

Improving Appropriate Management Of Chemotherapy Drugs In Paediatric Oncology, Hospital Tunku Azizah

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Loo Yee Shen



**Siti Syahirah Alyaa
Bt Saidi**



Selection Of Opportunities For Improvement

PROBLEM IDENTIFICATION

No.	Problem
1	High incidence of leaking or spillage for chemo preparations
2	Large number of wastage on reconstituted chemotherapy drugs among oncology patient
3	Low percentage of appropriate management of chemotherapy drugs in paediatric oncology
4	Incidence of long waiting time on receiving chemotherapy prescriptions from gynaeoncology ward
5	Incidence of long waiting time on confirming preparation for Intravitreal Topotecan and Melphalan among ophthalmology patient

PROBLEM VERIFICATION

No.	Problem	Problem Verification	Solution
1	High incidence of leaking or spillage for chemo preparations	0.7% of reconstituted chemo preparation were leaking during counterchecking process or administering in the ward from February 2023 to July 2023.	Product complaints on sodium chloride drip were reported to NPRA and respective company. Respective company was implementing several action to improve the quality of drip.
2	Large number of wastage on reconstituted chemotherapy drugs among oncology patient	2.1% reconstituted chemotherapy drugs were wasted from February 2023 to July 2023.	Discussion was carried out with doctors. Doctors will inform pharmacists about the cancellation on chemo preparation as earlier as possible.
3	Low percentage of appropriate management of chemotherapy drugs in paediatric oncology	Average 23.6% incidence of inappropriate management of chemotherapy drugs from February 2023 to July 2023.	QAQI project is planned to improve this problem.
4	Long waiting time on receiving chemotherapy prescription from gynaeoncology ward	4.1% Of chemotherapy prescription was received after 10 am February 2023 to July 2023.	Discussion was carried out with doctors and clinical pharmacists. A media (What'sapp group) was created among clinical pharmacists and staff nurse to update CDR pharmacy on the addition of chemotherapy.
5	Long waiting time on confirming preparation for Intravitreal Topotecan and Melphalan among ophthalmology patient	6.7% case need to wait for confirmation on preparation of Intravitreal Topotecan and Melphalan from February 2023 to July 2023.	Discussion was carried out with radiologist and ophthalmologist on the timing of ordering Topotecan and Melphalan before carrying out procedure.

PROBLEM PRIORITIZATION

PROBLEM	S	M	A	R	T	Total
High incidence of leaking or spillage for chemo preparations	33	29	33	25	28	148
Large number of wastage on reconstituted chemotherapy drugs among oncology patient	33	30	33	28	25	149
Low percentage of appropriate management of chemotherapy drugs in pediatric oncology	33	33	33	33	33	165
Incidence of long waiting time on receiving chemotherapy prescription from gynaeoncology ward	30	25	33	23	28	139
Incidence of long waiting time on confirming preparation for Intravitreal Topotecan and Melphalan among ophthalmology patient	30	28	33	29	25	145

Rating Scale: 1 – Low to 3 – High

Results were obtained from nominal group technique among 11 members.

PROBLEM TO BE STUDIED

**Low Percentage of
Appropriate Management of
Chemotherapy Drugs In
Paediatric Oncology**



REASON OF SELECTION

SERIOUSNESS

GLOBAL

Heike et al., 2019

Total of 406 **chemotherapy prescribing errors** were intercepted that affected 375 (2%) of the total orders which **causes the consequences such as reduced therapeutic efficacy (0.44%), the need for increased monitoring (0.48%), prolonged hospital stay (0.55%), and fatality (0.02%).**

Elsaid et al., 2013

Despite decades of increased knowledge of the toxicities and safety standards of chemotherapy, prescribing errors such as **transcription/communication errors** and **dosing errors in oncology practice** continue to be a **major issue** that causes patient harm.

Ford et al., 2006

In this paper-based system, errors were classified as either **order-writing, dispensing, or administration-related.**

MALAYSIA

Chua et al., 2009

Administration errors are **more prevalent in oncology paediatric wards** since medications are more complex. 10.4% of administration errors were considered as **potentially life-threatening.**

Chua et al., 2010

Drug administration errors are as common in paediatric wards in Malaysia as in other countries. The most common types of drug administration errors were incorrect time of administration (28.8%), followed by incorrect drug preparation (26%), omission errors (16.3%) and incorrect dose (11.5%).

Ong et al., 2013

Dispensing error were **wrong diluents/ wrong amount of diluents, exceeding stability time after reconstitution** can cause **harmful clinical outcomes** to patients.

SERIOUSNESS

GLOBAL

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Elsaid et al., 2013

Despite decades of toxicities and safety prescribing errors such as **errors** and **dosing errors** to be a **major issue** that

Ford et al., 2006

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MALAYSIA

Chua et al., 2009

Administration errors are **more prevalent in oncology paediatric wards** since medications are more complex. 10.4% of administration errors were considered as **potentially life threatening**

- ☐ **Reduce Therapeutic Efficacy**
- ☐ **Life-threatening Clinical Outcomes**
- ☐ **Prolong Hospital Stay**
- ☐ **Increased Need For Monitoring**

mon in paediatric tries. The most on errors were 3%), followed by on errors (16.3%)

Ong et al., 2013

Dispensing error were **wrong diluents/ wrong amount of diluents, exceeding stability time after reconstitution** can cause **harmful clinical outcomes** to patients.

MEDICATION ERROR

Incidence of double dose for chemotherapy in oncology ward (2016)



Weight: 11kg
Height: 111cm
BSA: **0.58m²**

**WRONG
CALCULATION**



Weight: 11kg
Height: 111cm
BSA: **1.17m²**

RESULTS

CHEMOTHERAPY

IV Cisplatin 40mg over 8H
IV Lomustine 40mg
IV Vincristine 0.9mg

CORRECT DOSE

CHEMOTHERAPY

IV Cisplatin 80mg over 8H
IV Lomustine 80mg
IV Vincristine 1.8mg

DOUBLE DOSE

ADVERSE EVENTS

- **Cisplatin toxicity**
 - developed acute kidney injury
- **Vincristine toxicity**
 - developed neuropathic pain and burning sensation
 - given IV Folinic 15mg q3H and Syp Carbamazepine 20mg TDS
- **Lomustine toxicity**
 - severe mucositis on whole throat

- ☐ Harm to patient
- ☐ Reduce treatment outcome
- ☐ Prolong hospitalization
- ☐ Increase healthcare cost

APPROPRIATENESS

Collins, C. M., & Elsaid, K. A.,
2011⁷

Healthcare failure modes and effects analysis revealed **hazard scores in the prescribing and administration components in chemotherapy.** Computerized Provider

Order F
0.023
elimin
signifi

Ranchon, F., et.al,
2011⁸

A study at French university hospital **detected 5.2% of 6,607 chemotherapy errors (91% prescription errors, 8% pharmacological and 1% administration error)** but

If the
would
a cost

- Improve patient safety and treatment outcome
 - Reduce hospitalization period
 - Reduce healthcare cost

Reinhardt,
H.et.al,
2019⁹

efficacy (0.44%), increased frequent monitoring (0.48%), an extended hospital stay (0.55%), and fatalities (0.02%). Appropriate prescribing by checking the order history, the patient's medical file, and having a thorough **understanding of chemotherapy protocols were the most effective methods for error prevention.**

MEASURABLE

Percentage of appropriate management of chemotherapy drugs

REMEDIAL

Remediable by appropriate strategies change and multidisciplinary approach

TIMELINESS

Can be completed in a short period of time

PROBLEM ANALYSIS

WHAT

Management of chemotherapy drug was **inappropriate** across the process of prescribing, preparing, dispensing and storage of chemotherapy drug.

WHY

Weakness of system and work process with **lack of knowledge** and awareness among staff

WHERE

In Paediatric Oncology ward **(10B)** in Hospital Tunku Azizah

WHO

Doctors, Nurses, Pharmacists

WHEN

From February 2023 until August 2024

HOW

Inappropriate management lead to **serious adverse effect** among patient and **increased healthcare cost**



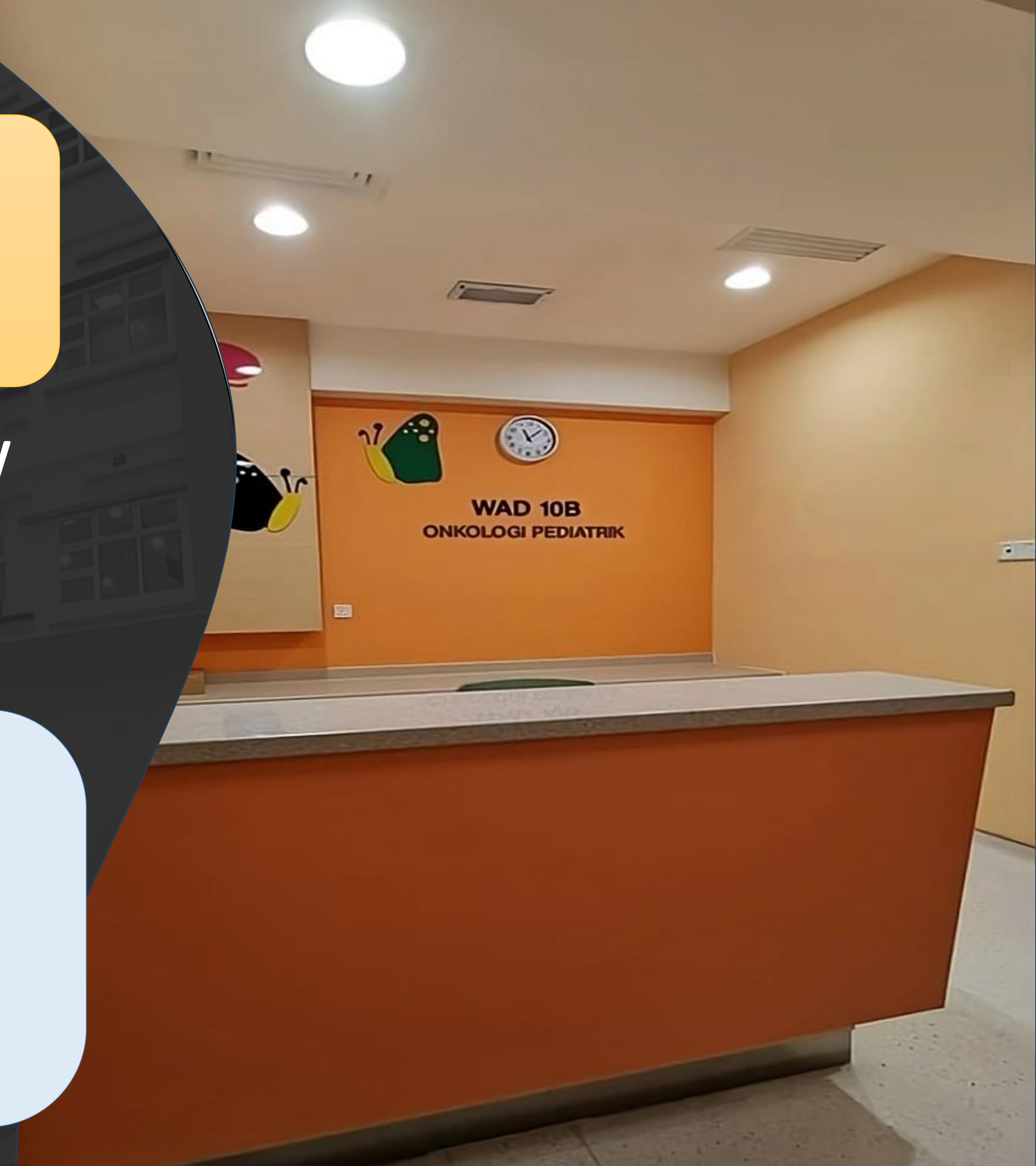
HOSPITAL TUNKU AZIZAH
(HOSPITAL WANITA & KANAK-KANAK)

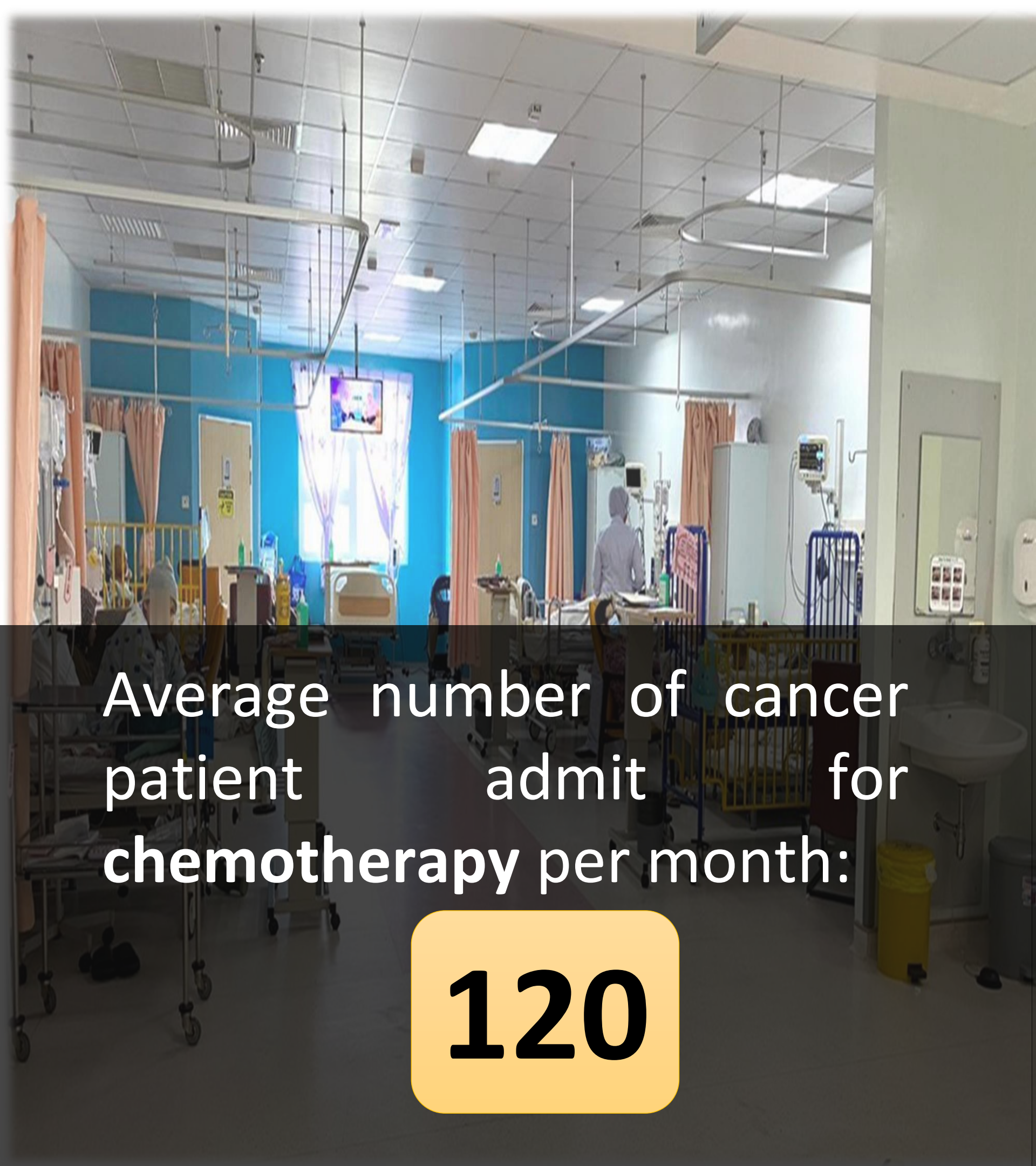
INTRODUCTION

The Largest Paediatric Oncology Centre

Treating >30% of all new
childhood cancer patients

**Training Paediatric
Oncology Centre for
sub-specialist**





Average number of cancer
patient admit for
chemotherapy per month:

120



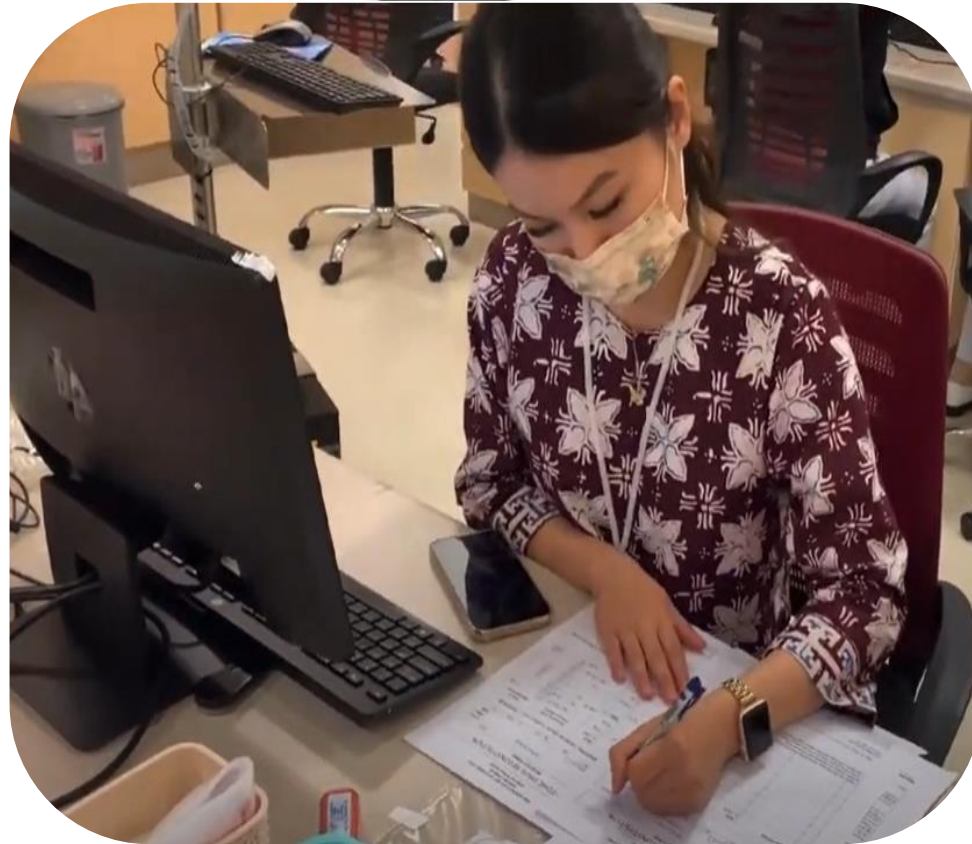
Average number of reconstituted
intravenous(IV) chemotherapy
drug by CDR pharmacy per
month:

800

The image shows a 3D-rendered presentation slide. The background is a solid light blue. In the center, there is a white rectangular box with a thin white border. Inside this box, the words "DAILY" and "WORKFLOW" are written in a large, bold, black sans-serif font, stacked vertically. Surrounding the central box are several light blue rectangular blocks of varying sizes, some floating in the air and others appearing to be attached to the wall, creating a modern, architectural feel. The lighting is soft, casting subtle shadows on the wall.

DAILY WORKFLOW

Prescribing



Specialist/ Trainee
Subspecialist prescribe
chemotherapy **manually**
by using **cytotoxic drug**
reconstitution (CDR)
form.

UNIT REKONSTITUSI UBAT SITOTOKSIK (CDR)
JABATAN FARMASI
HOSPITAL TUNKU AZIZAH

CYTOTOXIC DRUG RECONSTITUTION REQUEST FORM

DATE:

NAME:

MYKID/ MYKAD:

WARD:

Please [V]: New case ☐

Repeat case ☐

AGE:

5yo

SEX:

M (F)

WT:

14

kg

HT:

102

cm

BSA:

0.62 m²

DIAGNOSIS:

acute lymphoblastic lymphoma / leucemia ALL - protocol 1H

No.	Chemotherapy	Dose (....m ²)	Dose prescribed (infusion/bolus)	Date of PREPARATION*
1	iv mercurine	15mg	0.9mg in 10ml NS	07-09/24 (10B)
2	iv daunorubicin	30mg	18mg in 80ml NS	07-09/24
3	im pegaspasime	2500 unit	1550 unit	07-09/24
4	iv methotrexate		125mg in 5ml NS	07-09/24
				07-09/24
				07-09/24
				07-09/24
				07-09/24

**Cytotoxic Drug
Reconstitution Request
Form
(CDR Request Form)**

No. Keluaran: 01

No. Pindaan: 01

In-Patient Prescription

<u>In-Patient Prescription</u>															
Name _____										Weight _____					
MyKid / MyKad _____										Height _____					
RN _____										BSA _____					

		Date														
		Time	A	B	A	B	A	B	A	B	A	B	A	B	A	B
		6pm														
		HIS														

MO Sign & Chop Specialist

Differences:

- Chemotherapy drug for each regimen
- Diluent
- Volume of diluent
- Infusion hour
- Date of preparation

1

Prescribing

2

Reconstituting

Pharmacy &
Clean Room

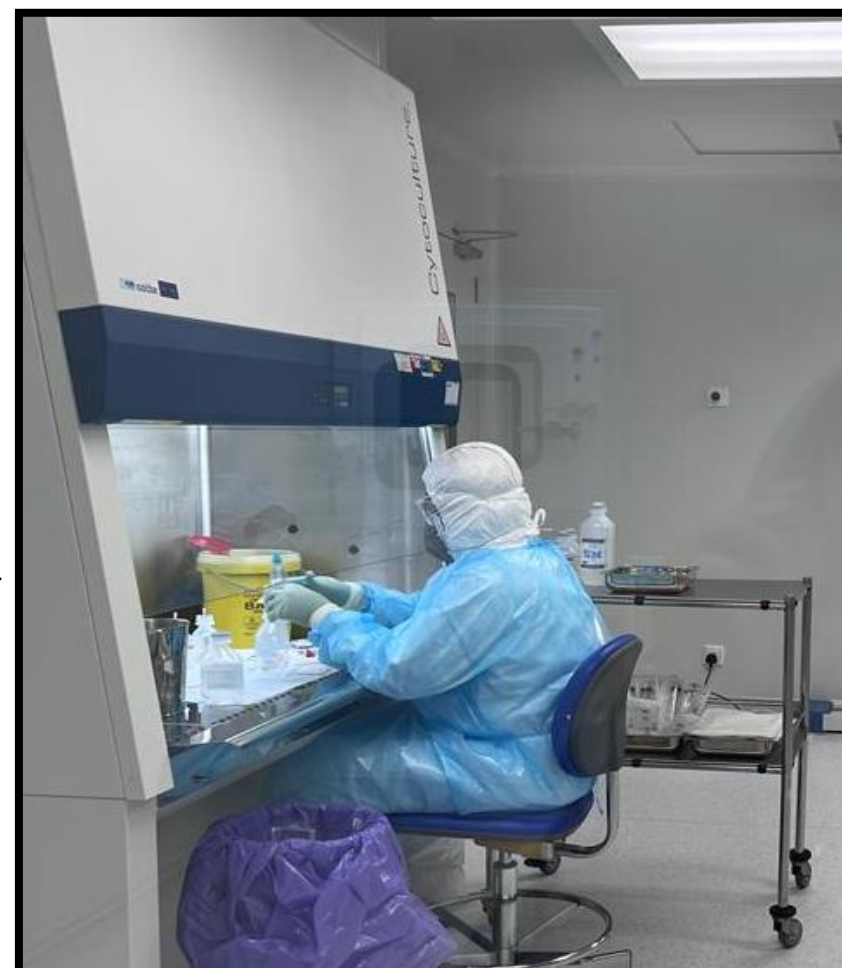
Pharmacist/ Assistant Pharmacist:

- Screen CDR form
- Prepare worksheet, label and chemo bag
- Counterchecking

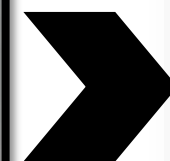
Process of reconstitution



Materials



**Reconstitute in
CLEAN ROOM**



Reconstituted chemotherapy drugs



Syringe



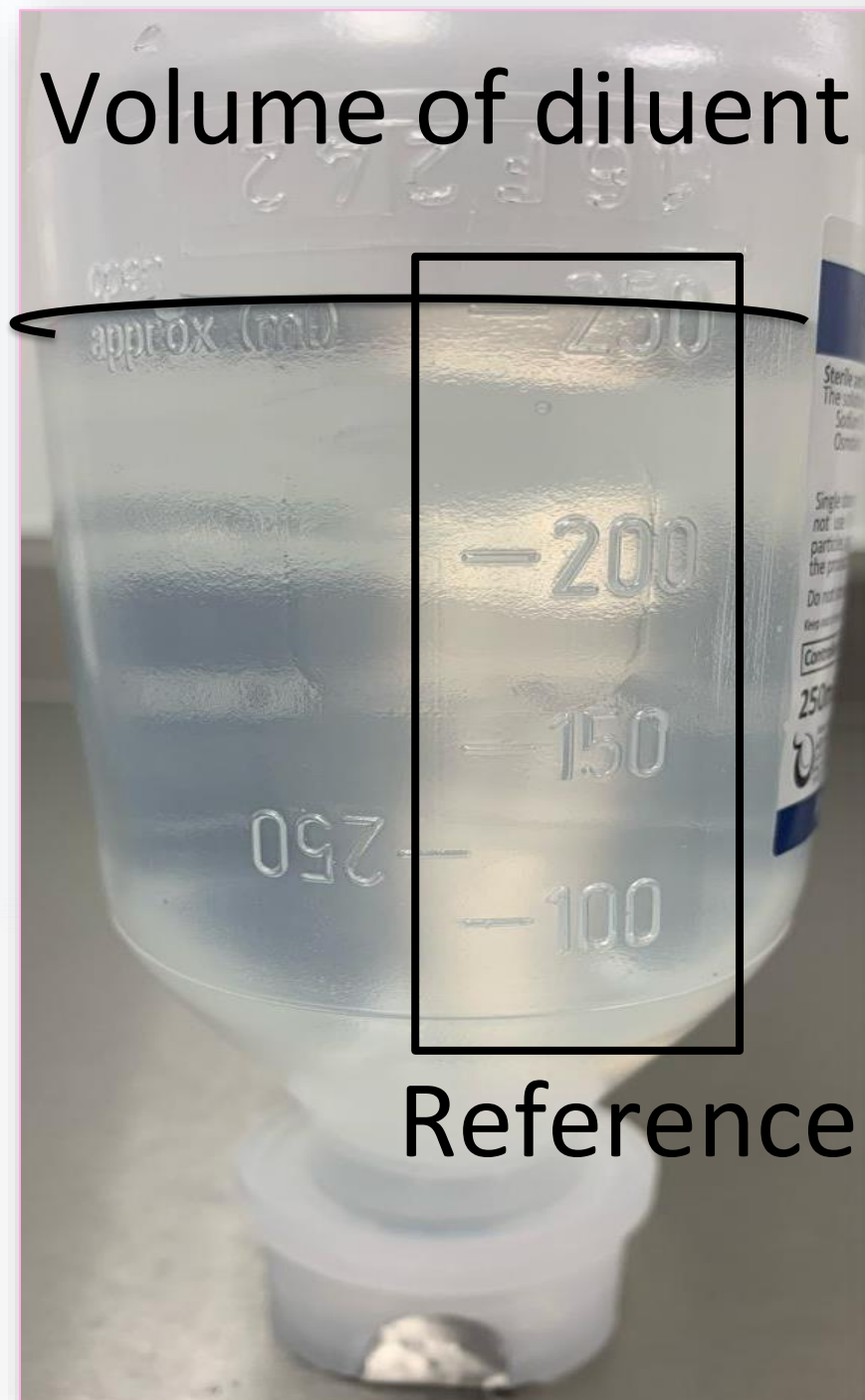
Infusion drip

1

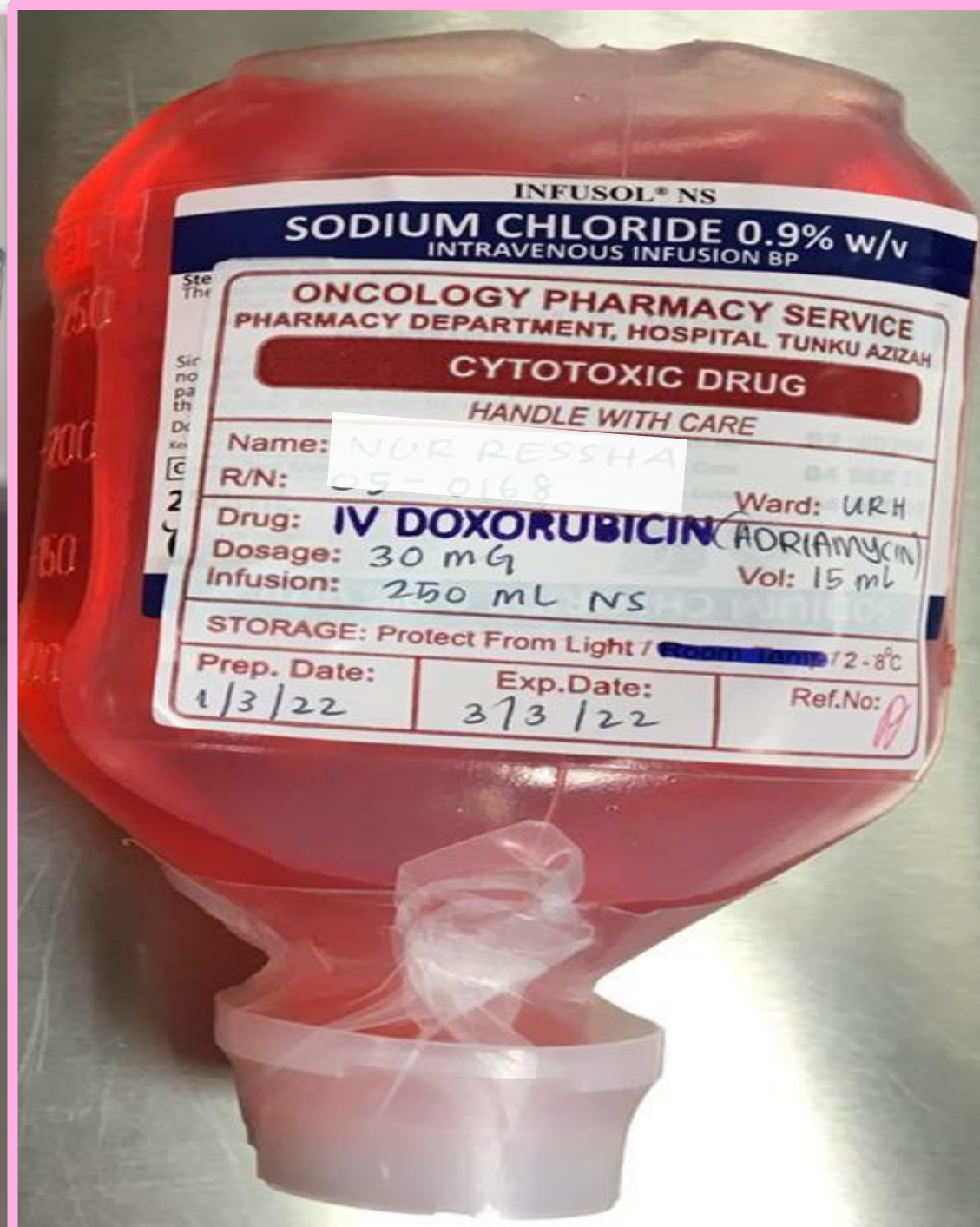
Staff Nurse:

