KONVENSYEN QA KEBANGSAAN KALI KE-12

OP 1

INCREASING THE PERCENTAGE OF VALVE REPLACEMENT (VR) PATIENTS ACHIEVING OPTIMUM TIME IN THERAPEUTIC RANGE (TTR) ON LIFELONG WARFARIN THERAPY

PHARMACY DEPARTMENT
HOSPITAL TENGKU AMPUAN AFZAN, KUANTAN

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PROBLEM IDENTIFICATION

1

Increased defaulted rate among Diabetes MTAC Patients

2

Low percentage of ferritin reduction among Thalassemia MTAC patients on chelation therapy

3

Low percentage of lifelong Warfarin patients achieving optimum time in therapeutic range (TTR)

4

Increasing medication return from patients at outpatient pharmacy

5

Low percentage of Diabetes MTAC patients achieving target HbA1C

PROBLEM PRIORITISATION- SMART CRITERIA

PROBLEM	S	M	A	R	T	TOTAL
Increased defaulted rate among Diabetes MTAC Patients	22	23	27	22	16	**110**
Low percentage of ferritin reduction among Thalassemia MTAC patients on chelation therapy	26	26	27	21	18	**118**
Low percentage of lifelong warfarin patients achieving optimum time in therapeutic range (TTR)	**26**	**26**	**27**	**23**	**20**	**122**
Increasing medication return from patients at outpatient pharmacy	20	21	25	21	18	**105**
Low percentage of Diabetes MTAC patients achieving target HbA1C	26	26	27	21	18	**118**

Number of voters (group members): 9

Scale: 1=disagree 2=agree 3=strongly agree

PROBLEM VERIFICATION

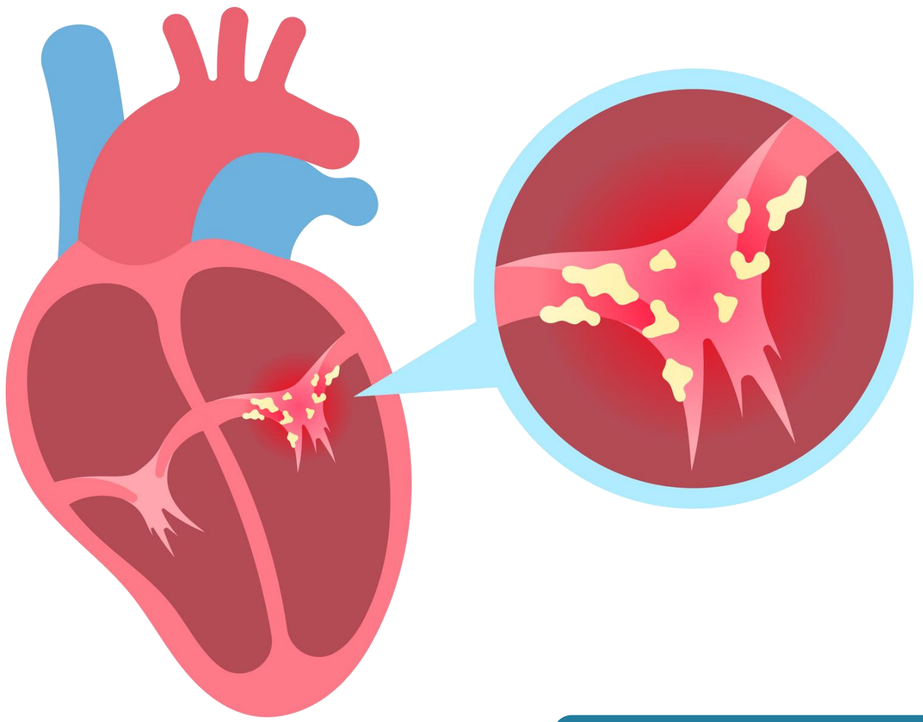
LOW PERCENTAGE OF FERRITIN REDUCTION AMONG THALASSEMIA MTAC PATIENTS ON CHELATION THERAPY

LOW PERCENTAGE OF LIFELONG WARFARIN PATIENTS ACHIEVING OPTIMUM TIME IN THERAPEUTIC RANGE (TTR)

LOW PERCENTAGE OF DIABETES MTAC PATIENTS ACHIEVING TARGET HBA1C

2019	2020	2021
5/7 x 100% = 71.4%	7/14 x 100% = 50.0%	11/19 x 100% = 57.9%
364/667 x 100% = 54.6%	**292/613 x 100% = 47.6%**	**273/584 x 100% = 46.7%**
15/89 x 100% = 16.9%	44/98 x 100% = 44.9%	41/80 x 100% = 51.25%

PROBLEM VERIFICATION AND JUSTIFICATION



Warfarin patients on lifelong Therapy

VALVE REPLACEMENT PATIENTS ON LIFELONG THERAPY

No alternative anticoagulation therapy as compared to other indications such as Atrial Fibrillation & Deep Vein Thrombosis

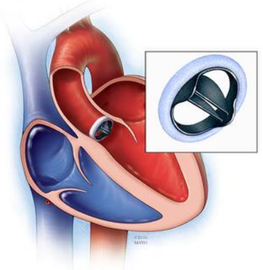
Havers-Bogersen et.al, 2020 (1):

- Mechanical Valve Replacement was associated with **lower TTR**
- Low quality of warfarin treatment is associated with **higher risk of thromboembolic events**

TERMS AND DEFINITIONS

Warfarin

Blood thinning medication used to prevent stroke in high risk patients (2)

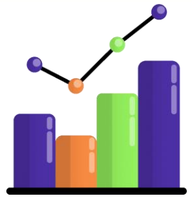


Valve Replacement (VR)

Replacement of the heart valves with either an artificial heart valve or bioprosthesis (2)

Time in Therapeutic Range (TTR)

Used to determine the EFFICACY and SAFETY of warfarin therapy (3,4)



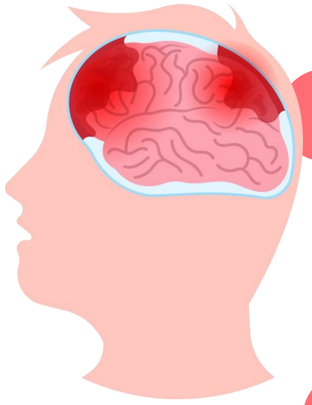
Optimum TTR

Set as ≥ 60% in this study (6)

RATIONAL SELECTION OF PROBLEM (SERIOUSNESS)

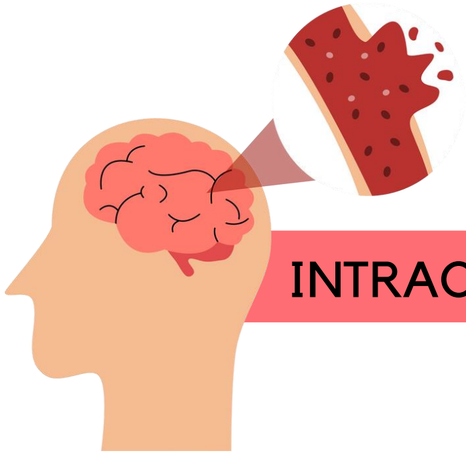
TTR

may lead to



ISCHEMIC STROKE

MAJOR BLEEDING



INTRACRANIAL HAEMORRHAGE

DEATH

Krittayaphong et.al, 2020 (7)

2020 BY THE NUMBERS ("Smart")

4 OUT OF 25

HOSPITALIZED WARFARIN PATIENTS **DIED** DUE TO **COMPLICATIONS** FROM **OVERWARFARINIZATION**

RM 14,904

WAS SPENT ON REVERSING OVERWARFARINIZATION WITH **PROTHROMBIN COMPLEX CONCENTRATES (PCC)**

Rational Selection of Problem (sMART)

MEASUREABLE

Calculated as the number of days **International Normalised Ratio (INR)** within target range divided by the total number of days in the observation period.

APPROPRIATENESS

VR patients were chosen in this study due to lack of alternative therapy

REMEDIABLE

Strategies for improvement can be implemented among healthcare providers involving in warfarin clinic through **effective counseling**

TIMELINESS

Estimated time period for this project is within **2 years**

PROBLEM STATEMENT

The road that **must not** be taken...

PROBLEMS IDENTIFIED

- POOR TTR KNOWLEDGE
- WARFARIN-DIET INTERACTIONS
- MISSED DOSES
- WRONG DOSE TAKEN

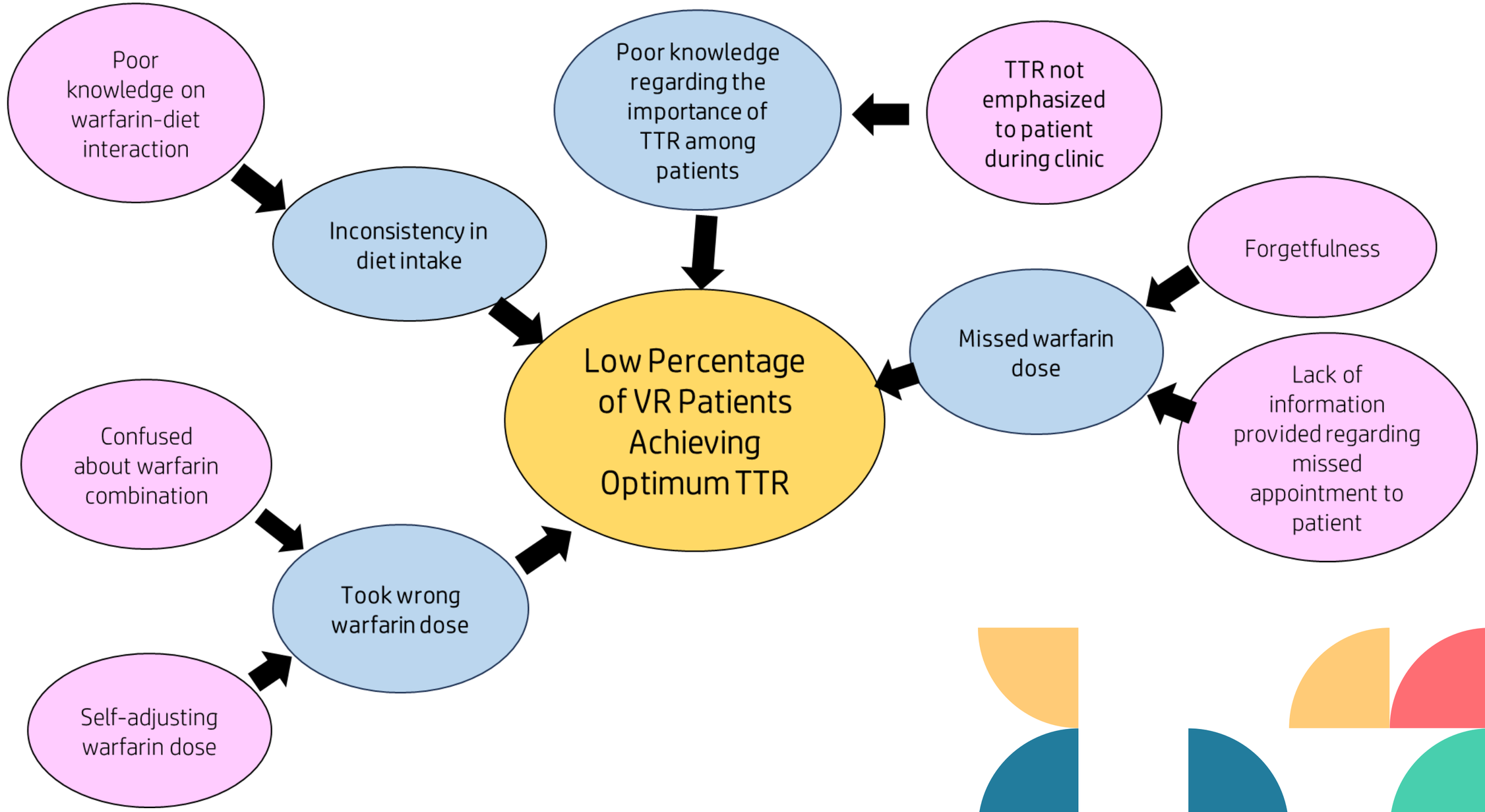
LOW TTR

INCREASED RISK OF BLEEDING OR THROMBOSIS

DEATH

AIM: To increase the percentage of VR patients achieving optimum TTR with proper remedial actions

