Logistics Solutions for Hospitals

Optimization with Automated Processes

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Head of South Europe for Swisslog Healthcare Solutions
AGENDA

- Logistics in Indian hospitals
- Risks by manual transports
- Advantages of automated logistics
- Different logistic needs in a hospital
- Solution: Pneumatic Tube System
- Solution: Automated Drug Management Systems
  Patient Safety through Unit Dose
- Swisslog Healthcare Solutions
LOGISTICS IN INDIAN HOSPITALS

- Healthcare industry in India is one of the fastest growing in the world
- Medical tourism could become a US$ 2 billion industry in India by 2012 according study by Mc Kinsey
- Estimated US$ 1.5 billion is spent on medical equipment
- Merely US$ 1 million is spent on intra-facility logistics → less than 0.06 % of total spending
- However: logistics comprises almost 90% of a healthcare facility’s operations

Hospital with 600 beds:
- 3000 runs every day (manual transports by humans)
- 70% to & from labs
- 10% to & from pharmacy
→ reduce workload and transport costs by automated logistics
RISKS AND PROBLEMS WITH MANUAL TRANSPORTS BY HUMANS

Personnel:
- non-availability of person
- less time available for patient care
- over hiring of staff, increased cost for staff
- use of skilled staff for low-reputed tasks (no job satisfaction due to monotony of logistics work)

Delays: low speed, critical life saving time

Theft: costs due to stolen material

Breakage of samples: risk of infection, costs/time

Mix-up of samples: misplacements, costs/time, patient safety

Unwanted access to confidential information/material
ADVANTAGES OF AUTOMATED LOGISTICS (I)

n Costs reduction:
- Less staff dealing with manual transport
- Reduction of transportation damage to facility and goods
- Less theft, less breakage
- Sterile goods transport: Reduction of circulation times due to fast transportation → higher availability of surgical instruments

n Increase in safety:
- Less opportunity of manipulation during transport (access lock)
- Reduction of cross-contamination
- Enhanced work place safety due to reduction of manual transportation

n Increase in patient service:
- Faster availability of test results due to high-speed
- Enhanced patient safety (e.g. no mix-up)
- Employees having more time for patient care
ADVANTAGES OF AUTOMATED LOGISTICS (II)

n Increase in quality:
  – Minimisation of wrongly delivered good
  – Better control of transported goods due to tracking and tracing

n Benefits for employees:
  – Workload reduction → focus on patient care
  – Less risk of bio-hazard
  – No monotonous transport tasks

n General benefits:
  – 24 hours / 7 days operating state
  – Modular concept: start small, grow big
  – For new and existing buildings
# Logistic Needs in a Hospital

## Transport Logistics
- Urgent, on-demand transports
  - Blood, samples
  - Drugs
  - Medical items
  - Sterilized items
  - Surgical instruments
  - Prescriptions, reports

## Transport Logistics
- Scheduled transports
  - Meals and food
  - Linen and laundry
  - Disposal of waste
  - Bulk drugs

## Logistics of Drugs
- Storage of drugs and medical items
- Automated retrieval and dispensing
- Unit dose drug management

### Tasks in a Hospital

### Goods and Materials

### Solutions

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Swisslog is the first company in the world to provide this integrated system based on total Swisslog products:

- Automated Drug Management System
- plus Automated Materials Transport System

PickRings for unite dose therapy are automatically handed over and transported with Pneumatic Tube System

Highest level of logistical performance for hospitals

less human interaction → less errors

fully automated → time reduction
SOLUTIONS FOR HOSPITALS: PNEUMATIC TUBE SYSTEMS
For in-house logistics to reduce manual transports
- On-demand transport of goods weighing up to 3,5 kg
- High speed for urgent transports or reduced speed for sensitive items
- Short and long distance transports, horizontally and vertically
- Fully automated send and receiving stations
- Computer controlled, track + tracing, access lock, RFID
Fortis will invest $200 million to set up a 950-bed hospital in Gurgaon.

The proximity to New Delhi's international airport will help attract patients from overseas.

8 percent of its revenue from treating foreign patients.