Collect and Countercheck chemotherapy from pharmacy

Volume of diluent



Reference

**CRITERIA for counterchecking:**

- Patient's Details
- Reconstituted Chemotherapy drug
 - (a) Dose
 - (b) Preparation and expiry date
 - (b) Volume of diluent
 - (c) Colour and characteristics
 - (d) Storage

Ward

1

Prescribing

2

Reconstituting

Pharmacy
& Clean
Room

Pharmacy

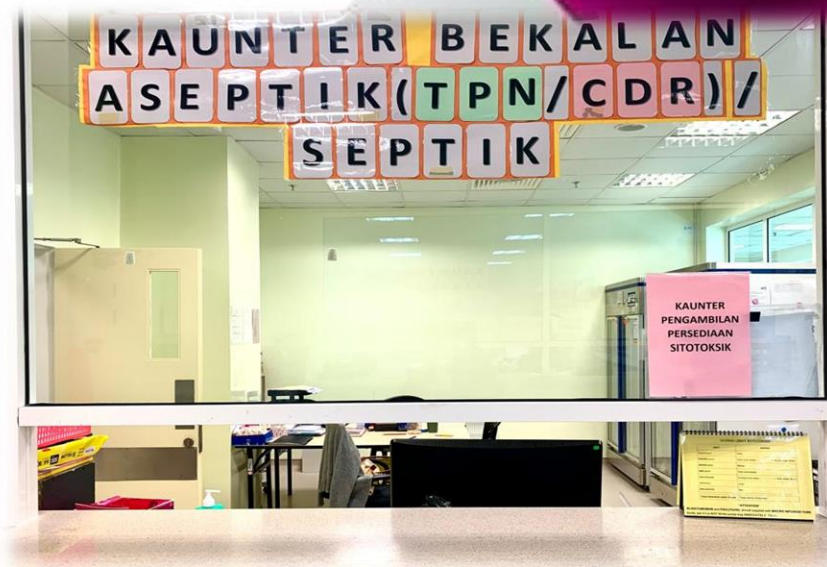
3

Dispensing

Pediatric
Oncology
Ward

4

Administering



TERMS AND DEFINITIONS

Management of Drugs

Include:

- Selection of drugs
- Use of drugs (prescribing, packaging, dispensing and counselling)
- Storage and distribution

Among personnel with appropriate skill and attitude

(WHO guide on Drug Management 2004)

Chemotherapy Drugs

- Drugs stop the growth of cancer cells, either by killing the cells or by stopping them from dividing.
- Can be given by mouth, injection, or infusion, or on the skin, depending on the type and stage of the cancer

(National Cancer Institute)

TERMS AND DEFINITIONS

- ✓ Patient's details
- ✓ Regimen
- ✓ Drug
- ✓ Dose
- ✓ Diluent
- ✓ Volume of infusion
- ✓ Concentration of drug
- ✓ Date of preparation
- ✓ Proper monitoring

Doctor



Pharmacist



- ✓ Patient's details
- ✓ Regimen
- ✓ Drug
- ✓ Dose
- ✓ Diluent
- ✓ Volume of infusion
- ✓ Concentration of drug
- ✓ Date of preparation

APPROPRIATE MANAGEMENT OF CHEMOTHERAPY DRUGS

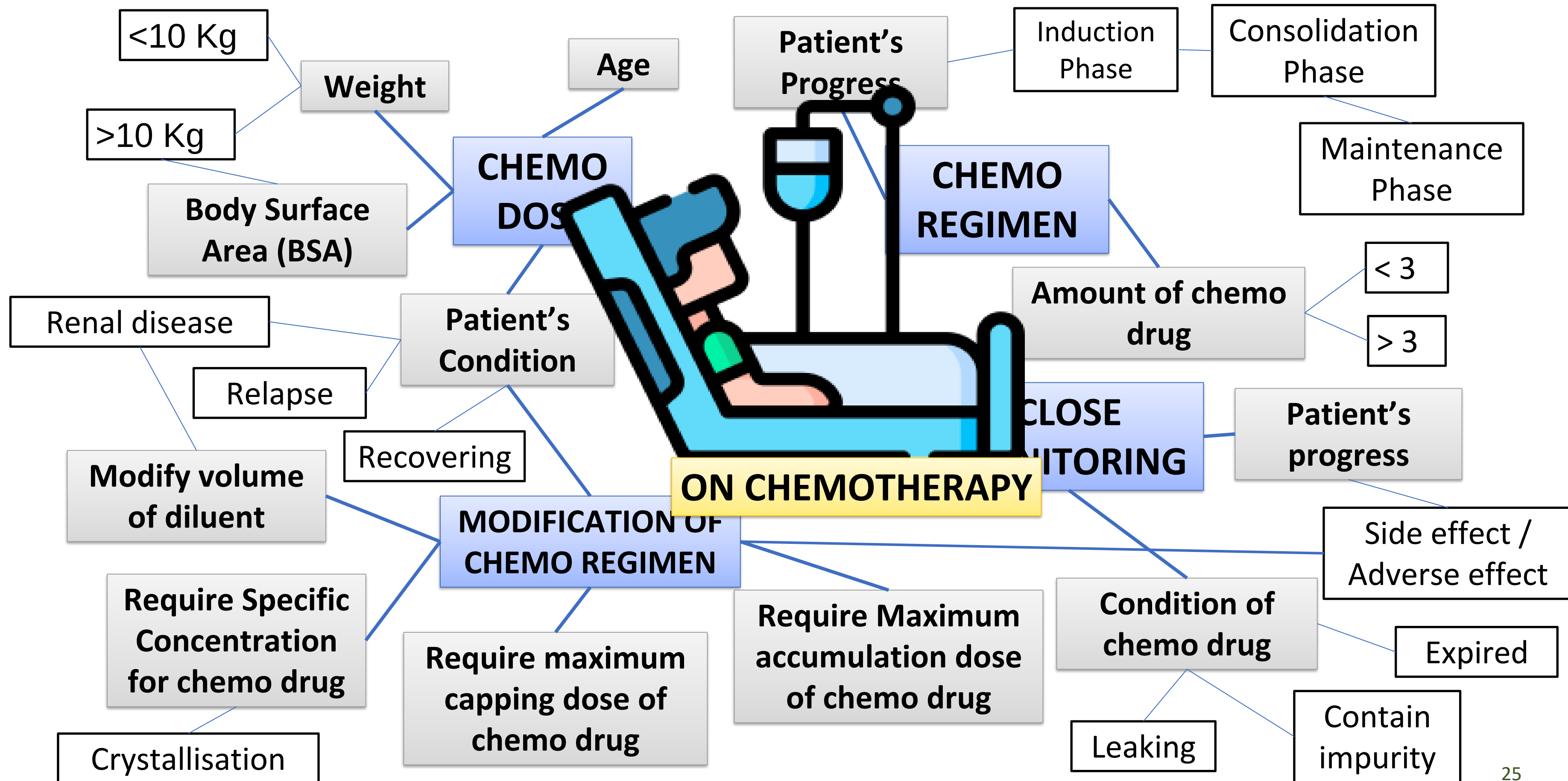
- ✓ Volume of infusion
- ✓ Infusion rate
- ✓ Proper monitoring

Nurse

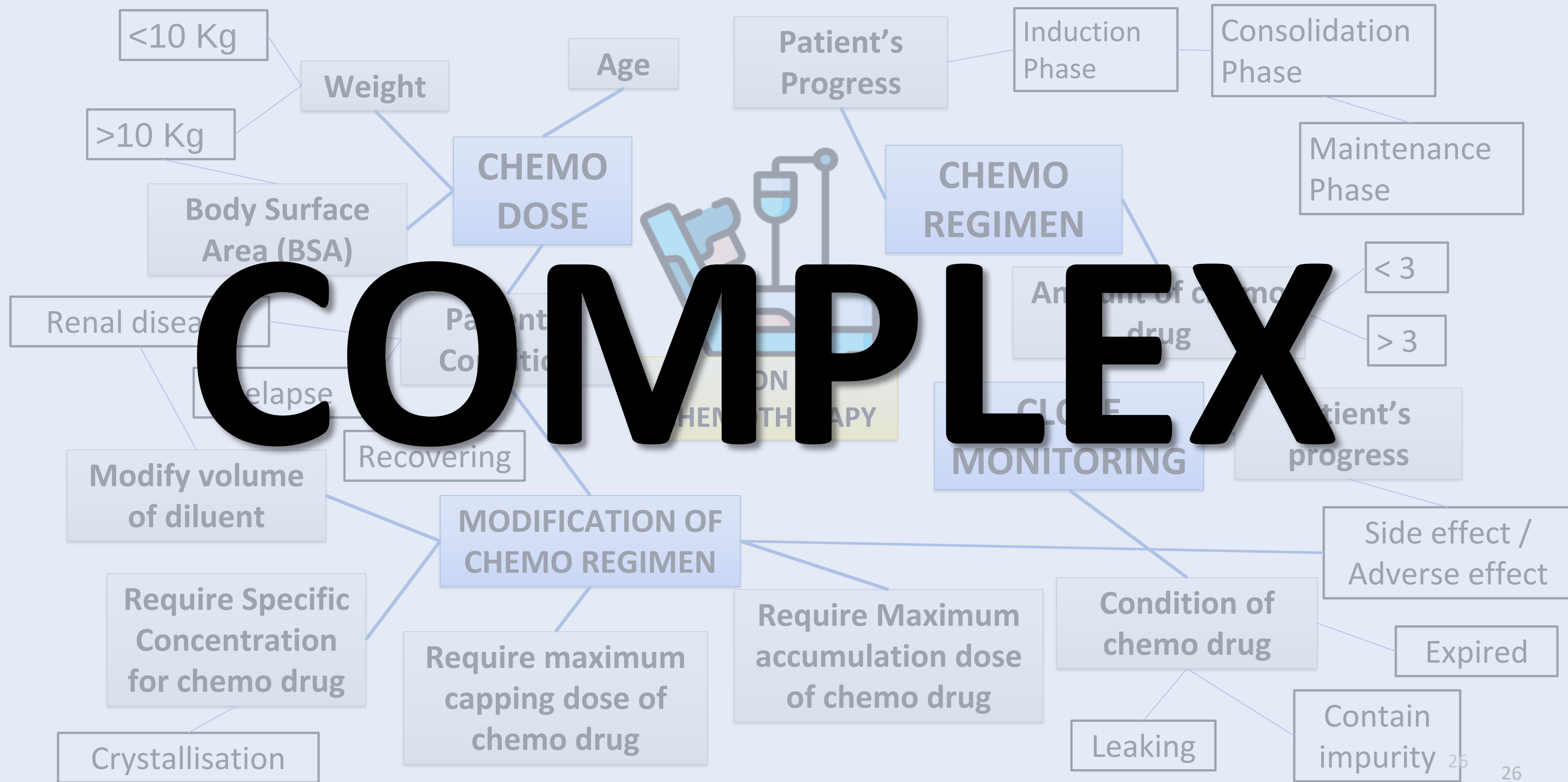


- ✓ Patient's details
- ✓ Drug
- ✓ Dose
- ✓ Diluent

IMPORTANT ASPECTS FOR CANCER CHILDREN



IMPORTANT ASPECTS FOR CANCER PATIENT



PROBLEM STATEMENT



A survey conducted in **February 2023 to July 2023** showed that only **76.4% of incident of appropriate management of chemotherapy drugs** in paediatric oncology.



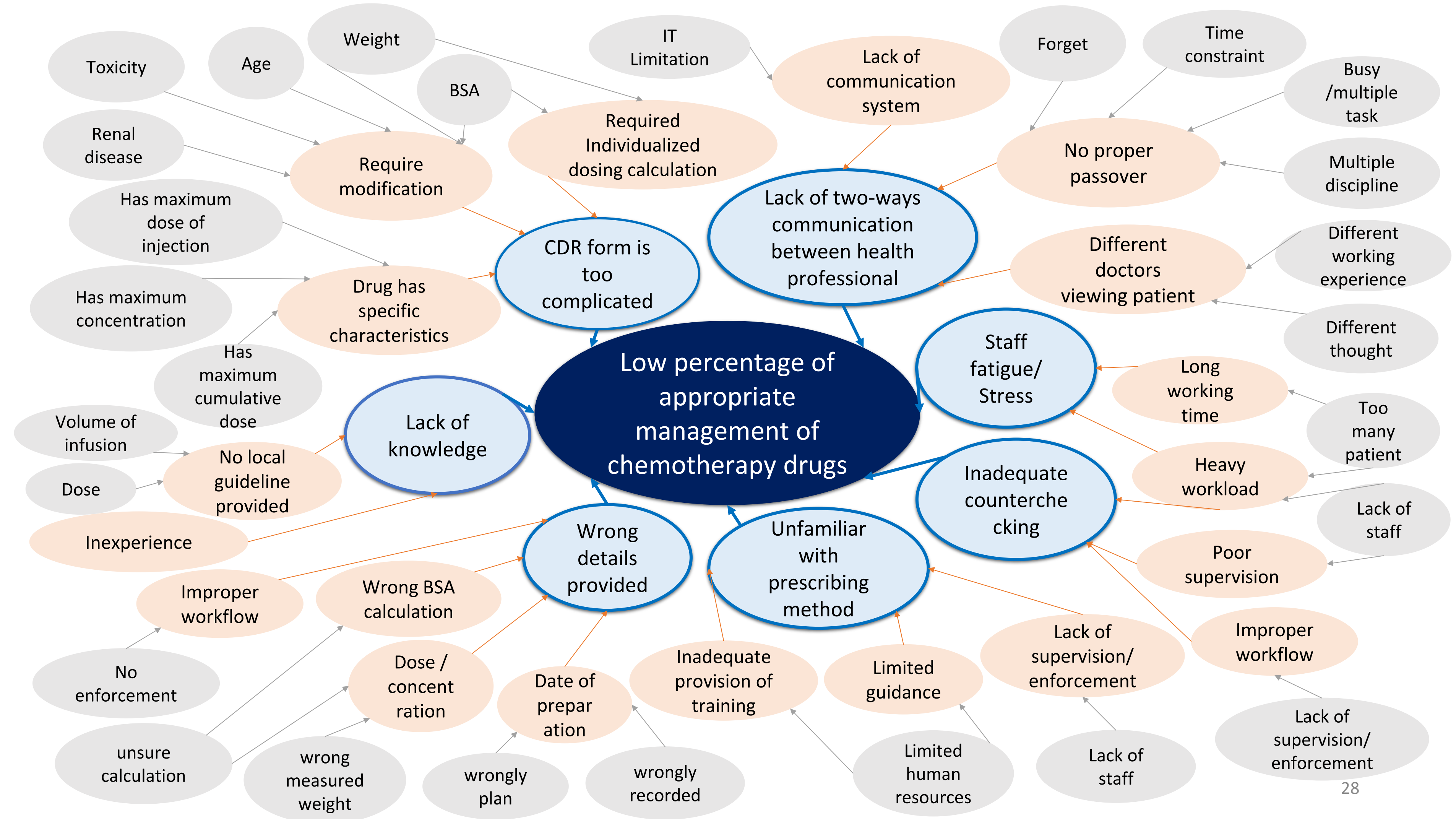
This will cause **poor clinical outcomes** and **increase risk of adverse effects of chemotherapy** as well as compromising total patient care.



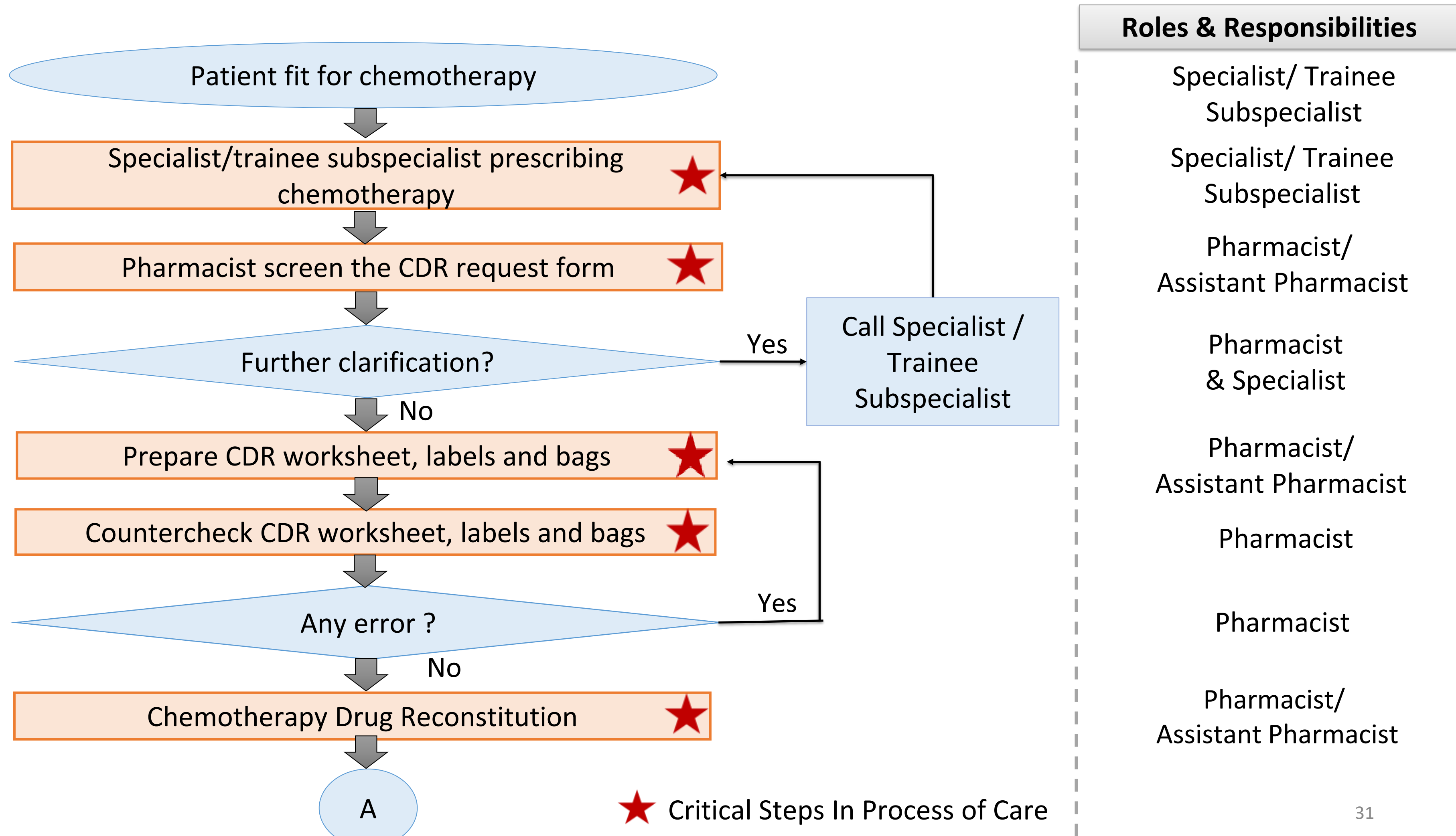
Multiple factors including CDR form is too complicated, lack of knowledge, lack of two-ways communication between health professional, staff fatigue, inadequate counterchecking, wrong details provided and unfamiliar with prescribing method may contribute to this problem.

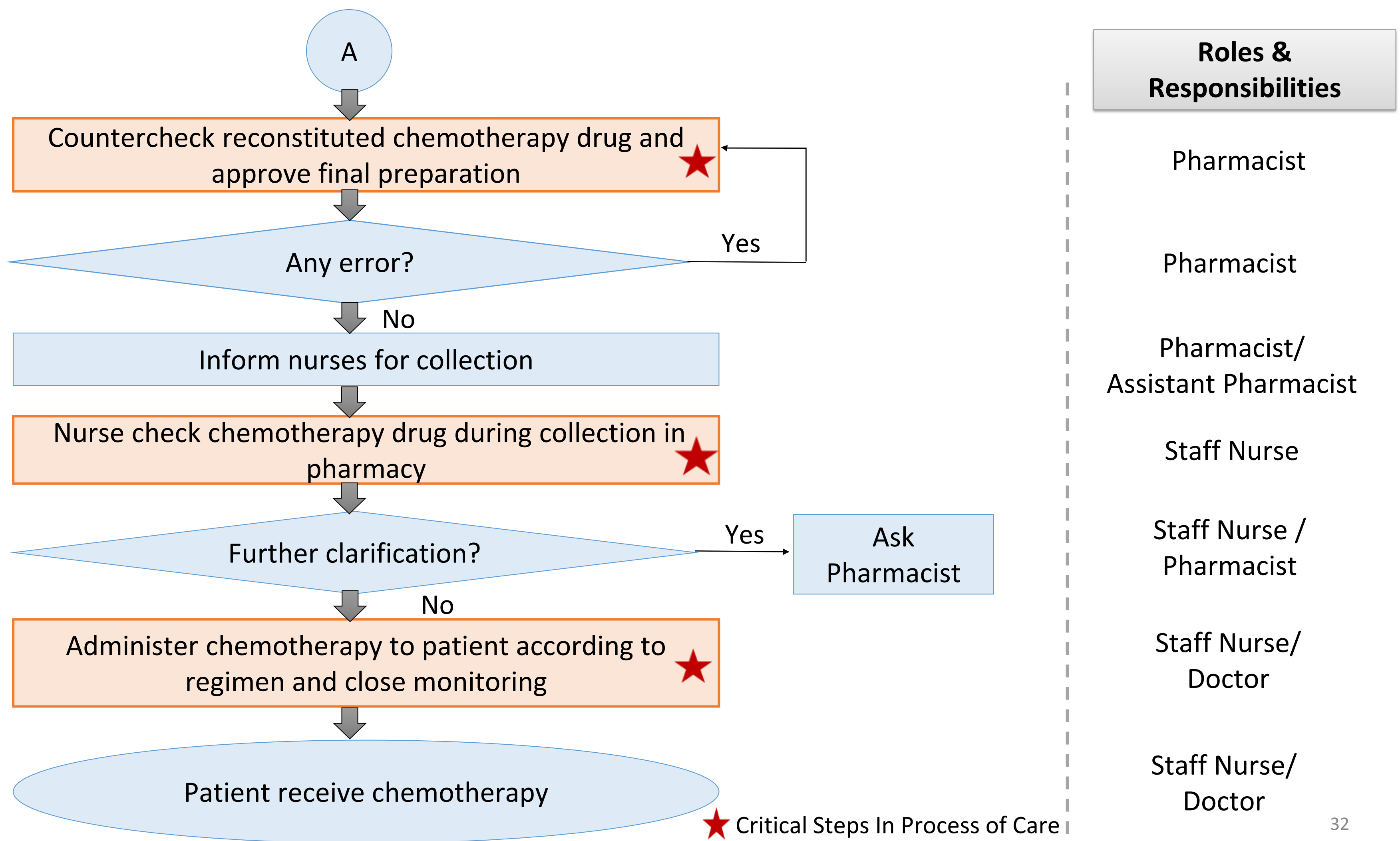


This study aims to **improve the percentage of appropriate management of chemotherapy drugs in paediatric oncology** to achieve optimal treatment outcome and reduce healthcare cost.



PROCESS OF CARE





A stack of white folders is positioned in the upper left corner of the frame, partially overlapping. The background is a solid, deep blue. The text 'MODEL OF GOOD CARE' is centered in a large, bold, white sans-serif font. Below the text is a thin, white, hand-drawn style horizontal line.