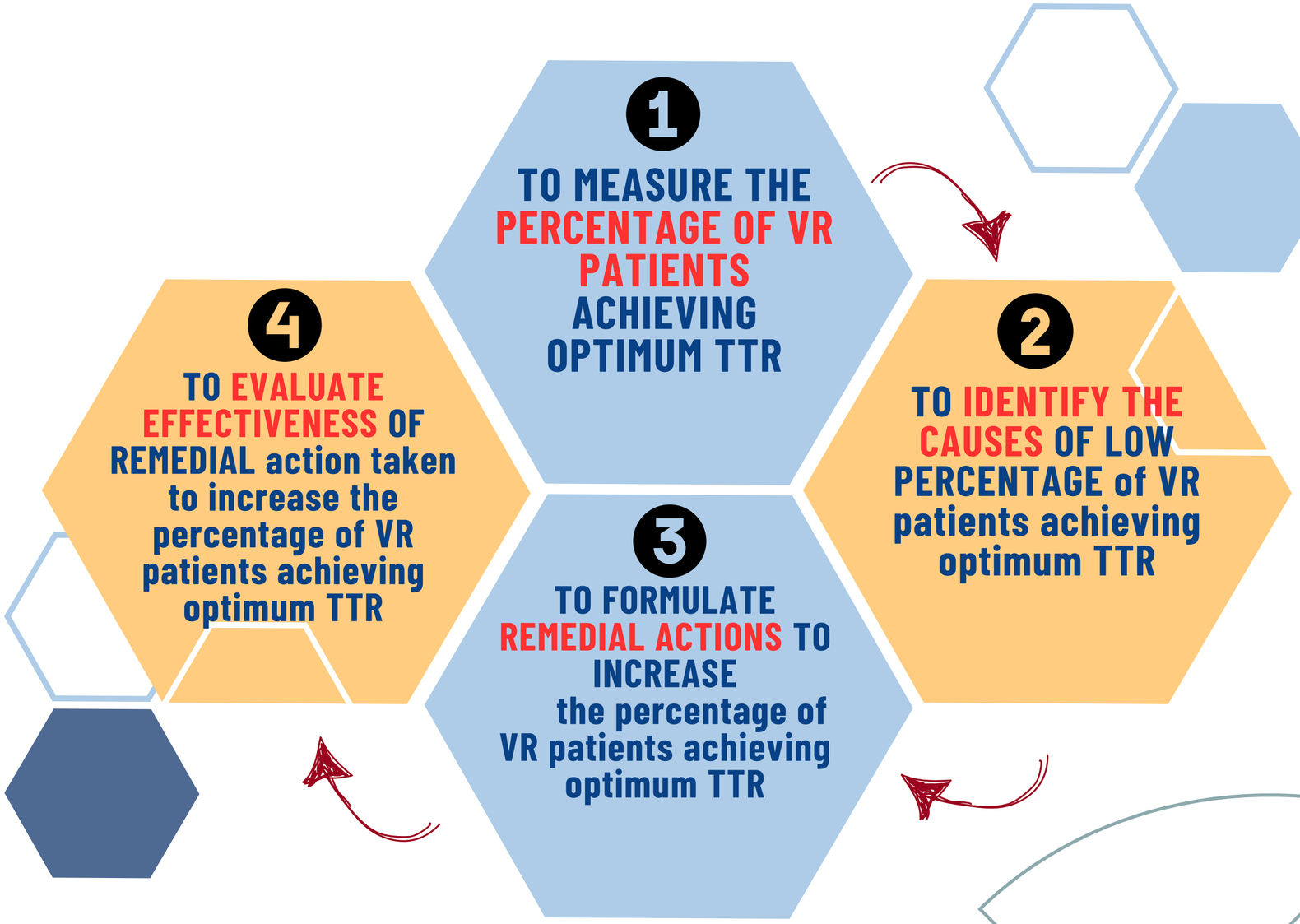
CAUSE-EFFECT ANALYSIS



GENERAL OBJECTIVE

TO IMPROVE THE PERCENTAGE OF VR PATIENTS ACHIEVING **OPTIMUM TTR** ON LIFELONG WARFARIN

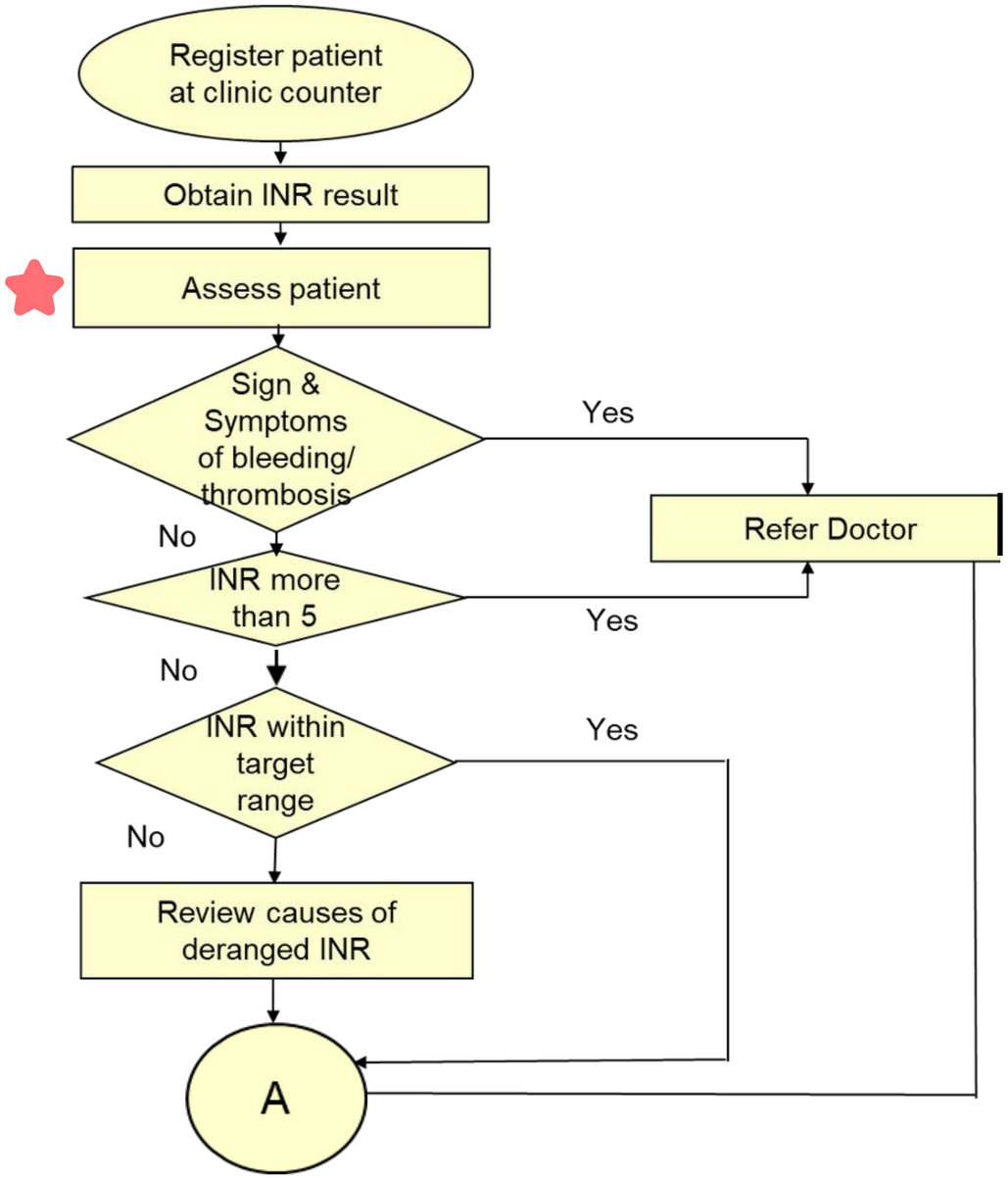
SPECIFIC OBJECTIVES

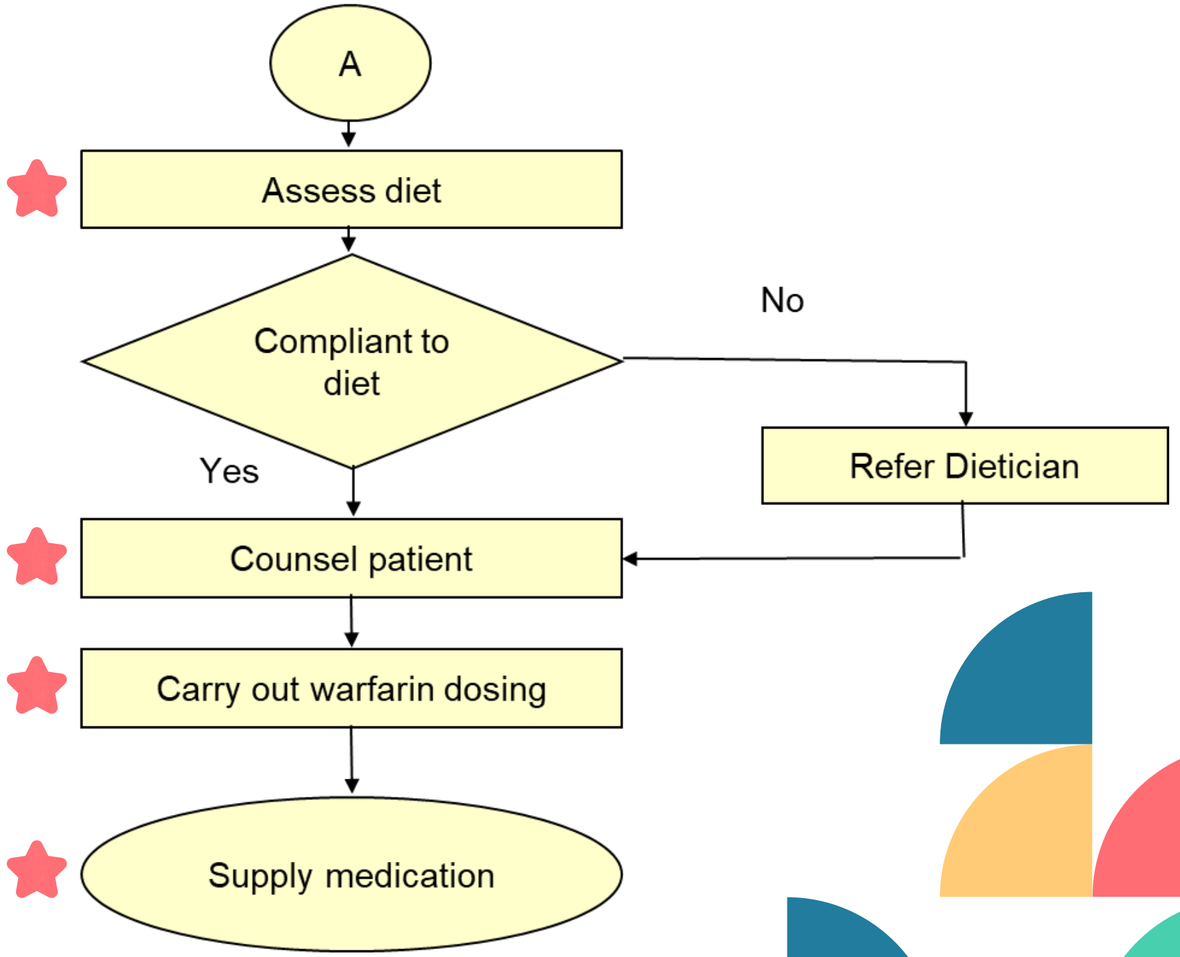


INDICATOR	FORMULA	STANDARD
Percentage of Valve Replacement (VR) Patients achieving optimum Time in Therapeutic Range (TTR)	$\frac{\text{Number of VR patients achieving optimum TTR}}{\text{Total number of VR patients}} \times 100\%$	≥ 65%*

- Initially was set at 70% based on group consensus
- Subsequently, the standard was changed to 65% in accordance to QAP as set by Pharmaceutical Services Division, Ministry of Health(8)

PROCESS OF CARE





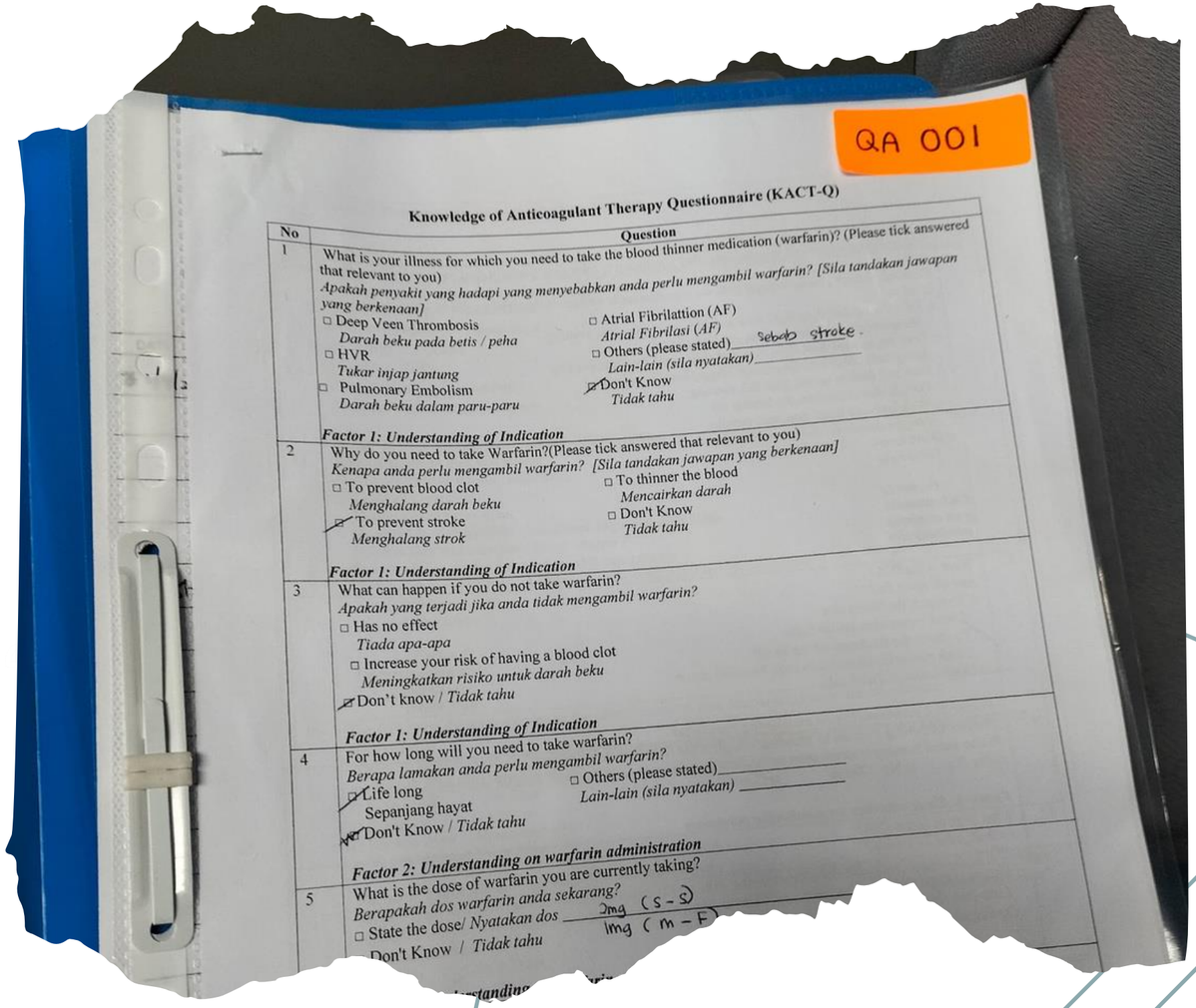
MODEL OF GOOD CARE (MOGC)

No	Process of care	Criteria	Standard (%)
1	Register patient at MTAC Counter	Register all patient by issuing number ticket	100
2	Obtain INR result	Attach patient's INR result to patient's BHT or Warfarin follow up form visit	100
3	Assess patient	-Check on patient's understanding of warfarin therapy using "Pocket TTR" -Check on medication compliance and missed dose - to provide Pharmacist hotline if there is any enquiries -Check on dietary changes using "FLIPME" -Check on drug interactions -Check on history of taking any OTC/Traditional medicine -Check on correct dose taken -Check on alcohol intake (if any) -Check on smoking habit (if any)	100 100 100 100 100 100 100 100
4	Assess diet	-Refer dietician for diet counseling if failed to achieve 4 consecutive target INR	100
5	Counsel patient *maintain dose *adjust warfarin dose	-Emphasize on medication compliance -Advice to maintain consistent diet -Counsel warfarin combination to patient using "Pill-ALERT"	100 100 100
6	Carry out warfarin dosing	-Complete documentation in INR follow up sheet -Complete documentation in patient's WMTAC profile -Write prescription with remark of patient's warfarin combination -Send prescription for Dr's countersign	100 100 100 100
7	Supply warfarin to patient	Fill, label (using "EZ-label"), countercheck and dispense warfarin tablets	100

METHODOLOGY OF QA STUDY

Study to determine **percentage of VR patients** achieving optimum TTR on lifelong warfarin therapy.

Study to **determine factors** contributing to low percentage of VR patients achieving optimum TTR on lifelong warfarin therapy.