700 m tube length

21 PTS stations

750-beds, highly respected healthcare provider in Asia

1200 transports a day

400 transports in the rush-hours

1500 m tube length

17 PTS stations (additional stations already planned for phase 2)

automatic compact zone transfer unit
PNEUMATIC TUBE SYSTEMS

REFERENCES OF SNG

- 17 acres of campus area with 1500 beds
- One of the largest healthcare providers in private sector in Asia
- 2500 m tube length
- 120 PTS stations
- RFID technology

- A conglomeration of hospitals in one campus with 1000 beds
- 24 operation theatres
- 50 major heart surgeries daily
- Treating patients from 73 countries with complex heart disease
- 12 PTS stations
SOLUTIONS FOR HOSPITALS: AUTOMATED DRUG MANAGEMENT SYSTEMS
PATIENT SAFETY THROUGH UNIT DOSE
INTRODUCTION

The American Society of Health-System Pharmacists (ASHP) stated that¹:

“...unit dose distribution systems, with respect to other drug distribution methods, are

1) safer for the patient

2) more efficient and economical for the organization

3) a more effective method of utilizing professional resources.”

PATIENT DRUG DELIVERY MECHANISM

n Floor Ward Stock (FWS)

n Unit Dose System (UDS)

Ironically:
The traditional & historical Indian Ayurvedic system of drug preparation and administration was based on Unit Dose System!
FLOOR WARD STOCK SCENARIO

- Doctor prescribes – prescription on paper
- Nurse prepares indent for Pharmacy and/or uses the stock she holds at the Nurse Station (Floor Ward Stock)
- Nurse prepares Unit Doses as per doctor’s prescription
- Drug is administered to the patient
- Nurse orders medications for ward stock refilling

Example of floor ward stock “organization”
FWS: PROCESS

Drug Administration

Patient

cPOE/Paper prescription

Therapy preparation at ward level

Orders for ward stock refill

Shipment product packages to the wards

Central Pharmacy
WEAKNESS POINTS OF THE TRADITIONAL SCENARIO

n Errors can happen in each step of the drug process:
   Pharmacy
      1. Prescription
      2. Transcription
      3. Therapy preparation
      4. Distribution
      5. Administration

n The point is: how can we make the system safer?

“To err is human …”, but the system must prevent failures.

(Michael Cohen, Medication errors, 1999)
PRESCRIPTION ERROR

Who?

What?

When?

Decision error:
- Wrong medication choice

Writing error:
- Uncompleted prescription
- Wrong drug name
- Wrong dose
- Wrong unit (mg, mcg, etc)
- Unreadable handwriting
Incorrect transcription of the prescription on nurse therapy book may be due to several reasons and literature says that it may have an occurrence rate range between:

- 12% (Leape L., et al., 1995)
- 32% (Hartwig SC et al., 1991).
PREPARATION ERROR

- Storage and expiry
- Not correct dilutions
- Combining not compatible drugs.
ADMINISTRATION ERROR

1. Difference between what has been prescribed and what has been administered
   - Patient
   - Drug
   - Dose
   - Administration way
   - Administration time

2. Type of omission errors that often recurs on prescriptions
## HOW TO PREVENT MEDICATION ERRORS?

<table>
<thead>
<tr>
<th>Critical points</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prescription</strong></td>
<td><strong>Computerized Physician Order Entry (cPOE)</strong></td>
</tr>
<tr>
<td></td>
<td>The physician has at his disposal a tool to help him decide:</td>
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<td>- List of the hospital drugs easily and rapidly available</td>
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<td>- Immediate consultation of treatments, including those previously</td>
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<td>prescribed: current treatments for every patient can be viewed as</td>
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<tr>
<td></td>
<td>well as those already carried out (active + suspended or stopped)</td>
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<tr>
<td></td>
<td>- Chance to implement remedies and drug associations according to</td>
</tr>
<tr>
<td></td>
<td>protocol</td>
</tr>
<tr>
<td><strong>Transcription</strong></td>
<td><strong>Computerized Physician Order Entry (cPOE)</strong></td>
</tr>
<tr>
<td></td>
<td>Nurses no longer have to copy the prescription onto their own</td>
</tr>
<tr>
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<td>administration sheet: by eliminating copying time is saved, as is</td>
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<tr>
<td></td>
<td>further risk of error</td>
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<tr>
<td>**Therapy preparation and</td>
<td><strong>Equipment to automatically prepare therapies</strong></td>
</tr>
<tr>
<td>distribution**</td>
<td></td>
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<tr>
<td></td>
<td>With the specific automation it is possible to eliminate the human</td>
</tr>
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<td>intervention in operations in which it can be source of errors. The</td>
</tr>
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<td>human intervention is fundamental in checking and monitoring phases.</td>
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<tr>
<td><strong>Administration</strong></td>
<td><strong>Administration control through barcode reading</strong></td>
</tr>
<tr>
<td></td>
<td>A cross control between patient and medication barcodes guarantees</td>
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<tr>
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<td>that the administered drug corresponds to the prescribed one</td>
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</tbody>
</table>
FINANCIAL CONSEQUENCES OF MEDICATION ERRORS