MODEL OF GOOD CARE

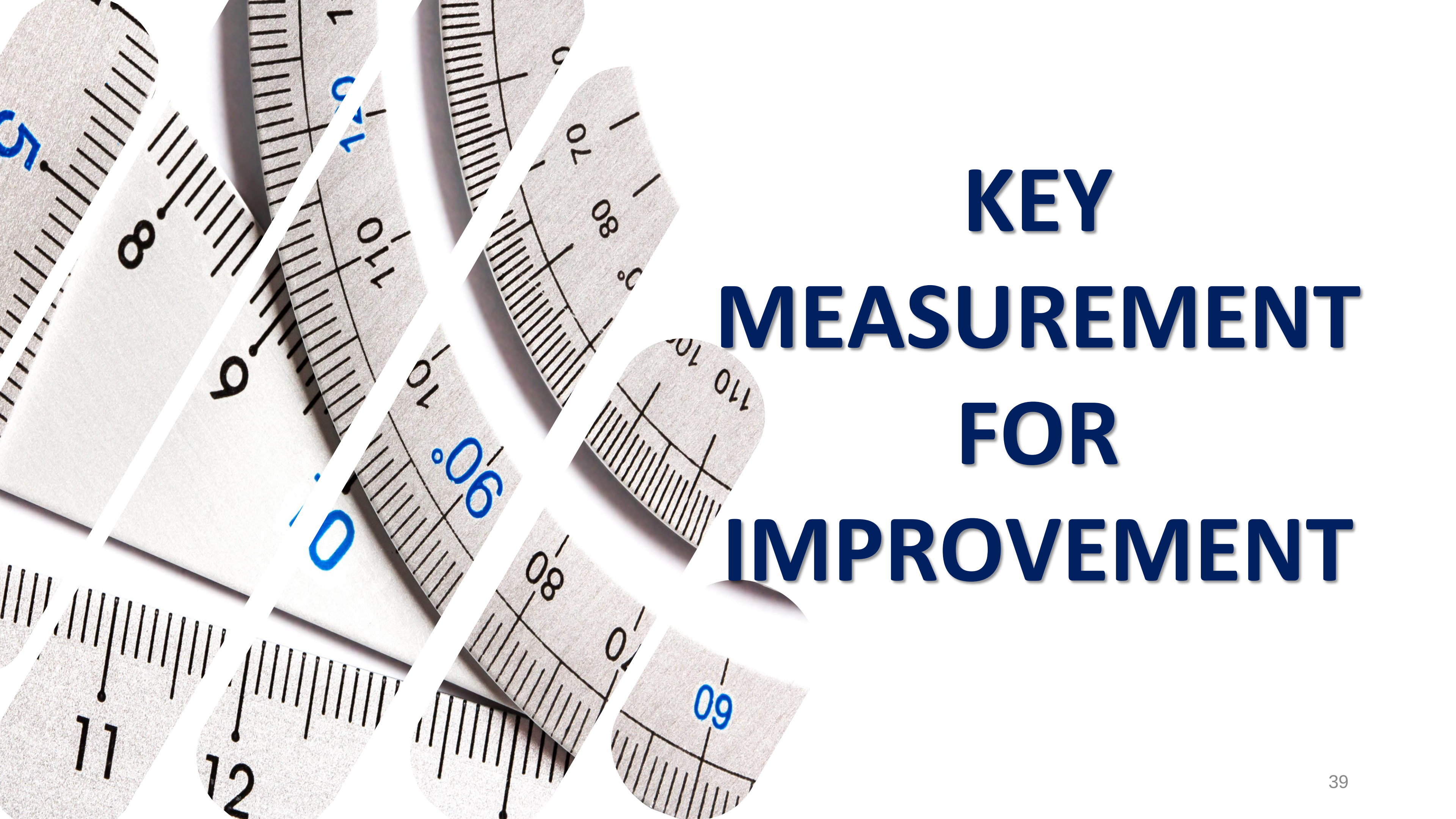
No .	Critical step	Criteria	Standard
1	Specialist/ trainee subspecialist prescribing chemotherapy	CDR request form need to be filled by specialist/trainee subspecialist and include data:	
		a) Correct Patient's Details	100%
		b) Correct Regimen	100%
		c) Correct Drug	100%
		d) Correct Dose In Correct Unit (Based On BSA/ Weight)	100%
		e) Correct Diluent With Its Volume	100%
		f) Correct Concentration Of Drug	100%
		g) Correct Date Of Preparation	100%
2	Pharmacist screen the CDR request form	Pharmacist screen on received CDR form whether it is a complete CDR form with:	
		a) Correct Patient's Details	100%
		b) Correct Regimen	100%
		c) Correct Drug	100%
		d) Correct Dose In Correct Unit (Based On BSA/ Weight)	100%
		e) Correct Diluent With Its Volume	100%
		f) Correct Concentration Of Drug	100%
		g) Correct Date Of Preparation	100%
		h) Presence Of Specialist/Trainee Subspecialist's Chop And Signature	100%

No.	Critical step	Criteria	Standard
3	Prepare CDR worksheet, labels and bags	Pharmacist or Assistant Pharmacist will prepare: CDR Worksheet: a) Correct Patient's Details b) Correct Drug c) Correct Dose Of Drug d) Correct Diluent With Its Volume Labels: a) Correct Patient's Details b) Correct Drug c) Correct Dose d) Correct Diluent With Its Volume e) Correct Preparation Date And Expiry Date f) Correct Storage Condition For Reconstituted Chemotherapy Drug Bags: a) Correct Patient's Details b) Correct Drug c) Correct Number And Size Of Bags Required	100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100%

No.	Critical step	Criteria	Standard
4	Countercheck CDR worksheet, labels and bags	Pharmacist will counter check on the written criteria on:	
		Prepared CDR Worksheet:	
		a) Correct Patient's Details	100%
		b) Correct Drug	100%
		c) Correct Dose	100%
		d) Correct Diluent With Its Volume	100%
		Prepared Labels:	
		a) Correct Patient's Details	100%
		b) Correct Drug	100%
		c) Correct Dose	100%
		d) Correct Diluent With Its Volume	100%
		e) Correct Preparation Date And Expiry Date	100%
		f) Correct Storage Condition Of Reconstituted Chemotherapy Drug	100%
		Prepared Bags:	
		a) Correct Patient's Details	100%
		b) Correct Drug	100%
		c) Correct Number And Size Of Bags Required	100%

No.	Critical step		Criteria	Standard
5	Chemotherapy Drug Reconstitution		Pharmacist or assistant pharmacist reconstitute the chemotherapy drug with:	
			a) Correct Drug	100%
			b) Correct Volume Of Drug	100%
			c) Correct Volume Of Diluent	100%
			d) Absence Of Leakage Or Impurity	100%
6	Countercheck reconstituted chemotherapy and approve drug final preparation		Pharmacist countercheck on the reconstituted chemotherapy drug by checking on:	
			a) Correct Patient's Details On Label And Bag	100%
			b) Correct Drug	100%
			c) Correct Colour And Its Characteristics	100%
			d) Correct Final Volume	100%
			e) Absence Of Leakage Or Impurity	100%
			f) Presence Of Supplied Administration Set For Specific Chemotherapy Drug	100%

No	Critical step	Criteria	Standard
7	Nurse check chemotherapy drug during collection in pharmacy	Nurse check the reconstituted chemotherapy drug for a) Correct Patient's Details b) Correct Drug c) Correct Colour And Characteristics d) Correct Dose e) Correct Final Volume f) Absence Of Leakage Or Impurity g) Correct Preparation Date And Expiry Date h) Correct Storage Condition i) Presence Of Supplied Administration Set For Specific Chemotherapy Drug	100% 100% 100% 100% 100% 100% 100% 100%
8	Administer chemotherapy to patient according to regimen and close monitoring	Doctors or nurses will administer chemotherapy according to the regimen planned with following criteria: a) Correct Patient's Details b) Correct Drug c) Correct Dose And Final Volume Of Reconstituted Chemotherapy Drug d) Correct Route Of Administration e) Correct Infusion Rate f) Correct Date And Time Of Administration g) Close Monitor Patient's Vital Sign And Condition During And Post Chemotherapy	100% 100% 100% 100% 100% 100% 100%



KEY MEASUREMENT FOR IMPROVEMENT

STUDY OBJECTIVES

General Objectives:

- To improve percentage of appropriate management of chemotherapy drugs in paediatric oncology

Specific Objectives:

1. To determine the percentage of appropriate management of chemotherapy drugs in paediatric oncology ward
2. To identify the causes that lead to low percentage of appropriate management of chemotherapy drugs
3. To formulate and implement appropriate remedial measures
4. To evaluate the effectiveness of remedial measures

INDICATOR AND STANDARD

INDICATOR	Percentage of appropriate management of chemotherapy drugs
FORMULA	$\frac{\text{Total Number of Patient with Appropriate Management of Chemotherapy drugs}}{\text{Total Number of Patient on Chemotherapy}} \times 100\%$
STANDARD	95%

*Number of patient is calculated based on each prescribe regimen

Prescribing phase: 0.1% - 24.6%, Preparation phase: 0.40% - 0.50%, Dispensing phase: 0.03%, Administering phase: 0.02% - 0.10%¹¹



PROCESS OF GATHERING INFORMATION

METHODOLOGY

Study Design

- Quasi Experimental

Sampling Technique

- Universal Sampling

Sample Size

- 100 (Raosoft Software)

Study Population

- Cancer patient admitted for chemotherapy in paediatric oncology (chemo) ward only (10B)

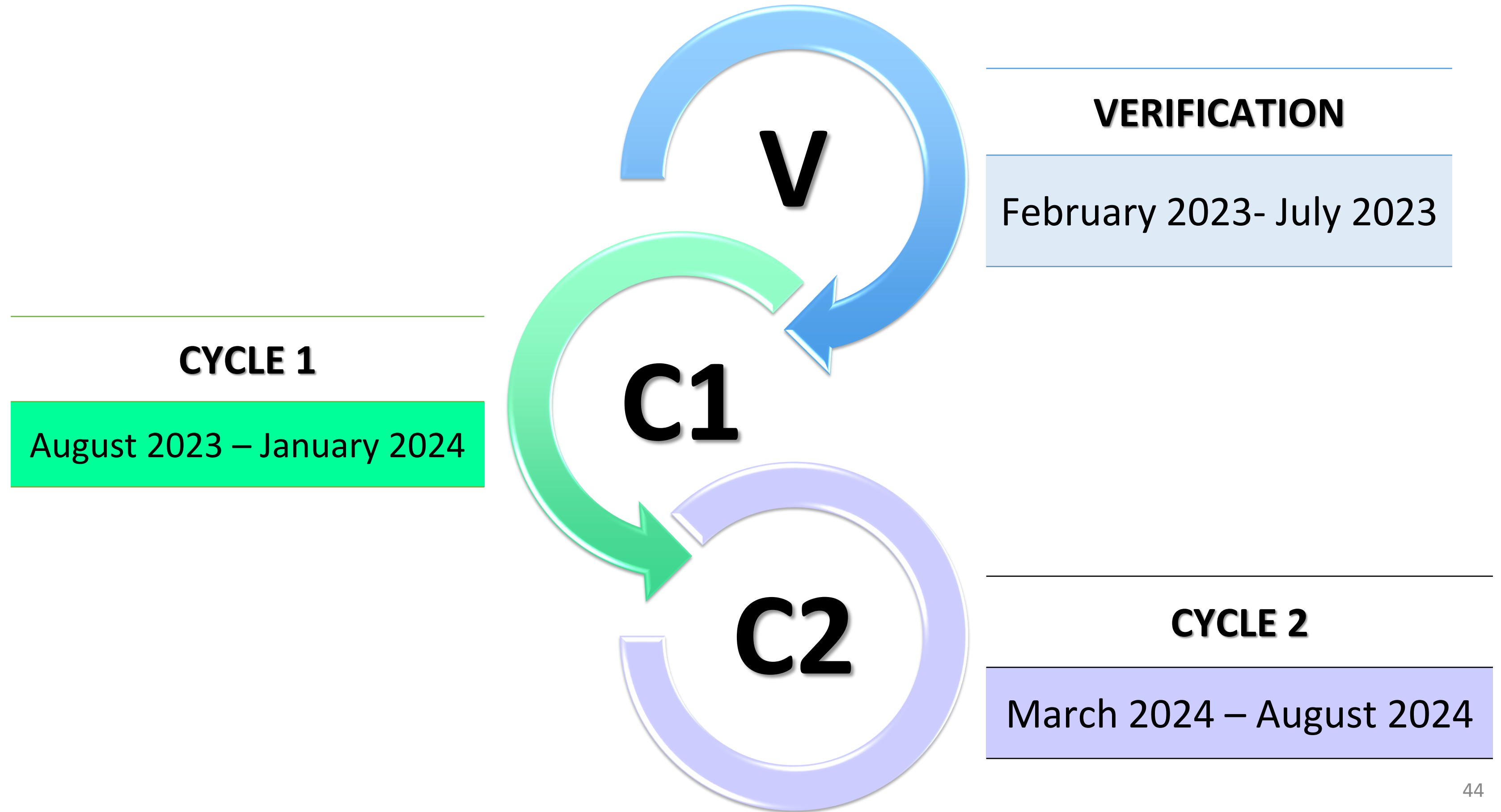
Tools

- Data collection forms
- Questionnaire
- CDR Request Form

Exclusion Criteria

- Patient admitted in the other ward for chemotherapy with other indication (eg: nephrology, neurology, ophthalmology)

STUDY TIMELINE



DATA COLLECTION FORM

Doctors:

- ☐ Right patient's detail
- ☐ Right protocol
- ☐ Right cytotoxic drug
- ☐ Right dose based on BSA and weight
- ☐ Right diluent and volume of infusion
- ☐ Right concentration of drug
- ☐ Right date of preparation

Pharmacist:

- ☐ Right patient's detail
- ☐ Right protocol
- ☐ Right cytotoxic drug
- ☐ Right dose based on BSA and weight
- ☐ Right diluent and volume of infusion
- ☐ Right concentration of drug
- ☐ Right date of preparation
- ☐ Presence of prescriber's chop and signature

Nurses:

- ☐ Right patient's detail
- ☐ Right cytotoxic drug
- ☐ Right dose
- ☐ Right diluent and volume of infusion
- ☐ Right routes of administration
- ☐ Right infusion rate
- ☐ Absence of Leakage or Impurity
- ☐ Presence of supplied administration set for specific chemo product

QUESTIONNAIRE

Questionnaire (Prescriber)

Thanks for helping us to fill up the survey =)

* Indicates required question

1. Is it easy to fill up the CDR request form? *

Mark only one oval.

- ☐ Easy
☐ Hard

2. Do you require any reference / guideline to fill up the CDR form? *

Mark only one oval.

- ☐ Yes
☐ No

3. What is the formula of hydration status per hour for pediatric patient (weight > 10 kg)?

Mark only one oval.

- ☐ 125ml x BSA
☐ 100ml x BSA
☐ 125ml x kg
☐ I am not aware of it

Questionnaire (Pharmacists)

Thanks for helping to fill up these questions. :)

* Indicates required question

1. Email *

2. What criteria should be checked during counterchecking of reconstituted chemotherapy drugs?
(Can choose more than one criteria)

Check all that apply.

- ☐ Patient's details
☐ Name of chemotherapy drugs
☐ Final volume of reconstituted chemotherapy drug
☐ Colour and characteristics chemotherapy drug
☐ Leaking / impurities
☐ Storage and stability
☐ Sealed properly

3. Which reconstituted chemotherapy drug are in red / red orange colour? *

- I. Doxorubicin
II. Mitoxantrone
III. Daunorubicin
IV. Idarubicin

Mark only one oval.

- ☐ I & III
☐ I, III & IV
☐ II & IV
☐ All of the above

Questionnaire (Nurses)

1. Which criteria should be checked during counterchecking of chemotherapy?

- I. Correct Patient's details
II. Correct Drug
III. Correct Dose
IV. Correct Date of preparation and date of expiry
V. Correct Colour of drug

Mark only one oval.

- ☐ I & II
☐ I, II & III
☐ I, III, & IV
☐ All of the above

2. Which is the criteria for correct drug condition?

- I. No leaking
II. No presence of foreign particles
III. Properly sealed with syringe cap or parafilm

Mark only one oval.

- ☐ I only
☐ I & II
☐ All of the above

VERIFICATION STUDY

CDR REQUEST FORM

✓
CYTOTOXIC DRUG RECONSTITUTION
REQUEST FORM

DATE: 13/2/22

NAME: ALI BIN ABU MYKID/ MYKAD: WCH 0012345 WARD: 10B

Please [V]: New case ☐ Repeat case ☐

AGE: 4 years SEX: M (F) WT: 12.5 kg HT: 99.6 cm BSA: 0.6 m²

DIAGNOSIS: Left Adrenal Neuroblastoma

No.	Chemotherapy	Dose (....m ²)	Dose prescribed (infusion/bolus)	Date of PREPARATION*
1.	IV Carboplatin 450mg/150mL	400	220 mg in 100 mL NS over 1 hour 22 mL	13/2
2.	IV Ifosfamide 14/25mL	1500	850 mg in 150 mL NS over 3 hours 21 mL	13/2 - 14/2
3.	IV Etoposide 100mg/5 mL	100	60mg in 200 mL NS over 4 hours 3 mL	12/2 - 15/2

No. of patient on chemotherapy =
No. of CDR form received from
pharmacy

For Pharmacy Use
Pharmacist signature:

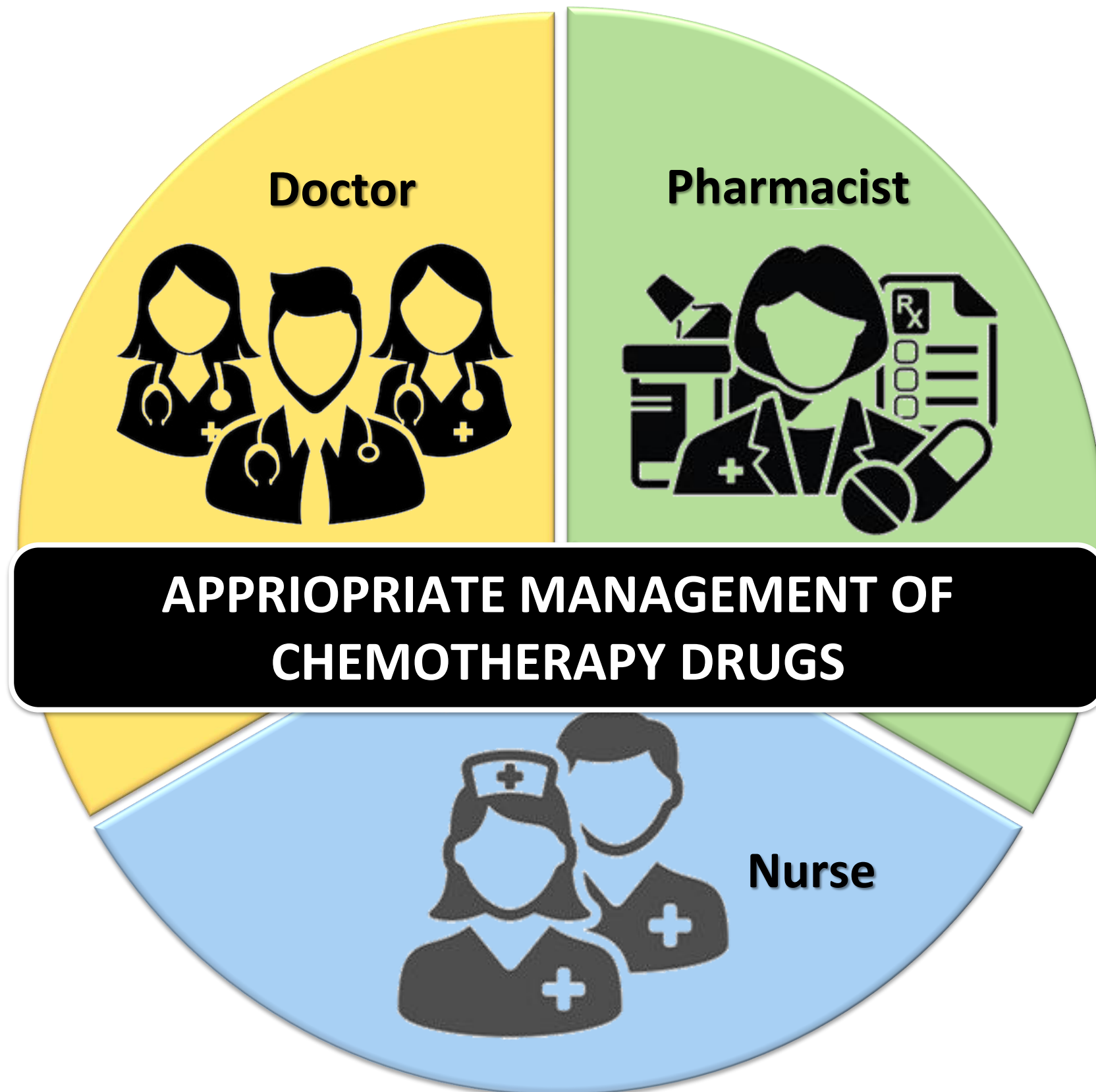
Borang Permohonan yang lengkap hendaklah dihantar sehari sebelum tarikh sediaan diperlukan
Selewat-lewatnya jam 3.00 petang)
Untuk kes-kes kecemasan yang memerlukan persediaan pada hari yang sama, Pegawai Farmasi hendaklah dihubungi di
tambungan 1240/1238/1239 dan borang permohonan perlu dihantar sebelum jam 9.00 pagi.
Borang CDR yang diterima selepas jam 9.00 pagi akan diproses & dibancuh pada keesokan harinya.

Appropriate Management of Chemotherapy Drugs:

- ✓ Patient's Details
- ✓ Regimen
- ✓ Drug
- ✓ Dose
- ✓ Diluent
- ✗ Volume of infusion
- ✓ Concentration of drug
- ✓ Date of Preparation
- ✓ Prescriber's sign and chop

0% OR ~~100%~~

VERIFICATION



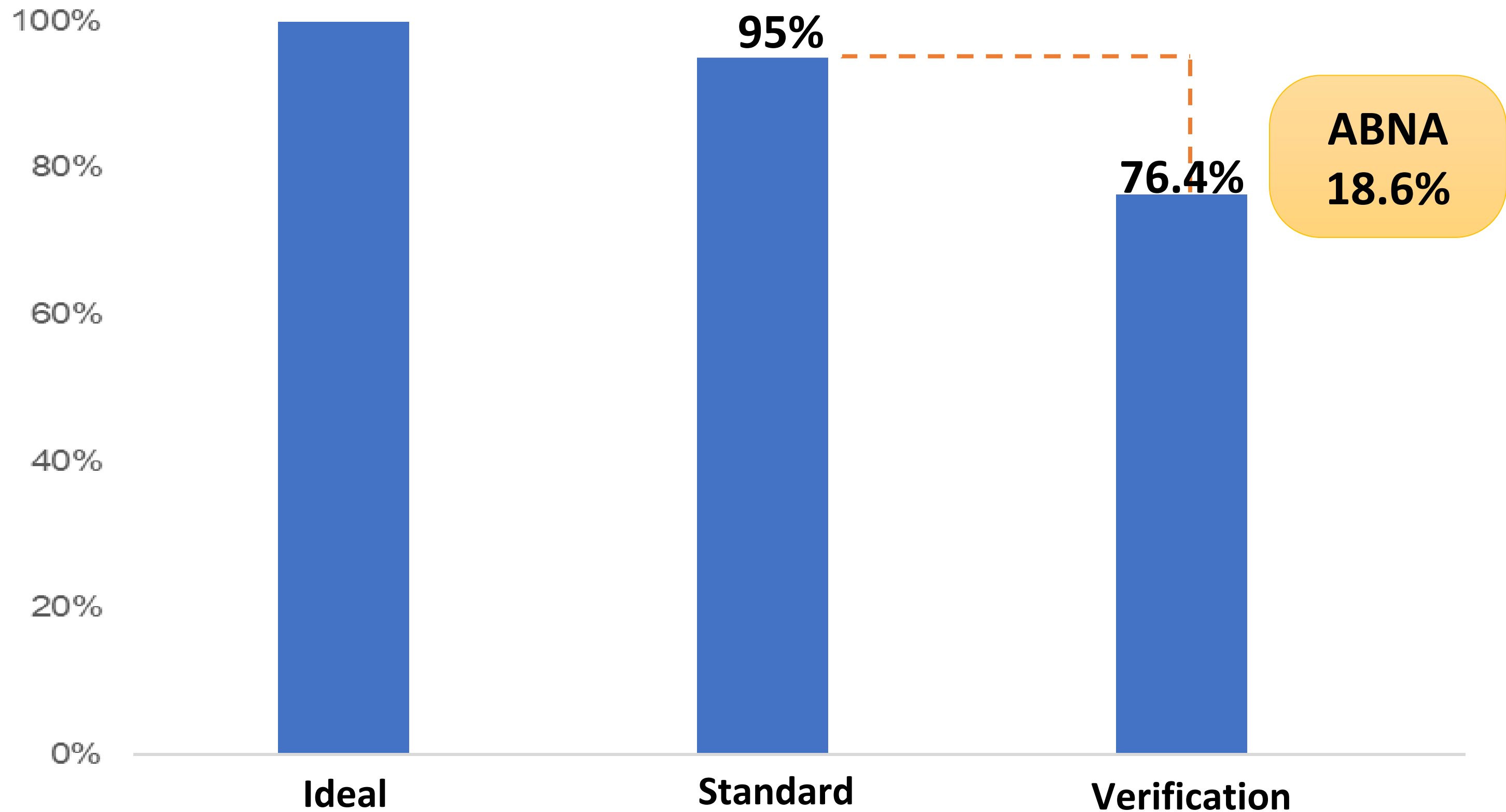
Total Number of Patient on
Chemotherapy Drugs 674

Total Number of Patient with
Appropriate Management of 515
Chemotherapy Drugs

**Percentage of Appropriate
Management of
Chemotherapy Drugs 76.4%**

ACHIEVABLE BENEFIT NOT ACHIEVED (ABNA)

Percentage of Appropriate Management of Chemotherapy Drug



MODEL OF GOOD CARE

No.	Critical step	Criteria	Standard	Verification (N=674)
1	Specialist/ trainee subspecialist prescribing chemotherapy drug	CDR request form need to be filled by Specialist/ Trainee Subspecialist include data:		
		a) Correct Patient's Details	100%	99.4%
		b) Correct Regimen	100%	99.0%
		c) Correct Drug	100%	100%
		d) Correct Dose In Correct Unit (Based On BSA/ Weight)	100%	98.1%
		e) Correct Diluent With Its Volume ★	100%	84.6%
		f) Correct Concentration Of Drug ★	100%	87.5%
		g) Correct Date Of Preparation	100%	98.5%
2	Pharmacist screen the CDR request form	Pharmacist screen on received CDR form whether it is a complete CDR form with:		
		a) Correct Patient's Details	100%	99.4%
		b) Correct Regimen	100%	100%
		c) Correct Drug	100%	100%
		d) Correct Dose In Correct Unit (Based On BSA/ Weight)	100%	100%
		e) Correct Diluent With Its Volume	100%	100%
		f) Correct Concentration Of Drug	100%	98.1%
		g) Correct Date Of Preparation	100%	99.5%
		h) Presence Of Specialist/Trainee Subspecialist's Chop And Signature	100%	99.7%

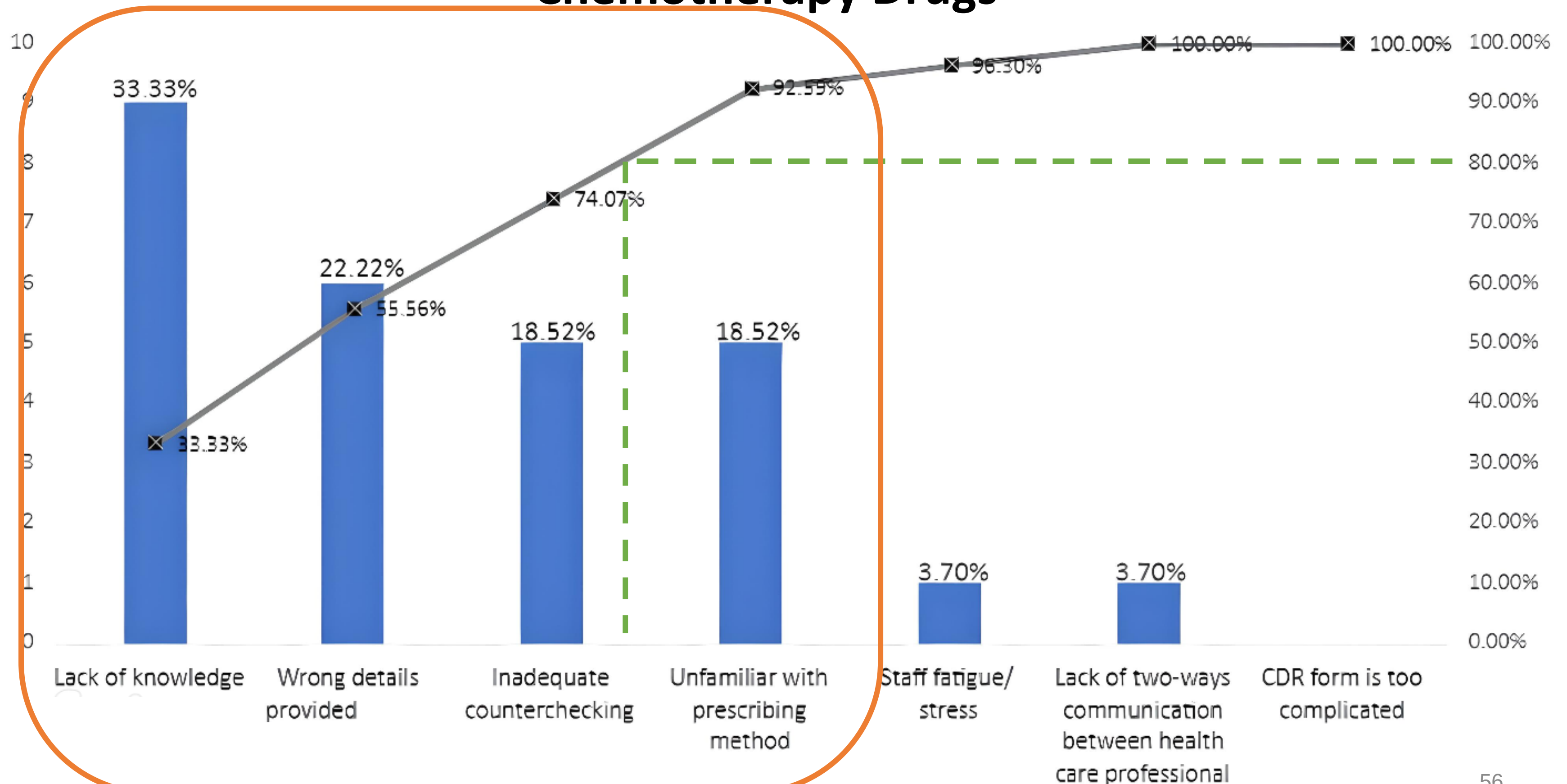
No.	Critical step	Criteria	Standard	Verification (N=674)
3	Prepare CDR worksheet, labels and bags	Pharmacist or Assistant Pharmacist will prepare: CDR Worksheet:		
		a) Correct Patient's Details	100%	93.0%
		b) Correct Drug	100%	100%
		c) Correct Dose	100%	95.4%
		d) Correct Diluent With Its Volume	100%	97.5%
		Labels:		
		a) Correct Patient's Details	100%	98.2%
		b) Correct Drug	100%	98.2%
		c) Correct Dose	100%	99.5%
		d) Correct Diluent With Its Volume	100%	96.4%
		e) Correct Preparation Date And Expiry Date	100%	96.1%
		f) Correct Storage Condition For Reconstituted Chemotherapy Drug	100%	99.5%
		Bags:		
		a) Correct Patient's Details	100%	99.1%
		b) Correct Drug	100%	98.3%
		c) Correct Number And Size Of Bags Required	100%	95.8%

No.	Critical step	Criteria	Standard	Verification (N=674)
4	Countercheck CDR worksheet, labels and bags	Pharmacist will countercheck on the written criteria on:		
		Prepared CDR Worksheet:		
		a) Correct Patient's Details	100%	99.5%
		b) Correct Drug	100%	100%
		c) Correct Dose	100%	100%
		d) Correct Diluent With Its Volume	100%	99.5%
		Prepared Labels:		
		a) Correct Patient's Details	100%	99.1%
		b) Correct Drug	100%	100%
		c) Correct Dose	100%	100%
		d) Correct Diluent With Its Volume	100%	99.1%
		e) Correct Preparation Date And Expiry Date	100%	99.5%
		f) Correct Storage Condition For Reconstituted Chemotherapy Drug	100%	100%
		Prepared Bags:		
		a) Correct Patient's Details	100%	99.1%
		b) Correct Drug	100%	99.5%
		c) Correct Number And Size Of Bags Required	100%	99.5%

No .	Critical step	Criteria	Standard	Verification (N=674)
5	Chemotherapy Drug Reconstitution	Pharmacist or assistant pharmacist reconstitute the chemotherapy drug with:		
		a) Correct Drug	100%	100%
		b) Correct Volume Of Drug	100%	100%
		c) Correct Volume Of Diluent	100%	99.4%
		d) Absence Of Leakage Or Impurity	100%	96.8%
6	Countercheck reconstituted chemotherapy drug and approve final preparation	Pharmacist countercheck on the reconstituted chemotherapy product by checking on:		
		a) Correct Patient Details On Label And Bag	100%	98.8%
		b) Correct Drug	100%	100%
		c) Correct Colour And Its Characteristics	100%	100%
		d) Correct Final Volume	100%	99.9%
		e) Absence Of Leakage Or Impurity	100%	99.8%
		f) Presence Of Supplied Administration Set For Specific Chemotherapy Drug	100%	99.9%