METHODOLOGY

Type of study	Prospective cohort	
Study population	All valve replacement patients on lifelong warfarin therapy	
Sampling method	Universal sampling	
Study period	Pre-remedial action	March 2022 - April 2022
	Remedial action	May 2022 – October 2023
	Post-remedial action	November 2023 – December 2023
Data collection techniques	(1) Percentage of VR patients achieving optimum TTR: Pharmacy Warfarin Clinic TTR Database	
	(2) Determine factors contributing to low percentage of VR patients achieving optimum TTR: a. Interview patients during clinic sessions b. Survey among pharmacists/ doctor involved in clinic	

INCLUSION CRITERIA

1. Adult ≥ 18 years old

2. With valve replacement

3. Lifelong warfarin therapy

4. At least 3 months on warfarin prior to study

5. At least 4 consecutive INR readings

EXCLUSION CRITERIA

1. Defaulted treatment during implementation of changes

2. Passed away during implementation of changes

3. Cancer patient on palliative treatment

4. Patient on anti-tuberculosis, radioactive iodine (RAI), chemotherapy/ radiotherapy medication

ANALYSIS & INTERPRETATION

RESULTS OF PRE-REMEDIAL STUDY (1)

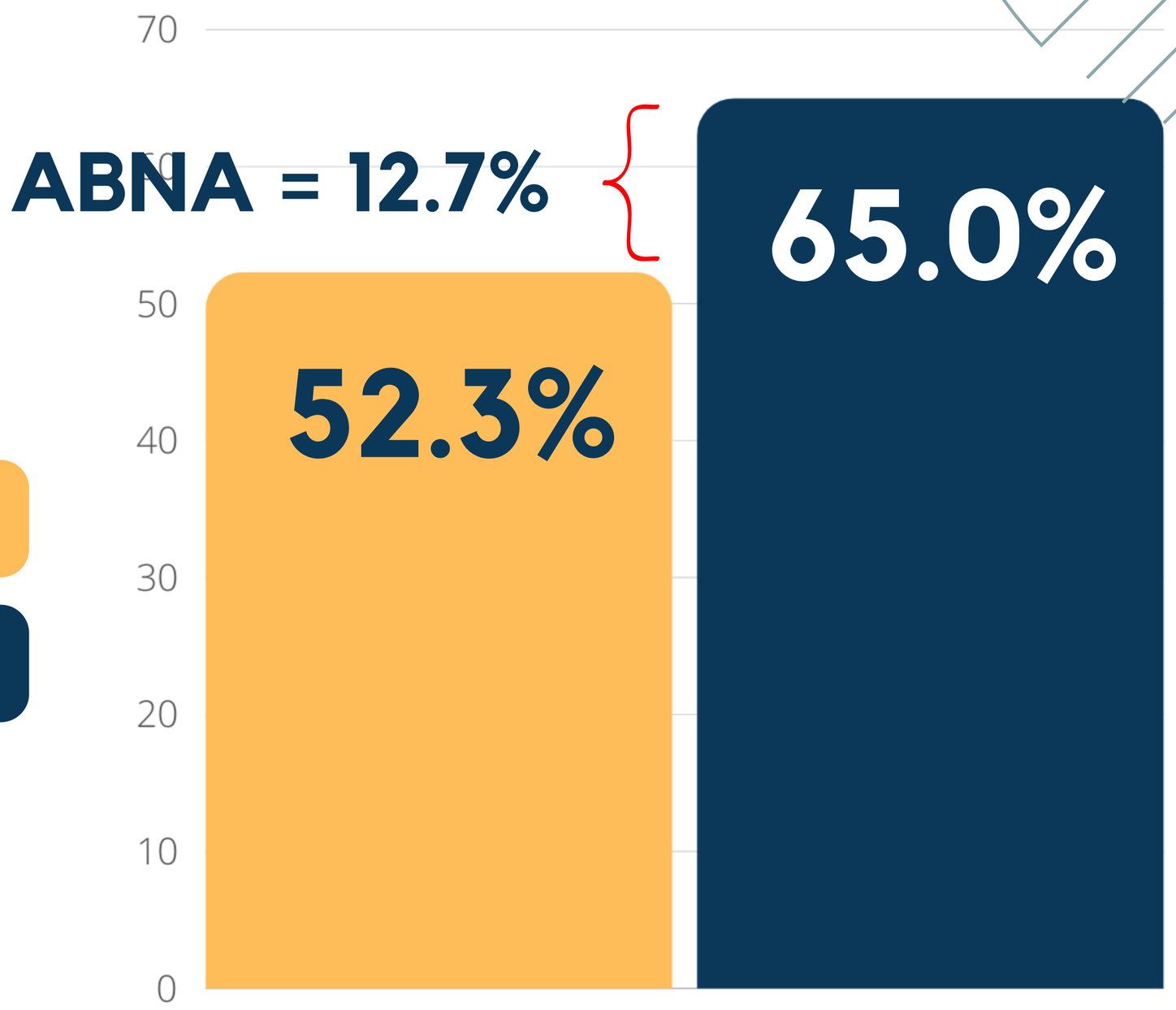
INDICATOR	FORMULA	STANDARD
Percentage of Valve Replacement (VR) Patients achieving optimum Time in Therapeutic Range (TTR)	$\frac{\text{Number of VR patients achieving optimum TTR}}{\text{Total number of VR patients}} \times 100\%$	57/109 x 100% **=52.3%**

ACHIEVABLE BENEFIT NOT ACHIEVED (ABNA)

(PRE-REMEDIAL)

PRE STUDY

STANDARD



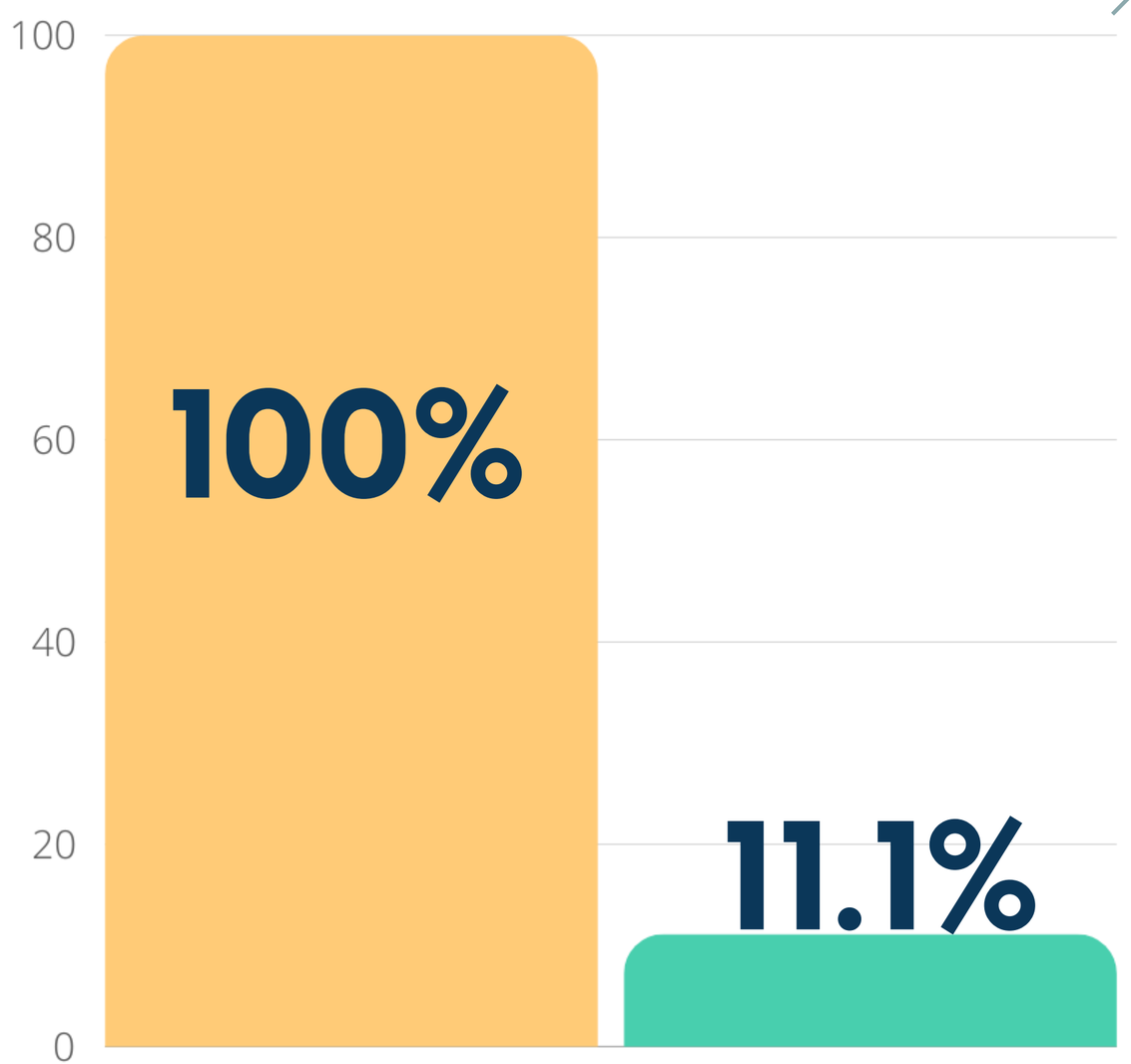
RESULTS OF PRE-REMEDIAL STUDY (2)

STAFF FACTOR

Contributing to Low Percentage of VR Patients achieving Optimum TTR

01 - TTR NOT EMPHASIZED TO PATIENT DURING CLINIC

02 - LACK OF INFORMATION PROVIDED REGARDING MISSED APPOINTMENT TO PATIENT

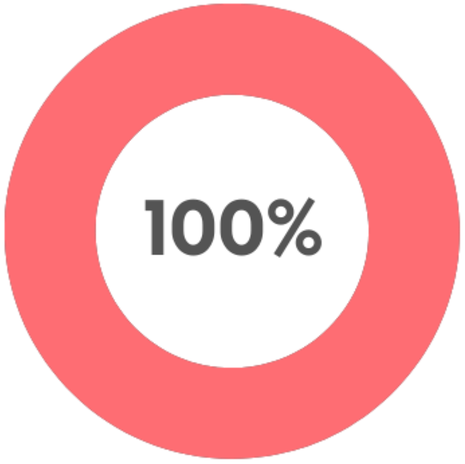


Total staff = 27

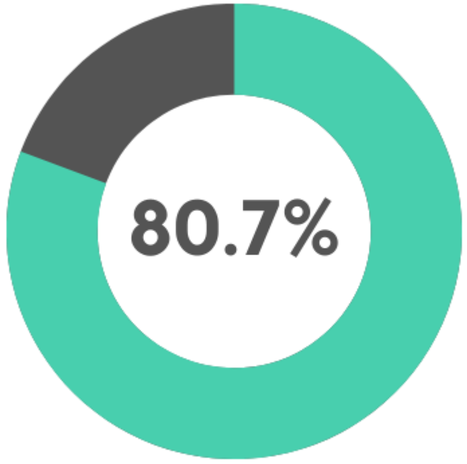
RESULTS OF PRE-REMEDIAL STUDY (3)

PATIENT FACTOR

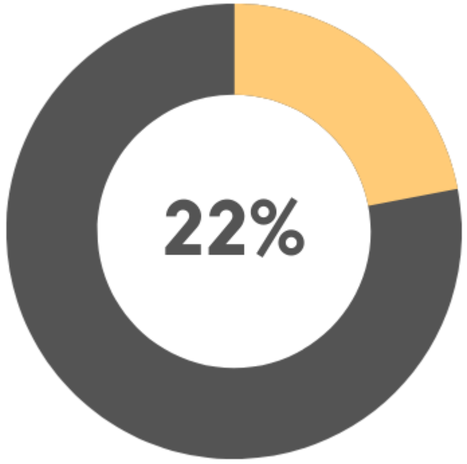
Contributing to Low Percentage of VR Patients achieving Optimum TTR



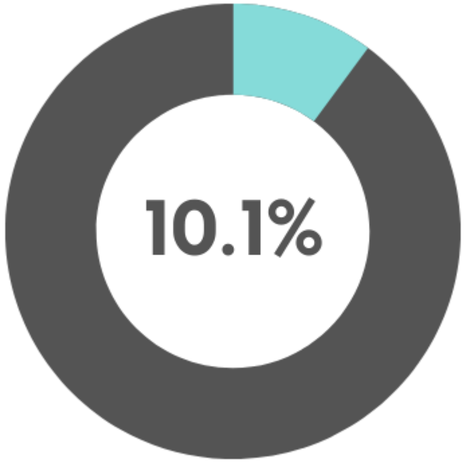
01 - POOR TTR KNOWLEDGE



02 - WARFARIN-DIET INTERACTION



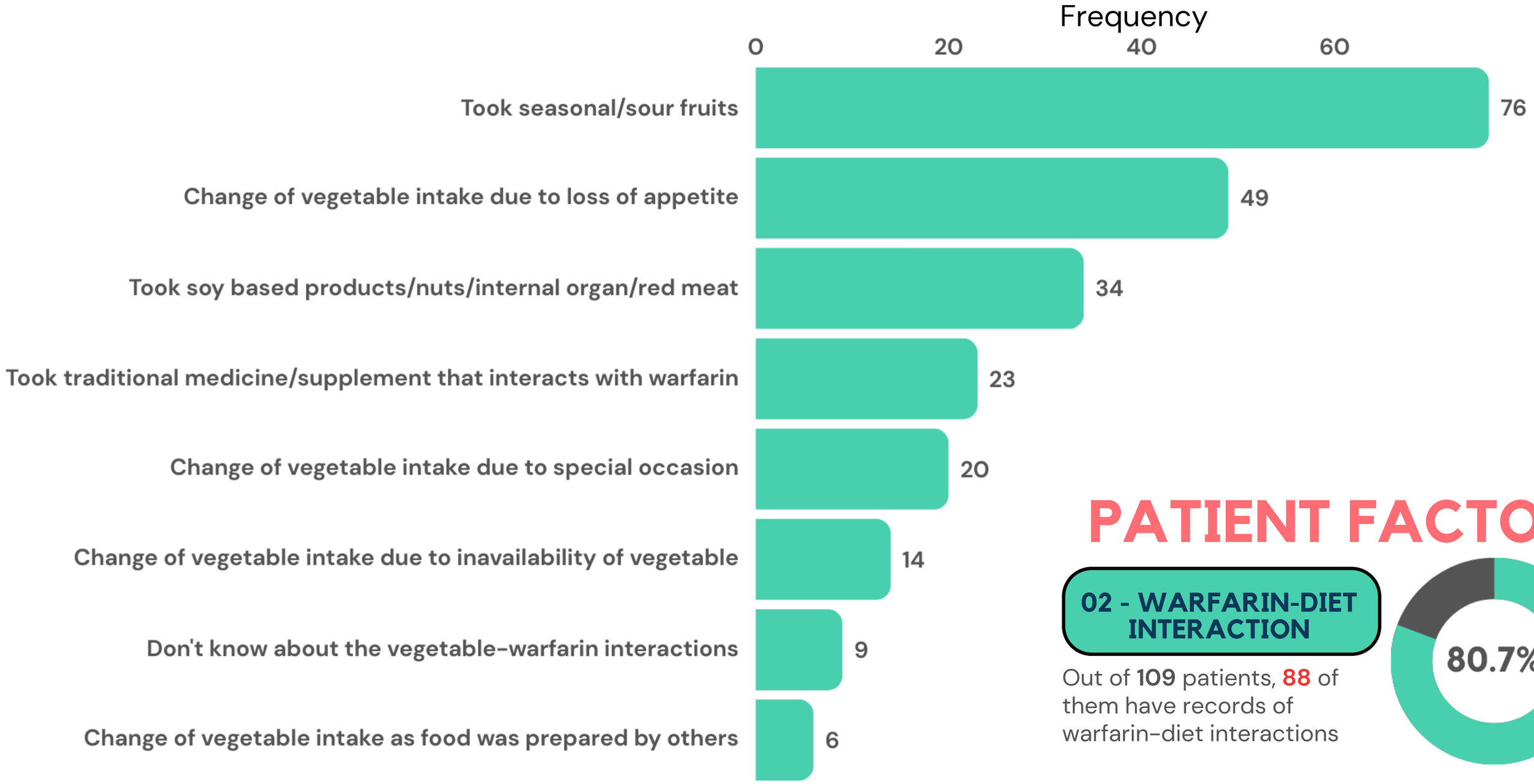
03 - MISSED DOSE



04 - WRONG DOSE TAKEN

Total patients = 109

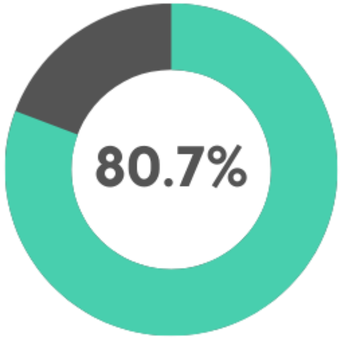
RESULTS OF PRE-REMEDIAL STUDY (3)(A)



