

PEDIATRIC SATELLITE PHARMACY IN PRINCESS MARGARET HOSPITAL

CANDY LAU

PHARMACIST

PRINCESS MARGARET HOSPITAL

SERVICE INTRODUCTION

Medication error is a common cause of morbidity and mortality in NICU



Home > Health

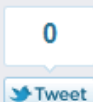
CORPUS CHRISTI, Texas, July 10, 2008

2nd Baby In Heparin OD Cases Dies

Texas Hospital Says Previous Infant Death Was Not Caused By The B

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(CBS/AP) A second infant has died where an investigation is uncovering thinner heparin given to as m

The attorney for the infant girl, Wednesday, a day after her t infant girl's death has not be Caller-Times reported that h newborn who died Tuesday overdose.

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PEDIATRICS Vol. 77 No. 6 June 1986, pp. 848-849

Tenfold Errors in Administration of Drug Doses: A Neglected Iatrogenic Disease in Pediatrics

Gideon Koren MD¹, Zohar Barzilay MD¹, Mark Greenwald MD¹

¹ From the Division of Clinical Pharmacology and General Pediatrics, The Research Institute, The Hospital for Sick Children, Department of Pediatrics and Pharmacology, University of Toronto, Toronto, and The Chaim Sheba Medical Centre, Sackler School of Medicine, Tel Aviv University, Tel Aviv, Israel

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SERVICE INTRODUCTION

Pediatric Satellite Pharmacy with success

The image shows a screenshot of a PubMed search result page. The search term is 'pediatric satellite pharmacy', which has returned 16 records. The top result is from the *Am J Hosp Pharm*, 1992 Sep;49(9):2192-7, by Hawkins VA and Powell MF. The abstract describes the justification for a pediatric satellite pharmacy at a tertiary-care institution, highlighting the benefits of such a pharmacy in improving pediatric care and reducing medication errors. The text is partially obscured by red boxes, which appear to be highlighting specific parts of the abstract.

NCBI Resources How To

PubMed.gov
US National Library of Medicine
National Institutes of Health

PubMed

Display Settings: Abstract Send to:

★ Performing your original search, *pediatric satellite pharmacy*, in PubMed will retrieve [16 records](#).

[Am J Hosp Pharm](#). 1992 Sep;49(9):2192-7.
[Hawkins VA](#), [Powell MF](#).
Pediatric Service, MetroHealth Medical Center, Cleveland, OH 44109-1998.

Abstract
The justification for a pediatric satellite pharmacy is described. Of the 742 inpatient beds in a tertiary-care medical center, 150 are dedicated to pediatric patients. The pharmacy department provides services to both adult and pediatric patients from a central pharmacy. However, unit dose drug distribution services are not provided to the nurseries. Furthermore, the department lacks a core of pharmacists specializing in pediatric practice. As a result, the ability of the pharmacy to support pediatric drug use has been compromised, and medication errors and infection control problems have occurred that can be attributed to this situation. A pediatric satellite pharmacy was proposed to improve the quality of pediatric care. Service objectives were established, and benefits were identified. A financial analysis was included in the proposal that documented a total gain attributable to a pediatric satellite pharmacy of approximately \$285,000 over five years. The satellite pharmacy was approved by hospital administration. The pharmacy department's quality assurance committee will monitor the satellite's impact. The justification for a proposed pediatric satellite pharmacy included indications that the satellite could correct medication-related problems and improve pediatric care and that implementation would have a positive effect on finances.

PMID: 1524060 [PubMed - indexed for MEDLINE]

PMID: 10248359 [PubMed - indexed for MEDLINE]

PEDIATRIC SATELLITE PHARMACY

Set up in Princess Margaret Hospital in June, 2011

Located in NICU

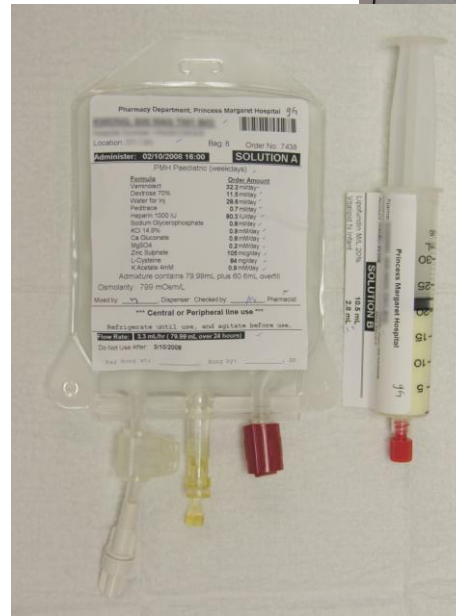
Targets: NICU and SCBU patients



SERVICES

Clinical Pharmacy Service (Monday to Sunday)