No.	Critical step	Criteria	Standard	Verification (N=674)
7	Nurse check chemotherapy drug during collection in pharmacy	Nurse check the reconstituted chemotherapy drug for a) Correct Patient's Details b) Correct Drug c) Correct Colour And Characteristics ★ d) Correct Dose e) Correct Final Volume ★ f) Absence Of Leakage Or Impurity ★ g) Correct Preparation Date And Expiry Date ★ h) Correct Storage Condition ★ i) Presence Of Supplied Administration Set For Specific Chemotherapy Drug ★	100% 100% 100% 100% 100% 100% 100% 100%	100% 100% 0% 100% 14.3% 28.5% 28.5% 0% 0%
8	Administer chemotherapy to patient according to regimen and close monitoring	Doctors or nurses will administer chemotherapy according to the regimen planned with following criteria: a) Correct Patient's Details b) Correct Drug c) Correct Dose And Final Volume Of Reconstituted Chemotherapy Drug d) Correct Route Of Administration e) Correct Infusion Rate f) Correct Date And Time Of Administration g) Close Monitor Patient's Vital Sign And Condition During And Post Chemotherapy	100% 100% 100% 100% 100% 100% 100%	100% 100% 100% 100% 100% 100%

Factors For Low Percentage Of Appropriate Management Of Chemotherapy Drugs



STRATEGIES FOR CHANGE

MAIN FINDINGS FOR CONTRIBUTING FACTORS

REMEDIAL CHANGES		CONTRIBUTING FACTOR	PROFESSION
1	Build KiddoInfuse	- Lack of knowledge - Inadequate counterchecking - Wrong details provided	- Specialists / Subspecialists - Pharmacists - Nurses
2	Development Of Quick Reference	- Lack of knowledge - Inadequate counterchecking	Nurses
3	Standardized Chemotherapy Regimen	- Lack of knowledge - Unfamiliar with prescribing method - Inadequate counterchecking	Specialists / Subspecialists
4	Standardized Chemotherapy Worksheet	- Lack of knowledge - Wrong details provided	Pharmacists
5	Conduct Continuous Education	Lack of knowledge	- Specialists / Subspecialists - Pharmacists - Nurses

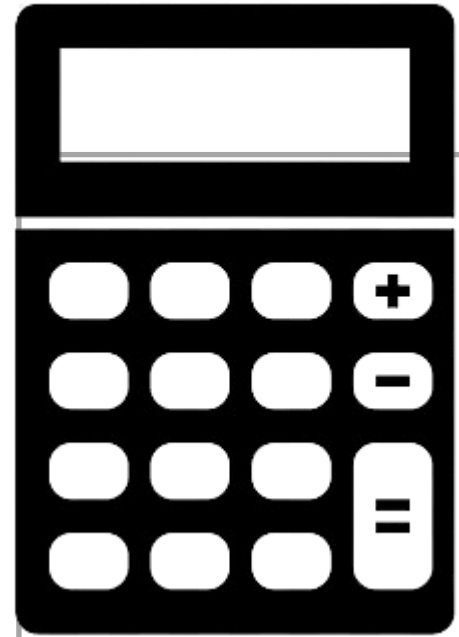
CYCLE 1



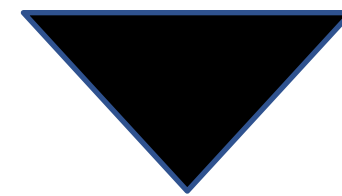
01

**DEVELOPMENT
OF APP
KIDDOINFUSE**

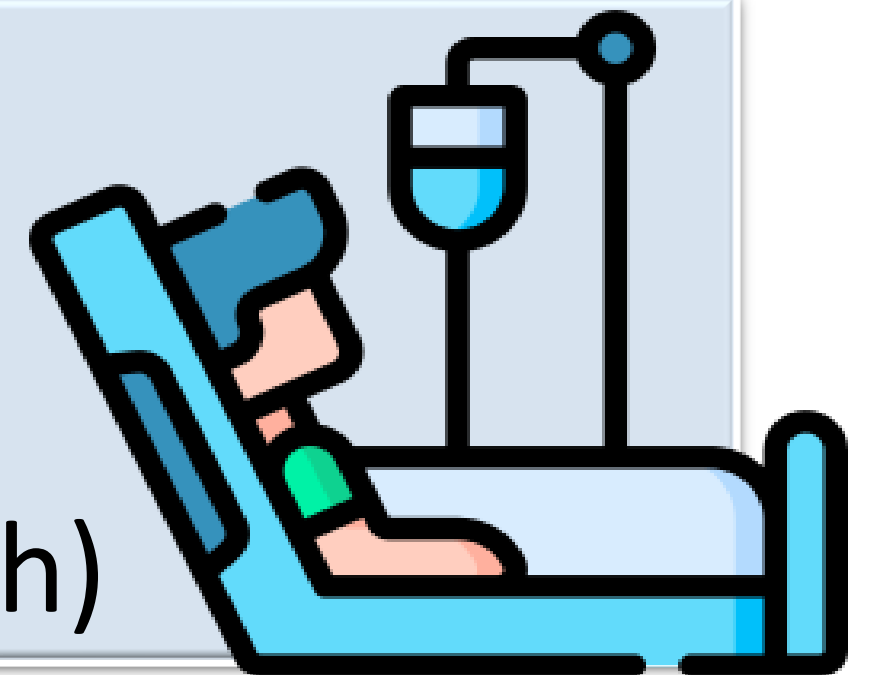
BEFORE



INCONSISTENT METHOD OF CALCULATION FOR HYDRATION / CONCENTRATION



- **Adverse event of chemotherapy**
(eg: haemorrhagic cystitis)
- **Infusion-related reaction**
(eg: fever, oedema, flushing, shortness of breath)



KIDDOINFUSE



LACK OF KNOWLEDGE



- Maximum concentration of chemotherapy drug
- Hydration formula for cancer children
- Maximum capacity of drip

INADEQUATE COUNTERCHECKING



- Details of chemotherapy drug prescribed

WRONG DETAILS PROVIDED



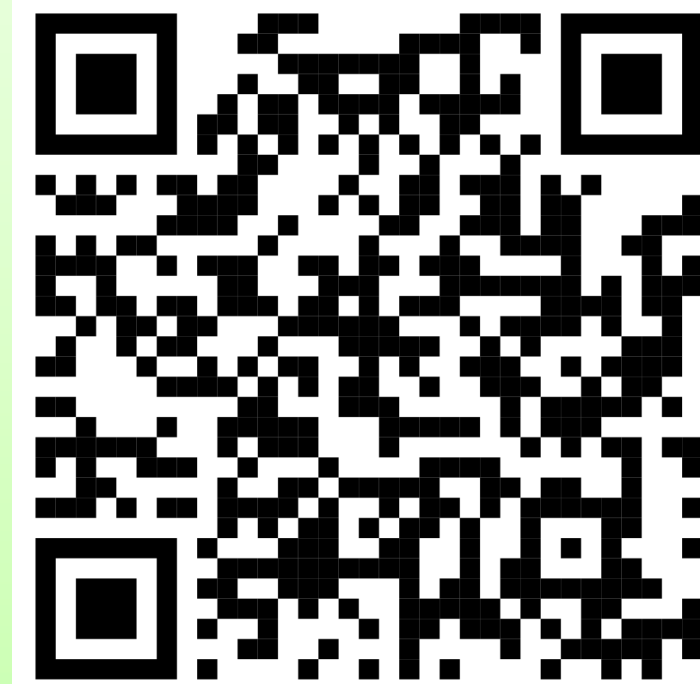
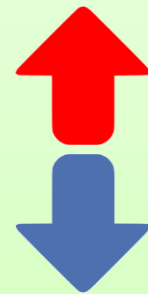
- Volume of diluent for chemotherapy drug
- Concentration of chemotherapy drug

AFTER

KIDDOINFUSE

Ready-to-use apps:

- ✓ Applicable for all chemotherapy drugs (**39 drugs**)
- ✓ Can be used by nurses, doctors and pharmacists
- ✓ Convenient
- ✓ Work Productivity
- ✓ Medication error



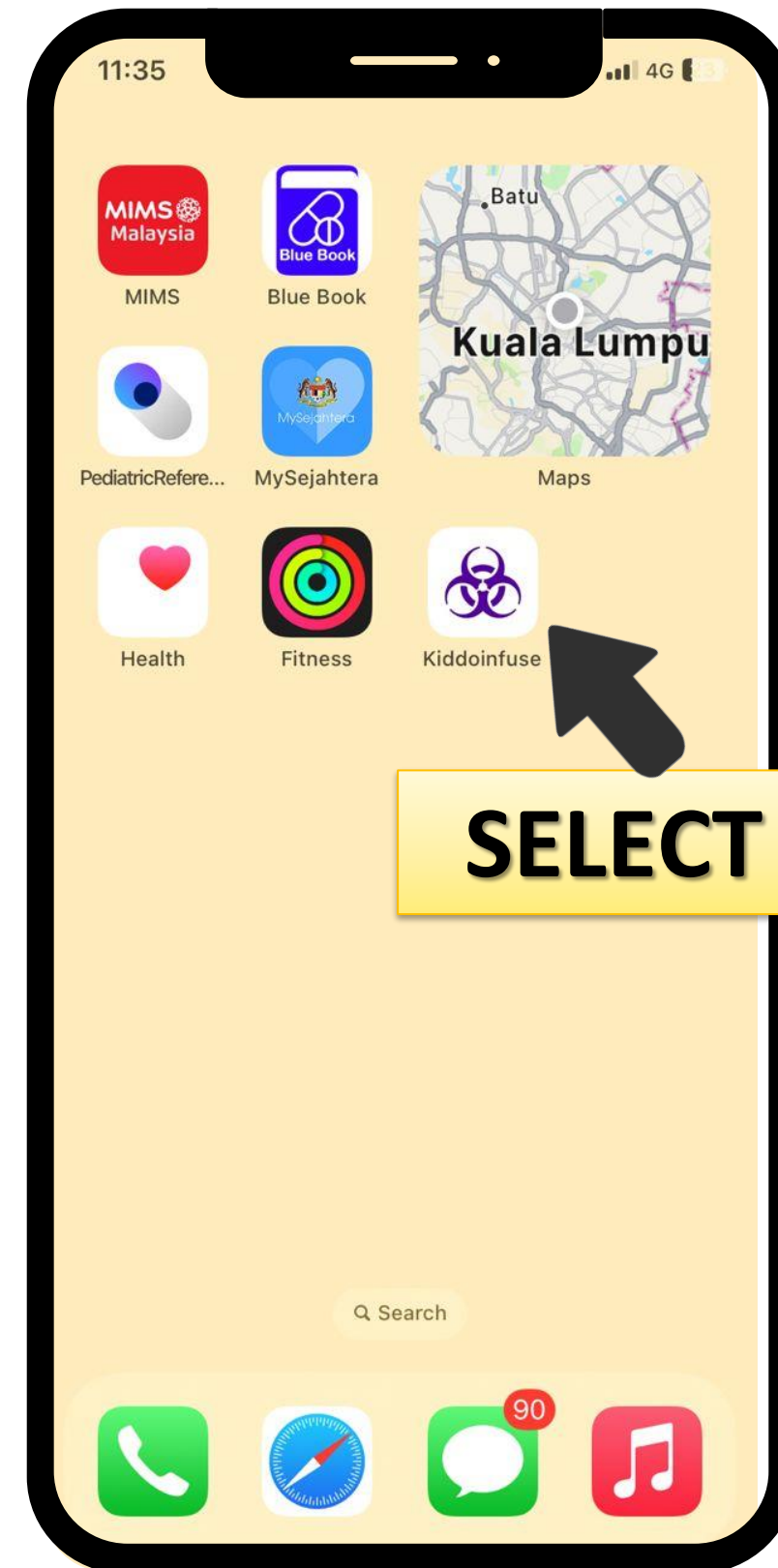
What is the infusion volume?



KIDDOINFUSE



Weight: 11kg
Height: 79cm
BSA: **0.49m²**



KiddoInfuse

Search

0.1 to 0.19

* Only for IV Cyclophosphamide 1500mg/m² & IV Carboplatin 750mg/m² * Do not refer this reference fo...

0.2 to 0.24

* Only for IV Cyclophosphamide 1500mg/m² & IV Carboplatin 750mg/m² * Do not refer this reference fo...

0.25 to 0.29

* Only for IV Cyclophosphamide 1500mg/m² & IV Carboplatin 750mg/m² * Do not refer this reference fo...

0.3 to 0.34

* Only for IV Cyclophosphamide 1500mg/m² & IV Carboplatin 750mg/m² * Do not refer this reference fo...

0.35 to 0.39

* Only for IV Cyclophosphamide 1500mg/m² & IV Carboplatin 750mg/m² * Do not refer this reference fo...

0.4 to 0.44

* Only for IV Cyclophosphamide 1500mg/m² & IV Carboplatin 750mg/m² * Do not refer this reference fo...

0.45 to 0.49

* Only for IV Cyclophosphamide 1500mg/m² & IV Carboplatin 750mg/m² * Do not refer this reference fo...

SELECT

0.45 to 0.49 mg/m²



Title

BSA (>10kg)

Recommended Volume for 1 hour

60mL,

*80mL (For IV Cyclophosphamide 1500mg/m² & IV Carboplatin 750mg/m²)

Recommended Volume for 2 hour

100mL

Recommended Volume for 3 hour

120mL

Recommended Volume for 4 hour

150mL

Recommended Volume for 6 hour

250mL

Recommended Volume for 12 hour

250mL, 500mL

Recommended Volume for 24 hour

250mL, 500mL

Notes

Do not refer this reference for fixed volume stated in CDR form

0.45 to 0.49 mg/m²

Title

BSA (>10kg)

Recommended Volume for 1 hour

60mL,

*80mL (For IV Cyclophosphamide 1500mg/m² & IV Carboplatin

750mg/m²)

Recommended Volume for 2 hour

100mL

Recommended Volume for 3 hour

120mL

Recommended Volume for 4 hour

150mL

Recommended Volume for 6 hour

250mL

Recommended Volume for 12 hour

250mL, 500mL

Recommended Volume for 24 hour

250mL, 500mL

Notes

Do not refer this reference for fixed volume stated in CDR form

**Range of Body
Surface Area (BSA)**

**Select Based On
Calculated BSA**

0.45 to 0.49 mg/m²



Title

BSA (>10kg)

Recommended Volume for 1 hour

60mL,

*80mL (For IV Cyclophosphamide 150
750mg/m²)

Recommended Volume for 2 hour

100mL

Recommended Volume for 3 hour

120mL

Recommended Volume for 4 hour

150mL

Recommended Volume for 6 hour

250mL

Recommended Volume for 12 hour

250mL, 500mL

Recommended Volume for 24 hour

250mL, 500mL

**Recommended Volume Of
Infusion For Each Hour
Based On Calculated BSA**

**Customize volume of
infusion based on infusion
hour of chemotherapy
drug**

Notes

Do not refer this reference for fixed volume stated in CDR form

0.45 to 0.49 mg/m2



Title

BSA (>10kg)

Recommended Volume for 1 hour

60mL,

*80mL (For IV Cyclophosphamide 1500mg/m2 & IV Carboplatin 750mg/m2)

Recommended Volume for 2 hour

100mL

Recommended Volume for 3 hour

120mL

Recommended Volume for 4 hour

150mL

Recommended Volume for 6 hour

250mL

Recommended Volume for 12 hour

250mL, 500mL

Recommended Volume for 24 hour

250mL, 500mL

Remarks

For users to take note on the volume of infusion for specific Chemotherapy drug

Notes

Do not refer this reference for fixed volume stated in CDR form

0.45 to 0.49 mg/m²



Title

BSA (>10kg)

Recommended Volume for 1 hour

60mL,

*80mL (For IV Cyclophosphamide 1500mg/m² & IV Carboplatin 750mg/m²)

Recommended Volume for 2 hour

100mL

Recommended Volume for 3 hour

120mL

Recommended Volume for 4 hour

150mL

Recommended Volume for 6 hour

250mL

Recommended Volume for 12 hour

250mL, 500mL

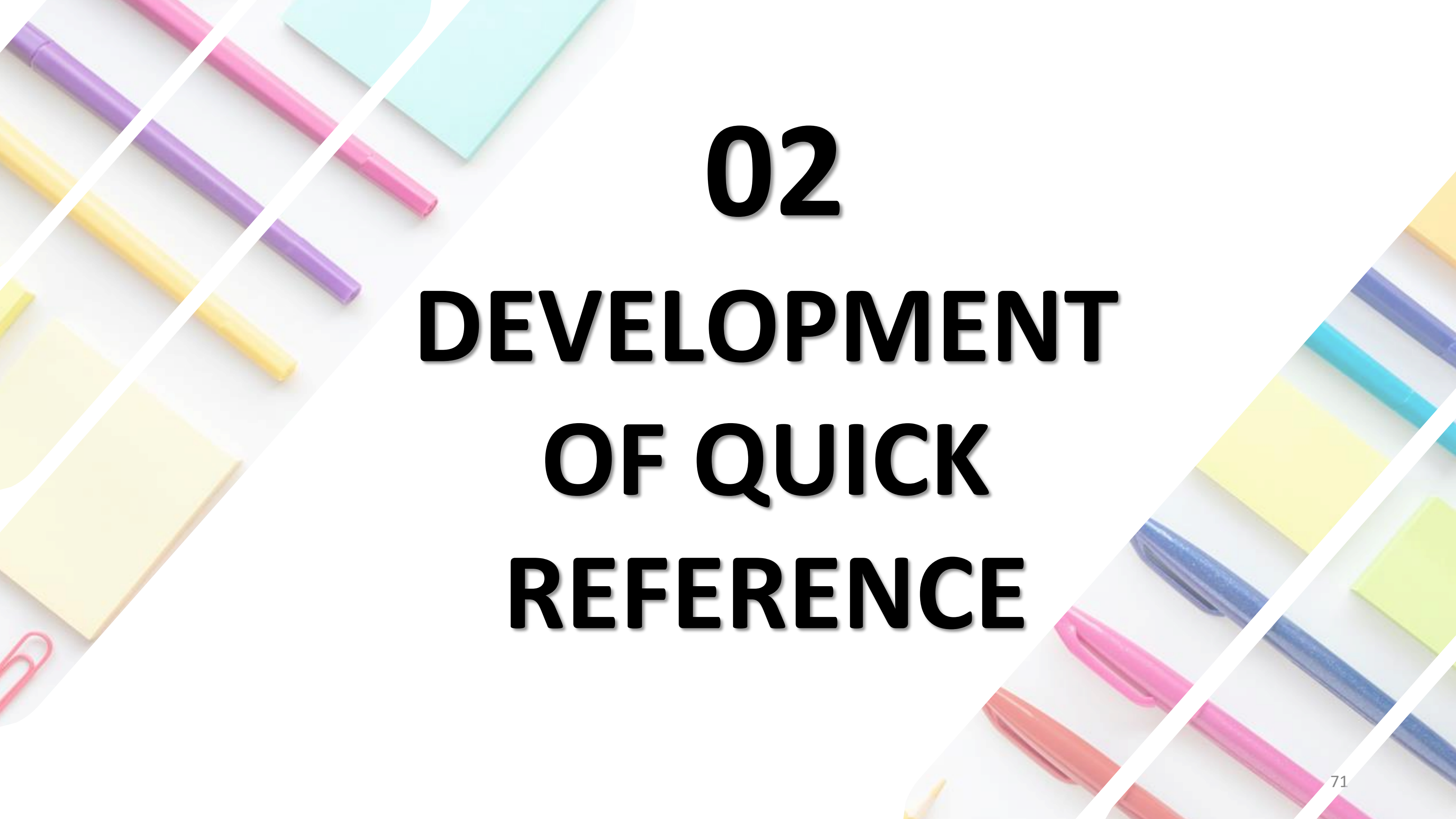
Recommended Volume for 24 hour

250mL, 500mL

Notes

Do not refer this reference for fixed volume stated in CDR form

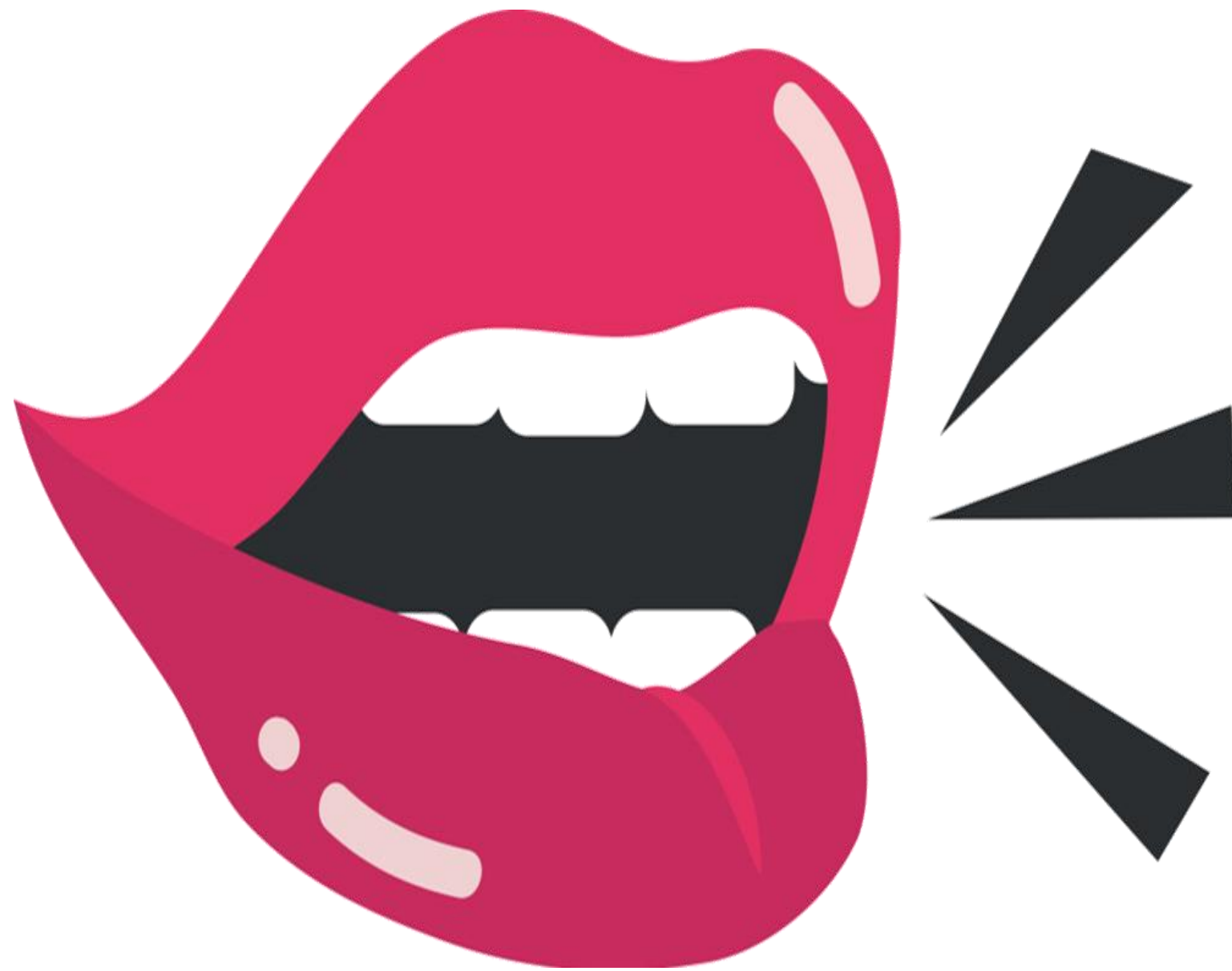
✓ Correct volume of diluent
(hydration)
✓ Correct concentration of
chemotherapy

The background of the slide is a collage of stationery items. On the left, there are several pens in purple, pink, and yellow, along with light blue and yellow sticky notes. On the right, there are pens in blue, pink, and orange, along with yellow and light green sticky notes. A red paper clip is visible in the bottom left corner. The entire background is divided into sections by white diagonal lines.

02

DEVELOPMENT OF QUICK REFERENCE

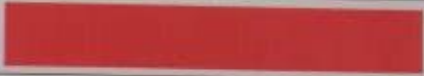
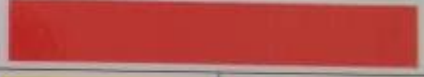
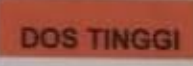
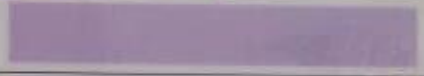
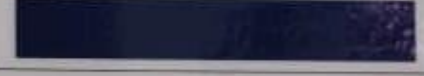
BEFORE



**REFERENCE DURING
COUNTERCHECKING
CHEMOTHERAPY
DRUGS**



AFTER

WARNA UBAT SITOTOKSIK		
UBAT	WARNA	
Actinomycin	Oren	
DAUNORubicin	Oren / Merah (ikut kepekatan)	 DOS RENDAH  DOS TINGGI
DOXORubicin	Merah	
IDARubicin	Oren kemerahan	
Methotrexate	Kuning / Oren (ikut kepekatan)	 DOS RENDAH  DOS TINGGI
Mitomycin	Ungu	
Mitoxantrone	Biru	
*Ubat Sitotoksik selain di atas		Tiada warna (Colourless)

ATTENTION

BLINATUMOMAB / PACLITAXEL - supply with **MACRO INFUSION TUBE**.
Kindly ask if it is NOT IN the purple bag IMMEDIATELY. TQ =)

Colour of Chemotherapy

STORAGE AND STABILITY		
24 HOURS	STORAGE	48 HOURS
IT Cytarabine	Fridge (2-8 °C)	IV Cyclophosphamide
IT Methotrexate		IV Daunorubicin
IV Methotrexate		IV Doxorubicin
Intraventricular Methotrexate		IV Vincristine
IV Ifosfamide		IV Idarubicin
IM L-Asparaginase		
IV Dacarbazine		
IV Fludarabine		
IV Rituximab		
24 HOURS	STORAGE	48 HOURS
IV Actinomycin D	Room Temperature	IV Mitoxantrone
IV Carboplatin		IV Cytarabine
IV Cisplatin		IV Fluorouracil (5-FU)
IV Etoposide		
IV Gemcitabine		
IV Mitoxantrone		
IV Paclitaxel		

Storage and Stability

WARNA UBAT SITOTOKSIK

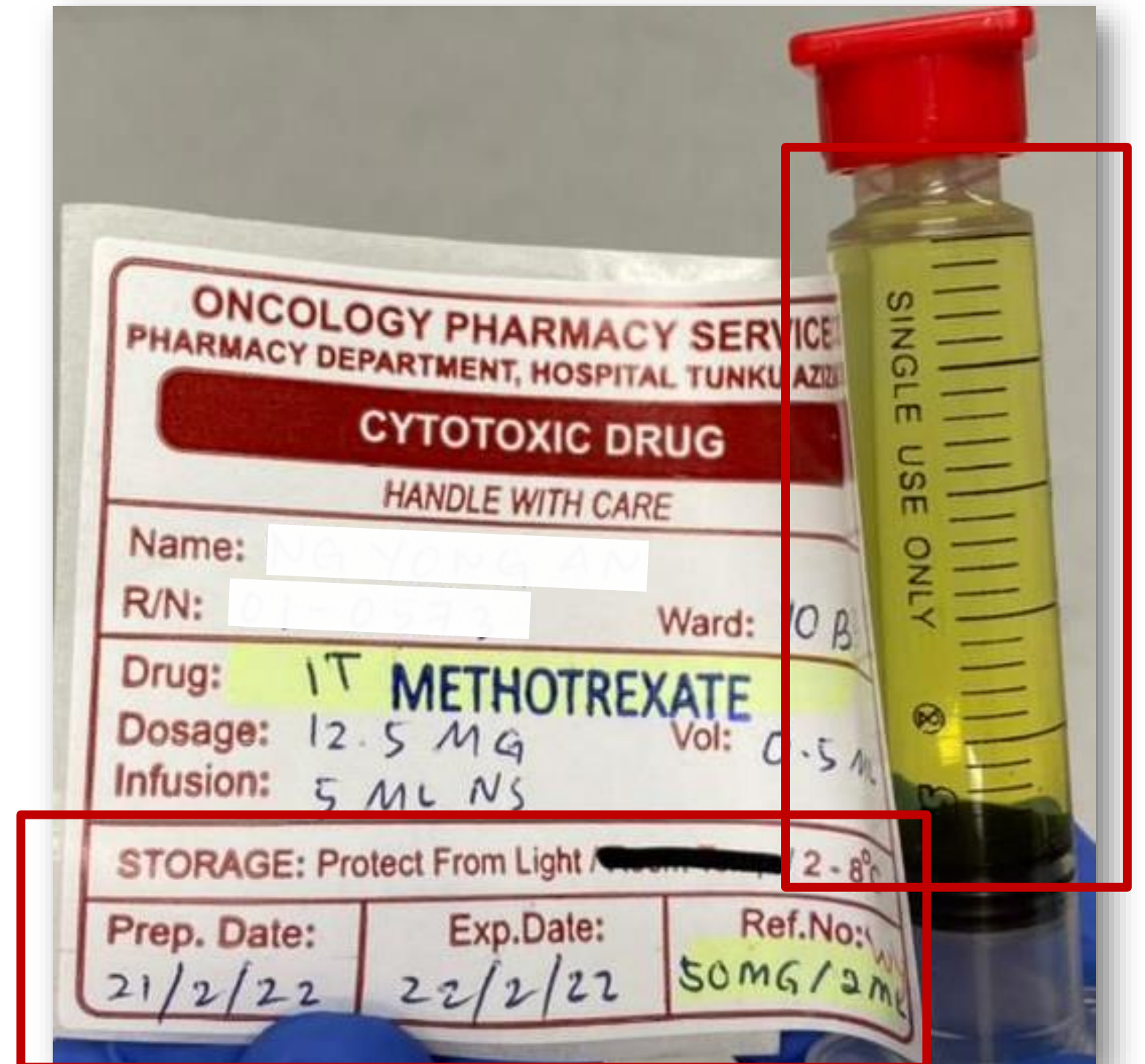
UBAT	WARNA	
Actinomycin	Oren	
DAUNOrubicin	Oren / Merah (ikut kepekatan)	DOS RENDAH DOS TINGGI
DOXOrubicin	Merah	
IDArubicin	Oren kemerahan	
Methotrexate	Kuning Oren (ikut kepekatan)	DOS RENDAH DOS TINGGI
Mitomycin	Ungu	
Mitoxantrone	Biru	