PATIENT FACTOR

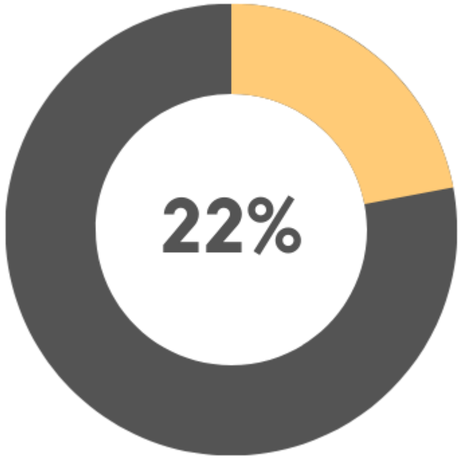
02 - WARFARIN-DIET INTERACTION

Out of **109** patients, **88** of them have records of warfarin-diet interactions



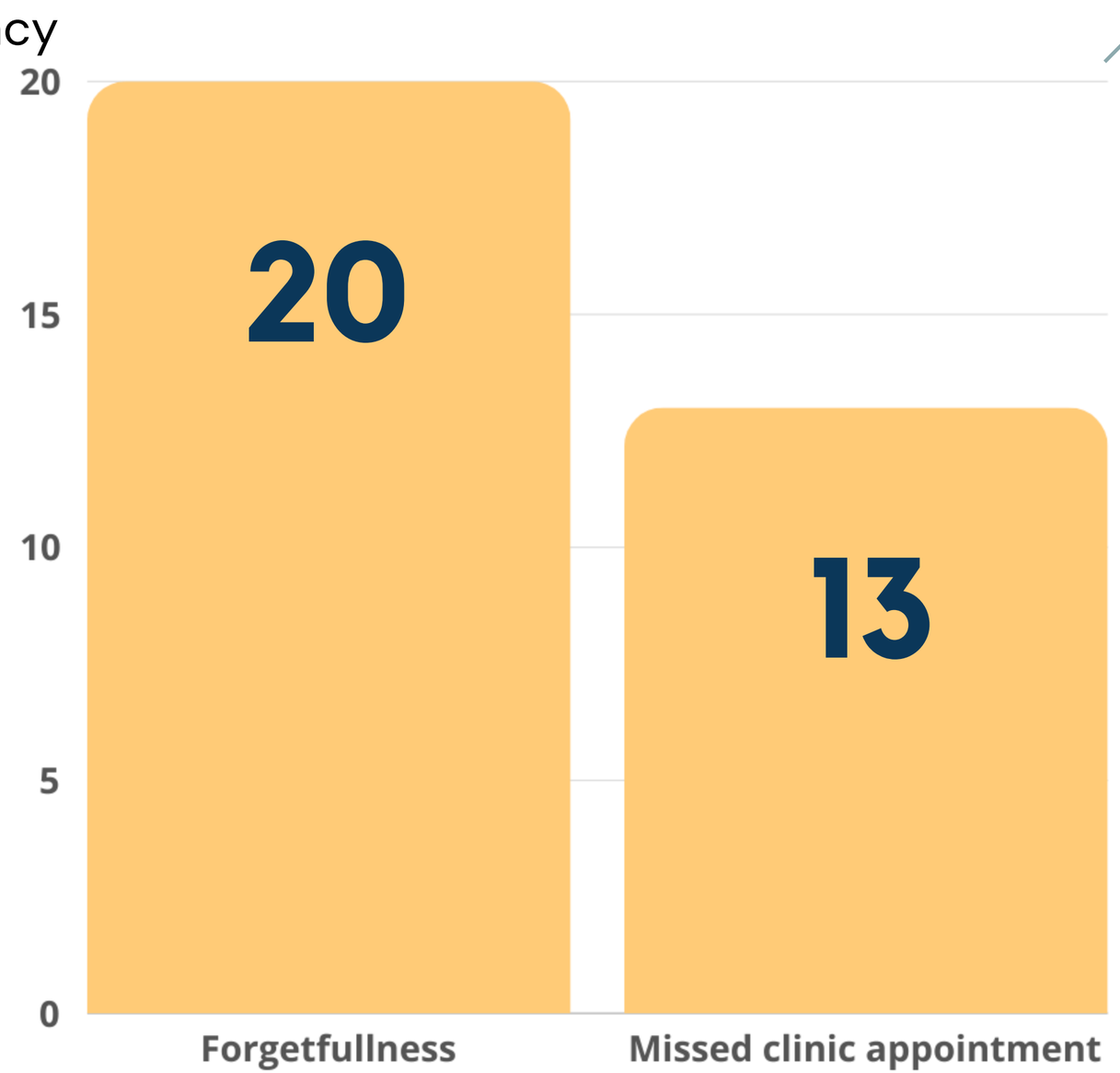
RESULTS OF PRE-REMEDIAL STUDY (3)(B)

PATIENT FACTOR



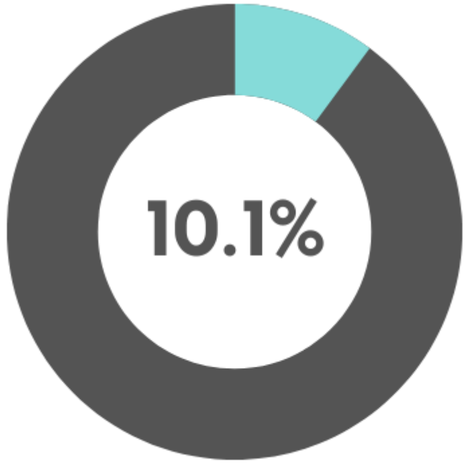
03 - MISSED DOSE

Out of **109** patients, **24** of them have records of missed dose



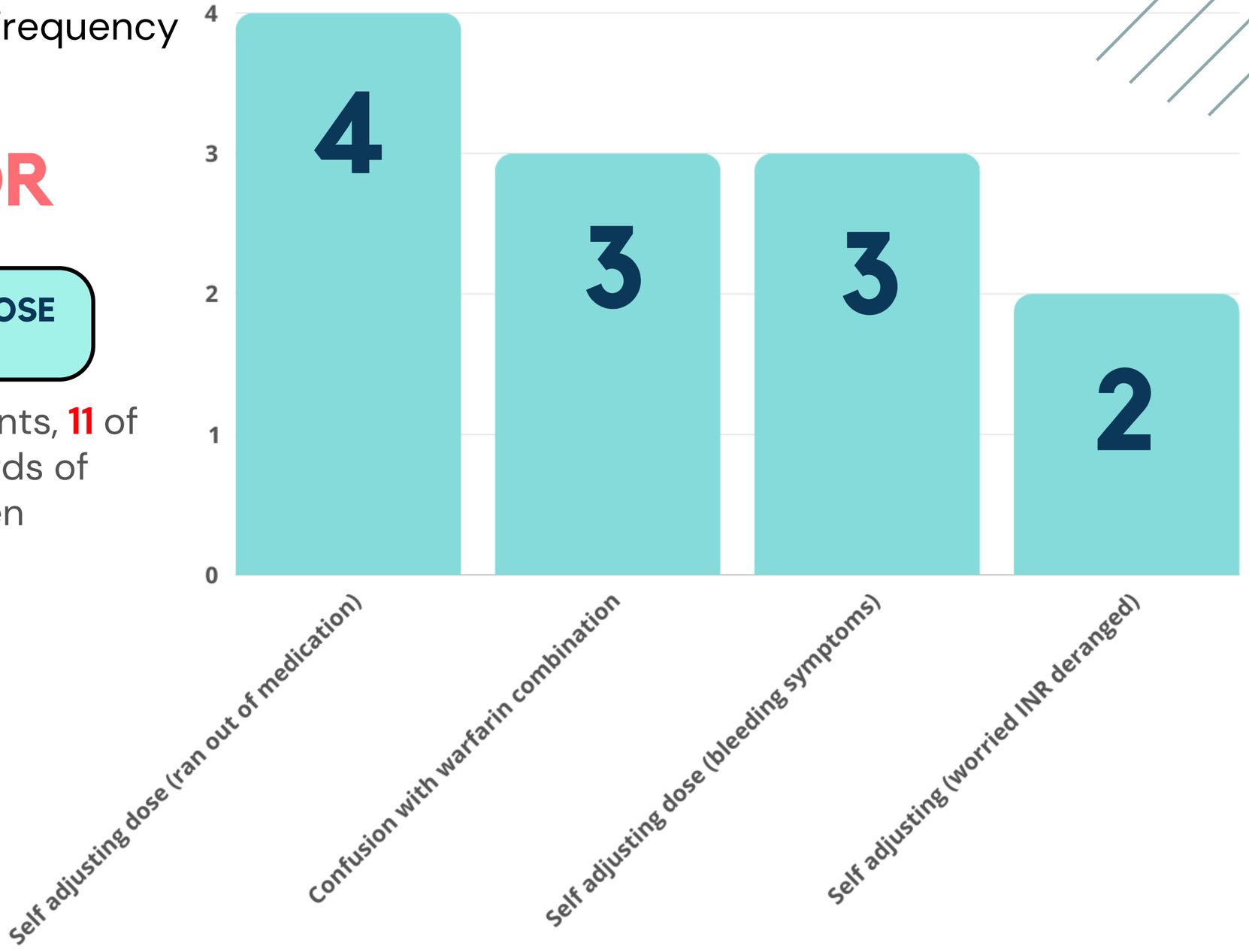
RESULTS OF PRE-REMEDIAL STUDY (3)(C)

PATIENT FACTOR



04 - WRONG DOSE TAKEN

Out of **109** patients, **11** of them have records of wrong dose taken



STRATEGIES FOR CHANGE

HOW WE DID IT?

Pharmacist's HOTLINE in "Pocket TTR"

STAFF FACTOR

Lack of information provided regarding missed appointment

TTR not emphasized during clinic

"Pocket TTR"

PATIENT FACTOR

Poor warfarin-diet Interaction Knowledge

"FLIPME"

Took wrong dose due to confusion in warfarin combination

"Pill-ALERT" & "EZ-Label"

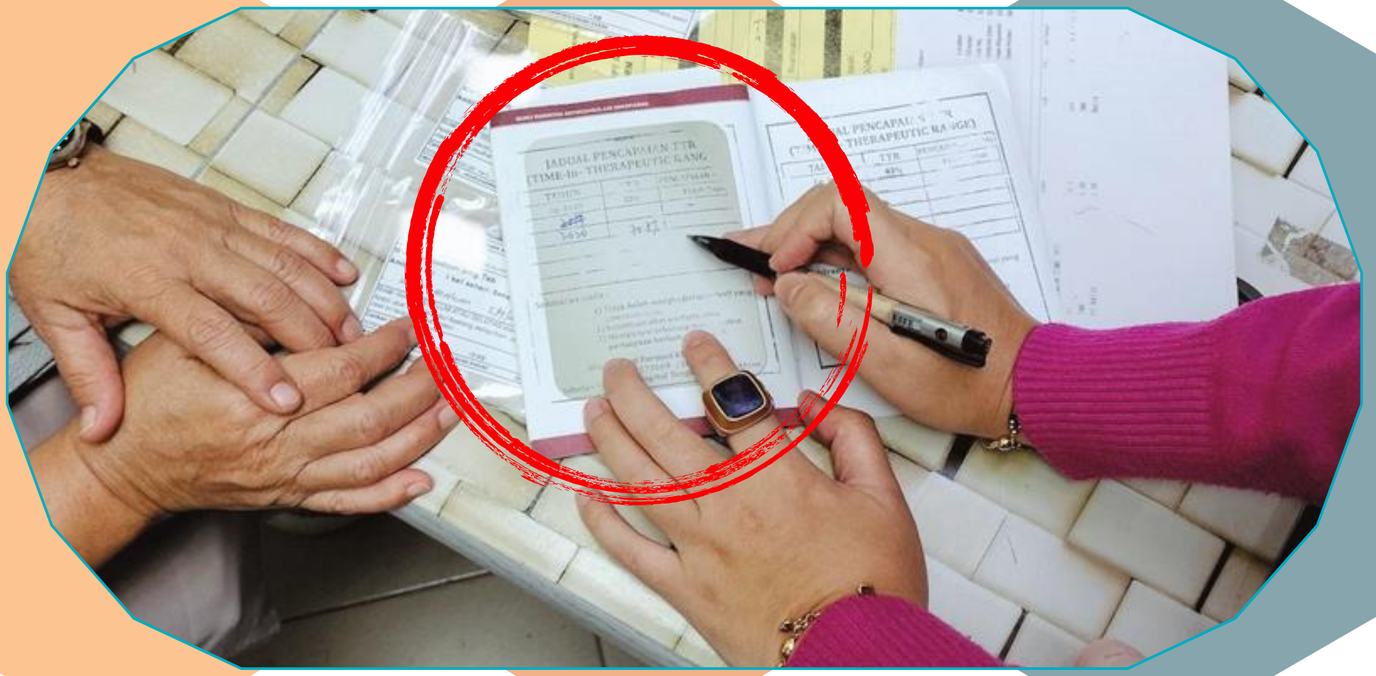
FACTOR 1:
TTR NOT EMPHASIZED DURING CLINIC

→

"Pocket TTR" included in patient's warfarin book

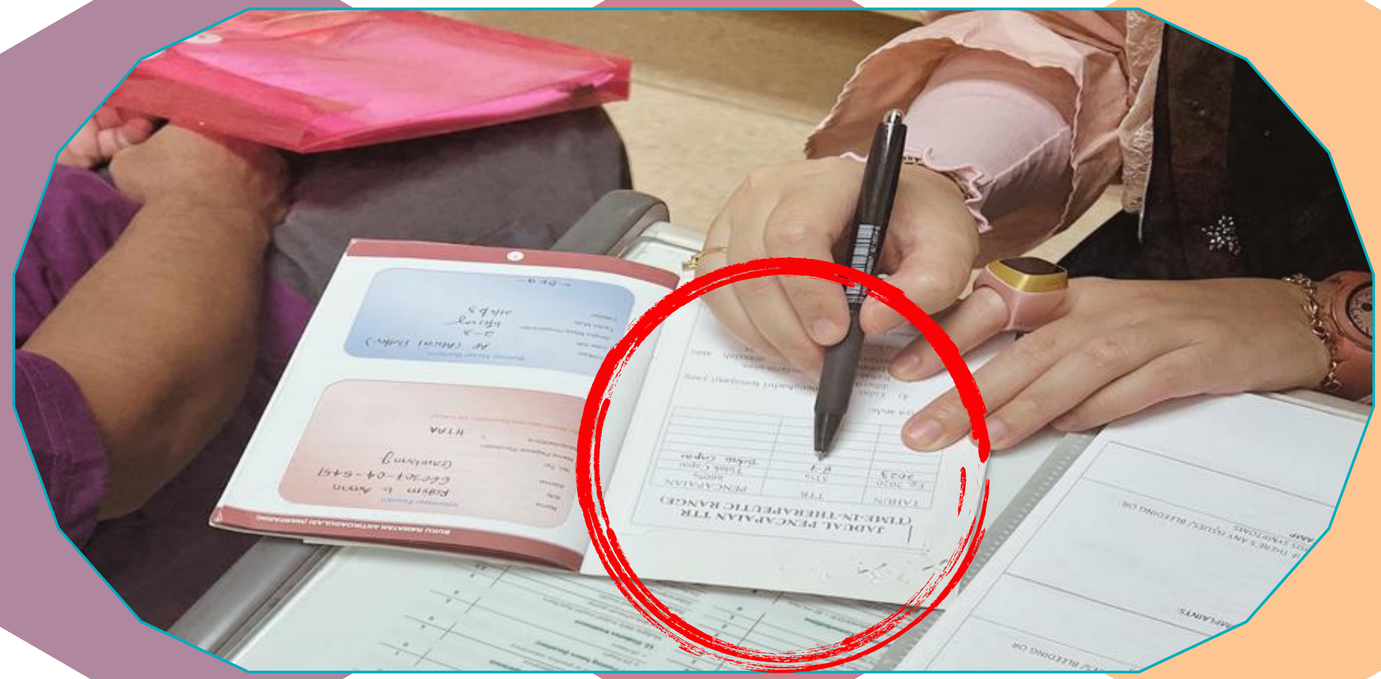
JADUAL PENCAPAIAN TTR
(TIME-IN-THERAPEUTIC RANGE)