- Ward-round with doctors
- Clinical screening of medication orders
- Drug information service
- TPN consult and review



Paediatric Parenteral Nutrition Prescription

HOSPITAL AUTHORITY
Department of Paediatrics & Adolescent Medicine
Princess Margaret Hospital

No known allergy

Days of prescription: 26/Mar/2013

TPN analysis	Design	TPN actual (g)	Amount in		Total IV		Total
			TPN	Other IV (B)	TPN	Other	
Fluid	12.0	12.0	0	0	12.0	0	12.0
Ascorbic acid	0.5	0.5	0.5	0.0	0.5	0.0	0.5
Fat	2.0	1.8	1.8	0.0	1.8	0.0	1.8
TPN N (%)	11.2	11.2	11.2	0.0	11.2	0.0	11.2
Total	25.7	25.7	25.7	0.0	25.7	0.0	25.7
Calorie %	76.3	69.8	69.8	0.0	69.8	0.0	69.8
TPN N (%)	11.2	11.2	11.2	0.0	11.2	0.0	11.2
Calorie %	76.3	69.8	69.8	0.0	69.8	0.0	69.8
Sodium	4.5	4.4	4.4	0.0	4.4	0.0	4.4
Potassium	2.3	2.2	2.2	0.0	2.2	0.0	2.2
Calcium	2.0	1.8	1.8	0.0	1.8	0.0	1.8
Phosphate	1.5	1.5	1.5	0.0	1.5	0.0	1.5
Magnesium	1.5	1.5	1.5	0.0	1.5	0.0	1.5
Zinc	0.2	0.2	0.2	0.0	0.2	0.0	0.2
Glucose infusion rate	3.82	3.81	3.81	0.0	3.81	0.0	3.81
Glucose concentration	10.0	7.9	7.9	0.0	7.9	0.0	7.9

Design rate: 11.2 ml/hour
Actual rate to be given: 11.2 ml/hour for 24 hours

TPN A: 11.2 ml/hour
TPN B: 1.1 ml/hour

To Nursing Staff: Give TPN solution A at the rate of 11.2 ml/hour for 24 hours; Give TPN solution B at the rate of 1.1 ml/hour for 24 hours.

To Pharmacist: TPN Composition and Amount to be given (per design) table.