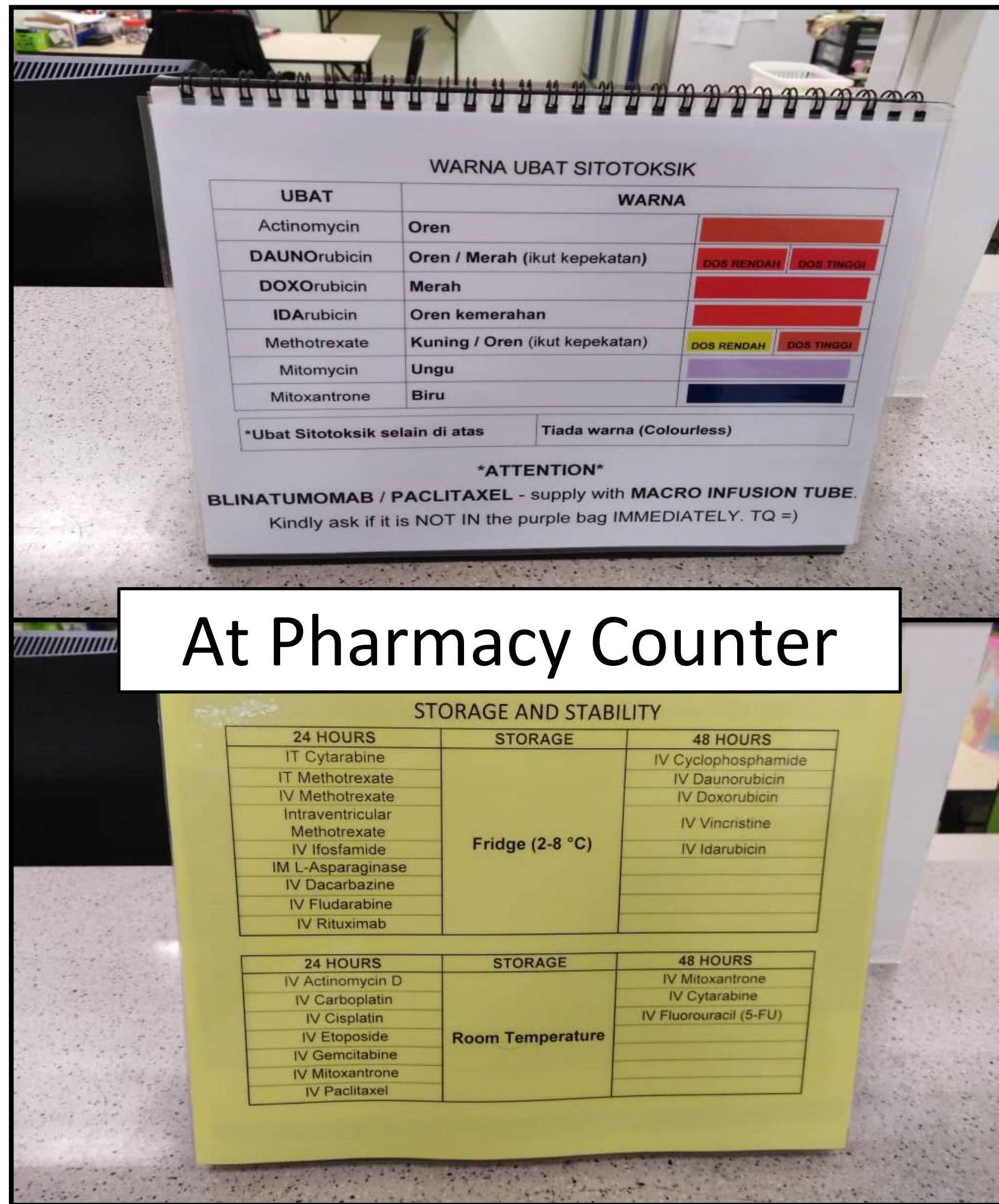
*Ubat Sitotoksik selain di atas Tiada warna (Colourless)

STORAGE AND STABILITY

24 HOURS	STORAGE	48 HOURS
IT Methotrexate IV Methotrexate Intraventricular Methotrexate IV Ifosfamide IM L-Asparaginase IV Dacarbazine IV Fludarabine IV Rituximab	Fridge (2-8 °C)	IV Cyclophosphamide IV Daunorubicin IV Doxorubicin IV Vincristine IV Idarubicin
24 HOURS	STORAGE	48 HOURS
IV Actinomycin D IV Carboplatin IV Cisplatin IV Etoposide IV Gemcitabine IV Mitoxantrone IV Paclitaxel	Room Temperature	IV Mitoxantrone IV Cytarabine IV Fluorouracil (5-FU)

QUICK REFERENCE





- ✓ Convenient
- ✓ Increase knowledge
- ✓ Enhance counterchecking process

The background is a collage of medical-related images. On the left, there are several horizontal teal bars of varying lengths. In the top left, a syringe is partially visible. In the top right, there's a close-up of a hand in a blue glove. On the right side, there's a stethoscope and a clipboard with a pen. At the bottom right, a stethoscope is resting on a reflective surface. The overall color palette is dominated by teal, white, and light blue.

03

STANDARDIZED CHEMOTHERAPY REGIMEN

PRESCRIBERS

CYTOTOXIC DRUG
REQUEST

BEFORE – MANUAL FORM

NAME: MYKID/ MYKAD: WARD:
Please (✓): New case ☐ Repeat case ☐
AGE: SEX: M / F WT: kg HT: cm BSA: m²
DIAGNOSIS:

No.	Chemotherapy	Dose (....m ²)	Dose prescribed (infusion/bolus)	Date of PREPARATION*

BLANK

240 REGIMENS
45 TYPES OF CANCER

Borang Permohonan yang lengkap hendaklah dihantar sehari sebelum tarikh sediaan diperlukan
(Selewat-lewatnya jam 3.00 petang)

Untuk kes-kes kecemasan yang memerlukan persediaan pada hari yang sama, Pegawai Farmasi hendaklah dihubungi di
sambungan 1240/1238/1239 dan borang permohonan perlu dihantar sebelum jam 10.00 pagi.

Borang CDR yang diterima selepas jam 10.00 pagi akan diproses & dibancuh pada keesokan harinya.

DRUG RECONSTITUTION
REQUEST FORM

NAME: MYKID/ MYKAD: WARD:
AGE: 8yo SEX: M (F) WT: 14 kg HT: 102 cm BSA: 0.62 m²
DIAGNOSIS: acute lymphoblastic lymphoma / leucemia ALL - protocol 1H

No.	Chemotherapy	Dose (....m ²)	Dose prescribed (infusion/bolus)	Date of PREPARATION*
1	iv mercurine	15mg	0.9mg in 10ml NS	07-09/24 (LOB)
2	iv daunorubicin	30mg	18mg in 80ml NS	07-09/24
3	im pegaspasime	2500 unit	1550 unit	07-09/24
4	iv methotrexate		125mg in 5ml NS	07-09/24
				08-09/24
				09-09/24
				10-09/24
				11-09/24
				12-09/24
				01-10/24
				02-10/24
				03-10/24
				04-10/24
				05-10/24
				06-10/24
				07-10/24
				08-10/24
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				03-12/24
				04-12/24
				05-12/24
				06-12/24
				07-12/24
				08-12/24
				09-12/24
				10-12/24
				11-12/24
				12-12/24

* Please be informed that chemo will be prepared and ready by 4.30-5.00pm (Monday-Friday) & 1pm (Saturday, Sunday & Public Holiday) on requested date of preparation.
* If you intend to give chemo prior to that, please request the chemo to be prepared 1 day earlier.
* For chemo with short shelf life (<24hour) post preparation, please liaise with CDR Pharmacist.

Sign & Chop. (Consultant/ Specialist/ Medical Officer)

For Pharmacy Use
Pharmacist signature:

Borang Permohonan yang lengkap hendaklah dihantar sehari sebelum tarikh sediaan diperlukan
(Selewat-lewatnya jam 3.00 petang)

Untuk kes-kes kecemasan yang memerlukan persediaan pada hari yang sama, Pegawai Farmasi hendaklah dihubungi di
sambungan 1240/1238/1239 dan borang permohonan perlu dihantar sebelum jam 9.00 pagi.

Borang CDR yang diterima selepas jam 9.00 pagi akan diproses & dibancuh pada keesokan harinya.

No. Keluaran: 01 No. Pindaan: 01

CYTOTOXIC DRUG RECONSTITUTION REQUEST FORM

DATE:

NAME:		MYKID/ MYKAD:		WARD: UKH/ LOB.	
AGE: 5yo	SEX: M (F)	WT: 14 kg	HT: 102 cm	BSA: 0.62 m ²	
DIAGNOSIS: acute lymphoblastic lymphoma / leucemia ProB - protocol 1 CH					

No.	Chemotherapy	Dose (....m ²)	Dose prescribed (infusion/bolus)	Date of PREPARATION*
1	iv m ^u artine	15mg	0.9mg in 10ml NS	07-11/2/24 (LOB)
2	iv daunorubicin	30mg	18mg in 80ml NS	07-11/2/24
3	im pegaspasime	2500 unit	1550 unit	07-11/2/24
4	iv methotrexate		125mg in 5ml NS	07-11/2/24
				035-1/10/24

* Please be informed that chemo will be prepared and ready by 4.30-5.00pm (Monday-Friday) & 1pm (Saturday, Sunday & Public Holiday) on requested date of preparation.
* If you intend to give chemo prior to that, please request the chemo to be prepared 1 day earlier.
* For chemo with short shelf life (<24hour) post preparation, please liaise with CDR Pharmacist.

Sign & Chop. (Consultant/ Specialist/ Medical Officer)

For Pharmacy Use
Pharmacist signature:

Borang Permohonan yang lengkap hendaklah dihantar sehari sebelum tarikh sediaan diperlukan (Selewat-lewatnya jam 3.00 petang)

Untuk kes-kes kecemasan yang memerlukan persediaan pada hari yang sama, Pegawai Farmasi hendaklah dihubungi di sambungan 1240/1238/1239 dan borang permohonan perlu dihantar sebelum jam 9.00 pagi.

Borang CDR yang diterima selepas jam 9.00 pagi akan diproses & dibancuh pada keesokan harinya.

No. Keluaran: 01 No. Pindaan: 01

CONSEQUENCES

- ✗ Choice of Chemotherapy Drug
- ✗ Details for Chemotherapy
 - Drug
 - Dose
 - Volume of Diluent
 - Infusion Hour
- ✍ Confusing Writing

IMPACT TO PATIENT

- ↓ Treatment Outcomes
- ↑ Medication Error



**Collaboration with
DR TEH KOK HOI,
Senior Specialist of
Paediatric Haematology
and Oncology**

AFTER

CYTOTOXIC DRUG RECONSTITUTION REQUEST FORM					
NAME:					DATE:
Please [V]: New case ☐ Repeat case ☐			MYKID/ MYKAD:		WARD: 10B
AGE:	SEX: M / F	WT: kg	HT: cm	BSA: m ²	
DIAGNOSIS: Acute Lymphoblastic Lymphoma / Leukemia – Protocol <u>HR3</u>					

No.	Chemotherapy	Dose (.../m ²)	Dose prescribed (infusion/bolus)	Date of PREPARATION*
1.	IV Cytarabine (4 doses in total)	2g	mg in mL NS over 3H BD	D1 x2 D2 x2
2.	IV Etoposide	100mg	mg in mL NS over 2H BD	D3 x2 D4 x2
	(5 doses in total, 12H apart, starting 12H after the last dose of Ara-C)			D5 x1
3.	IM Pegasparaginase (max 3750 unit/dose)	2,500unit	unit	D6 (single dose only)
	Or IM L-Asparaginase	12,500	unit	D6 x2

Standardised Chemotherapy Regimen

For Pharmacy Use
Pharmacist signature:

Borang Permohonan yang lengkap hendaklah dihantar **sehari sebelum tarikh sediaan diperlukan**
(Selewat-lewatnya jam 3.00 petang)

Untuk kes-kes kecemasan yang memerlukan persediaan pada hari yang sama, Pegawai Farmasi hendaklah dihubungi (sambungan 1240/1238/1239 dan borang permohonan perlu dihantar **sebelum jam 9.00 pagi**).

Borang CDR yang diterima selepas jam 9.00 pagi akan diproses & dibancuh pada keesokan harinya.

CYTOTOXIC DRUG RECONSTITUTION
REQUEST FORM

DATE:

NAME:

MYKID/ MYKAD:

WARD:

Please [V]: New case

☐

Repeat case

☐

AGE:

SEX: M / F

WT:

kg

HT:

cm

DIAGNOSIS:

Acute Lymphoblastic Lymphoma / Leukemia – Protocol HR3

No.	Chemotherapy	Dose (..../ m^2)	Dose prescribed (infusion/bolus)	Frequency
1.	IV Cytarabine (4 doses in total)	2g	mg in mL NS over 3H BD	D1 x2 D2 x2
2.	IV Etoposide	100mg	mg in mL NS over 2H BD	D3 x2 D4 x2
	(5 doses in total, 12H apart, starting 12H after the last dose of Ara-C)			D5 x1
3.	IM Pegasparaginase (max 3750 unit/dose)	2,500unit	unit	D6 (single dose only)
	Or IM L-Asparaginase	12,500 unit	unit	D6 x2
4.	IT Methotrexate	age related	mg in 5mL NS	D1
	<i>All chemo are ordered on day of administration except IT MTX</i>			

* Please be informed that chemo will be prepared and ready by 4.30-5.00pm (Monday-Friday) & 1pm (Saturday, Sunday & Public Holiday) on requested date of preparation.

* If you intend to give chemo prior to that, please request the chemo to be prepared 1 day earlier.

* For chemo with short shelf life (<24hour) post preparation, please liaise with CDR Pharmacist.

.....
Sign & Chop. (Consultant/ Specialist/ Medical Officer)

For Pharmacy Use

Pharmacist signature:

Borang Permohonan yang lengkap hendaklah dihantar **sehari sebelum tarikh sediaan diperlukan**
(Selewat-lewatnya jam 3.00 petang)

Untuk kes-kes kecemasan yang memerlukan persediaan pada hari yang sama, Pegawai Farmasi hendaklah dihubungi (sambungan 1240/1238/1239 dan borang permohonan perlu dihantar **sebelum jam 9.00 pagi**).

Borang CDR yang diterima selepas jam 9.00 pagi akan diproses & dibancuh pada keesokan harinya.

Diagnosis

Select Based On
Patient's Diagnosis

CYTOTOXIC DRUG RECONSTITUTION
REQUEST FORM

DATE:

NAME:		MYKID/ MYKAD:		WARD: 10B	
Please [V]: New case ☐ Repeat case ☐					
AGE:	SEX: M / F	WT:	kg	HT:	cm
DIAGNOSIS:		BSA: m ²			
Acute Lymphoblastic Lymphoma / Leukaemia					

No.	Chemotherapy	Dose (.../m ²)
1.	IV Cytarabine (4 doses in total)	2g
2.	IV Etoposide	100mg
	(5 doses in total, 12H apart, starting 12H after the last dose of Ara-C)	
3.	IM Pegasparaginase (max 3750 unit/dose) <u>Or</u> IM L-Asparaginase	2,500unit 12,500 unit
4.	IT Methotrexate	age related
	All chemo are ordered on day of administration except IT MTX	

Chemotherapy Drug & Dose

Fixed Chemotherapy
Drug And Dose Based
On Each Diagnosis &
Patient's Condition

* Please be informed that chemo will be prepared and ready by 4.30-5.00pm (Monday-Friday) & 1pm (Saturday-Sunday & Public Holiday) on requested date of preparation.
* If you intend to give chemo prior to that, please request the chemo to be prepared earlier.
* For chemo with short shelf life (<24hour) post preparation, please liaise with CDR Pharmacist.

.....
Sign & Chop. (Consultant/ Specialist/ Medical Officer)

For Pharmacy Use
Pharmacist signature:

Borang Permohonan yang lengkap hendaklah dihantar **sehari sebelum tarikh sediaan diperlukan**
(Selewat-lewatnya jam 3.00 petang)

Untuk kes-kes kecemasan yang memerlukan persediaan pada hari yang sama, Pegawai Farmasi hendaklah dihubungi (sambungan 1240/1238/1239 dan borang permohonan perlu dihantar **sebelum jam 9.00 pagi**).

Borang CDR yang diterima selepas jam 9.00 pagi akan diproses & dibancuh pada keesokan harinya.

CYTOTOXIC DRUG RECONSTITUTION
REQUEST FORM

DATE:

NAME:

MYKID/ MYKAD:

WARD:

10B

kg

HT:

cm

BSA:

m²

Leukemia - Protocol **HR3**

Dose prescribed
(infusion/bolus)

Date of
PREPARATION*

mg in mL NS	D1	x2
over 3H BD	D2	x2
mg in mL NS	D3	x2
over 2H BD	D4	x2
	D5	x1
unit	D6	(single dose only)
unit	D6	x2
mg in 5mL NS	D1	

2.	IV Etoposide	100mg
3.	IM Pegasparginase (max 3750 unit/dose) Or IM L-Asparaginase	2,500unit 12,500 unit
4.	IT Methotrexate	age related

* Please be informed that chemo will be prepared and ready by 4.30-5.00pm (Monday-Friday) & 1pm (Saturday, Sunday & Public Holiday) on requested date of preparation.

* If you intend to give chemo prior to that, please request the chemo to be prepared 1 day earlier.

* For chemo to be given on the day of preparation, please liaise with CDR Pharmacist.

Sign & Chop. (Consultant/ Specialist/ Medical Officer)

For Pharmacy Use

Pharmacist signature:

Borang Permohonan yang lengkap hendaklah dihantar **sehari sebelum tarikh sediaan diperlukan**
(Selewat-lewatnya jam 3.00 petang)

Untuk kes-kes kecemasan yang memerlukan persediaan pada hari yang sama, Pegawai Farmasi hendaklah dihubungi (sambungan 1240/1238/1239 dan borang permohonan perlu dihantar **sebelum jam 9.00 pagi**).

Borang CDR yang diterima selepas jam 9.00 pagi akan diproses & dibancuh pada keesokan harinya.

**Diluent &
Infusion Hour**

**Fixed Diluent
&
Infusion Hour
For Each Regimen**

CYTOTOXIC DRUG RECONSTITUTION REQUEST FORM

DATE:

NAME:		MYKID/ MYKAD:		WARD: 10B	
Please [V]: New case ☐ Repeat case ☐					
AGE:	SEX: M / F	WT: kg	HT: cm	BSA: m ²	
DIAGNOSIS: Acute Lymphoblastic Lymphoma / Leukemia – Protocol <u>HR3</u>					

No.	Chemotherapy	Dose	Frequency	Preparation	Administration
1.	IV Cytarabine (4 doses in total)			mL NS	D1 x2
2.	IV Etoposide (5 doses in total, 12H apart, starting 12H after the last dose of Ara-C)	100mg	mg in over 2H BD	mL NS	D3 x2 D4 x2 D5 x1
3.	IM Pegasparginase (max 3750 unit/dose) <u>Or</u> IM L-Asparaginase	2,500unit 12,500 unit	unit		D6 x2 (single dose only)
4.	IT Methotrexate	age related	mg in 5mL NS		
All chemo are ordered on day of administration except IT MTX * Please be informed that chemo will be prepared and ready by 4.30-5.00pm (Monday-Friday) & 1pm (Saturday, Sunday & Public Holiday) on requested date of preparation. * If you intend to give chemo prior to that, please request the chemo to be prepared 1 day earlier. * For chemo with short shelf life (<24hour) post preparation, please liaise with CDR Pharmacy.					

.....
Sign & Chop. (Consultant/ Specialist/ Medical Officer)

For Pharmacy Use
Pharmacist signature:

Borang Permohonan yang lengkap hendaklah dihantar **sehari sebelum tarikh sediaan diperlukan**
(Selewat-lewatnya jam 3.00 petang)

Untuk kes-kes kecemasan yang memerlukan persediaan pada hari yang sama, Pegawai Farmasi hendaklah dihubungi (sambungan 1240/1238/1239 dan borang permohonan perlu dihantar **sebelum jam 9.00 pagi**).

Borang CDR yang diterima selepas jam 9.00 pagi akan diproses & dibancuh pada keesokan harinya.

Remarks

- Maximum Dose of chemotherapy drug
- Frequency of chemotherapy drug
- Reminder for each regimen

AFTER

CYTOTOXIC DRUG RECONSTITUTION REQUEST FORM					
NAME:					DATE:
Please [V]: New case ☐ Repeat case ☐			MYKID/ MYKAD:		WARD: 10B
AGE:	SEX: M / F	WT: kg	HT: cm	BSA: m ²	
DIAGNOSIS: Acute Lymphoblastic Lymphoma / Leukemia – Protocol <u>HR3</u>					

Standardised Chemotherapy Regimen:

- Convenient
- Accurate
- Work Productivity 

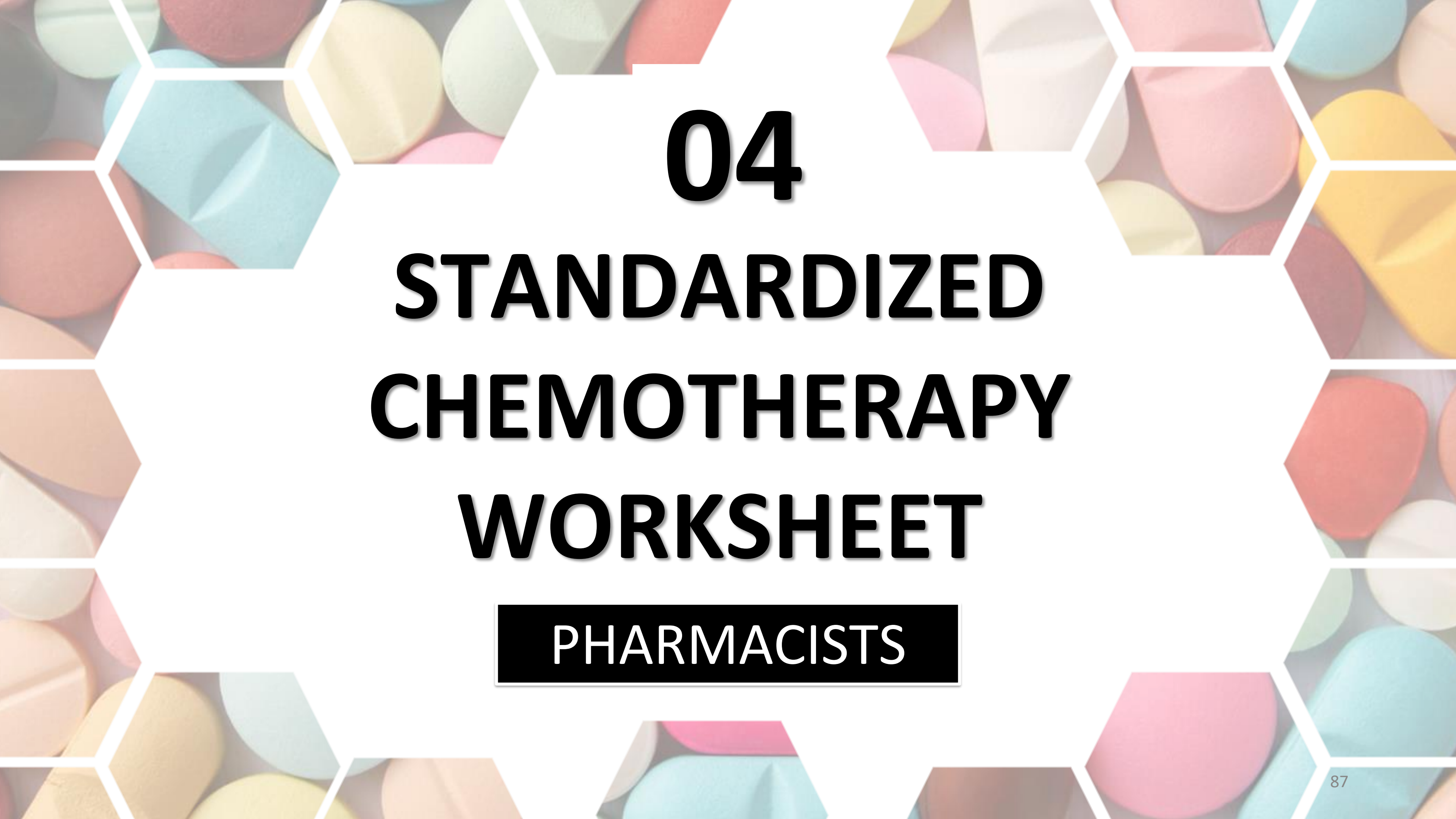
.....
Sign & Chop. (Consultant/ Specialist/ Medical Officer)

For Pharmacy Use
Pharmacist signature:

Borang Permohonan yang lengkap hendaklah dihantar **sehari sebelum tarikh sediaan diperlukan**
(Selewat-lewatnya jam 3.00 petang)

Untuk kes-kes kecemasan yang memerlukan persediaan pada hari yang sama, Pegawai Farmasi hendaklah dihubungi (sambungan 1240/1238/1239 dan borang permohonan perlu dihantar **sebelum jam 9.00 pagi**).

Borang CDR yang diterima selepas jam 9.00 pagi akan diproses & dibancuh pada keesokan harinya.



04

STANDARDIZED CHEMOTHERAPY WORKSHEET

PHARMACISTS

BEFORE – MANUAL FORM

KERTAS KERJA REKONSTITUSI UBAT SITOTOKSIK	TARIKH:
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UNIT REKONSTITUSI UBAT SITOTOKSIK, SEKSYEN FARMASI PENGELUARAN JABATAN FARMASI, HOSPITAL TUNKU AZIZAH (HOSPITAL WANITA DAN KANAK-KANAK)
--

NAMA:	BERAT (kg):	UNIT/WAD:
RN:	TINGGI (cm):	NAMA DOKTOR:
JANTINA:	BSA (m ²)	
UMUR:	DIAGNOSIS:	

MAKLUMAT REKONSTITUSI						MAKLUMAT PRODUK
Ubat Sitotoksik	Dos (MG)	Bil. Amp/vial & kekuatan	Diluent	Isipadu diluent	Isipadu Bolus/Infusi	
						*Sila rujuk Senarai Semak Kemoterapi untuk nama dagangan, pengeluar, nombor kelompok dan tarikh luput produk.
Disediakan oleh:			Direkonstitusi oleh:			Disemak oleh:
Dibungkus oleh:			Diluluskan oleh:			

BLANK

HANDWRITTEN

MANUAL FORM

KERTAS KERJA REKONSTITUSI UBAT SITOTOKSIK

TARIKH: 13/2/22

T SITOTOKSIK, SEKSYEN FARMASI PENGELUARAN
TUNKU AZIZAH (HOSPITAL WANITA DAN KANAK-KANAK)

✗ Patient's Detail

NAMA: NUR ZARA AFEYA binti AHMAD MOHAMMAD
RN: 10-0286
JANTINA: Perempuan
UMUR: 4 YR
BERAT (kg): 12.5
TINGGI (cm): 99.6
BSA (m²): 0.6
UNIT/WAD: 108
NAMA DOKTOR: KO GILAVAN I

**✗ Strength & Quantity Of
Chemotherapy Drug**

Ubat Sitotoksik	Dosis	Frekuensi	Volume
IV IFOSFAMIDE	1500 mg	1 x	16.150 mL
IV ETOPOSIDE	100 mg	1 x	5 mL

**✗ Volume Of
Chemotherapy Drug**

75 mL in 150 mL NS

✗ Missed out Of 1 Chemotherapy Drug

IV Carboplatin	220 mg	1x	450mg/45mL	-	-	22mL in 70mL NS

Disediakan oleh: [Signature]
Direkonstitusi oleh: [Signature]
Dibungkus oleh: [Signature]
Disemak oleh: [Signature]
Diluluskan oleh: [Signature]

UNIT REKONSTITUSI UBAT SITOTOKSIK (CDR)
JABATAN FARMASI
HOSPITAL TUNKU AZIZAH

CYTOTOXIC DRUG RECONSTITUTION REQUEST FORM

DATE: 13/2/22

NAME: Nur Zara Afeya binti AHMAD MOHAMMAD
MYKID/ MYKAD: 19042110286
WARD: 108

Please [v]: New case ☐ Repeat case ☐

AGE: 4 years SEX: M (F) WT: 12.5 kg HT: 99.6 cm BSA: 0.6 m²

DIAGNOSIS: Left Adrenal Neuroblastoma

No.	Chemotherapy	Dose (....m ²)	Dose prescribed (infusion/bolus)	Date of PREPARATION*
1	Carboplatin	450mg/45mL	220 mg in 100 mL NS over 1 hour 22 mL	13/2
2	Ifosfamide	1500	850 mg in 150 mL NS over 3 hours 21 mL	13/2 - 15/2
3	Etoposide	100mg/5 mL	60mg in 200 mL NS over 4 hours 3 mL	13/2 - 15/2

IMPACT TO PATIENT

- ↓ Treatment Outcomes
- ↑ Medication Error
- ↑ Wastage of Chemotherapy

Borang Permohonan yang lengkap hendaklah dihantar sehari sebelum tarikh sediaan diperlukan
Selewat-lewatnya jam 3.00 petang)
Untuk kes-kes kecemasan yang memerlukan persediaan pada hari yang sama, Pegawai Farmasi hendaklah dihubungi di
tambahan 1240/1238/1239 dan borang permohonan perlu dihantar sebelum jam 9.00 pagi.
Borang CDR yang diterima selepas jam 9.00 pagi akan diproses & dibancuh pada keesokan harinya.