TAHUN	TTR	PENCAPAIAN ≥60%
Eg. 2020	53%	Tidak Capai



FACTOR 2:
LACK OF INFORMATION PROVIDED REGARDING MISSED APPOINTMENT

Pharmacy HOTLINE in "Pocket TTR"



Sekiranya anda:

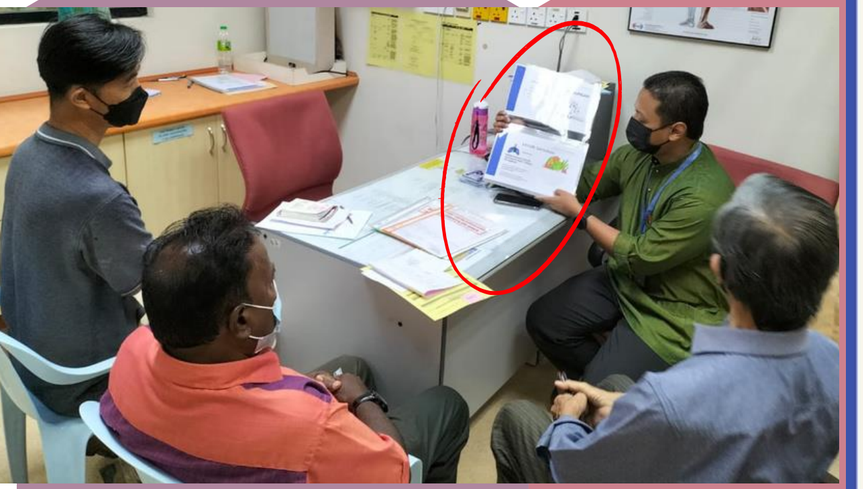
1) Tidak boleh menghadiri temujanji yang diberikan atau,
2) Kehabisan ubat warfarin atau,
3) Mempunyai sebarang masalah atau pertanyaan berkaitan warfarin

Sila hubungi Farmasi Klinik Pakar :
09-5572669 /2670
Jabatan Farmasi, Hospital Tengku Ampuan Afzan

FACTOR 3:
POOR KNOWLEDGE ON WARFARIN-DIET INTERACTION

"FLIPME"

VERIFIED BY JAWATANKUASA KECIL FARMASI KARDIOLOGI, KKM



FACTOR 3:
POOR KNOWLEDGE ON WARFARIN-DIET INTERACTION

"FLIPME"

VERIFIED BY JAWATANKUASA KECIL FARMASI KARDIOLOGI, KKM

BUAH-BUAHAN BERMUSIM

UNTUK KEGUNAAN MTAC WARFARIN JABATAN FARMASI HTAA

RAMBUTAN

DURIAN

DUKU & LANGSAT

NANGKA

MANGGIS

CEMPEDAK

BUAH-BUAHAN TIDAK BERMUSIM

UNTUK KEGUNAAN MTAC WARFARIN JABATAN FARMASI HTAA

MARKISA

DURIAN BELANDA

BERI

DELIMA

ANGGUR

LAICI

FACTOR 3:
POOR KNOWLEDGE ON WARFARIN-DIET INTERACTION

"FLIPME" QR code

"FLIPME" QR CODE ARE PASTED IN PATIENTS WARFARIN BOOK - EASILY ACCESSIBLE AS REFERENCE & SAVES ON PRINTING COST

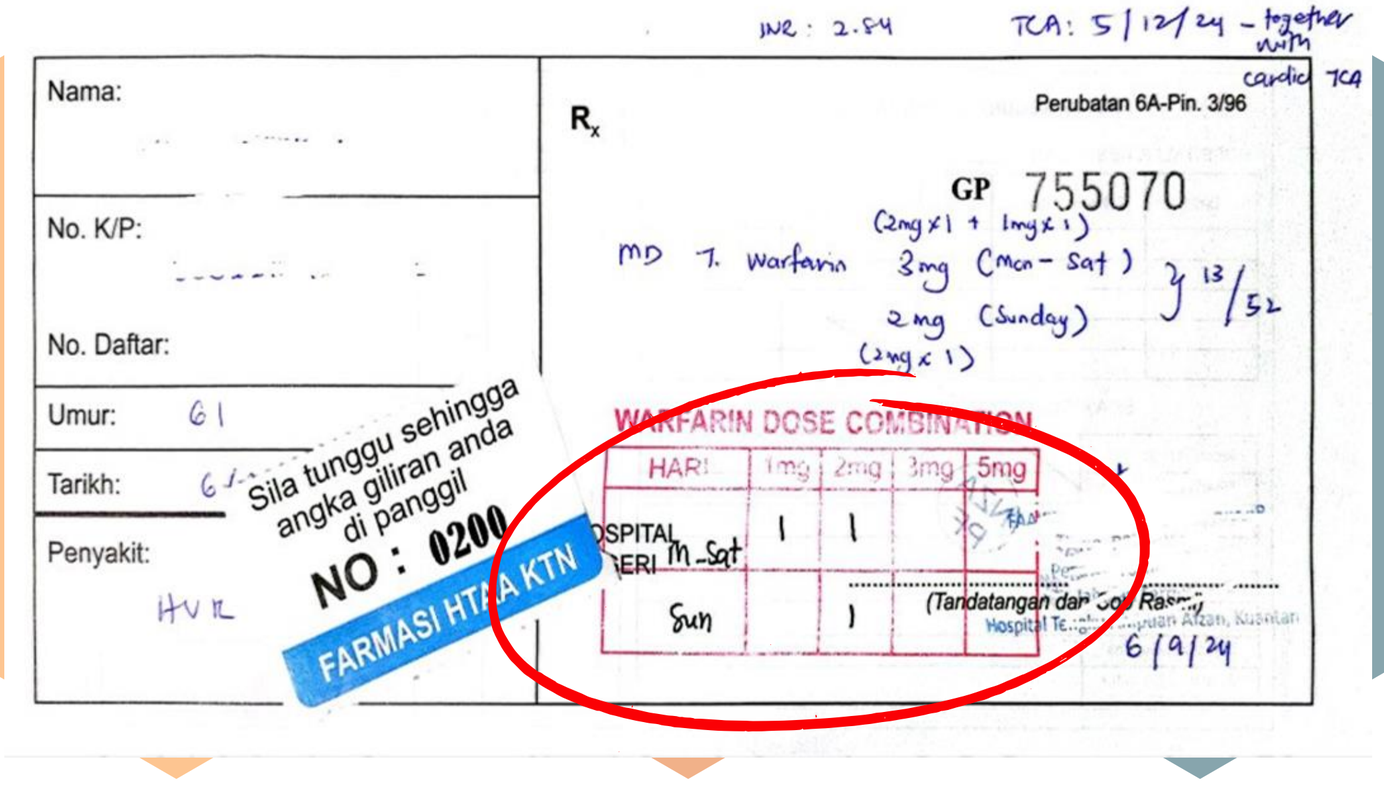
FACTOR 4:

TOOK WRONG DOSE DUE TO CONFUSION IN WARFARIN COMBINATION

"Pill-ALERT"

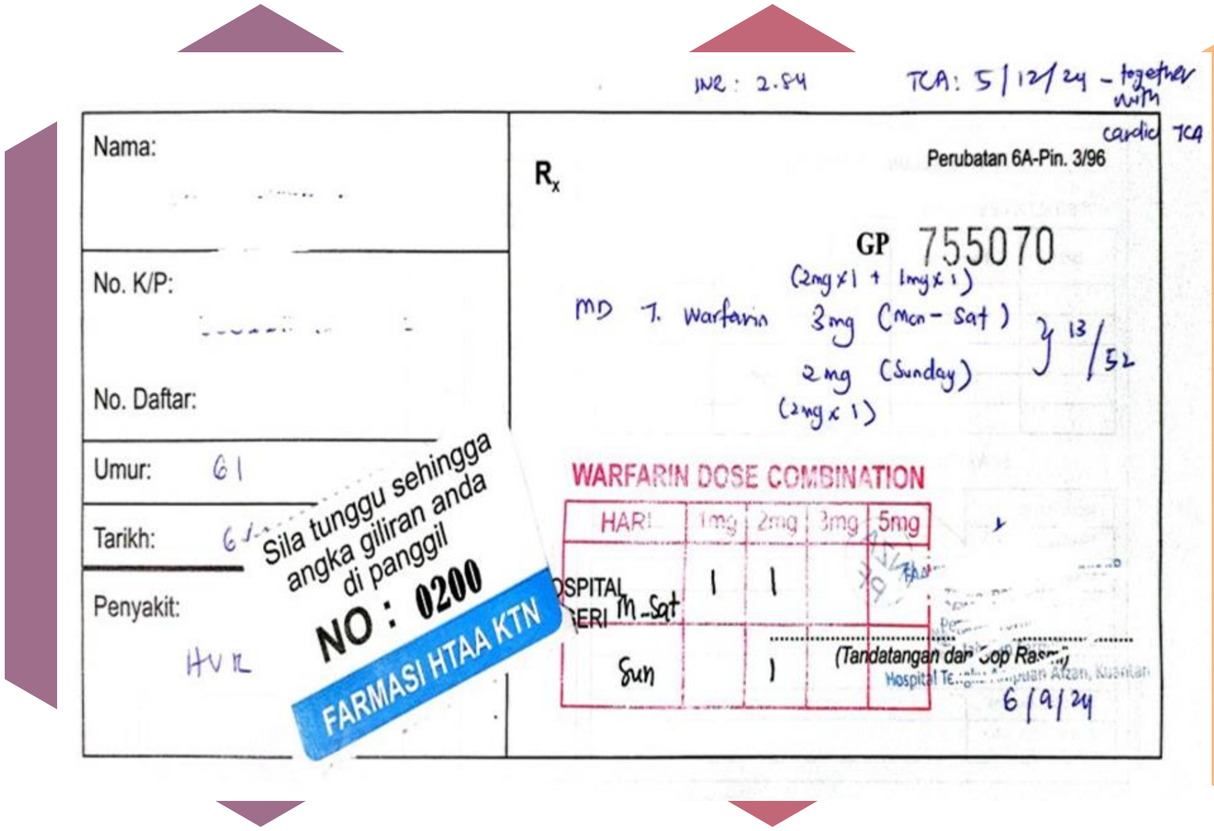
STANDARDIZED WARFARIN COMBINATION

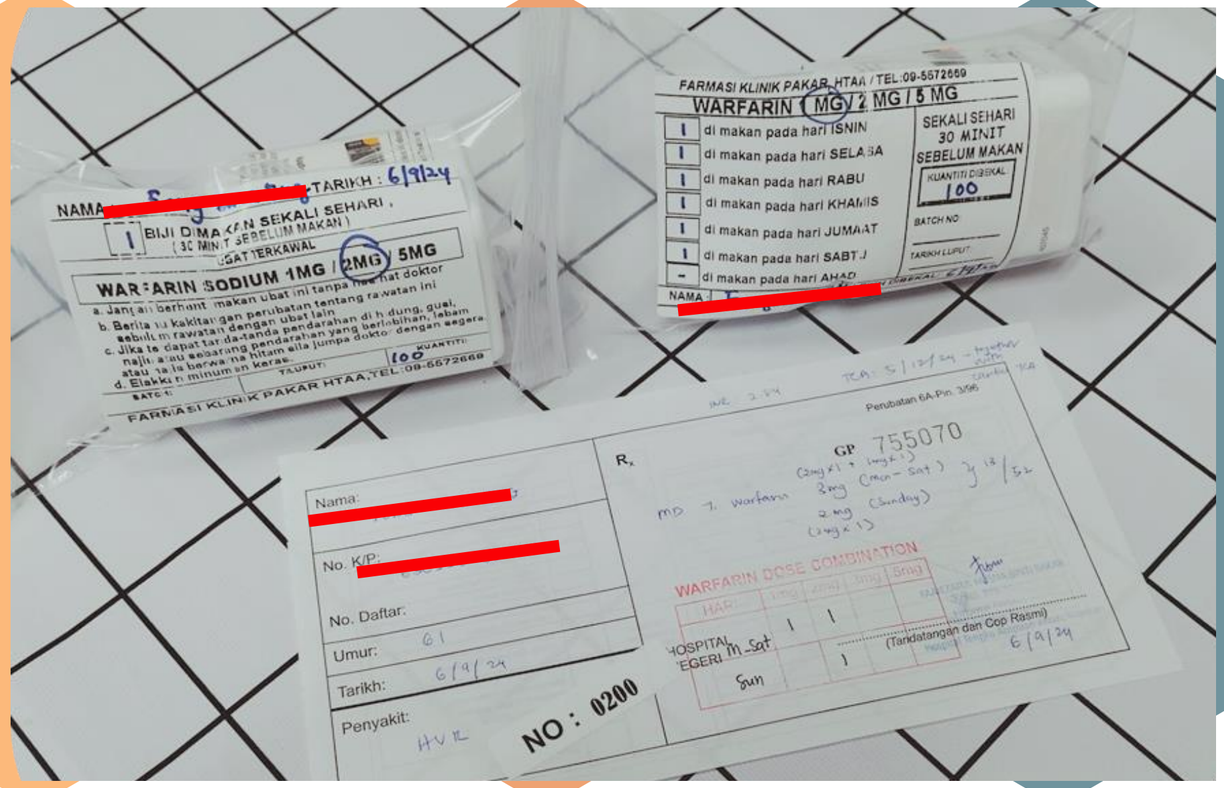
Dose (mg)	Recommended Tablet Warfarin Combination		
	1mg	2mg	5mg
0.5	½		
1	1		
1.5	1½		
2		1	
2.5			½
3	1	1	
3.5	1		½
4		2	
4.5		1	½
5			1
5.5	½		1
6	1		1
6.5	1½		1
7		1	1
7.5			1½
8	1	1	1
8.5	1		1½
9		2	1
9.5		1	1½
10			2
10.5	½		2
11	1		2
11.5	1½		2
12		1	2
12.5			2½
13	1	1	2
13.5	1		2½
14		2	2
14.5		1	2½
15			3
15.5	½		3
16	1		3
16.5	1½		3
17		1	3
17.5			3½
18	1	1	3
18.5	1		3½
19		2	3
19.5		1	3½
20			4



FACTOR 4:
TOOK WRONG DOSE DUE TO CONFUSION IN WARFARIN COMBINATION

"EZ-Label"





EZ-LABEL

NAMA : TARIKH :

☐ BIJI DIMAKAN SEKALI SEHARI ,
(30 MINIT SEBELUM MAKAN)

UBAT TERKAWAL

WARFARIN SODIUM 1MG / 2MG / 5MG

a. Jangan berhenti makan ubat ini tanpa nasihat doktor
b. Beritahu kakitangan perubatan tentang rawatan ini sebelum rawatan dengan ubat lain
c. Jika terdapat tanda-tanda pendarahan di hidung, gusi, najis atau sebarang pendarahan yang berlebihan, lebam atau najis berwarna hitam sila jumpa doktor dengan segera.
d. Elakkan minuman keras.