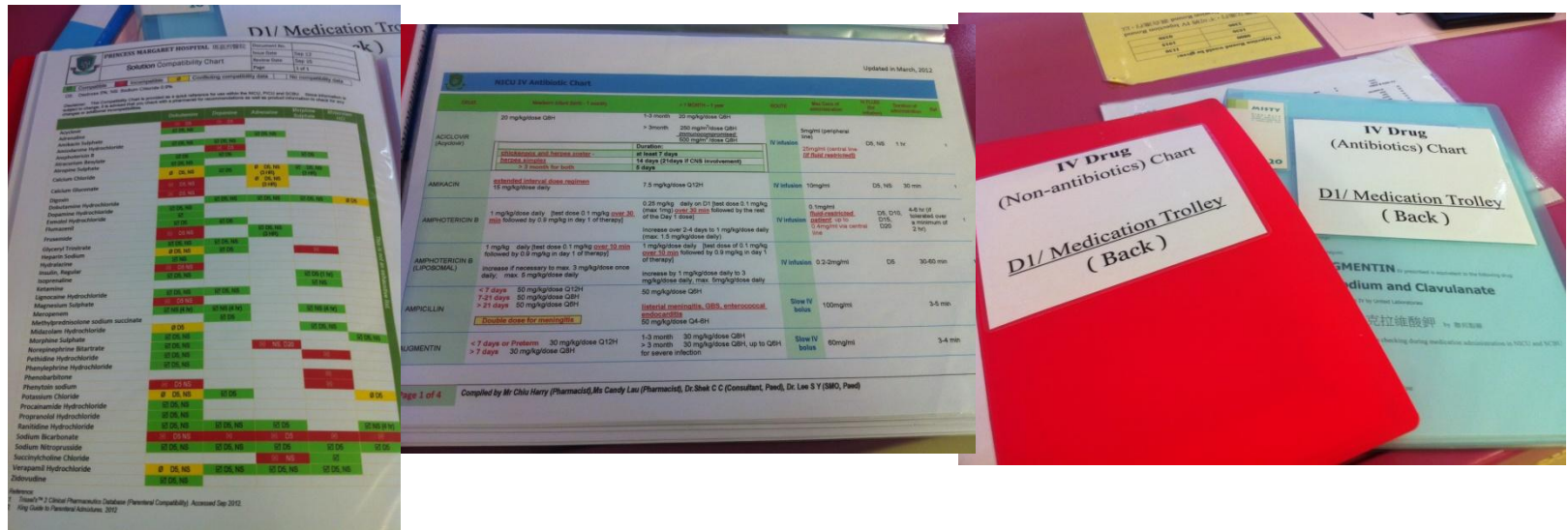
FAXED

signature

SERVICES

Clinical Pharmacy Service

- Drug reference charts compilation
- Pharmacokinetics consult and therapeutic drug monitoring
- Protocols and guidelines development



SERVICES

Medication Management Service

- Individual patient dispensing
- Pharmacy Intravenous Admixture Service (PIVAS)
- Drug cart management
- Ward stock management



SERVICE EVALUATION

July, 2011 to December, 2012 (18months)

Database for documentation of workload, interventions, drug information

The screenshot shows a Windows Internet Explorer browser window displaying a web form titled 'Clinical Pharmacy Daily Workload Documentation: New Item'. The browser's address bar shows the URL: <http://pmh.home/sites/pharmacy/restrict/Lists/Clinical%20Pharmacy%20Services%20Documentation/NewForm.aspx>. The form is a data entry interface with the following fields:

- Ward:
- Date: 26/3/2013 (with a calendar icon)
- No. of patients on wards:
- No. of Patients Reviewed:
- New cases:
- Followup cases:
- No. of MAR reviewed on wards:
- No. of Intervention made:
- No. of Drug Information Provided to Nurses:
- No. of Drug Information Provided to Doctors:
- No. of counselling provided to patients/carer:
- No. of D. D. supplied:
- Others:

The form includes 'Attach File' and 'OK'/'Cancel' buttons. The browser's taskbar at the bottom shows several open applications, including 'Pediatric Satellit...', 'Medication Safe...', 'CANDY', 'Microsoft Excha...', and 'Clinical Pharm...'. The system clock indicates the time is 17:14.

SERVICE EVALUATION

Medication incidents collected from AIRS (Advance Incident Report System)

The screenshot displays two browser windows. The left window, titled 'AIRS Authentication - Windows Internet Explorer', shows the login page for the 'Hospital Authority Advanced Incidents Reporting System'. It includes a 'Login Authentication' section with fields for 'Domain Id' and 'Password', and a 'References' list with seven items. The right window, titled 'HA-AIRS 2.0(Search Engine) - Windows Internet Explorer', shows the search interface with a navigation menu, user information (Candy LAU), and a search criteria form. The search criteria form includes dropdown menus for Cluster Service, Hospital, Service Dept., Reporting Dept., EIS Specialty, Location/Unit, Form Type, Body Parts, Person Involved, and Property Damage. It also has checkboxes for Incident Status and Case Marker.

Hospital Authority Advanced Incidents Reporting System

Login Authentication

Please enter the Domain Id and Password

Domain Id:

Password:

References

- [1. Information for reporters](#)
- Information for filtering administrators
 - [a. Operation guide for filtering persons](#)
 - [b. Tips for filtering persons](#)
- [3. Hospital Filtering Person list](#)
- [4. Root Cause Analysis Application Guidelines \(Sep. 2004\)](#)
- [5. Sentinel and Serious Untoward Event Policy \(Dec 2009\)](#)
- Hospital Guidelines related to complaint and or incident management ([PMH](#) / [CMC](#) / [KWH](#) & [WTSH](#) / [YCH](#))
- [7. RCA Form](#)

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醫院管理局
九龍西聯網
Hospital Authority
Kowloon West Cluster

HA-AIRS 2.0(Search Engine)

User Name: Candy LAU User Id: (lcm303)
26-Mar-2013 17:15:37

Home Reporting Forms Report Status Admin Filter Enquiry Reports Dictionary Maintenance Logout

HA-AIRS 2.0 Search Engine

Select the criteria for searching the incident(s) :

