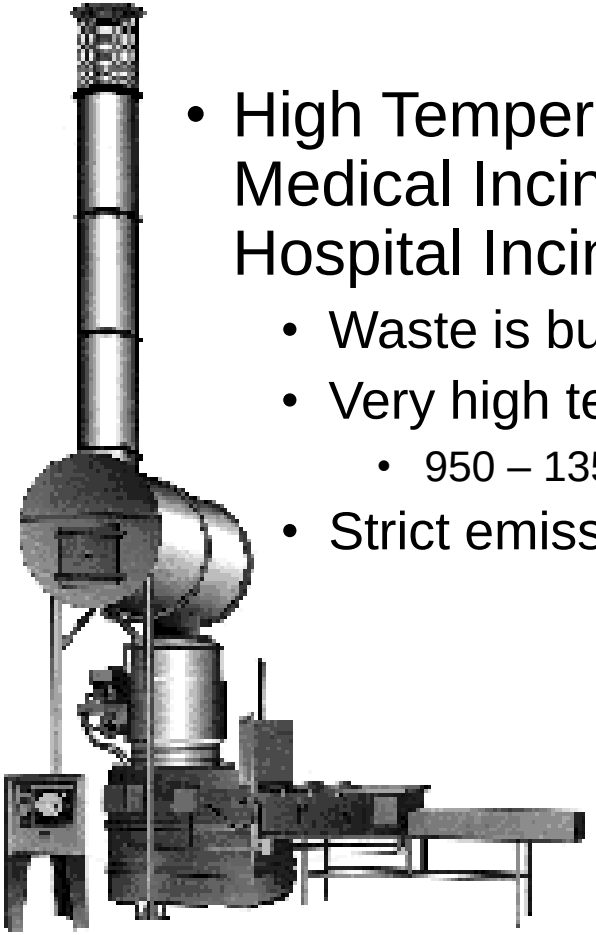
Biohazard Waste disposal Equipment

- **Autoclave.**
  - For decontamination so as to dispose as general wast
  - Decontaminate very dangerous pathogens in lal before disposal
  - Use super heated steam

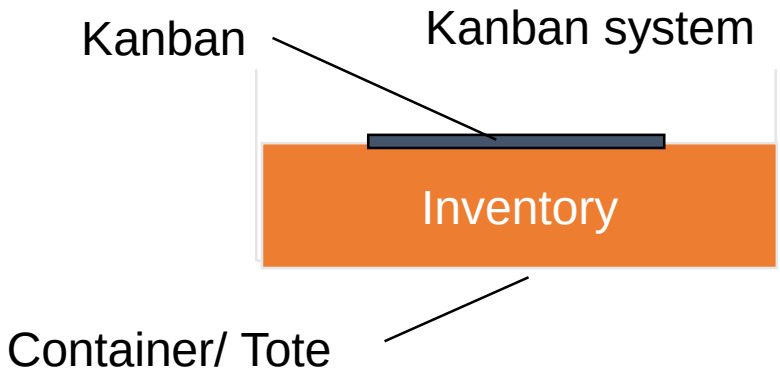


- High Temperature Medical Incinerator (aka Hospital Incinerator)
  - Waste is burnt
  - Very high temperature
    - 950 – 1350 deg C
  - Strict emission control

Licensed Biohazards Disposal Contractors/ Companies

- **5 available contractors in Singapore:**
  - Aroma Chemical Pte Ltd
  - Cramoil Singapore Pte Ltd
  - ECO Special Waste Management Pte Ltd
  - TEE Medical Services Pte Ltd
  - Modern Asia Environmental Holdings Pte Ltd
- **Transportation via totally enclosed trucks to provide collection and transportation of the biohazardous waste**
- **Dedicated hospital waste incinerators (medical incinerators) to incinerate the biohazardous and used cytotoxic wastes from the hospitals.**

Today's Problem



Stock no.: T-3476
Description: Test Tubes

From :

Central Store CS-1

To:

Satellite Store W-4

Box capacity 25

Box Type A

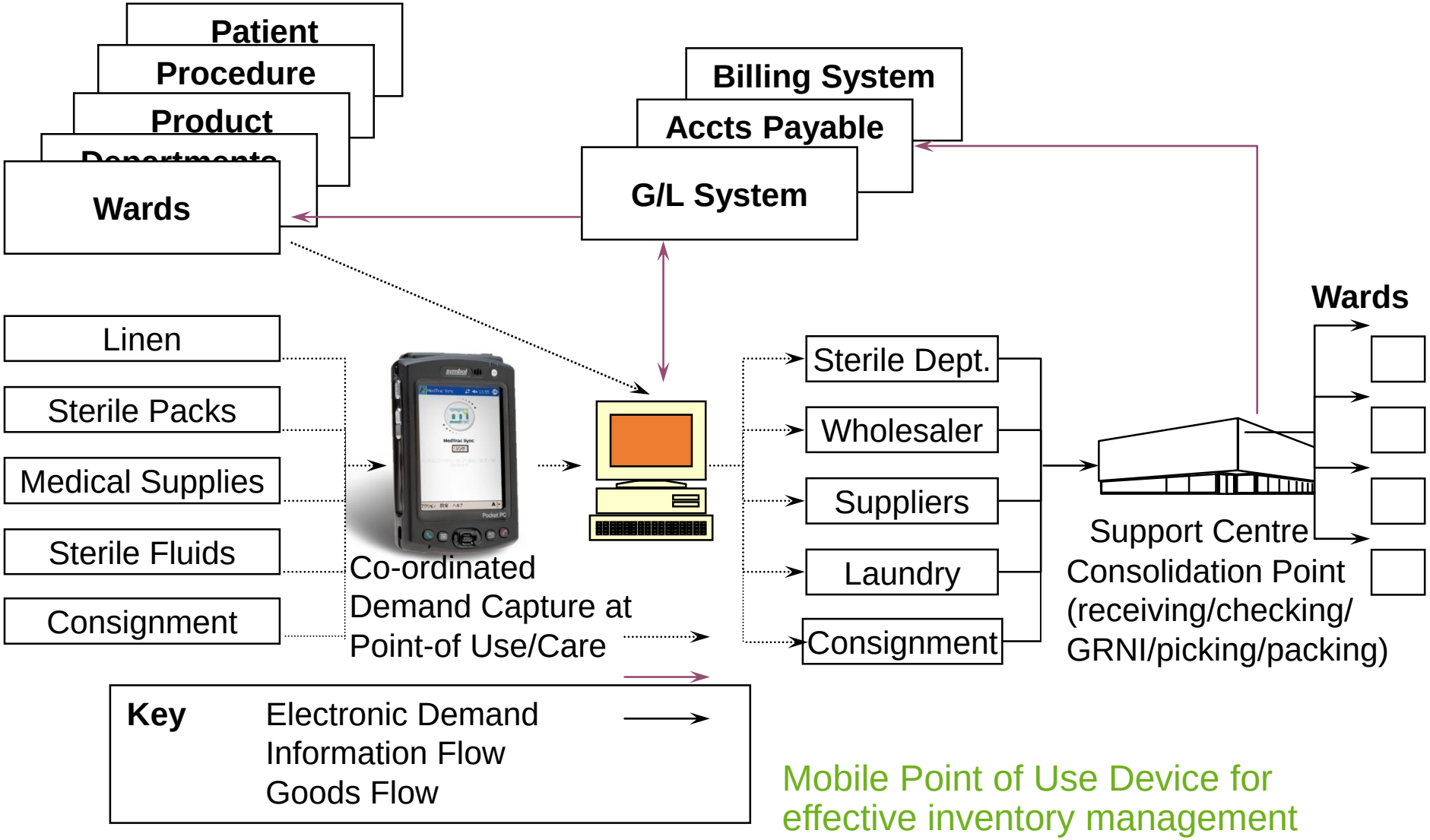
Issue No. 2/5

Today's Problem

Recommendations

For high value and consignment items, use RFID-enabled packages

Today's Problem



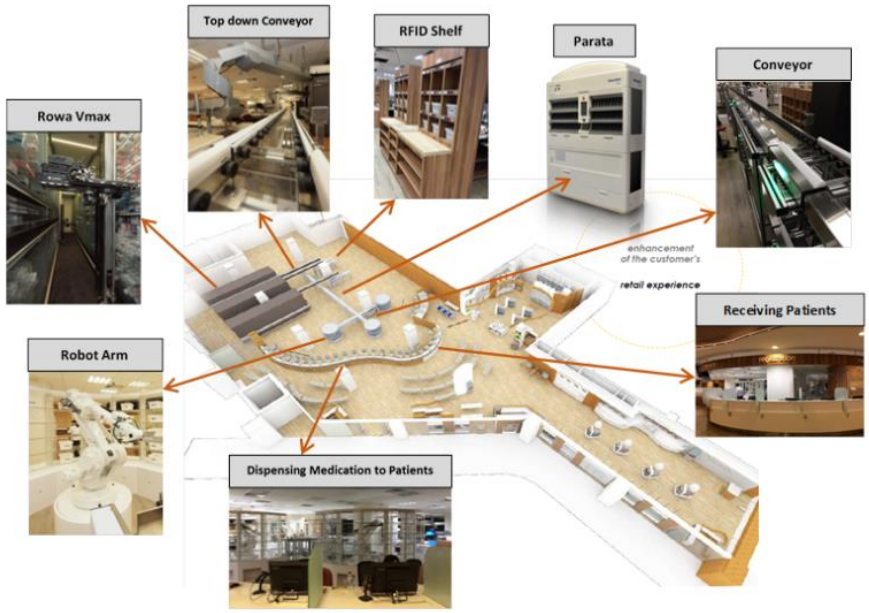
Mobile Point of Use Device for effective inventory management

Today's Problem

- **How IT system helps in material/inventory management in the hospital:**
  - Potential to give supply chain visibility to every area of the hospital
  - Reduce inventory costs, accurate, real-time item velocity, across the entire organization
  - Systems that connect to cloud-based technology, where benefits can be attained through data aggregation, can greatly enhance with accurate, real-time reporting
  - Enhance the end-to-end traceability of medical products in the health care supply chain

Today's Problem

- Fast Medication Dispensing System For Patients At Specialist Clinics And Polyclinics
- Outpatient Pharmacy Automation System (OPAS), developed by National University Hospital (NUH), Tan Tock Seng Hospital, NHG Pharmacy and Integrated Health Information Systems (IHiS)



OPAS comprises multi-disciplinary technologies such as robotic arms, medication picking robots, conveyors, LED, barcodes and RFID, to automate fast prescription filling.

Pills in a locker, available at SingHealth and NHG

Today's Problem

Recommendations

1) For consumables, use Kanban Inventory Management

- Kanbans are signals used to replenish the inventory of items used repetitively in a facility
- Consists of an information *Card* and *Container* that holds a standard quantity of items
- Kanban maintains discipline of pull production, based on actual demand (i.e. based on actual consumption level in a hospital)
- The basic idea is replenishment is based on Kanban cards to fill empty containers with standard fixed quantity of items thereby reduces waste (inventory)
- Suitable for consistent demand (no large fluctuations)
- Standard consumption fixed quantity is to be determined based on the historical usage at the patient wards