AFTER – STANDARDIZED (EXCEL)

KERTAS KERJA REKONSTITUSI UBAT SITOTOKSIK

TARIKH:

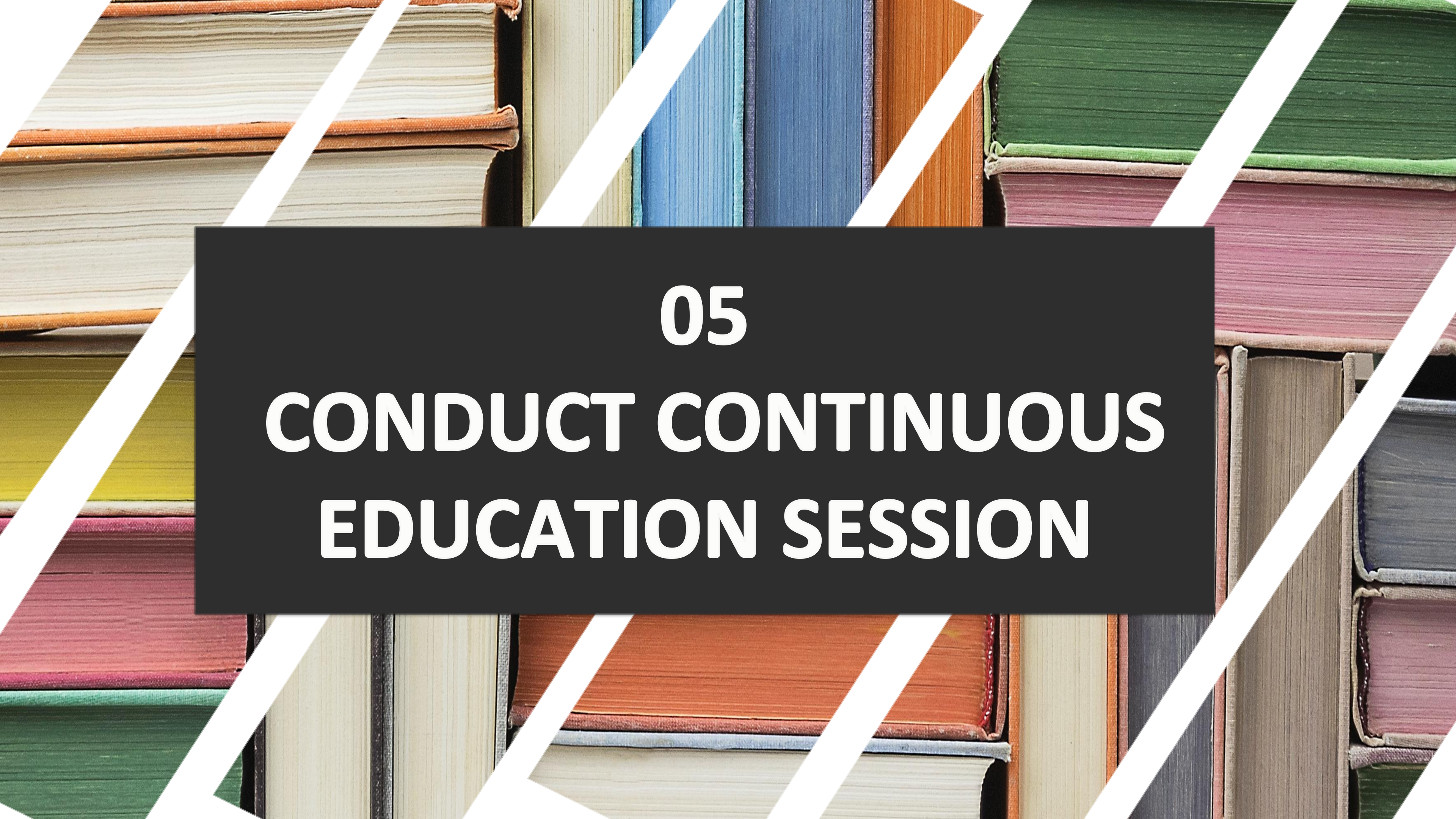
UNIT REKONSTITUSI UBAT SITOTOKSIK, SEKSYEN FARMASI PENGELUARAN
JABATAN FARMASI. HOSPITAL TUNKU AZIZAH (HOSPITAL WANITA DAN KANAK-KANAK)

NAMA:		BERAT (kg):		UNIT/WAD:	
RN:		TINGGI (cm):		NAMA DOKTOR:	
JANTINA:		BSA (m ²)	0.00		
UMUR:		DIAGNOSIS:	Acute Lymphoblastic Lymphoma/Leukemia Protocol HR2		

MAKLUMAT REKONSTITUSI					
Ubat Sitotoksik	Dos (MG)	Bil. Amp/vial & kekuatan	Diluent	Isipadu diluent	Isipadu Bolus Infusi
IV Vindesine	0	0 5MG/5ML	NS	0 X 5ML	0.0 ML IN ML NS
IV Methotrexate	0	0 1G/10ML			0.0 ML IN ML NS
IV Ifosfamide	0	0 1G/25ML	WFI	0 x 25ML	0.0 ML IN ML NS
IV Daunorubicin	0	0 20MG/4ML	WFI	0 x 4ML	0.0 ML IN ML NS
IM Pegasparaginase	0 UNIT	0 3750U/5ML			0.0 ML
IT Methotrexate	0	0 50MG/2ML			0.0 ML IN 5 ML NS
Disediakan oleh:		Direkonstitusi oleh:		Disema	
Dibungkus oleh:		Diluluskan oleh:			

using excel calculator

- ✓ Listed **Chemotherapy** for each regimen
- ✓ Listed **Strength** of chemotherapy drug used
- ✓ Calculated **No. of vial** of medication used with its strength
- ✓ Calculated **Volume** of Chemotherapy



05

CONDUCT CONTINUOUS EDUCATION SESSION



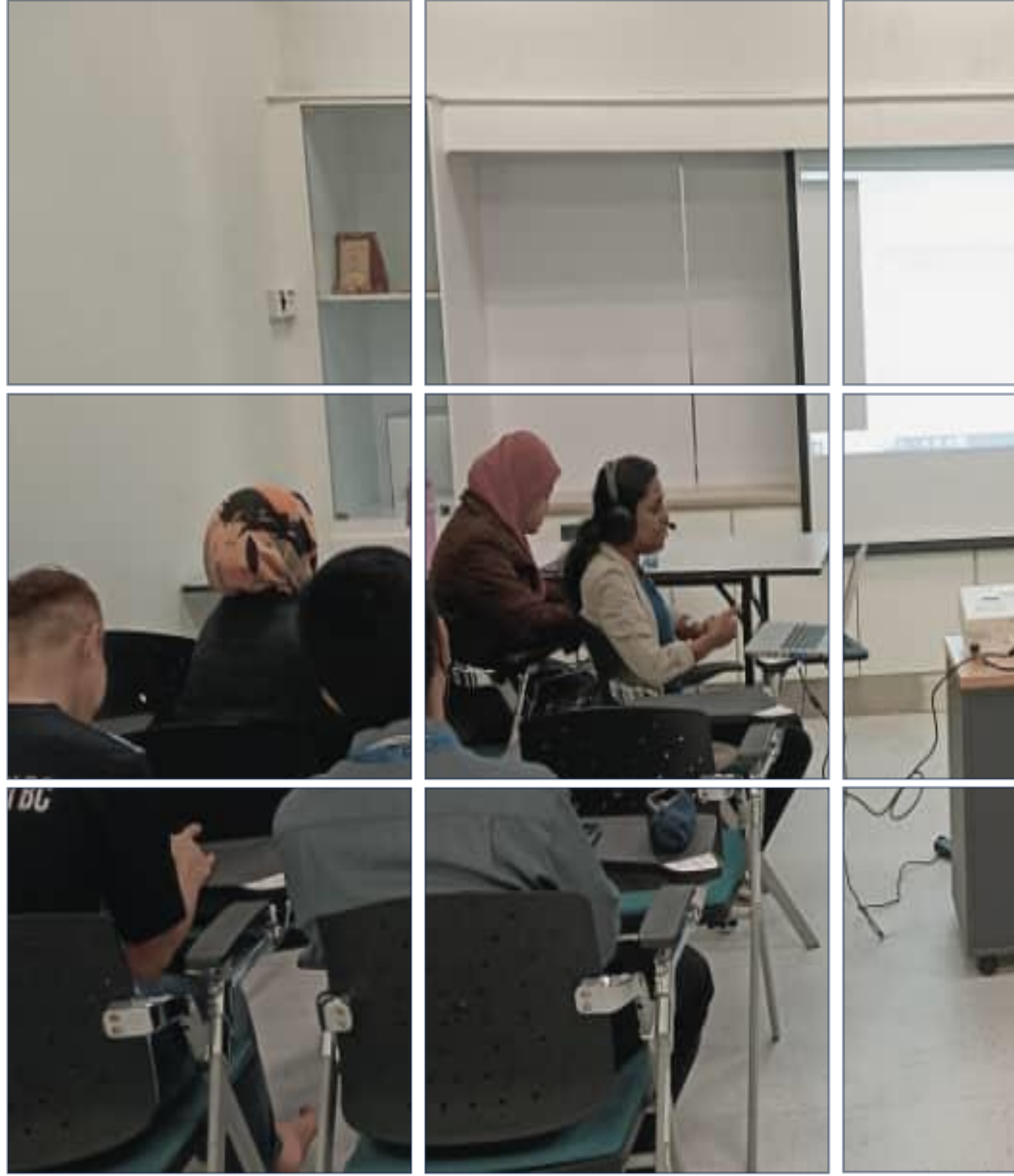
Continuous Medical Education ‘Practice Make Prefect’ was carried out among trainee sub-specialist 10B.

- ✓ **Refresh and increase knowledge** on:
 - a) Formula of volume of infusion based on hour
 - b) Special precautions for each medication
 - c) Available drip in pharmacy
 - d) Storage and expiry of chemotherapy drug

✓ **Training and demonstration for app**



**Trainee sub-specialist 10B
attended (100%)**

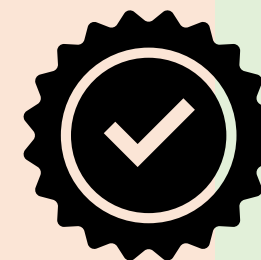


Continuous Medical Education was carried out among pharmacists and assistant pharmacists

✓ **Refresh and increase knowledge on:**

- a) Formula of volume of infusion based on hour
- b) Criteria to check during counterchecking
- c) Colour, Characteristics, Storage and expiry of chemotherapy drug

✓ **Training and demonstration for app**



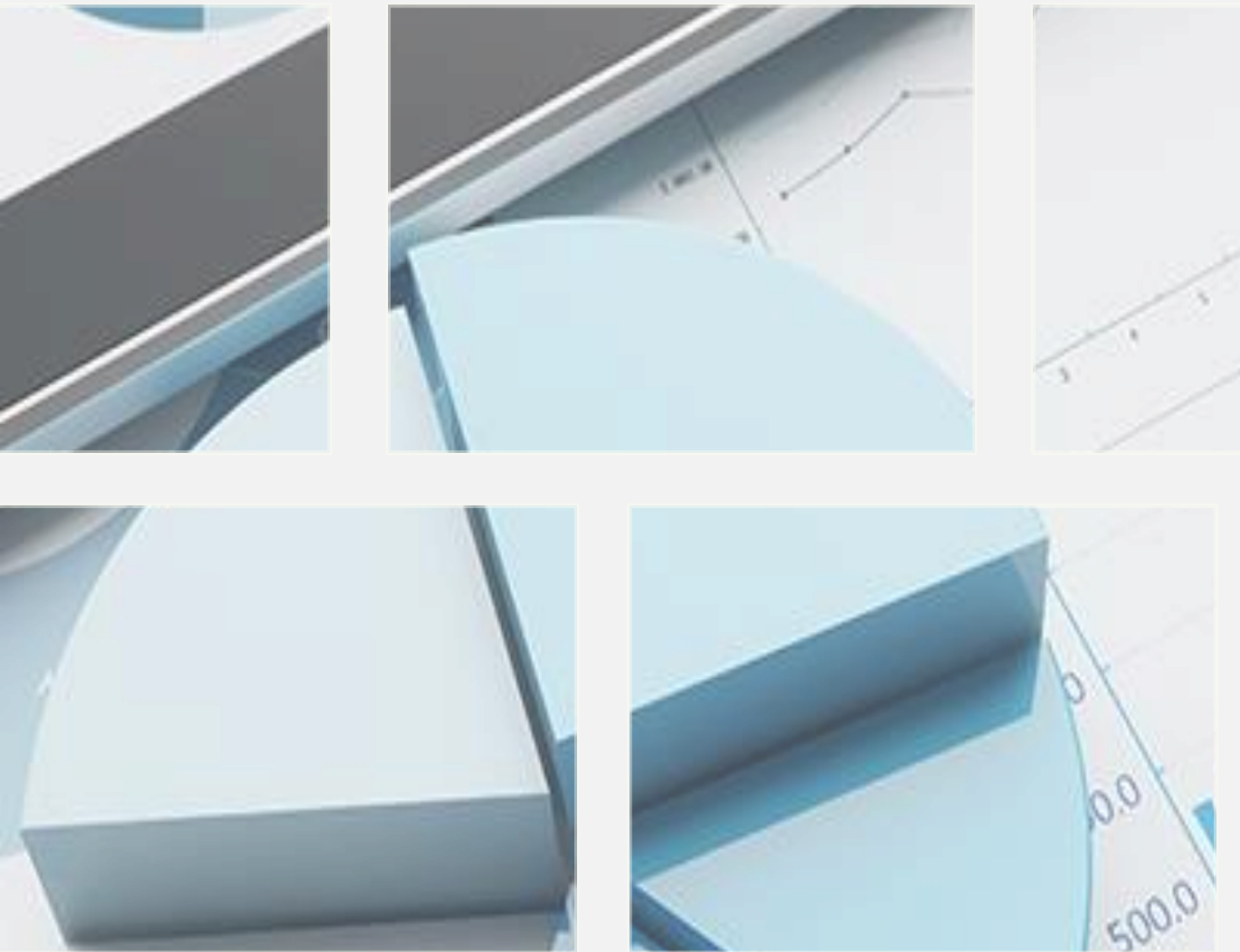
Pharmacist and Assistant Pharmacist attended

Continuous Nursing Education
‘Reginite, Refresh, Renew’: For better patient outcome’ was carried out among staff nurse 10B

- ✓ **Refresh and increase knowledge on:**
 - a) Criteria to check during counterchecking of chemotherapy drug
 - b) Way to check leaking or particles
 - c) Colour and Characteristics of chemotherapy drug
 - d) Storage and expiry of chemotherapy drug
- ✓ **Training and demonstration for app**



**Staff nurse 10B attended
(100%)**



EFFECTS OF CHANGE

CYCLE 1



MODEL OF GOOD CARE

No	Critical step	Criteria	Standard	Verification (N=674)	Cycle 1 (N=130)
1	Specialist/ Trainee Subspecialist prescribing chemotherapy drug	CDR request form need to be filled by specialist/ trainee subspecialist and include data:			
		a) Correct Patient's Details	100%	99.4%	97.0%
		b) Correct Regimen	100%	99.3%	 100%
		c) Correct Drug	100%	100%	100%
		d) Correct Dose In Correct Unit (Based On BSA/ Weight)	100%	98.1%	 99.2%
		e) Correct Diluent With Its Volume	100%	84.6%	 94.6%
		f) Correct Concentration Of Chemotherapy Drug	100%	87.5%	 98.5%
		g) Correct Date Of Preparation	100%	98.5%	 99.2%
2	Pharmacist screen the CDR request form	Pharmacist screen on received CDR form whether it is a complete CDR form with:			
		a) Correct Patient's Details	100%	99.4%	99.2%
		b) Correct Regimen	100%	100%	100%
		c) Correct Drug	100%	100%	100%
		d) Correct Dose In Correct Unit (Based On BSA/ Weight)	100%	100%	100%
		e) Correct Volume Of Diluent	100%	100%	100%
		f) Correct Concentration Of Chemotherapy Drug	100%	98.1%	 99.2%
		g) Correct Date Of Preparation	100%	99.5%	 100%
		h) Presence Of Specialist/Trainee Subspecialist's Chop And Signature	100%	99.7%	 100%

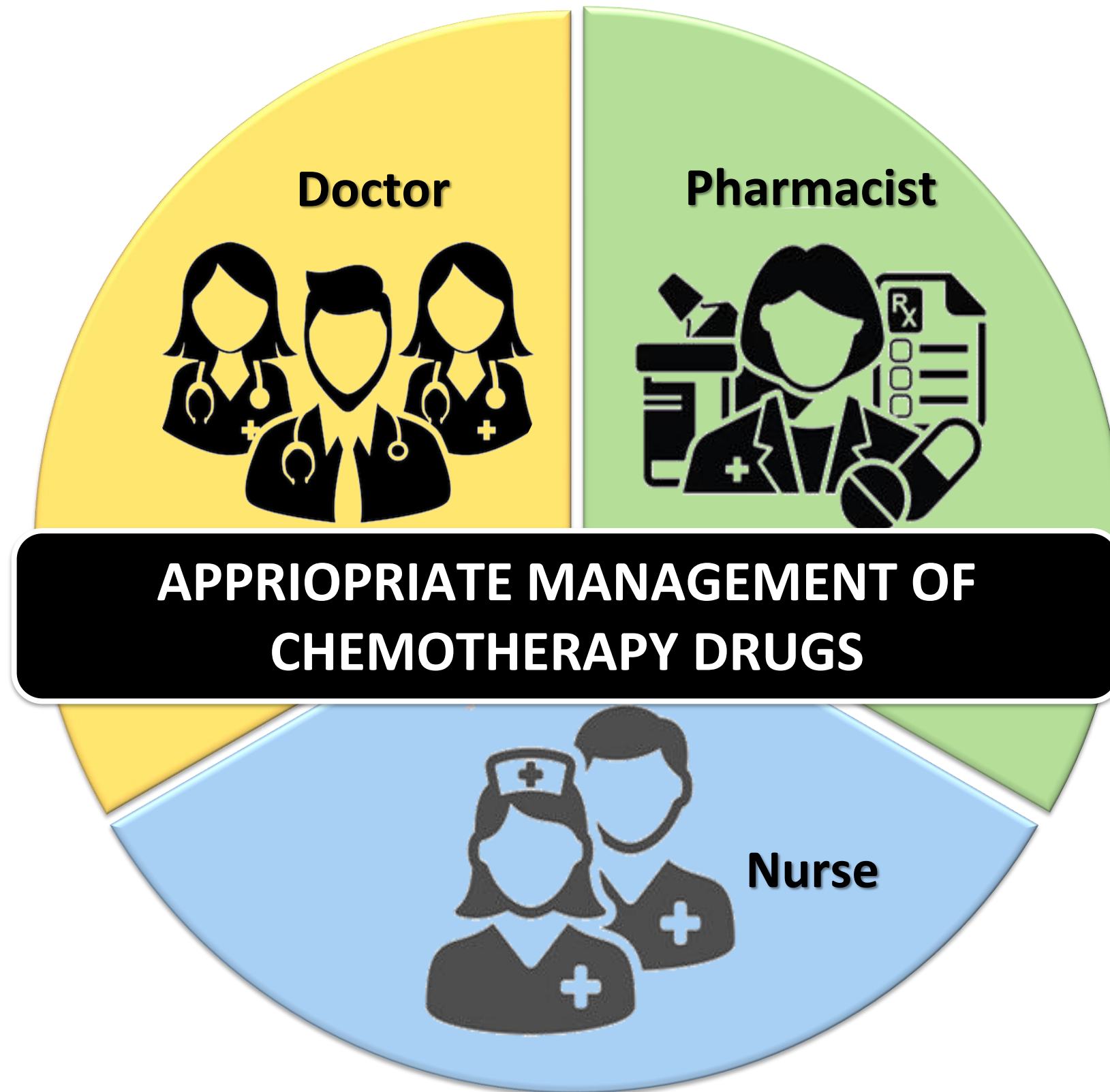
No	Critical step	Criteria	Standard	Verification (N=674)	Cycle 1 (N=130)
3	Prepare CDR worksheet, labels and bags	Pharmacist or Assistant Pharmacist will prepare: CDR Worksheet:			
		a) Correct Patient's Details	100%	93.0%	 98.5%
		b) Correct Drug	100%	100%	100%
		c) Correct Dose	100%	95.4%	 100%
		d) Correct Diluent With Its Volume	100%	97.5%	 98.5%
		Labels:			
		a) Correct Patient's Details	100%	98.2%	 98.5%
		b) Correct Drug	100%	98.2%	 98.5%
		c) Correct Dose	100%	99.5%	99.2%
		d) Correct Diluent With Its Volume	100%	96.4%	96.2%
		e) Correct Preparation Date And Expiry Date	100%	96.1%	 96.2%
		f) Correct Storage Condition For Reconstituted Chemotherapy Drug	100%	99.5%	 100%
		Bags:			
		a) Correct Patient's Details	100%	99.1%	98.5%
		b) Correct Drug	100%	98.3%	 98.5%
		c) Correct Number And Size Of Bags Required	100%	95.8%	 96.2%

No	Critical step	Criteria	Standard	Verification (N=674)	Cycle 1 (N=130)
4	Countercheck CDR worksheet, labels and bags	Pharmacist will countercheck on the written criteria on:			
		Prepared CDR Worksheet:			
		a) Correct Patient's Details	100%	99.5%	99.2%
		b) Correct Drug	100%	100%	100%
		c) Correct Dose	100%	100%	100%
		d) Correct Diluent With Its Volume	100%	99.5%	99.2%
		Prepared Labels:			
		a) Correct Patient's Details	100%	99.1%	↑ 99.2%
		b) Correct Drug	100%	100%	100%
		c) Correct Dose	100%	100%	100%
		d) Correct Diluent With Its Volume	100%	99.1%	↑ 100%
		e) Correct Preparation Date And Expiry Date	100%	99.5%	99.2%
		f) Correct Storage Condition For Reconstituted Chemotherapy Drug	100%	100%	100%
		Prepared Bags:			
		a) Correct Patient's Details	100%	99.1%	↑ 99.2%
		b) Correct Drug	100%	99.5%	99.2%
		c) Correct Number And Size Of Bags Required	100%	99.5%	99.2%

No	Critical step	Criteria	Standard	Verification (N=674)	Cycle 1 (N=130)
5	Chemotherapy Drug Reconstitution	Pharmacist or assistant pharmacist reconstitute the chemotherapy product with:			
		a) Correct Drug	100%	100%	100%
		b) Correct Volume Of Drug	100%	100%	100%
		c) Correct Volume Of Diluent	100%	99.4%	99.4%
		d) Absence Of Leakage Or Impurity	100%	96.8%	 97.2%
6	Countercheck reconstituted chemotherapy drug and approve final preparation	Pharmacist countercheck on the reconstituted chemotherapy drug by checking on:			
		a) Correct Patient Details On Label And Bag	100%	98.8%	 99.6%
		b) Correct Drug	100%	100%	100%
		c) Correct Colour And Its Characteristics	100%	100%	100%
		d) Correct Final Volume	100%	99.9%	 100%
		e) Absence Of Leakage Or Impurity	100%	99.8%	 100%
		f) Presence Of Supplied Administration Set For Specific Chemotherapy Drug	100%	99.9%	99.8%

No	Critical step		Criteria	Standard	Verification (N=674)	Cycle 1 (N=130)
7	Nurse check chemotherapy drug during collection in pharmacy		Nurse check the reconstituted chemotherapy drug for			
			a) Correct Patient's Details	100%	100%	100%
			b) Correct Drug	100%	100%	100%
			c) Correct Colour And Characteristics	100%	0%	 69.2%
			d) Correct Dose	100%	100%	100%
			e) Correct Final Volume	100%	14.3%	 100%
			f) Absence Of Leakage Or Impurity	100%	28.5%	 100%
			g) Correct Preparation Date And Expiry Date	100%	28.5%	 61.5%
			h) Correct Storage Condition	100%	0%	 46.2%
			i) Presence Of Supplied Administration Set For Specific Chemotherapy Drug	100%	0%	 100%
8	Administer chemotherapy to patient according to regimen and close monitoring		Doctors or nurses will administer chemotherapy according to the regimen planned with following criteria:			
			a) Correct Patient's Details	100%	100%	100%
			b) Correct Drug	100%	100%	100%
			c) Correct Dose And Final Volume Of Reconstituted Chemotherapy Drug	100%	100%	100%
			d) Correct Route Of Administration	100%	100%	100%
			e) Correct Infusion Rate	100%	100%	100%
			f) Correct Date And Time Of Administration	100%	100%	100%
			g) Close Monitor Patient's Vital Sign And Condition During And Post Chemotherapy	100%	100%	100%

CYCLE 1



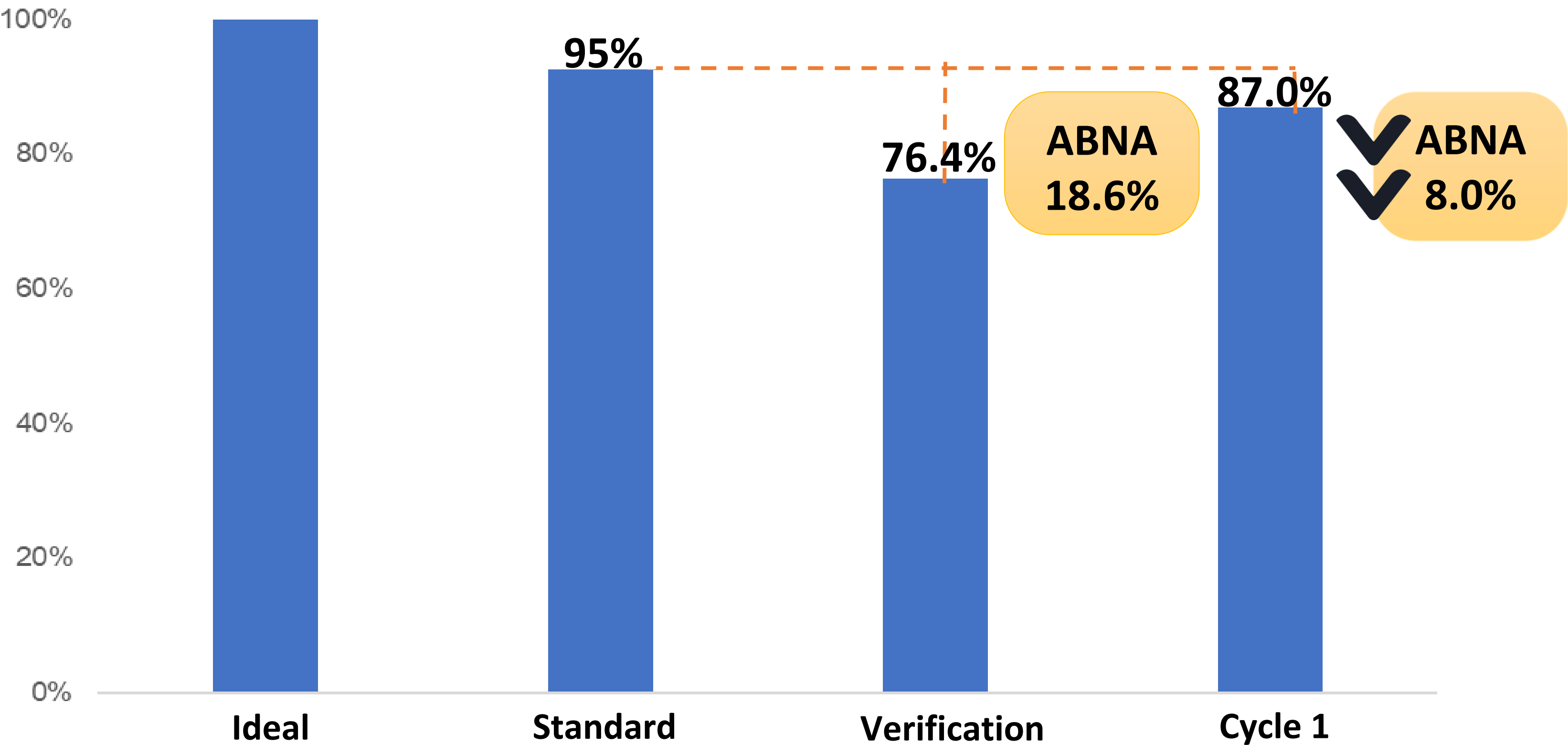
Total Number of Patient On
Chemotherapy Drugs 130

Total Number of Patient with
Appropriate Management of
Chemotherapy Drugs 113

Percentage of Appropriate
Management of Chemotherapy
Drugs 87.0%

ACHIEVABLE BENEFIT NOT ACHIEVED (ABNA)

Percentage of Appropriate Management of Chemotherapy Drug



The background of the image is a vibrant, futuristic cityscape at night. The scene is filled with a dense grid of glowing orange and yellow lights, suggesting a highly developed urban environment. In the upper left, a large, reflective sphere, possibly a space station or a large satellite, is visible, reflecting the city lights. The overall color palette is dominated by deep blues and purples, with the warm lights providing a strong contrast. A large, white, stylized text 'CYCLES 2' is superimposed over the center of the image, partially obscuring the cityscape. The text is bold and modern, with a slight shadow effect. The image is split diagonally by a white line, with the cityscape on the left and a solid white background on the right.