Cluster Service -- All Cluster Service --

Hospital -- All Hospital --

Service Dept. -- All Service Dept --

Reporting Dept. -- All Reporting Dept --

EIS Specialty -- All EIS Specialty --

Location/Unit -- All Location/Unit --

Form Type -- All Form Type --

Body Parts -- All Body-- -- All Part --

Person Involved -- All --

Property Damage -- All --

Incident Status -- All Status -- (Include 'Deleted')

Case Marker

- Complaint case
- Coroner case (not falling within category of Potential Medico-legal incidents)
- EOC
- Media case
- OMB
- OS-Other Statutory
- PCC
- Police case
- Potential Medico-legal Incidents

SERVICE EVALUATION

Satisfaction Survey in September, 2012

Survey on Paediatric Clinical Pharmacy Services and Satellite Pharmacy Service

Background Information

RANK:

- Consultant Senior Medical Officer Associate Consultant MO Resident
 DOM Ward manager Advanced Practice Nurse Nursing Officer
 Nurse Specialist Registered Nurse Enrolled Nurse

WARD: _____

A. Scope of services

According to the following list of services provided by pharmacy, which one will be the most helpful to you? Please indicate your preference in the order of 1-5 (1 is the most useful, 5 is the least useful):

- Clinical Pharmacy service (e.g. consultation service provided to doctors regarding patients drug therapy, and review patient's drug record for possible drug-drug interactions)
 Satellite Pharmacy service (e.g. processing normal and urgent drug orders, ward stock supply)
 Pharmacy Intravenous Admixture Service (PIVAS) (e.g. preparing ready-to-administer syringe or infusion bags)
 Drug information service
 Education service for patients or nurses

B. Clinical Pharmacy Service

Please circle the number that best reflects the extent to which you agree that the following statements:

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1.	Clinical pharmacist can play an important role in assisting the physicians/nurses in managing patient's drug therapy.	1	2	3	4	5
2.	Clinical pharmacist can expedite the clarification on the prescriptions and TPN orders, and smooth out the dispensing/reconstitution process.	1	2	3	4	5
3.	Clinical pharmacist can take up the role of therapeutic drug monitoring of drugs such as aminoglycosides and vancomycin.	1	2	3	4	5
4.	Clinical pharmacist on the ward can assist doctors in selecting a better choice of drugs and drug administration plans for patients.	1	2	3	4	5
5.	Clinical pharmacist can assist in identifying and handling drug-related problems (e.g. administration, compatibility problems of drug and TPN infusions).	1	2	3	4	5
6.	Clinical pharmacist on the ward can intervene in time to minimize medication errors.	1	2	3	4	5
7.	Recommendations provided by clinical pharmacists were helpful and reliable.	1	2	3	4	5
8.	A clinical pharmacist on the ward can help sort out drug-related issues and allow nurses to spend more time with direct patient care activities.	1	2	3	4	5

How do you rank the level of satisfaction with the clinical pharmacy service provided?
 Very satisfied Satisfied Unsatisfied Very unsatisfied

C. Drug Information Service

Please circle the number that best reflects the extent to which you agree that the following statements:

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1.	You can obtain drug information easily from the clinical pharmacist.	1	2	3	4	5
2.	You are satisfied with the response time by clinical pharmacist in answering drug information enquiries.	1	2	3	4	5
3.	It is helpful to have a clinical pharmacist readily available on the ward to answer drug information questions.	1	2	3	4	5

How do you rank the level of satisfaction with the drug information service provided?

Very satisfied Satisfied Unsatisfied Very unsatisfied

D. Satellite Pharmacy service

Please circle the number that best reflects the extent to which you agree that the following statements:

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1.	You are satisfied with the response time by satellite pharmacy in dispensing drugs required by your patients.	1	2	3	4	5
2.	Emergency drugs can be supplied in a timely manner.	1	2	3	4	5
3.	Since more dispensing related tasks are taken up by the satellite pharmacy, the number of medication incidents involved in dispensing can be reduced.	1	2	3	4	5
4.	You are satisfied with the ward stock, trolley items and dangerous drug top-up service.	1	2	3	4	5

How do you rank the level of satisfaction with the drug distribution service provided by the satellite pharmacy?