- USA: 37.6 Billion $ (4%)
  (Kohn et al.; 1999; Institute of Medicine)

- Australia: 4.7 Billion $ (16.6%)
  (Wilson et al.; Med J Aust; 1995; 163; 158-71)

- UK: 1 Billion GBP (10.8%)
  (Vincent et al; BMJ; 2001; 322; 517-19)
Other negative consequences of the traditional workflow:

- High level of stocks required to be maintained at Nurse Station
- Risk of higher drug expenditure
- Risk of medication errors
- Nurse busy almost half the time performing tasks not specifically related to patient care
- Risk of legal suits derived from incidents (huge costs due to legal expenses and damages compensations)
- Risk of reduction in patient safety & quality of patient care!
AUTOMATED DRUG MANAGEMENT SYSTEM (ADMS) – Unit Dose Drug Management
AUTOMATED DRUG MANAGEMENT SYSTEMS (ADMS)

- **PillPick**: Unit Dose drug management system

- **BoxPicker**: Automated warehouse for the management, storing and dispensing of medications

- **PillPick Manager**: Software for the management and supervision of PillPick System
AUTOMATED DRUG MANAGEMENT SYSTEM: THE PROCESS

WARD

Prescription

Trolleys preparation

Personalized therapies

PHARMACY

Validation

Preparation

Store

Personalized Therapies
### SUMMARY OF BENEFITS WITH PILLPICK SYSTEM

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td><strong>Cost Reduction</strong></td>
<td>-10.36%</td>
</tr>
<tr>
<td><strong>Mistakes reduction</strong></td>
<td>~88%</td>
</tr>
<tr>
<td><strong>Ward stock reduction</strong></td>
<td>-61.50%</td>
</tr>
<tr>
<td><strong>Nursing time reduction</strong></td>
<td>-44%</td>
</tr>
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The decrease in total cost of medication and related activities has been quantified in, at least, 10% due to:

1. Drugs are delivered to the wards only in the needed quantities.
2. Total control on medications: elimination of pilferages.
3. Integration of the pharmacist in the clinical team: pharmacists can suggest therapies with the same efficacy, but less expensive
4. A different management of ward stocks …
1. **NEEDED QUANTITY DELIVERING**

“Drug waste was reduced by 64% in dollar value; time for drug processing in the long-term care facility was reduced by 46% on a daily basis”


2. **ELIMINATION OF PILFERAGES**

Precise data on pilferages do not exist, but everybody knows that their percentage is very high.

A stock in unit doses allows to keep at ward level a large drug variety, but only in the needed quantities: this makes pilferage more “complicated”.

3. **PHARMACIST INTERVENTION IN CLINICAL TEAM**

“With the intervention of a pharmacist, within one year, the number of doses and scheduled medications used per patient was reduced from 7,20 to 5,34. Use of routinely scheduled medications was reduced by about 30%.

Based on an average cost of medication administered, we calculated a cost savings of about $ 27,400 (in a 120-bed facility)”

REDUCTION IN MEDICATION ERRORS

“In the 36 institutions, 19% of the doses were in error. The most frequent errors by category were wrong time (43%), omission (30%), wrong dose (17%) and unauthorized drug (4%). Seven percent of the errors were judged potential ADEs. Medication errors were common (nearly 1 of every 5 doses). The percentage of errors rated potentially harmful was 7%, or more than 40 per day in a typical 300-patient facility. …”


“Over 770,000 people are injured each year in hospitals from adverse drug events (ADEs)\(^1\), which may cost up to $ 5,6 million each year per hospital depending on hospital size\(^2\). National hospital expenses to treat patients who suffer ADEs during hospitalization are estimated at between $ 1,56 and $ 5,6 billion annually”\(^3\).

CONCLUSIONS

High level organizations are not immune to adverse events, but we have learnt from experience that:

- Errors which can occur are based on precise mechanisms and predictable circumstances

- Technology can help every system and organization to build up solid barriers in order to prevent errors
WHO IS SWISSLOG

Swisslog
Provider of integrated logistics solutions for warehouses, distribution centers and hospitals.

Warehouse & Distribution Solutions (WDS)
Healthcare Solutions (HCS)

- Employees worldwide: more than 2000
- Headquarters: Switzerland, local offices in 20 countries
- History: company founded in 1898
- Power of Swisslog: Integrated solutions
  Swisslog is not focused on single products but offers a wide range of solutions for ALL logistic requirements inside a hospital.

Own production and innovation centres:
- Pneumatic Tube Systems
- Electric Tack Vehicles
- Automated Guided Vehicles
- Automated Drug Management Systems
Swisslog – Your Partner for Logistics Solutions in Hospitals

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