CYCLES 2

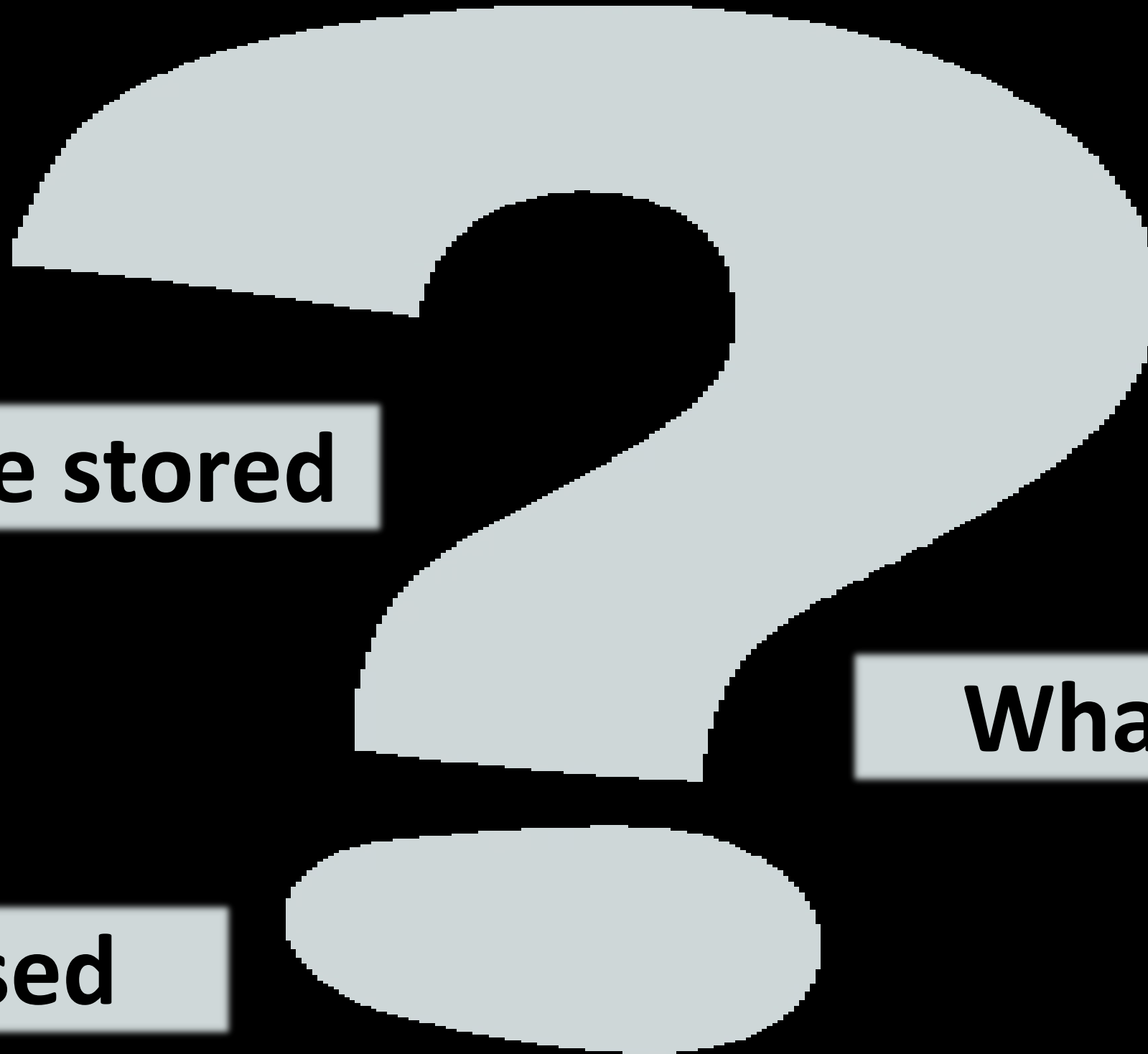
What is the strength used

Where to be stored

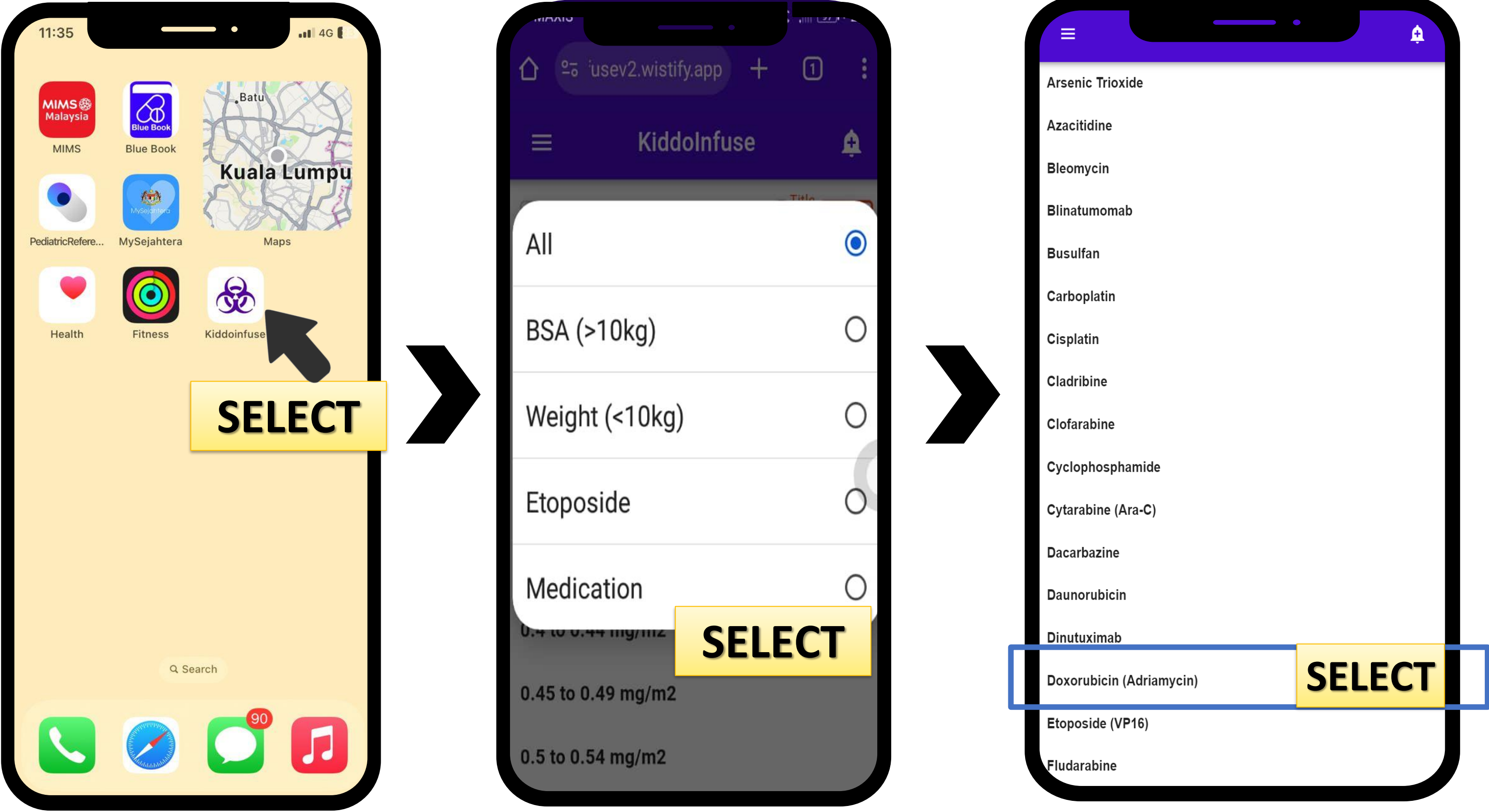
How long can it be stored

What is the colour

Can it still be used



CHEMOTHERAPY DRUG





Doxorubicin (Adriamycin)

Name Of Chemotherapy Drug

Title
Medication

Strength

Strength
50mg/25ml

Stability and Storage
Fridge (48 hours)

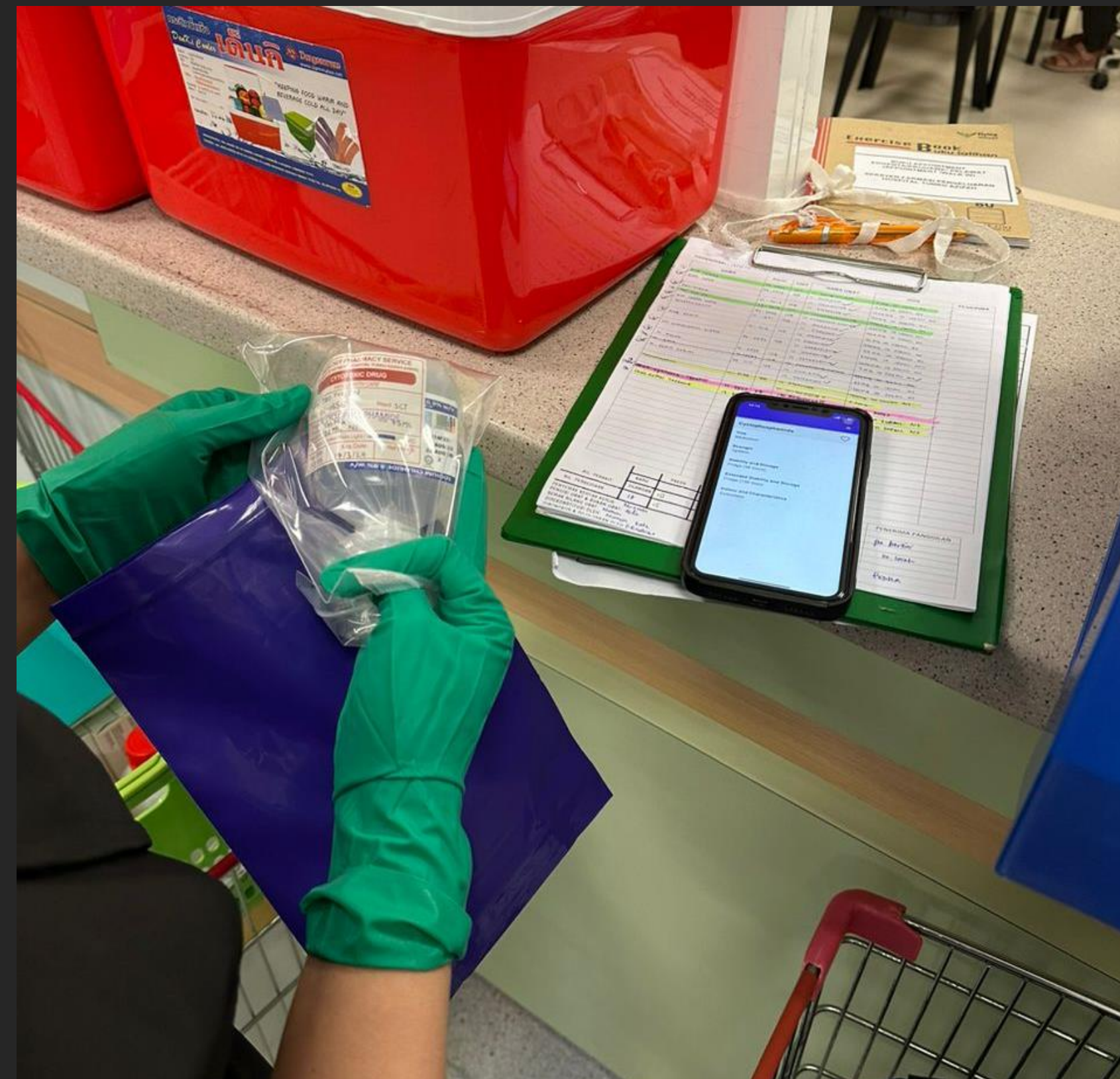
Stability & Storage

Extended Stability & Storage

Extended Stability and Storage
IV preparation:
Conc (0.1 - 0.2mg/ml) - Fridge (28 days)
Conc (>0.2mg/ml) - Fridge (84 days)

Colour and Characteristics
Red

Colour & Characteristics



Use KIDDOINFUSE during counterchecking chemotherapy

KIDDOINFUSE VERSION 2



1 hour

IV Cyclophosphamide 1500mg/m² & IV Carboplatin

2 hour

3 hour

4 hour

6 hour

12 hour

24 hour

For fixed volume stated in CDR form

5kg to 5.9kg



Title

Weight (<10kg)

Recommended Volume for 1 hour

30 mL

*50mL (for all IV Cyclophosphamide & IV Carboplatin)

Recommended Volume for 2 hour

50mL

Recommended Volume for 3 hour

80 mL

*80mL (for IV Methotrexate 12000mg/m²)

Recommended Volume for 4 hour

100mL

Recommended Volume for 6 hour

100 mL

Recommended Volume for 12 hour

250mL

Recommended Volume for 24 hour

500 mL

Notes

Do not refer this reference for fixed volume stated in CDR form

0.45 to 0.49 mg/m²

Title

Etoposide

Recommended Volume for 1 hour

150mg/m² - 180mL

Recommended Volume for 2 hour

120mg/m² - 150mL

150mg/m² - 180mL

200mg/m² - 250mL

Recommended Volume for 4 hour

100mg/m² - 120mL

120 - 125mg/m² - 150mL

150mg/m² - 180mL

175mg/m² - 250mL

300mg/m² - 400mL

Notes

Do not refer this reference for fixed volume stated in CDR form

KIDDOINFUSE VERSION 2



5kg to 5.9kg

Title
Weight (<10kg)

Recommended Volume for
30 mL
*50mL (for all IV Cyclophosphamide 1500mg/m² & IV Carboplatin

Recommended Volume for
50mL

Recommended Volume for 3 hour
80 mL
*80mL (for IV Methotrexate 12000mg/m²)

Recommended Volume for 4 hour
100mL

Recommended Volume for 6 hour
100 mL

Recommended Volume for 12 hour
250mL

Recommended Volume for 24 hour
500 mL

Notes
Do not refer this reference for fixed volume stated in CDR form



0.45 to 0.49 mg/m²

Title
Etoposide

Recommended Volume for 1 hour
150mg/m² - 180mL

Recommended Volume for 2 hour
120mg/m² - 150mL
150mg/m² - 180mL
200mg/m² - 250mL

Recommended Volume for 4 hour
100mg/m² - 120mL
120 - 125mg/m² - 150mL
150mg/m² - 180mL
175mg/m² - 250mL
300mg/m² - 400mL

Notes
Do not refer this reference for fixed volume stated in CDR form

**WEIGHT
(KG)**

**For patient
<10kg**

1 hour
Cyclophosphamide 1500mg/m² & IV Carboplatin

2 hour

3 hour

4 hour

6 hour

12 hour

24 hour

For fixed volume stated in CDR form

KIDDOINFUSE VERSION 2

0.45 to 0.49 mg/m²

ETOPOSIDE



Title

Etoposide

Recommended Volume

150mg/m² - 180mL

**BODY SURFACE
AREA (mg/m²)**

Recommended Volume

120mg/m² - 150mL

150mg/m² - 180mL

200mg/m² - 250mL

Recommended Volume

100mg/m² - 120mL

120 - 125mg/m² - 150mL

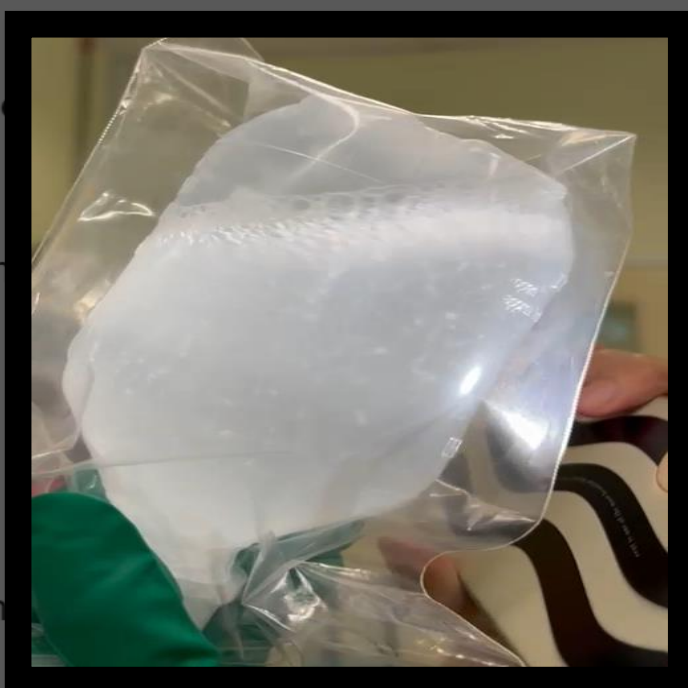
150mg/m² - 180mL

175mg/m² - 250mL

300mg/m² - 400mL

Notes

Do not refer this referen



7kg to 8kg

ETOPOSIDE

Title

Etoposide

Recommended Volu

IV Etoposide:

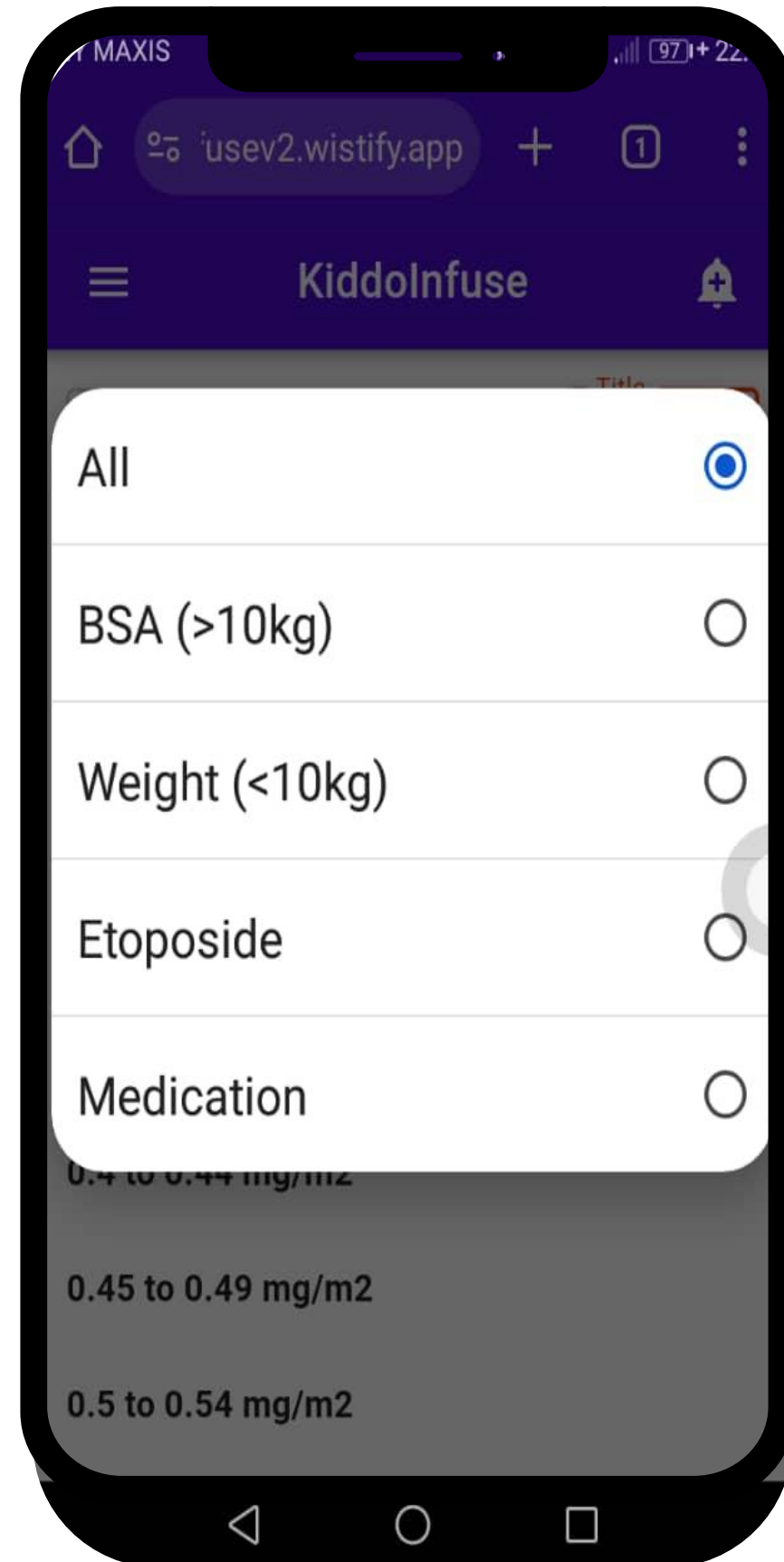
Other doses - 150mL

10mg/kg - 200mL

**WEIGHT
(KG)**

SOLVE problem of **crystallisation** of
etoposide based on concentration
($<0.4\text{mg/mL}$)

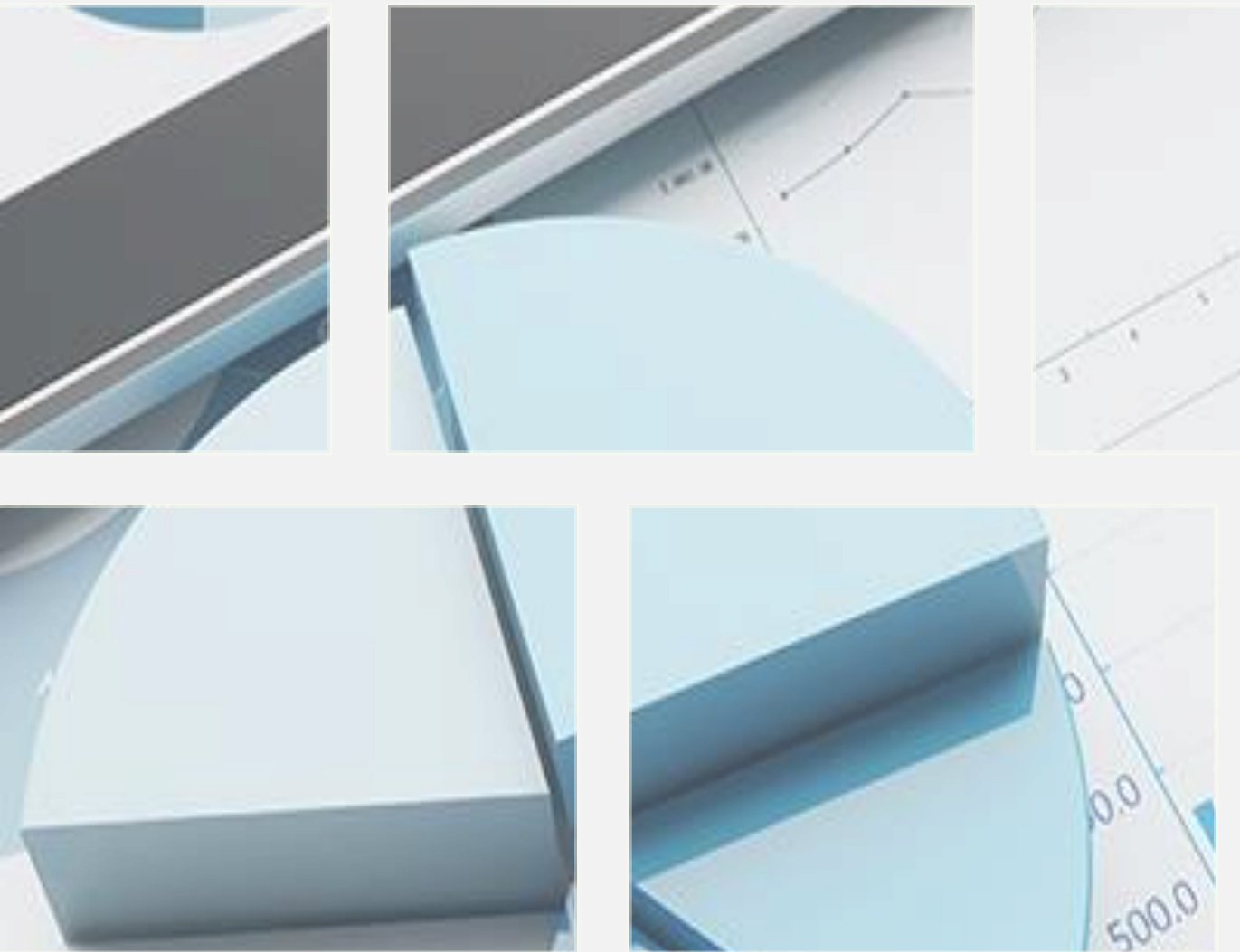
UPDATED KIDDOINFUSE



- ☐ More precise version
- ☐ Introduce new features and functionality

Factors:

- ✓ Lack of knowledge
- ✓ Inadequate counterchecking



EFFECTS OF CHANGE

CYCLE 2

MODEL OF GOOD CARE

No	Critical step	Criteria	Standard	Verification (N=674)	Cycle 1 (N=130)	Cycle 2 (N= 130)
1	Specialist/ Trainee Subspecialist prescribing chemotherapy drug	CDR request form need to be filled by specialist/ trainee subspecialist and include data:				
		a) Correct Patient's Details	100%	99.4%	97.0%	↑100%
		b) Correct Regimen	100%	99.3%	100%	100%
		c) Correct Drug	100%	100%	100%	100%
		d) Correct Dose In Correct Unit (Based On BSA/ Weight)	100%	98.1%	99.2%	99.2%
		e) Correct Diluent With Its Volume	100%	84.6%	94.6%	↑97.7%
		f) Correct Concentration Of Drug	100%	87.5%	98.5%	↑99.1%
		g) Correct Date Of Preparation	100%	98.5%	99.2%	↑100%
2	Pharmacist screen the CDR request form	Pharmacist screen on received CDR form whether it is a complete CDR form with:				
		a) Correct Patient's Details	100%	99.4%	99.2%	↑100%
		b) Correct Regimen	100%	100%	100%	100%
		c) Correct Drug	100%	100%	100%	100%
		d) Correct Dose In Correct Unit (Based On BSA/ Weight)	100%	100%	100%	100%
		e) Correct Volume Of Diluent	100%	100%	100%	100%
		f) Correct Concentration Of Drug	100%	98.1%	99.2%	99.2%
		g) Correct Date Of Preparation	100%	99.5%	100%	100%
		h) Presence Of Specialist/Trainee Subspecialist's Chop And Signature	100%	99.7%	100%	100%