Very satisfied Satisfied Unsatisfied Very unsatisfied

E. Pharmacy Intravenous Admixture service

Please circle the number that best reflects the extent to which you agree that the following statements:

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1.	Ready-to-use medications with better drug labeling can be provided by PIVAS.	1	2	3	4	5
2.	PIVAS can improve patient drug safety by reducing the risk of fill in drug dilution and reconstitution.	1	2	3	4	5
4.	Nursing time on drug dilution and reconstitution can be reduced.	1	2	3	4	5
5.	Reconstitution or "first dose" in satellite pharmacy can reduce the delay of drug supply related to clarification of prescription and drug related problems.	1	2	3	4	5

How do you rank the level of satisfaction with the drug distribution service provided by the satellite pharmacy?

Very satisfied Satisfied Unsatisfied Very unsatisfied

F. Communication between departments

Please circle the number that best reflects the extent to which you agree that the following statements:

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1.	There is sufficient opportunity for face-to-face	1	2	3	4	5

		1	2	3	4	5
2.	discussion with pharmacy staff					
2.	You welcome more direct face-to-face interaction with pharmacy staff.	1	2	3	4	5
3.	A pharmacist on the ward serves as a good channel between the wards and pharmacy department.	1	2	3	4	5

How do you rank the level of satisfaction with the communication between you and the satellite pharmacy services?
 Very satisfied Satisfied Unsatisfied Very unsatisfied

G. Overall evaluation

How do you rank the level of satisfaction with the overall services provided by satellite pharmacy?
 Very satisfied Satisfied Unsatisfied Very unsatisfied

H. Please list further comments/concerns with regards to Paediatric Clinical Pharmacy Services and Satellite Pharmacy services:

WORKLOAD STATISTICS

Medications reviewed

- **18,305 patient days**

Medication orders screened

- **22,008**

TPN orders reviewed

- **4394**

Drug information provided

- **166**

Unit dose injections prepared by PIVAS

- **102,816**

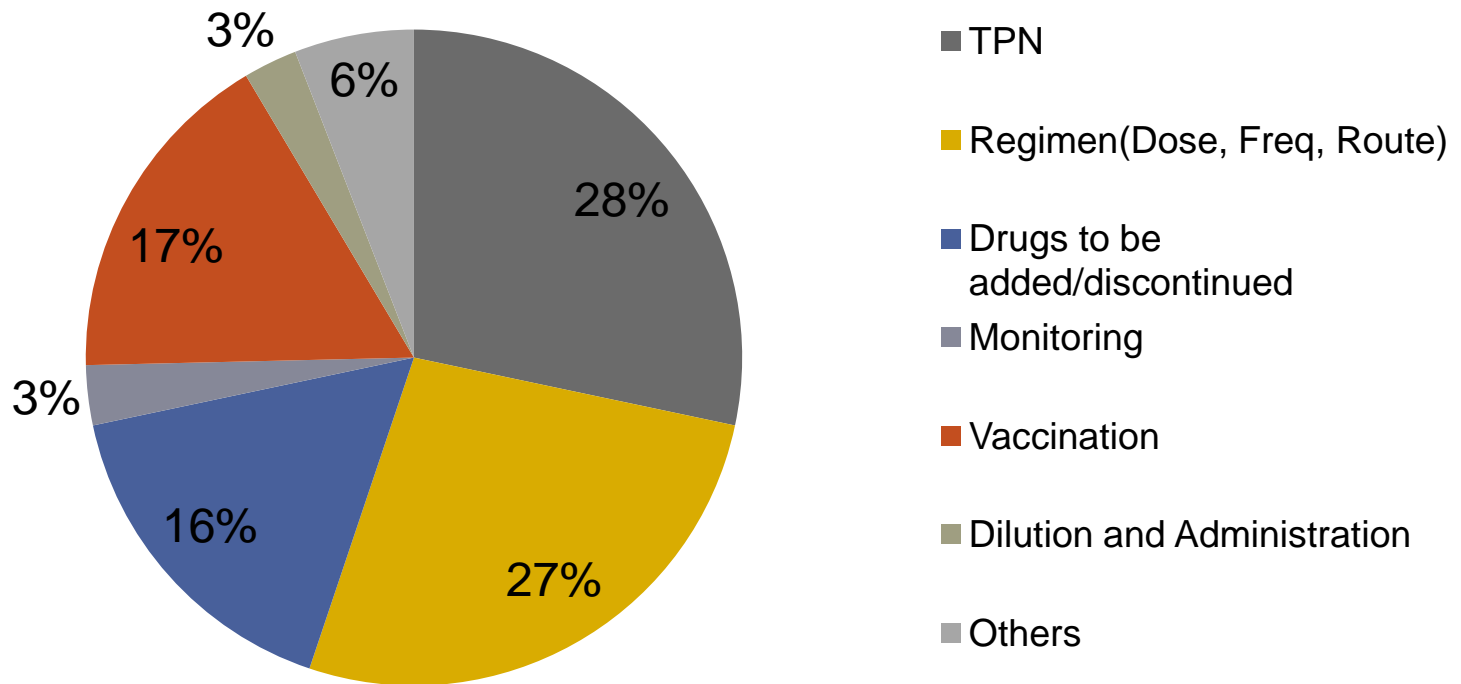
MEDICATION INCIDENT PREVENTION

	Before Satellite Pharmacy	After Satellite Pharmacy
“near miss” per 1000-neonatal-activity-days prevented	7	28

INTERVENTIONS

352 interventions documented

Interventions



EXAMPLE OF INTERVENTIONS



- **Fluconazole: CYP 3A4 inhibitor**
 - increase level of erythromycin
 - QTc prolongation
- This drug-drug interaction was not prompted by computer-checked function

If not prevented, medication incident with severity index ≥ 3

Severity Index

0: Incident occurred but stopped before reaching patient. No consequence.

1: Incident occurred (reached patient) but no injury sustained.

2: Minor injury

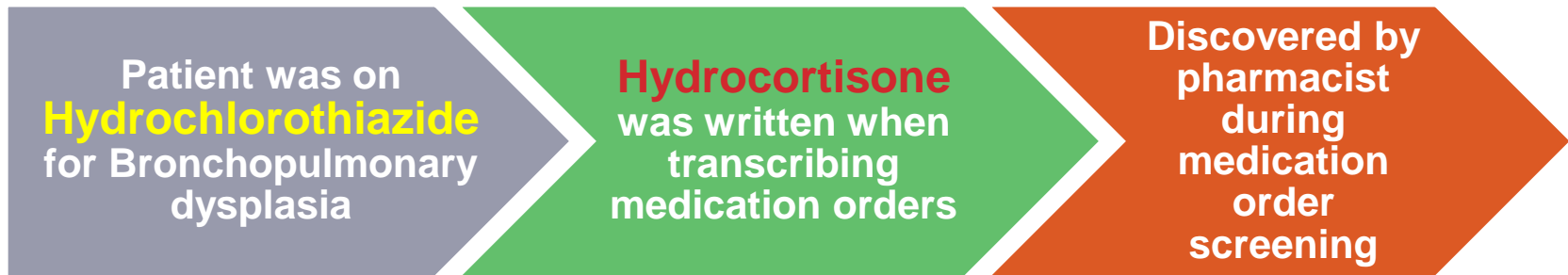
3: Temporary morbidity

5: Major permanent loss of function/disability

4: Significant morbidity

6: Death

EXAMPLE OF INTERVENTIONS



- Dosage of both drugs are similar
 - Both are common medications used in NICU
- Error may be missed out

If not prevented, medication incident with severity index ≥ 3

EXAMPLE OF INTERVENTIONS

Morphine infusion of initial dose **10mcg/kg/hr** was intended to be ordered by doctor

Dilution calculation problem occurred, **20mcg/kg/hr** was prescribed

On dosage checking, discrepancy found before drug was administered

Dose doubled

→ Increased risk of respiratory depression, hypotension

If not prevented, medication incident with severity index ≥ 3

EXAMPLE OF INTERVENTIONS

NICU Infusion calculator

Princess Margaret Hospital
NICU Infusion Calculator

Name HN Number

Bed (optional) NICU Weight: kg

Please input the body weight, targeted dose, infusion rate, then press <Calculate> for dose calculation