BATCH:	T/LUPUT:	KUANTITI:

FARMASI KLINIK PAKAR HTAA,TEL:09-5572669

NAMA: TARIKH:

LOADING DOSE

WARFARIN 1MG / 2MG / 5MG

☐ BIJI DIMAKAN SEKALI SEHARI

PADA ☐

KUANTITI: ☐ EXP: BN:

FARMASI KLINIK PAKAR HTAA

Sebarang pertanyaan, sila hubungi pegawai farmasi di talian: 09-5572669

NAMA: TARIKH:

WARFARIN 1MG / 2MG / 5MG

☐ dimakan pada hari ISNIN
☐ dimakan pada hari SELASA
☐ dimakan pada hari RABU
☐ dimakan pada hari KHAMIS
☐ dimakan pada hari JUMAAT
☐ dimakan pada hari SABTU
☐ dimakan pada hari AHAD

SEKALI SEHARI
30 MINIT
SEBELUM MAKAN

KUANTITI:

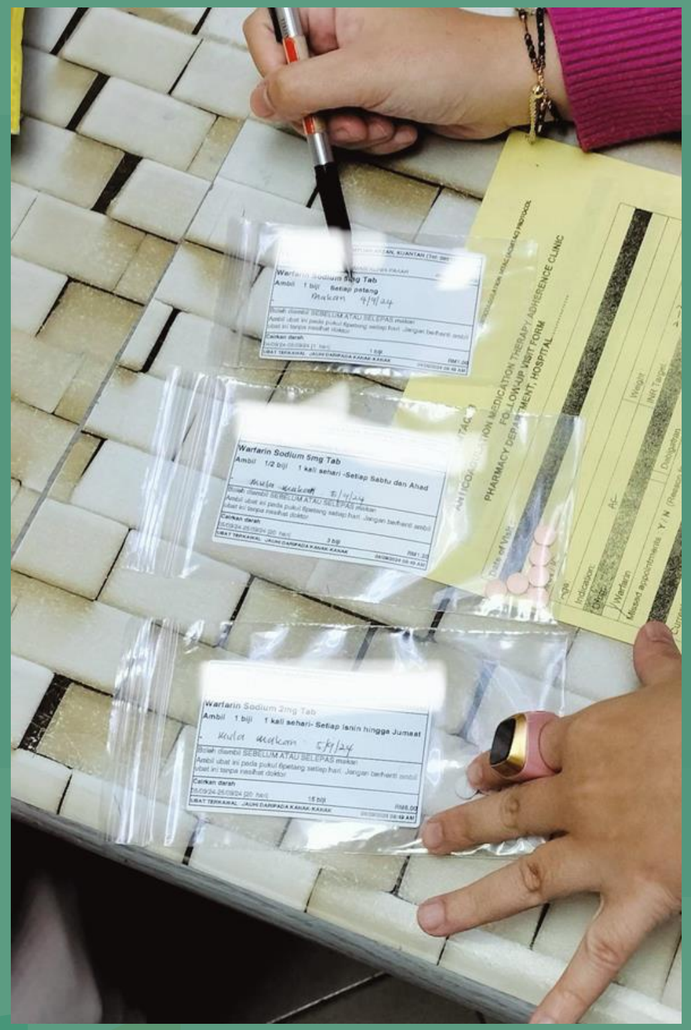
BATCH NO:
.....

TARIKH LUPUT:
.....

FARMASI KLINIK PAKAR HTAA,TEL:09-5572669

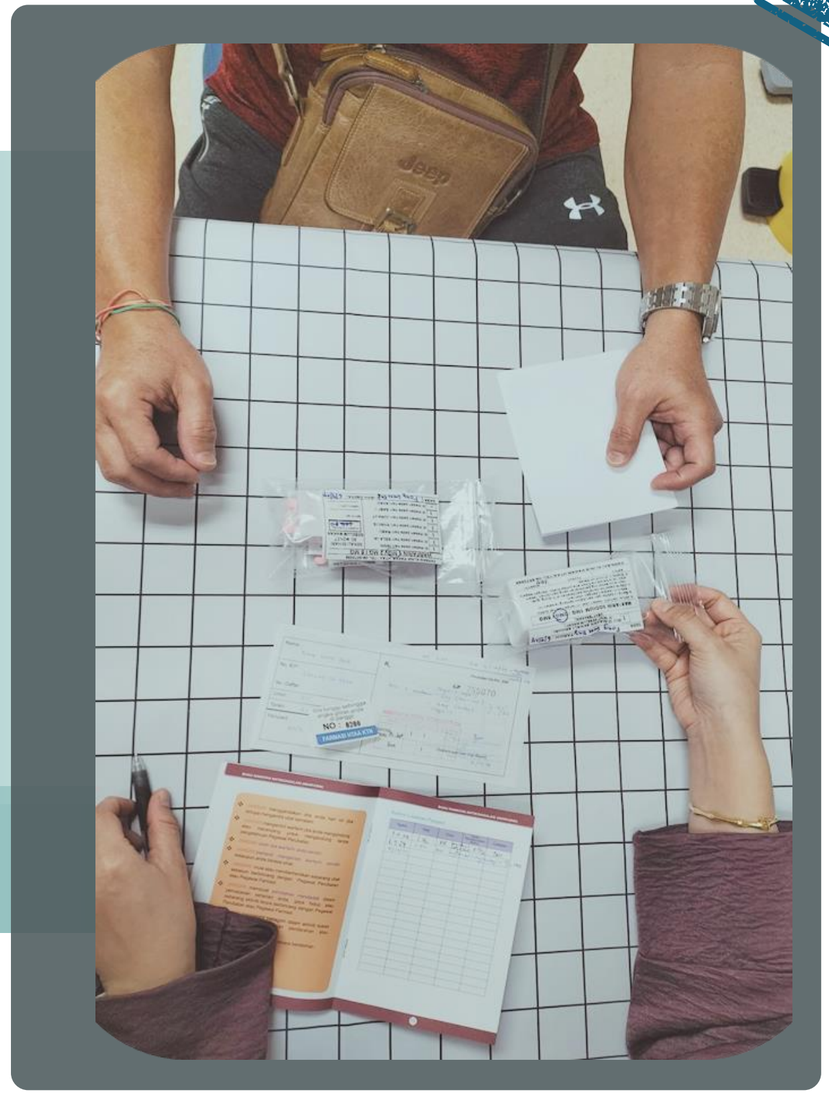
BEFORE

“PhIS Label”



“EZ-Label”

AFTER



BEFORE

MINI PHARMACY

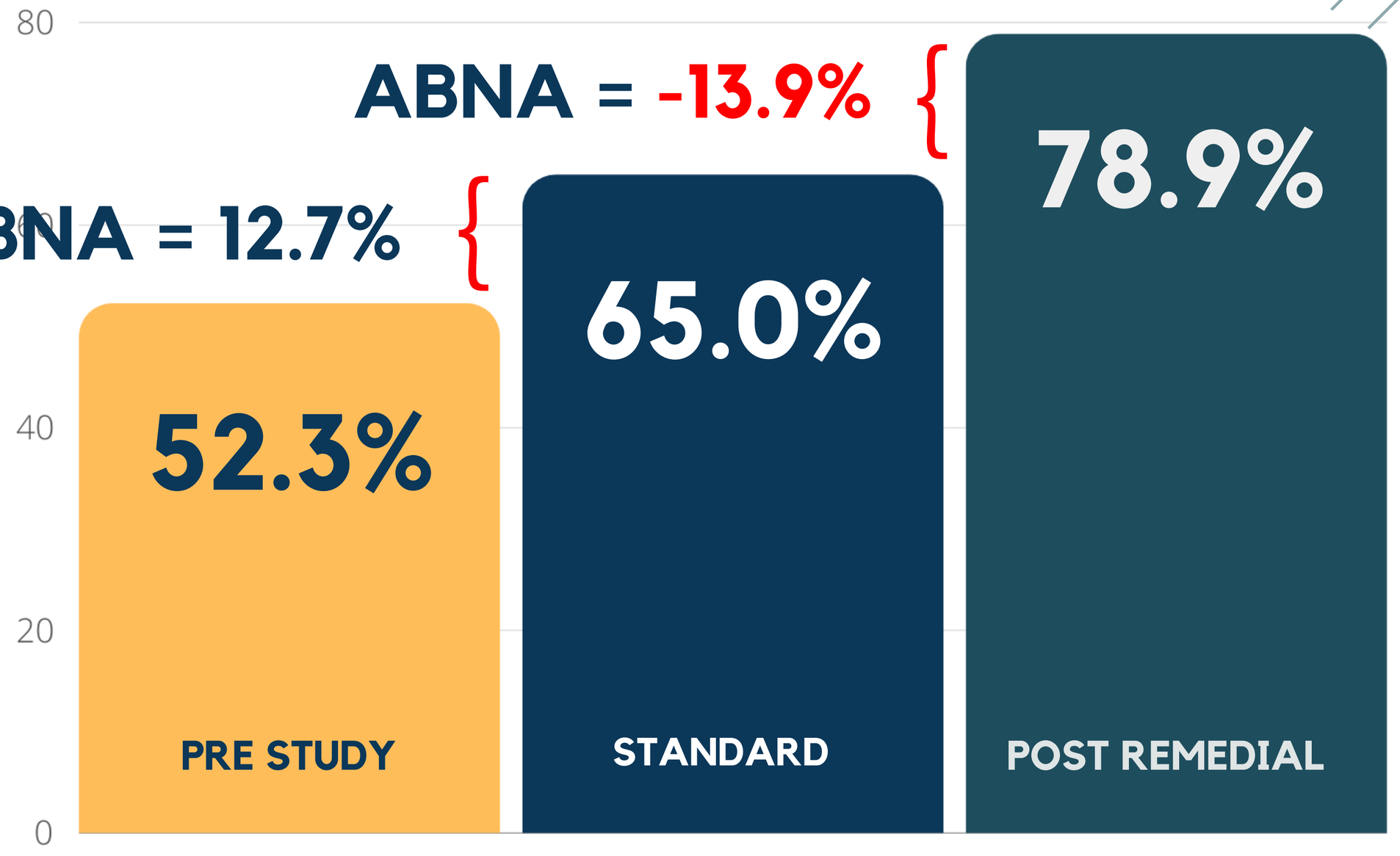
AFTER

EFFECTS OF CHANGE

ACHIEVABLE BENEFIT NOT ACHIEVED (ABNA)
(POST-REMEDIAL)

Percentage of VR patients achieving optimum TTR was **78.9%**.

The ABNA was reduced to **-13.9%**



CAUSE-EFFECT ANALYSIS

Poor knowledge on warfarin-diet interaction

Inconsistency in diet intake

Confused about warfarin combination

Took wrong warfarin dose

Self-adjusting warfarin dose

Poor knowledge regarding the importance of TTR among patients

TTR not emphasized to patient during clinic

Forgetfulness

Low Percentage of VR Patients Achieving Optimum TTR

Missed warfarin dose

Lack of information provided regarding missed appointment to patient

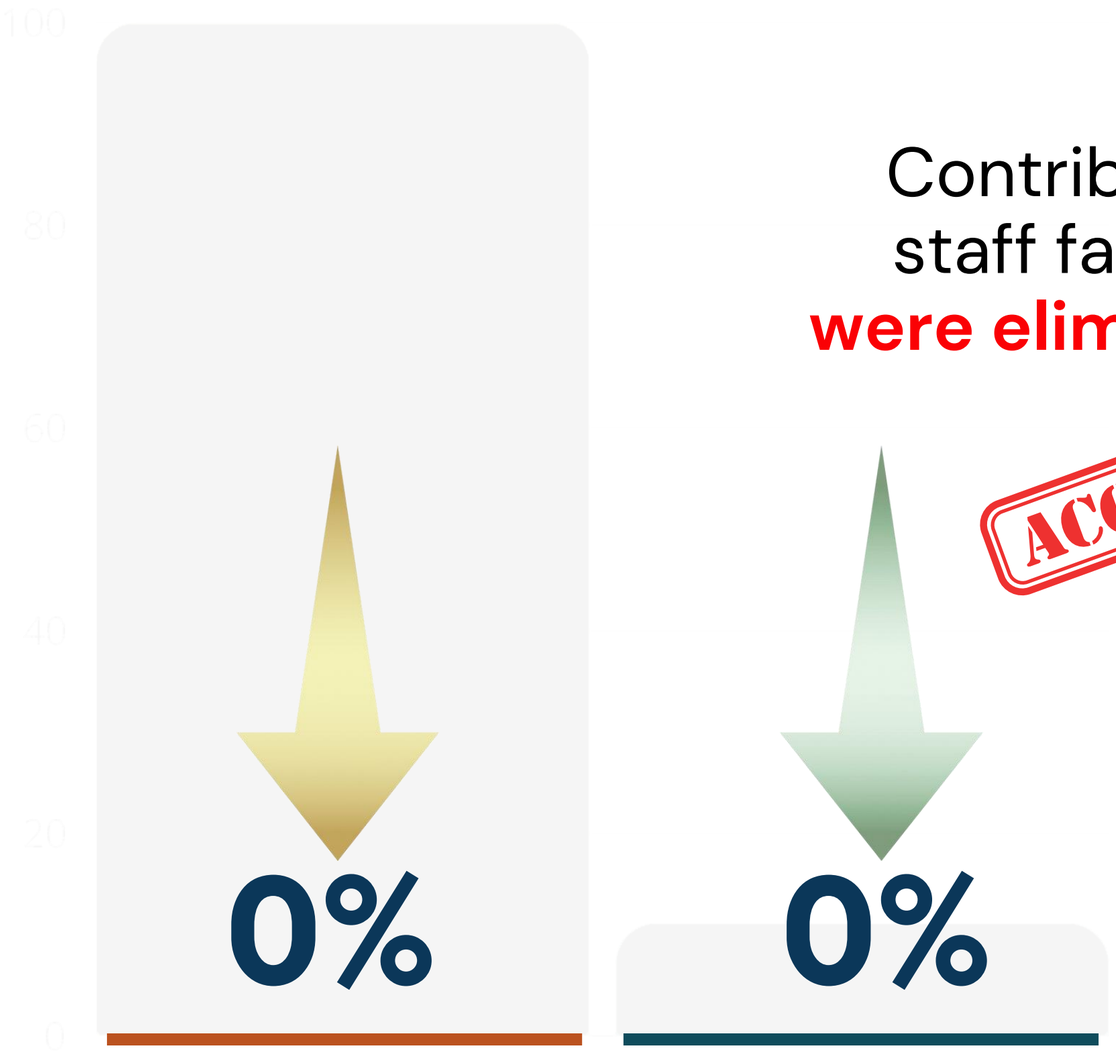
STAFF FACTOR

RESULTS OF POST-REMEDIAL STUDY (2)