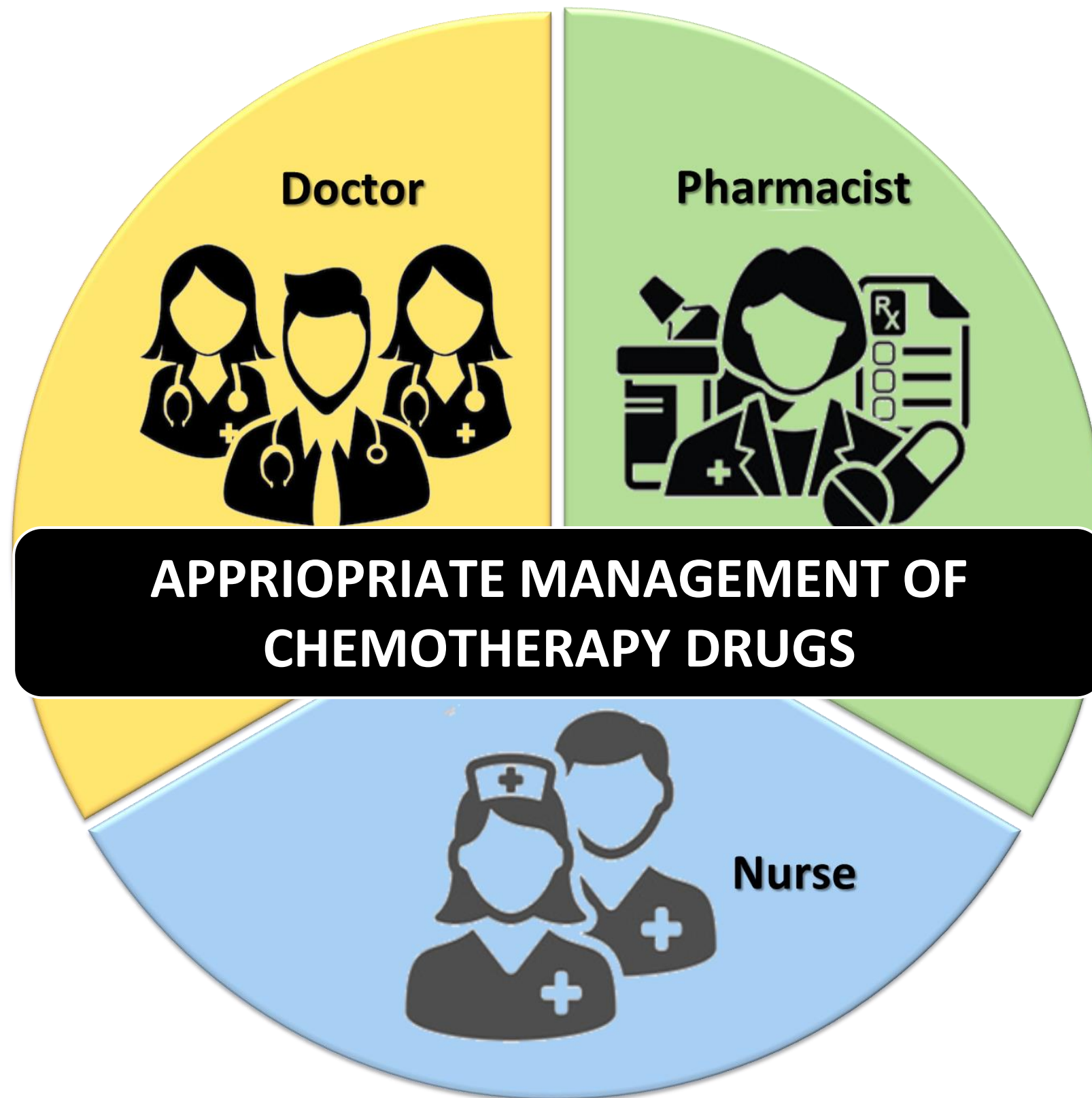
No	Critical step	Criteria	Standard	Verification (N=674)	Cycle 1 (N=130)	Cycle 2 (N= 130)
3	Prepare CDR worksheet, labels and bags	Pharmacist or Assistant Pharmacist will prepare: CDR Worksheet:				
		a) Correct Patient's Details	100%	93.0%	98.5%	↑ 100%
		b) Correct Drug	100%	100%	100%	100%
		c) Correct Dose	100%	95.4%	100%	100%
		d) Correct Diluent With Its Volume	100%	97.5%	98.5%	↑ 100%
		Labels:				
		a) Correct Patient's Details	100%	98.2%	98.5%	↑ 100%
		b) Correct Drug	100%	98.2%	98.5%	↑ 99.2%
		c) Correct Dose	100%	99.5%	99.2%	↑ 100%
		d) Correct Diluent With Its Volume	100%	96.4%	96.2%	↑ 98.5%
		e) Correct Preparation Date And Expiry Date	100%	96.1%	96.2%	↑ 97.7%
		f) Correct Storage Condition For Reconstituted Chemotherapy Drug	100%	99.5%	100%	100%
		Bags:				
		a) Correct Patient's Details	100%	99.1%	98.5%	↑ 99.2%
		b) Correct Drug	100%	98.3%	98.5%	↑ 99.2%
		c) Correct Number And Size Of Bags Required	100%	95.8%	96.2%	↑ 98.5%

No	Critical step	Criteria	Standard	Verification (N=674)	Cycle 1 (N=130)	Cycle 2 (N=130)
4	Countercheck CDR worksheet, labels and bags	Pharmacist will countercheck on the written criteria on:				
		Prepared CDR Worksheet:				
		a) Correct Patient's Details	100%	99.5%	99.2%	 100%
		b) Correct Drug	100%	100%	100%	100%
		c) Correct Dose	100%	100%	100%	100%
		d) Correct Diluent With Its Volume	100%	99.5%	99.2%	 100%
		Prepared Labels:				
		a) Correct Patient's Details	100%	99.1%	99.2%	99.2%
		b) Correct Drug	100%	100%	100%	100%
		c) Correct Dose	100%	100%	100%	100%
		d) Correct Diluent With Its Volume	100%	99.1%	100%	100%
		e) Correct Preparation Date And Expiry Date	100%	99.5%	99.2%	99.2%
		f) Correct Storage Condition	100%	100%	100%	100%
		Prepared Bags:				
		a) Correct Patient's Details	100%	99.1%	99.2%	 100%
		b) Correct Drug	100%	99.5%	99.2%	 100%
		c) Correct Number And Size Of Bags Required	100%	99.5%	99.2%	99.2%

No	Critical step	Criteria	Standard	Verification (N=674)	Cycle 1 (N=130)	Cycle 2 (N=130)
5	Chemotherapy Drug Reconstitution	Pharmacist or assistant pharmacist reconstitute chemotherapy product with:				
		a) Correct Drug	100%	100%	100%	100%
		b) Correct Volume Of Drug	100%	100%	100%	100%
		c) Correct Volume Of Diluent	100%	99.4%	99.4%	 100%
		d) Absence Of Leakage Or Impurity	100%	96.8%	97.2%	 99.2%
6	Countercheck reconstituted chemotherapy drug and approve final preparation	Pharmacist countercheck on the reconstituted chemotherapy drug by checking on:				
		a) Correct Patient Details On Label And Bag	100%	98.8%	99.6%	 100%
		b) Correct Drug	100%	100%	100%	100%
		c) Correct Colour And Its Characteristics	100%	100%	100%	100%
		d) Correct Final Volume	100%	99.9%	100%	100%
		e) Absence Of Leakage Or Impurity	100%	99.8%	100%	99.2%
		f) Presence Of Supplied Administration Set For Specific Chemotherapy Drug	100%	99.9%	99.8%	 100%

No	Critical step	Criteria	Standard	Verification (N=674)	Cycle 1 (N=130)	Cycle 2 (N=130)
7	Nurse check chemotherapy drug during collection in pharmacy	Nurse check the reconstituted chemotherapy drug for				
		a) Correct Patient's Details	100%	100%	100%	100%
		b) Correct Drug	100%	100%	100%	100%
		c) Correct Colour And Characteristics	100%	0%	69.2%	 100%
		d) Correct Dose	100%	100%	100%	100%
		e) Correct Final Volume	100%	14.3%	100%	100%
		f) Absence Of Leakage Or Impurity	100%	28.5%	100%	100%
		g) Correct Preparation Date And Expiry Date	100%	28.5%	61.5%	 100%
		h) Correct Storage Condition	100%	0%	46.2%	 100%
		i) Presence Of Supplied Administration Set For Specific Chemotherapy Drug	100%	0%	100%	100%
8	Administer chemotherapy to patient according to regimen and close monitoring	Doctors or nurses will administer chemotherapy according to the regimen planned with following criteria:				
		a) Correct Patient's Details	100%	100%	100%	100%
		b) Correct Drug	100%	100%	100%	100%
		c) Correct Dose And Final Volume Of Reconstituted Chemotherapy Drug	100%	100%	100%	100%
		d) Correct Route Of Administration	100%	100%	100%	100%
		e) Correct Infusion Rate	100%	100%	100%	100%
		f) Correct Date And Time Of Administration	100%	100%	100%	100%
		g) Close Monitor Patient's Vital Sign And Condition During And Post Chemotherapy	100%	100%	100%	100%

CYCLE 2



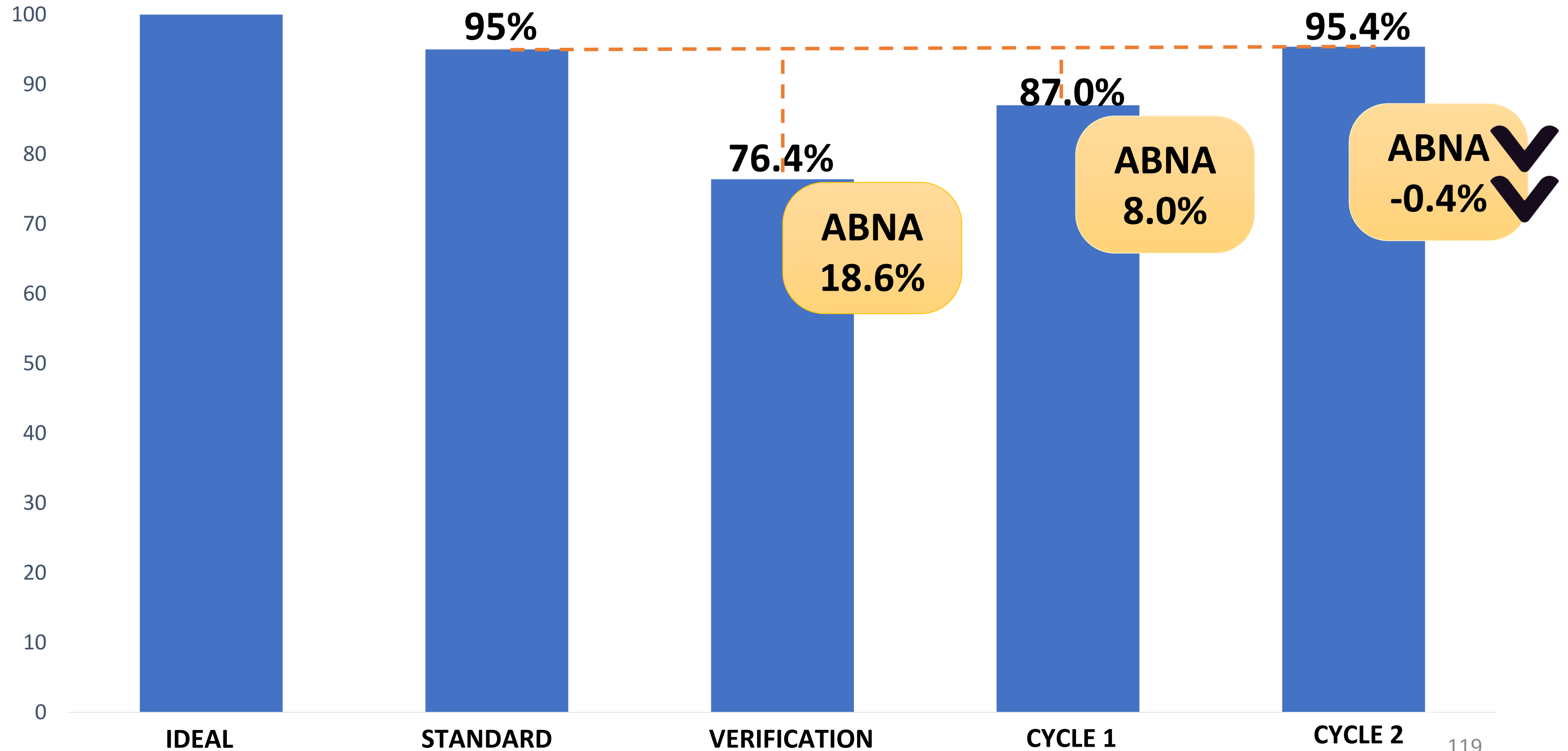
Total Number of Patient on
Chemotherapy Drugs 130

Total Number of Patient with
Appropriate Management of
Chemotherapy Drugs 124

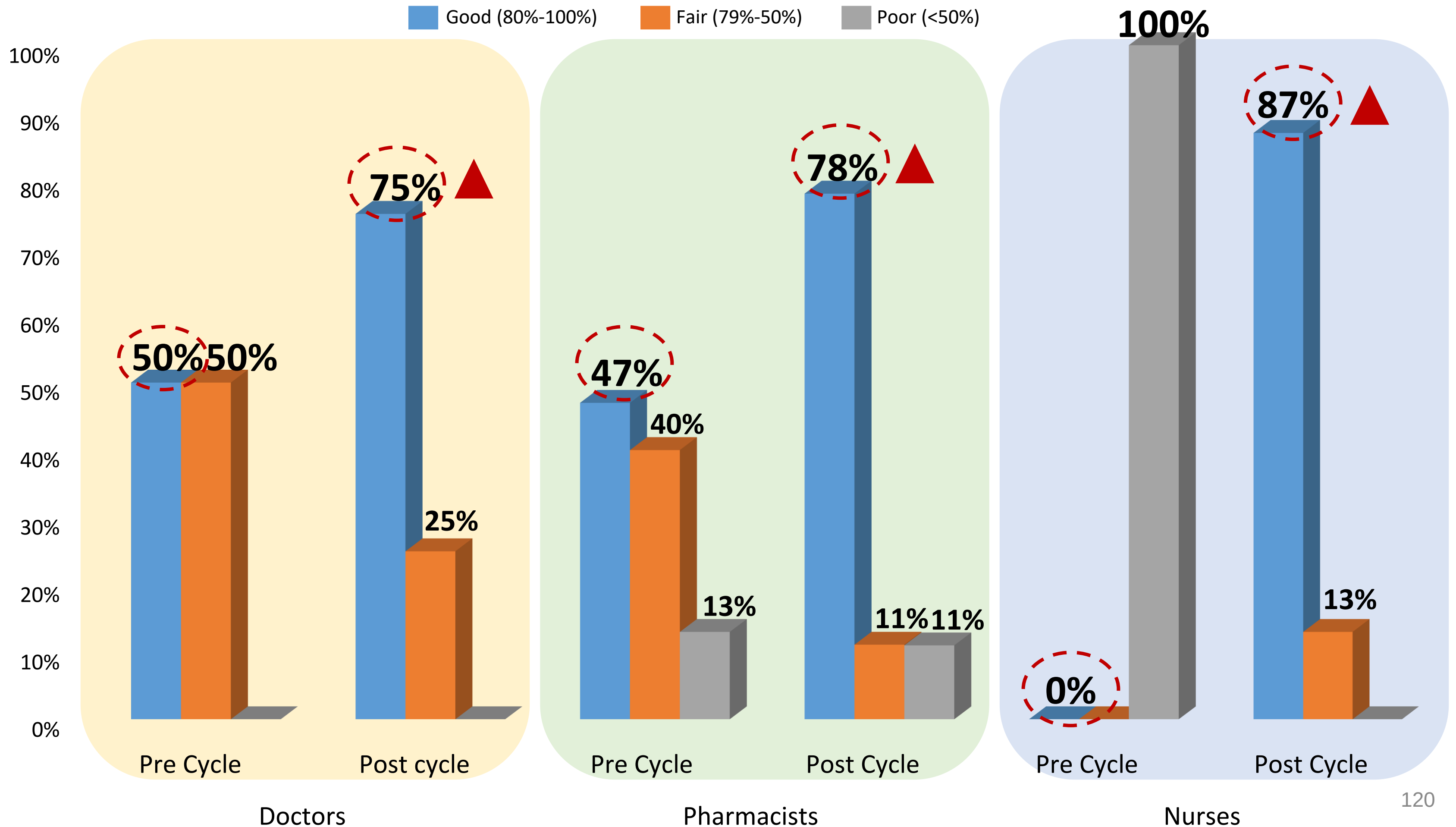
**Percentage of Appropriate
Management of Chemotherapy
Drugs 95.4%**

ACHIEVABLE BENEFIT NOT ACHIEVED (ABNA)

Percentage of Appropriate Management of Chemotherapy Drug



KNOWLEDGE SURVEY ANALYSIS



GOOD FEEDBACKS FROM DOCTORS ON UPDATED KIDDOINFUSE



Kok Hoi Teh 28 Feb
to me, Nik, NIK, Koo, Koo ▾

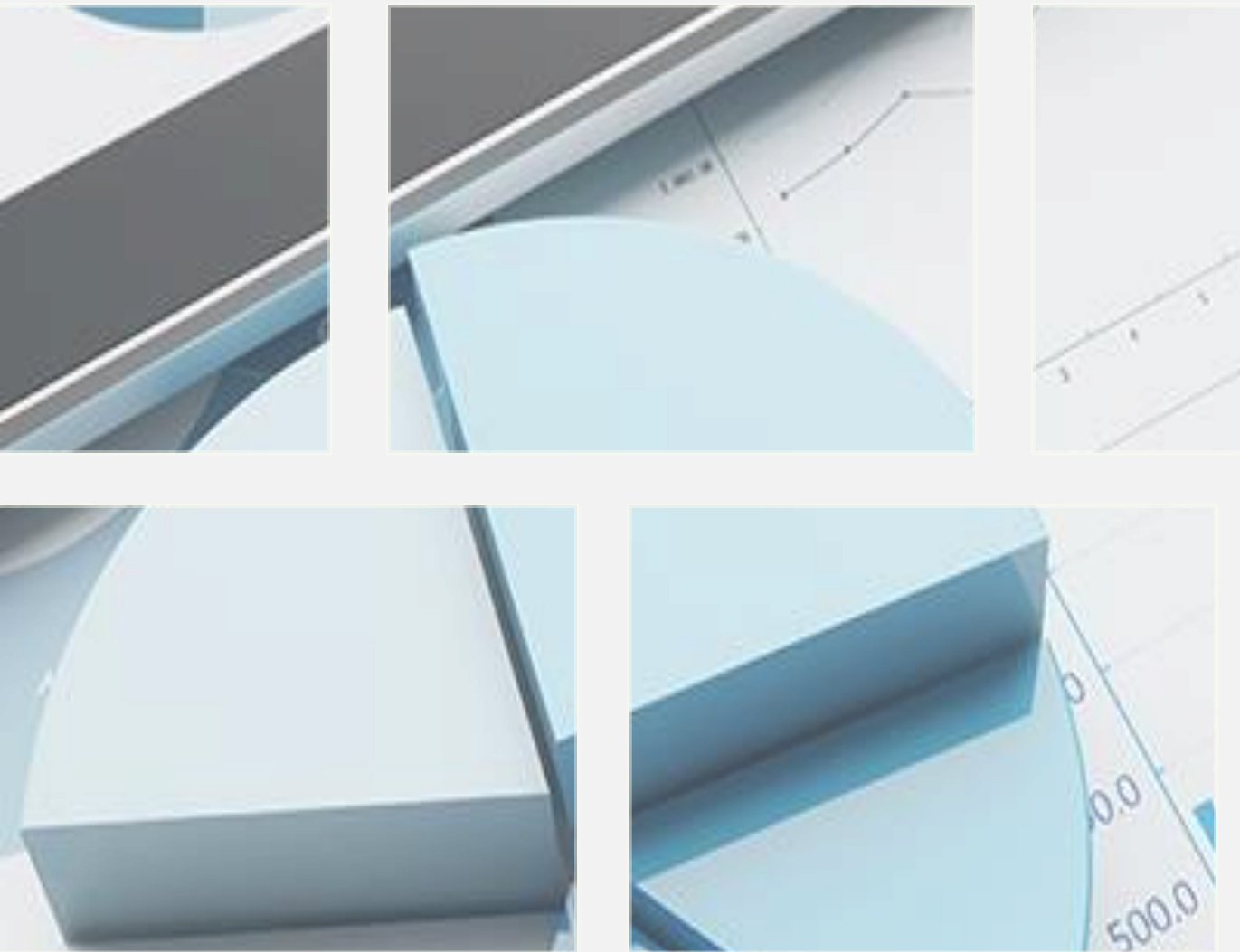


Dear Dr Rizal, Nabilah & Kai Tian,

TQ for including me in the QA / QI project for CDR chemo prescribing & preparation. It was great meeting Yee Shen, Alya & Radhika today. Congrats!

I can see a lot of passion, sweat & sleepless nights spent compiling the chemo prescription app & database! I'm sure our Paeds Onco fellows will be happy to use the app. And the nurses can get to know the chemo drugs better too. Thank you to your team for the great effort!





IMPACT OF PROJECT



PATIENT SAFETY

Numl

nt of

0

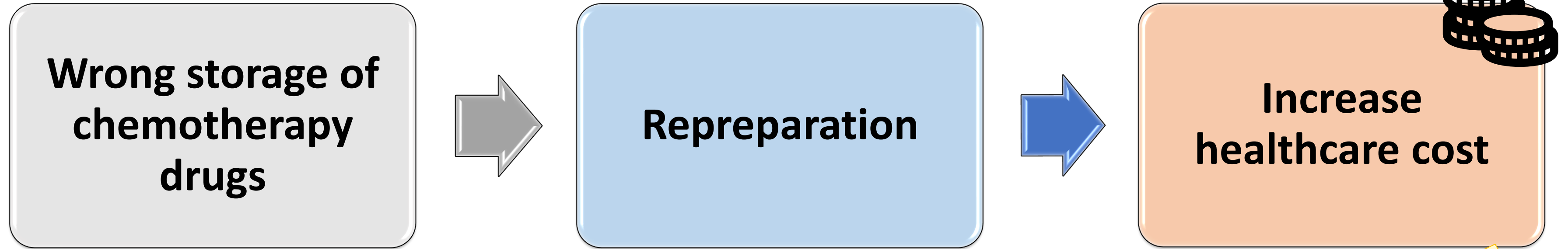
29 cas

MEDICATION ERROR

WORK PRODUCTIVITY

Number of Patient = 120 patients / month	Before (Manual Form)	After (Standardized Chemotherapy Form + KiddoInfuse App)
Time to prescribe chemotherapy drugs for 1 patient	10 minutes	5 minutes
Total Time Use to prescribe chemotherapy drugs for 120 patients	1200 minutes (~ 2.5 working days)	600 minutes (~ 1 working day)
Maximum Time Taken to solve interventions per month:	3 working days	1 hour (~ 0.1 working day)

COST SAVING



Price of chemotherapy preparation	
Price for chemotherapy medication (range)	RM10.44 to RM 53,277.00
Price of consumable:	
Personal Protective Equipment (PPE)	RM 150.00
Syringe + Needle (10's)	RM21.50
Others	RM 250.00
Total	RM 53698.50

Purchase for other medications:

- ✓ Etoposide
- ✓ Vincristine
- ✓ Doxorubicin
- ✓ Methotrexate
- ✓ Peg-asaparaginase and
- ✓ And other more medications

COST SAVING

LESSON LEARNT

- ✓ **TEAMWORK** from dedicated discipline
- ✓ **TARGETED REMEDIAL ACTION** on continuous enhancement





NEXT STEPS

KiddoInfuse App



**CHEMO
THERAPY**

 KiddoInfuse 

Search..

Title
All

0.1 to 0.19 mg/m2

0.2 to 0.24 mg/m2

0.25 to 0.29 mg/m2

0.3 to 0.34 mg/m2

0.35 to 0.39 mg/m2

0.4 to 0.44 mg/m2

0.45 to 0.49 mg/m2

0.5 to 0.54 mg/m2

0.55 to 0.59 mg/m2

0.6 to 0.64 mg/m2

0.65 to 0.69 mg/m2

0.7 to 0.74 mg/m2

Update the
content

 An updates of the data is available:

UPDATE



**CHEMO
THERAPY**

 KiddoInfuse 

Search..

Title
Height

Birth to 6 months

6 to 12 months

1 year to 2 years

2 years to 3 years

3 years to 4 years

5 years to 12 years

Introduce
New Feature

CYTOTOXIC DRUG RECONSTITUTION
REQUEST FORM

NAME:		DATE:		WARD:	
Please [v]: New case ☐ Repeat case ☐					
AGE:	SEX: M / F	WT: kg	HT: cm	BSA: m ²	
DIAGNOSIS: GLAUCOMA (Cycle: 1 / 2 / 3 / 4 / 5 / 6)					

No.	Chemotherapy	Dose	Dose prescribed (infusion/bolus)	Date of PREPARATION*
1.	SUBCONJUNCTIVAL MITOMYCIN Strength: 10MG/20ml (0.05%)	0.1mg /0.2ml	Pharmacy preparation: 0.25 mg (0.5ml) per eye BOLUS *To administer ____ mgl (____ ml) by opthal team Please select: ☐ LEFT eye ☐ RIGHT eye ☐ BOTH eye	
* Please be informed that chemo will be prepared and ready by 4.30-5.00pm (Monday-Friday) & 1pm (Saturday, Sunday & Public Holiday) on requested date of preparation. * If you intend to give chemo prior to that, please request the chemo to be prepared 1 day earlier. * For chemo with short shelf life (<24hour) post preparation, please liaise with CDR Pharmacist.				

Sign & Chop. (Consultant/ Specialist/ Medical Officer)

For Pharmacy Use
Pharmacist signature:
Stability:
*Mitomycin: 7 days (2-8C)

CYTOTOXIC DRUG RECONSTITUTION
REQUEST FORM

NAME:		DATE:		WARD:	
Please [v]: New case ☐ Repeat case ☐					
AGE:	SEX: M / F	WT: kg	HT: cm	BSA: m ²	
DIAGNOSIS: OVARIAN BEP (Cycle 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9/10)					

No.	Chemotherapy	Dose (....m ²)	Dose prescribed (infusion/bolus)	Date of PREPARATION*
1.	IV <u>Bleomycin</u> Day 1 + Day 8 + Day 15	Bolus	30mg bolus	D1 D8 D15
2.	IV Etoposide Day 1 + Day 2 + Day 3	120mg/ m ²	mg in 500ml NS over 2 hours	D1 D2 D3
3.	IV Cisplatin	25 mg/ m ²	mg in 500ml NS over 1 hour	D1 x 2 D2 x 2
* Please be informed that chemo will be prepared and ready by 4.30-5.00pm (Monday-Friday) & 1pm (Saturday, Sunday & Public Holiday) on requested date of preparation. * If you intend to give chemo prior to that, please request the chemo to be prepared 1 day earlier. * For chemo with short shelf life (<24hour) post preparation, please liaise with CDR Pharmacist.				

Sign & Chop. (Consultant/ Specialist/ Medical Officer)

For Pharmacy Use
Pharmacist signature:

Replication to other discipline in HTA

Institutions

KEPERLUAN DAN KELULUSAN ICT UNTUK BERKONGSI PENGGUNAAN APPS KIDDOINFUSE KEPADA PUSAT RAWATAN KANSER KANAK-KANAK YANG LAIN

RIZAL HUSAINI B RAZALI (MOH) <riezal@moh.gov.my>

to MALINISHAM, NURKHADIJA, YAM, FARIZAN, RADHIKA, NIK, me, SITI

Fri, 22 Mar, 14:43

Translate to English

Salam sejahtera dan Madani,

Puan Malinishan a/p Subramaniam

Cawangan Teknologi Maklumat & Informatik Farmasi
Bahagian Dasar & Perancangan Strategik Farmasi
Program Perkhidmatan Farmasi, KKM

Puan,

Merujuk kepada perkara di atas, pihak kami ingin mendapatkan pencerahan mengenai keperluan dan kelulusan sekiranya Apps KiddoInfuse yang dicipta oleh kakitangan jabatan ini dapat digunapakai dan dikongsikan dengan 8 buah hospital pakar kanser kanak-kanak yang lain.

Terdapat 8 buah Pusat Pakar Rawatan Kanser Kanak-kanak (Pediatrik Hematologi dan Onkologi) di Malaysia termasuk 2 hospital daripada Kementerian Pengajian Tinggi (KPT).

Senarai hospital-hospital tersebut seperti berikut:

1. Hospital Pulau Pinang
2. Hospital Sultanah Nur Zahirah, Kuala Terengganu
3. Hospital Raja Permaisuri Bainun, Ipoh, Perak
4. Hospital Sultan Ismail, Johor Bahru
5. Hospital Wanita dan Kanak-kanak Likas, Sabah
6. Hospital Umum Sarawak
7. Pusat Perubatan Universiti Malaya (PPUM)
8. Hospital Tunku Ampuan Besar Tunku Aishah Rohani, Hospital Pakar Kanak-kanak UKM (HPKK UKM)

List Of Hospitals

Oleh yang demikian, pihak kami memohon bantuan dan penjelasan lebih lanjut sekiranya terdapat permohonan yang perlu kami majukan untuk kelulusan tersebut.

Bersama-sama email ini disertakan maklumat ringkas berkenaan apps KiddoInfuse untuk Kajian QAQI peringkat HTA yang sedang dijalankan sekarang.

Kerjasama daripada pihak Puan amatlah dihargai.

Sekian, terima kasih.

Institutions



Patients

Create another app to educate
patient's guardian on information
of chemotherapy



Coming Together Is A
BEGINNING

Keeping Together Is
PROGRESS

Working Together Is
SUCCESS

ACKNOWLEDGEMENT

Pengarah Hospital Kuala Lumpur	Dato' Dr. Harikrishna a/l K.Ragavan Nair
Pengarah Hospital Tunku Azizah	Dr Shamsul Anuar B Kamarudin
Senior Pharmacist	Ms Tay Chan Yen
Senior Pharmacist	Ms. Gan Shiau Shuang
Unit Kualiti QA HKL	
Unit Kualiti QA HTA	



THANK YOU

A spiral-bound calendar is visible in the background, showing dates from 4 to 28. The days of the week are labeled: FRI, SAT, and SUN. The calendar is partially obscured by a large, semi-transparent yellow rectangle.

GANTT CHART

Plan\Time	Dec 22	Jan 23	Feb 23	Mac 23	Apr 23	May 23	Jun 23	July 23	Aug 23	Sept 23	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mac 24	Apr 24	May 24	Jun 24	July 24	Aug 24	Sept 24	Oct 24
Proposal preparation																							
Data collection (Verification study)																							
Analysis & reporting (Verification study)																							
Remedial actions implementation																							
Data collection & Analysis (Cycle 1)																							
Discussion and Remedial Action (Cycle 2)																							
Data collection & analysis (Cycle 2)																							
Follow up study data analysis / reporting																							
Presentation of results of completed study																							

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