- https://www.youtube.com/watch?v=02a3-PVC8_4

Today's Problem

2) Shirley has to understand the various sources of healthcare waste within Outram Community Hospital and categorize them according to WHO guidelines

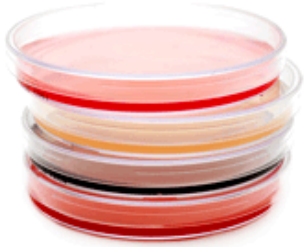
•There must be clear supervision and management structure for the management of the hospital waste

•She may follow closely to WHO proposed steps (steps 0-7) of healthcare waste management and take note of the key points each of the waste management step

•He needs to ensure that separate processes have to be laid out for external contractor. Only Step 1 to 4 are to be handled in house, while step 5-7 can be handled by an external contractor.

Today's Problem

- Shirley needs to ensure proper equipment are in place to handle the Biohazardous waste
- For road transportation and final elimination of the biohazard, off-site waste management will be employed. She can select one of the available licensed biohazards waste collectors/companies to dispose of the biohazards. Because,
  - No capital investment needed
  - Transportation in Singapore is good and suitable for offsite disposal.
  - Not economical viable for a small hospital to operate high temperature medical incinerator.
- Human Resources policies has to be implemented to ensure staff safety and adequate training.



Learning Outcomes

- Describe a typical hospital logistics and material management processes.
- Identify and discern the different types of inventory supplied to hospital and their point of care location.
- Discuss use of different inventory systems for different hospital supplies.
- Recognize the various types of Healthcare wastes.
- Assess the impact of product contamination and the importance of ensuring product quality and application of product recall and reverse logistics.
- Explain current and developing technology to enable an accurate tracking process of pharmaceutical products
- Recognize the need for proper bio-hazard removal
- Explain the proper procedures involved in bio-waste disposal