STAFF FACTOR

01 - TTR NOT EMPHASIZED TO PATIENT DURING CLINIC

02 - LACK OF INFORMATION PROVIDED REGARDING MISSED APPOINTMENT TO PATIENT



Total staff = 27

Contributing staff factors **were eliminated.**

ACCOMPLISHED

CAUSE-EFFECT ANALYSIS

Poor knowledge on warfarin-diet interaction

Inconsistency in diet intake

Poor knowledge regarding the importance of TTR among patients

TTR not emphasized to patient during clinic

Forgetfulness

Missed warfarin dose

Lack of information provided regarding missed appointment to patient

Low Percentage of VR Patients Achieving Optimum TTR

Confused about warfarin combination

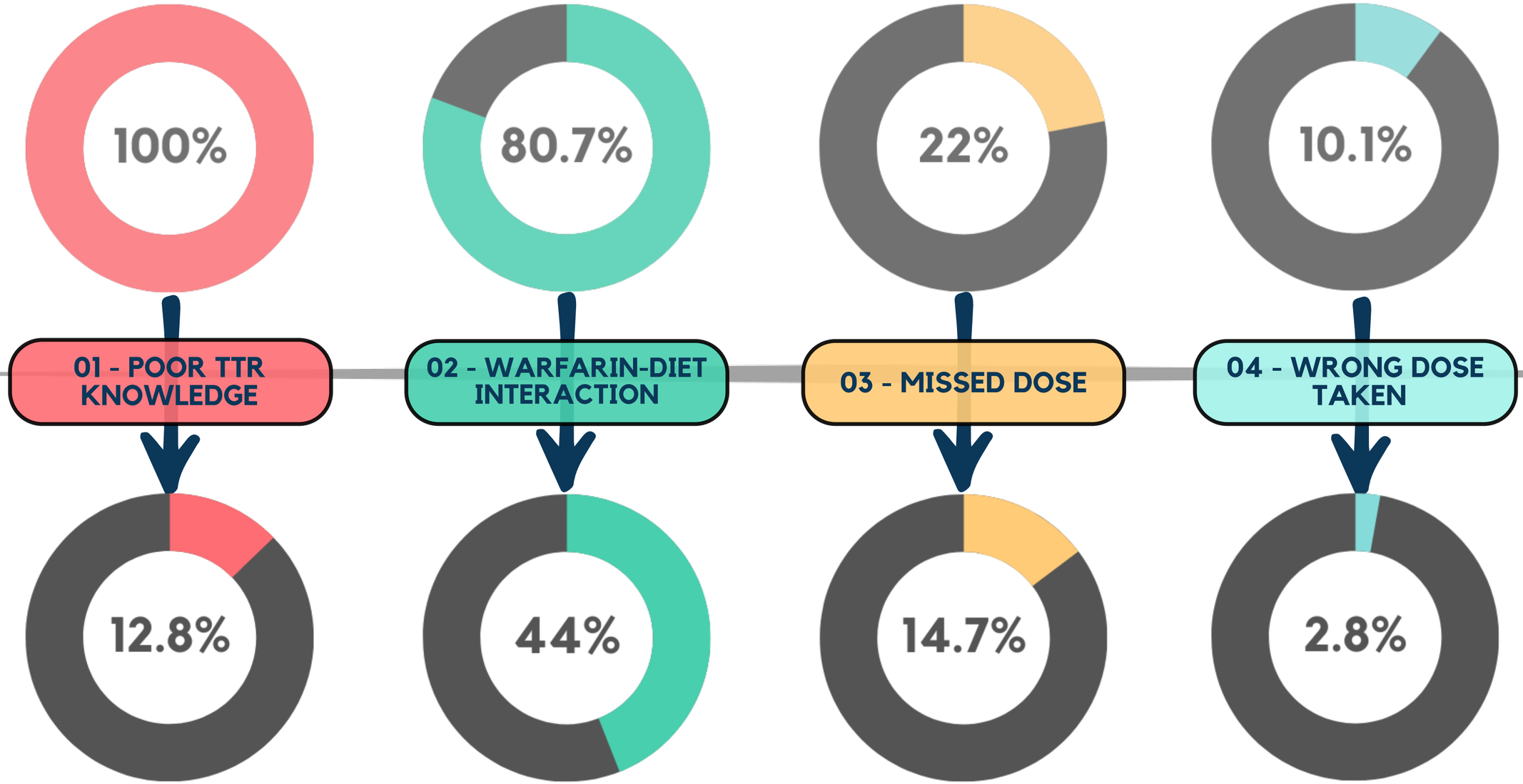
Took wrong warfarin dose

Self-adjusting warfarin dose

PATIENT FACTOR

RESULTS OF POST-REMEDIAL STUDY (3)

PATIENT FACTOR



Total patients = 109

CAUSE-EFFECT ANALYSIS

Poor knowledge on warfarin-diet interaction

Inconsistency in diet intake

Low Percentage of VR Patients Achieving Optimum TTR

Poor knowledge regarding the importance of TTR among patients

TTR not emphasized to patient during clinic

Forgetfulness

Missed warfarin dose

Lack of information provided regarding missed appointment to patient

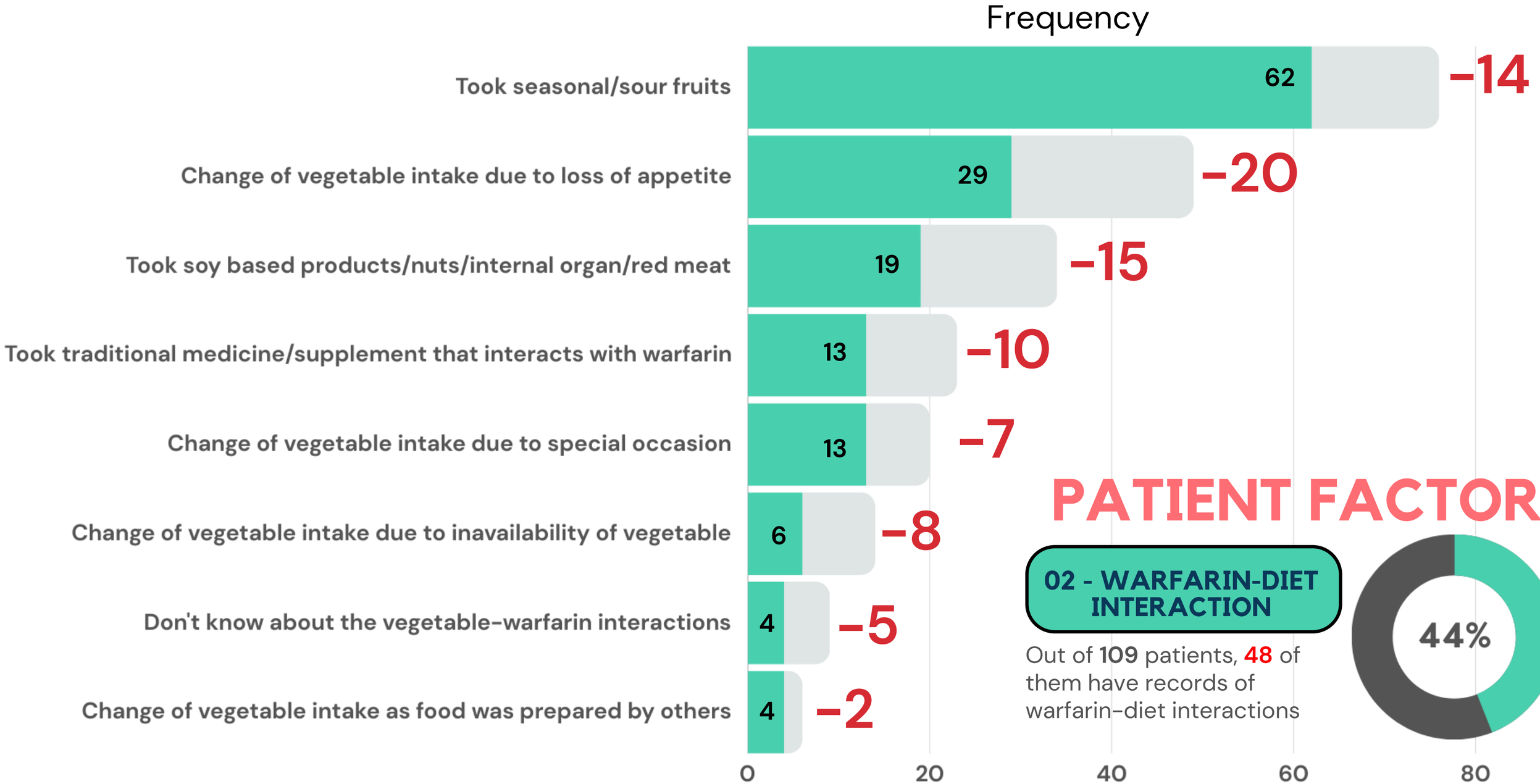
Confused about warfarin combination

Took wrong warfarin dose

Self-adjusting warfarin dose

PATIENT FACTOR

RESULTS OF POST-REMEDIAL STUDY (3)(A)



PATIENT FACTOR

02 - WARFARIN-DIET INTERACTION

Out of **109** patients, **48** of them have records of warfarin-diet interactions

CAUSE-EFFECT ANALYSIS

Low Percentage of VR Patients Achieving Optimum TTR

Missed warfarin dose

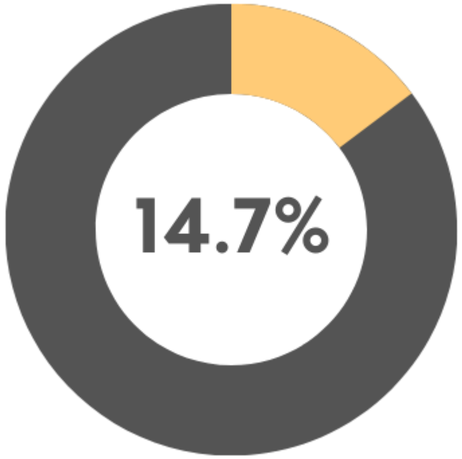
Forgetfulness

Lack of information provided regarding missed appointment to patient

PATIENT FACTOR

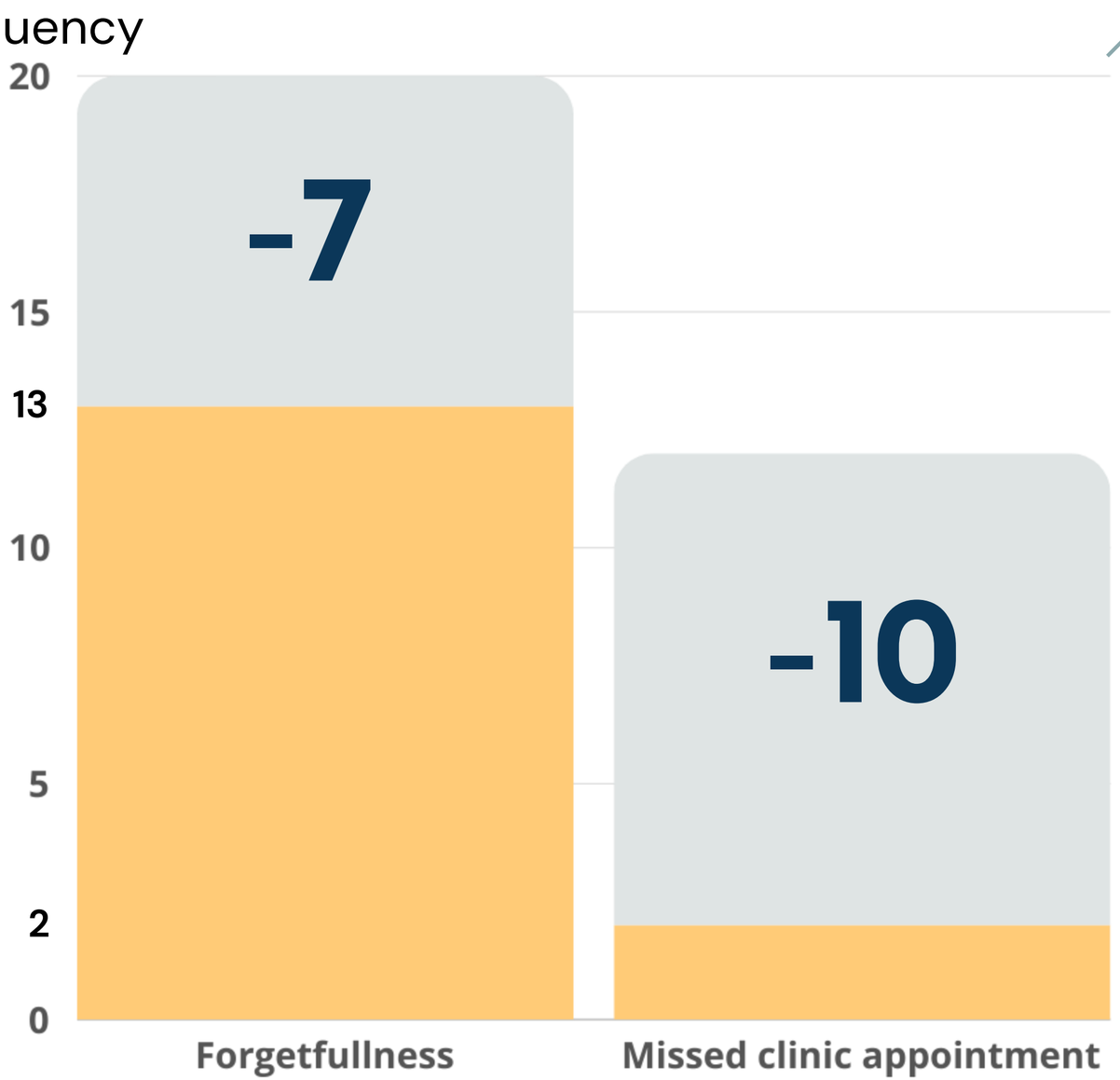
RESULTS OF POST-REMEDIAL STUDY (3)(B)