Drug	Dosage Range/kg	Targeted Dose	Infusion rate	Dilution
Adrenaline (1mg/ml) 1:1000	0.1-1.5 microgram/kg/min	<input type="text"/> mcg/kg/min	<input type="text"/> ml/hour	Mix in NS, D5, D10
Atracurium (10mg/ml)	<1 month 0.3-0.4 mg/kg/hour >1 month 0.3-0.6 mg/kg/hour	<input type="text"/> mg/kg/hour	<input type="text"/> ml/hour	Mix in NS, D5 [Do not mix atracurium with heparin in D5]
Dobutamine (12.5mg/ml)	2-20 microgram/kg/min	<input type="text"/> microgram/kg/min	<input type="text"/> ml/hour	Mix in NS, D5, D10
Dopamine (40mg/ml)	<1month: 3-20 microgram/kg/min >1month: 5-20 microgram/kg/min	<input type="text"/> microgram/kg/min	<input type="text"/> ml/hour	Mix in NS, D5, D10
Fentanyl (50mcg/ml)	1-5 microgram/kg/hour	<input type="text"/> microgram/kg/hour	<input type="text"/> ml/hour	Mix in NS, D5
Glyceryl Trinitrate (1mg/ml)	0.2-10 microgram/kg/min	<input type="text"/> microgram/kg/min	<input type="text"/> ml/hour	Mix in NS, D5
Isoproterenol / Isoprenaline (0.2mg/ml)	<1month: 0.02-0.3 microgram/kg/min >1month: 0.02-1 microgram/kg/min	<input type="text"/> microgram/kg/min	<input type="text"/> ml/hour	Mix in D5
Ketamine	<1month: 0.5-2 mg/kg/hour	<input type="text"/> mg/kg/hour	<input type="text"/> ml/hour	Mix in NS, D5

EXAMPLE OF INTERVENTIONS

NICU Infusion calculator

NICU Infusion Entry Form - Windows Internet Explorer

http://pmh.home/sites/pharmacy/Calculator/NICU%20infusion%202010.htm

File Edit View Favorites Tools Help

NICU Infusion Entry Form

(0.2mg/ml)	>1month: 0.02-1 microgram/kg/min <1month: 0.5-2 mg/kg/hour	<input type="text"/> microgram/kg/min	<input type="text"/> ml/hour	Mix in NS, D5
Ketamine (50mg/ml)	>1month: 0.6-2.7 mg/kg/hour	<input type="text"/> mg/kg/hour	<input type="text"/> ml/hour	Mix in NS, D5
Lignocaine (20mg/ml)	10-50 microgram/kg/min	<input type="text"/> microgram/kg/min	<input type="text"/> ml/hour	Mix in D5
Magnesium Sulphate (500mg/ml)	20-75mg/kg/hour	<input type="text"/> mg/kg/hour	<input type="text"/> ml/hour	Mix in NS, D5
Midazolam (5mg/ml)	0.5-5 microgram/kg/min	<input type="text"/> microgram/kg/min	<input type="text"/> ml/hour	Mix in NS, D5
Morphine (15mg/ml)	<1month: 5-40 microgram/kg/hour 1-6month: 10-30 microgram/kg/hour >6month: 20-30 microgram/kg/hour	<input type="text"/> 10 microgram/kg/hour	<input type="text"/> 2 ml/hour	Mix in 100ml NS, D5 [Incompatible with heparin]
Norepinephrine (1mg/ml)	0.02-1 microgram/kg/min	<input type="text"/> microgram/kg/min	<input type="text"/> ml/hour	Mix in D5
Prostaglandin E2 [Dinoprostone] (10mg/ml)	5-20 nanogram/kg/min	<input type="text"/> nanogram/kg/min	<input type="text"/> ml/hour	Mix in NS, D5
Thiopentone (500mg)	1-3 mg/kg/hour	<input type="text"/> mg/kg/hour	see calculated result	Mix in NS [Do not mix with heparin]

Calculate

Reference:
 1. BNF for Children 2010
 2. Medicines for Children, 2003. RCPCH
 3. Pediatric Injectable Drugs 8th edition, ASEP

Disclaimer: All calculations must be confirmed by doctor before use
 @ prepared by PMH Pharmacy and Paediatric Department (Oct 2011)

EXAMPLE OF INTERVENTIONS

NICU Infusion calculator

NICU Infusion Medications - Windows Internet Explorer

Princess Margaret Hospital : NICU Infusion Medications (NICU)

Name: HN No: Bed: Pt wt: 1 kg

Prepared on: 11, April 2013

Drug (Concentration)	Dosage Range/kg	Targeted Dose	Targeted Inf Rate	Dilution
Morphine (15mg/ml) Inj	<1month: 5-40 microgram/kg/hour; 1-6month:10-30 microgram/kg/hour; >6month: 20-30 microgram/kg/hour	10 microgram/kg/hour	2 ml/hour	Mix 0.5 mg up to 100ml with NS or D5. Dilution Method: Add 7.5mg (0.5ml Morphine 15mg/ml Inj) to 7ml H2O to make a DILUTED MORPHINE solution [7.5mg per 7.5ml]; Mix 0.5 mg (0.5 ml diluted morphine) up to 100ml with NS or D5 [Incompatible with heparin]

Prepared by: _____ (Doctor) Checked by: _____ (Nurse)

Disclaimer: For PMH NICU Use Only. All calculations must be confirmed by doctor before use.

SHORTEN DISPENSING TIME

	Before Satellite Pharmacy	After Satellite Pharmacy
Turn around time for routine orders	3 hr	20 min
Turn around time for urgent orders	30 min	8 min

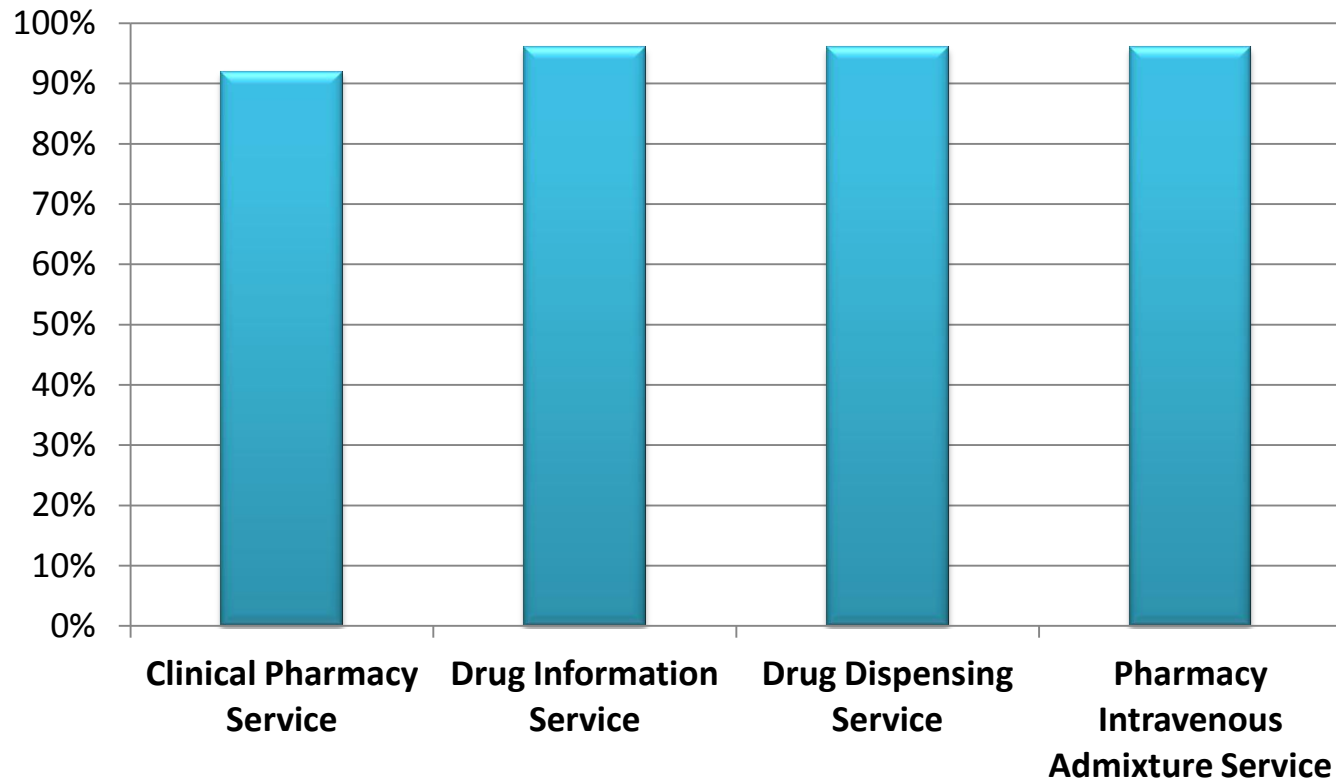
MEDICATION INCIDENTS

Medication Incidents

During operation hours	During non-operation hours
None	11
	<ul style="list-style-type: none">• 9 discovered by clinical pharmacist during medication order screening<ul style="list-style-type: none">• 7 dose omissions• 1 transcription error• 1 wrong dose

SATISFACTION SURVEY

Overall Satisfaction



CONCLUSION

Pediatric Satellite Pharmacy

Reduce medication errors

Reduce time for drug dispensing

Save nursing time for drug preparation

Well-accepted by most doctors and nurses

Improve overall patient quality and safety



THANK YOU!!