PATIENT FACTOR



03 - MISSED DOSE

Out of **109** patients, **16** of them have records of missed dose



CAUSE-EFFECT ANALYSIS

Poor knowledge on warfarin-diet interaction

Poor knowledge regarding the importance of TTR among patients

TTR not emphasized to patient during clinic

Inconsistency in diet intake

Forgetfulness

Missed warfarin dose

Lack of information provided regarding missed appointment to patient

Low Percentage of VR Patients Achieving Optimum TTR

Confused about warfarin combination

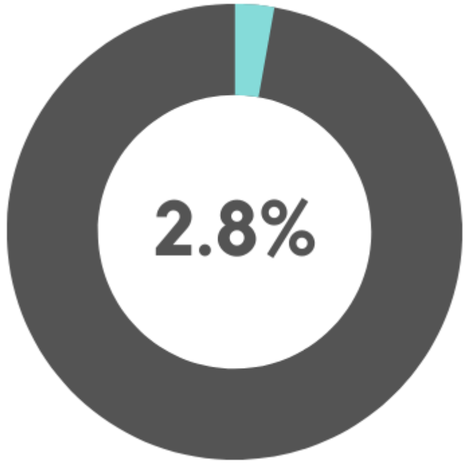
Took wrong warfarin dose

Self-adjusting warfarin dose

PATIENT FACTOR

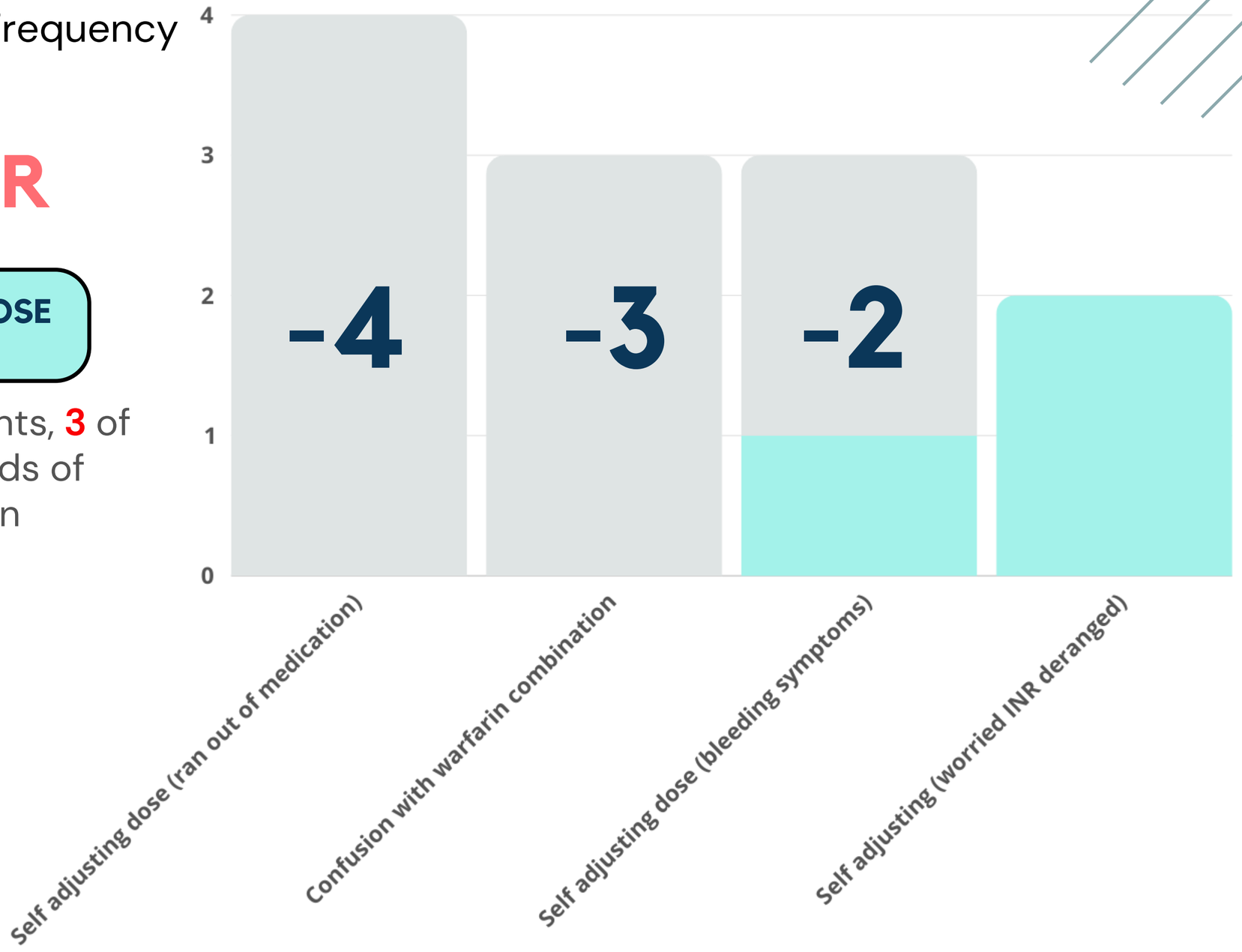
RESULTS OF POST-REMEDIAL STUDY (3)(C)

PATIENT FACTOR



04 - WRONG DOSE TAKEN

Out of **109** patients, **3** of them have records of wrong dose taken



MODEL OF GOOD CARE (MOGC)

No	Process of care	Criteria	Standard (%)	Pre remedial (%)	Post remedial(%)
1	Register patient at MTAC Counter	Register all patient by issuing number ticket	100	100	100
2	Obtain INR result	Attach patient's INR result to patient's BHT or Warfarin follow up form visit	100	100	100
3	Assess patient	-Check on patient's TTR understanding of warfarin therapy using "Pocket TTR" -Check on medication compliance and missed dose - to provide Pharmacist hotline if there is any enquiries -Check on dietary changes using "FLIPME" -Check on drug interactions -Check on history of taking any OTC/Traditional medicine -Check on correct dose taken -Check on alcohol intake (if any) -Check on smoking habit (if any)	100 100 100 100 100 100 100	0 0 0 100 100 100 100	100 100 100 100 100 100 100
4	Assess diet	-Refer dietician for diet counseling if failed to achieve 4 consecutive target INR	100	0	0
5	Counsel patient *maintain dose *adjust warfarin dose	-Emphasize on medication compliance -Advice to maintain consistent diet -Counsel warfarin combination for patient using "Pill-ALERT"	100 100 100	100 100 70	100 100 100
6	Carry out warfarin dosing	-Complete documentation in INR follow up sheet -Complete documentation in patient's WMTAC profile -Write prescription remark of patient's warfarin combination -Send prescription for Dr's countersign	100 100 100 100	100 100 60 100	100 100 100 100
7	Supply warfarin to patient	Fill, label (using "EZ-label"), countercheck and dispense warfarin tablets	100	60	100

CYCLE 2

THE NEXT STEP..

REMEDIAL ACTIONS IN CYCLE 2

1. **WARFARIN-DIET COUNSELING**
   Involve **dietitian** to provide warfarin-diet counseling to patients during clinic day

2. **FOOD FREQUENCY QUESTIONNAIRE (FFQ)**
   Introduce Food Frequency Questionnaire (FFQ) (9,10) to quantify the amount of vitamin K intake **(collaboration with Dietitian)**

3. **ALL WARFARIN PATIENTS**
   Expand remedial actions to **whole population** in warfarin clinic HTAA

FOOD FREQUENCY QUESTIONNAIRE

FOOD FREQUENCY QUESTIONNAIRE FOR VITAMIN K INTAKE IN WARFARIN PATIENT For QA study purposes

SAYUR-SAYURAN (DIMASAK)				
No	Food / Item (Vitamin K content)	In the past 7 days,how many times did you take?	How many cups per meal?	Total vitamin K (mcg)
1	BAYAM (888 µg/cup)	1	0.5	
2	BROKOLI (220µg/cup)			
3	BRUSSEL SPROUTS (220µg/cup)			
4	DAUN BAWANG (6.4µg/**table spoon**)			
5	DAUN KELEDEK (69.5µg/cup)			
6	DAUN SUP (164µg/10 **springs**)			
7	KAILAN (1062.1µg/cup)			
8	KANGKUNG (641.7µg/cup)			
9	KOBIS (164µg/cup)			
10	KOBIS MERAH (70µg/cup)			
11	PAKU PAKIS (170.9µg/100G)			
12	PERIA (6µg/cup)			
13	ROMAINE LETTUCE (57µg/cup)			

CONCLUSION

•The pre-remedial data of this QA showed that the percentage of VR patients achieving optimum TTR was 52.3%.

•However, after implementation of proper remedial actions, the percentage was increased to 78.9%.

•We hope that the implementation and expansion of remedial actions in cycle 2 will further benefit all warfarin patients and improve quality of warfarin treatment. This in turn will improve TTR, improve quality of life while saving healthcare cost and reducing clinical waste.

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7. Krittayaphong R, Chantrarat T, Rojjarekampai R,et al. Poor Time in Therapeutic Range Control is Associated with Adverse Clinical Outcomes in Patients with Non-Valvular Atrial Fibrillation: A Report from the Nationwide COOL-AF Registry. J Clin Med. 2020 Jun 2;9(6):1698. doi: 10.3390/jcm9061698.

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9. Pinto E, Viegas C, Martins P.V et al. New Food Frequency Questionnaire to estimate vitamin K intake in Mediterranean Population. Nutrients. 2023; 15, 3012.

10.Dias D, et al. Development of food frequency questionnaire to determine vitamin k intake in anticoagulated patients: a pilot study. Rev ChilNutr. 2018; 45(4): 363-371.

DISCLAIMER

THIS STUDY WAS STARTED SINCE 2022, PRIOR TO THE IMPLEMENTATION OF TTR AS QUALITY ASSURANCE PROGRAM (QAP) BY PHARMACEUTICAL SERVICES DIVISION, MINISTRY OF HEALTH IN 2023.

THANK YOU

Pharmacy Department
Hospital Tengku AmpuanAfzan Kuantan

APPENDIX

Appendix 3 - *ACMTAC/F3*

ANTICOAGULATION MEDICATION THERAPY ADHERENCE CLINIC
FOLLOW-UP VISIT FORM
PHARMACY DEPARTMENT, HOSPITAL.....

Date of Visit :														
Patient Information														
Name:														
MRN / IC:														
Age:							Weight :							
Indication:							INR Target :							
Drug:														
☐ Warfarin		☐ Dabigatran			☐ Rivaroxaban			☐ Apixaban						
Missed appointments : **Y / N** (Reason for missed appointment)														
Objective Information														
Current dose a. DOAC_____ b. Warfarin:							Correct dose taken : ☐ Yes ☐ No (DOAC) _____ ☐ No (**Warfarin):**							
Mon	Tue	Wed	Thur	Fri	Sat	Sun	Mon	Tue	Wed	Thur	Fri	Sat	Sun	
Subjective Information														
Compliance ☐ Good ☐ Poor_____ Missed doses in past 1 week : ☐ No ☐ Yes _____ Bleeding ☐ No ☐ Yes _____ Thrombosis ☐ No ☐ Yes _____ Drug Interaction ☐ No ☐ Yes _____ Food / Herbs/ supplement Interaction ☐ No ☐ Yes _____ Alcohol consumption? ☐ No ☐ Yes _____ Smoker? ☐ No ☐ Yes _____ Change in Medical Status/ Illness ☐ No ☐ Yes _____ Change in Physical Activity : ☐ No ☐ Yes _____ Pregnancy / plan to get pregnant? ☐ No ☐ Yes _____														
Other complain / Patients Plans : **Y / N**(Describe if Yes)														

Assessment			
INR Value	Sub-therapeutic	Within Range	Supra-therapeutic
INR (Laboratory) / (Point of Care)			

Pharmacist Review / Plan

Plan ☐ Maintain dose ☐ Loading dose _____ Withhold ____day(s)
☐ Increase dose _____ ☐ Reduce dose _____
☐ S/C Enoxaparin _____
TCA _____Date_____
☐ **Advice patient to go to ED if had bleeding/thrombosis symptoms or any problems**

Warfarin dose recommended:						
Mon	Tue	Wed	Thur	Fri	Sat	Sun

Pharmacist's Signature and Stamp

Doctor Review & Notes (If applicable)

Physician's Signature and Stamp

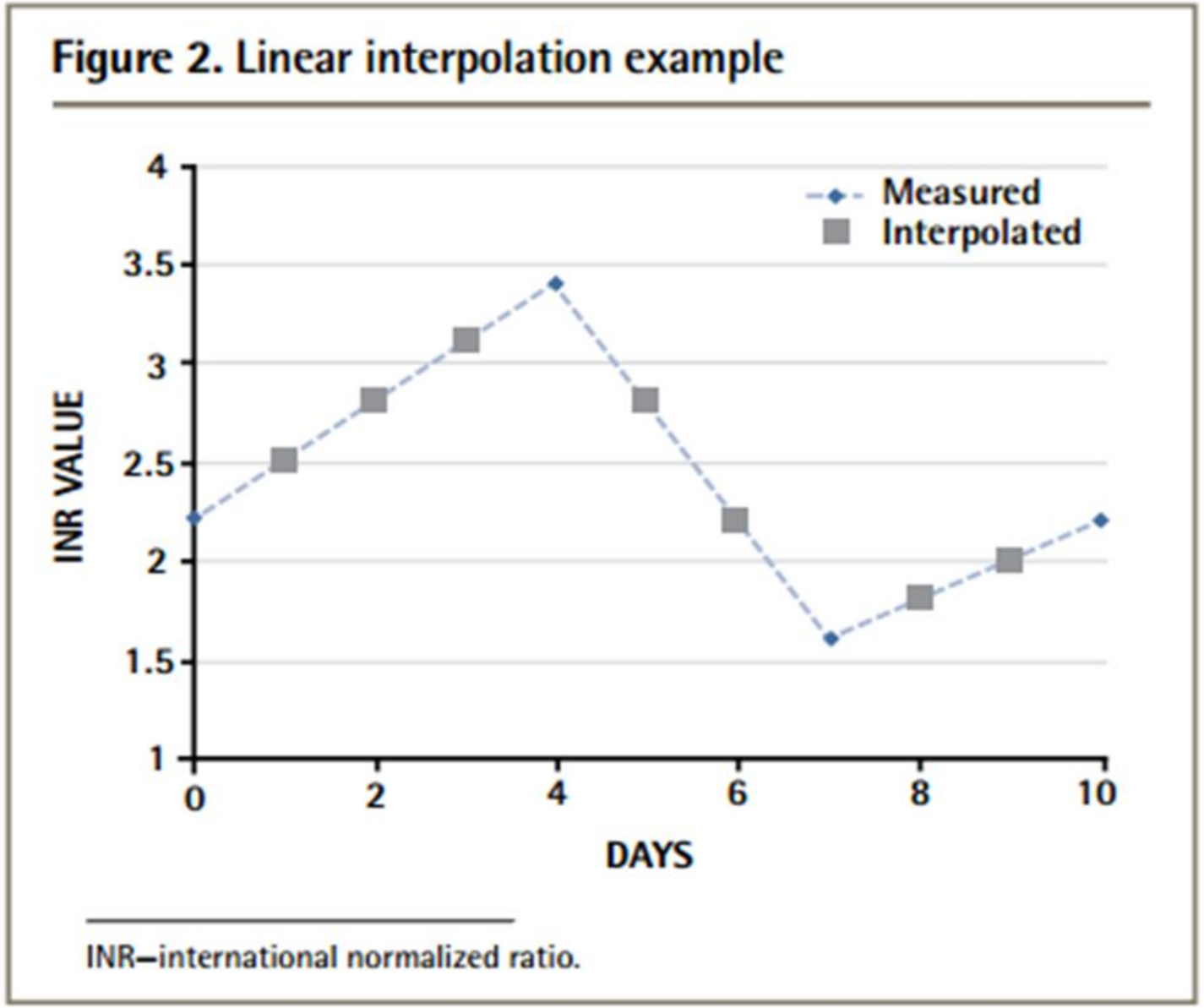
B	H	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA
		whole year of 2023)										
				Non compliant to vege(including taugeh) intake that causes INR deranged (if not details available, just put the frequency of non compliance in column AQ)			Non compliant to other than vege intake that causes INR deranged					TTR knowledg (Yes/No
WMTAC NO	TTR 2021	others (please state frequency in respective row)	total wrong dose	frequency of non compliant to diet because food is prepared by others	frequency of non compliant to diet because don't know the interactions	others (please state in respective row with frequency)	Frequency of seasonal fruits/sour fruits intake	Frequency of traditional medicine/supplement intake	frequency of soy based product/nuts/internal organ/red meat	diet interaction	TTR knowledge	yes
M252	74	0	1	0	0	0	0	2	3	1	1	Y
M275	90	0	0	0	0	0	0	0	1	1	1	Y
M278	49.3	0	0	0	0	2	4	0	1	1	0	N
M284	60.4	0	0	0	0	0	0	0	0	0	1	yes
M290	38	0	0	0	0	0	0	0	0	0	0	N
M293	97.6	0	0	0	0	0	0	0	0	0	1	Y
M323	81.2	0	0	0	0	7	1	0	0	1	1	Y
M361	42.6	0	0	0	0	0	0	0	0	0	1	Y
N004	43.4	0	0	0	0	1	0	0	1	1	0	N
N005	55.6	0	0	0	0	0	0	0	0	0	1	Y
N014	26.5	0	0	0	0	0	0	0	0	0	1	Y
N025	71.2	0	0	0	0	1	1	3	0	1	1	yes
N026	71.8	0	0	0	0	0	2	0	0	1	1	Y
N030	53.8	0	0	0	0	3	3	0	0	1	1	Y
N037	57.7	0	0	0	0	1	0	1	0	1	1	Y
N038	84.3	0	0	0	0	0	0	0	0	0	1	yes
N039	3.5	0	0	0	0	0	0	0	0	0	1	yes
N040	46.5	0	0	0	0	2	0	0	0	1	1	yes
N042	44.8	0	0	0	0	0	0	0	0	0	1	yes
N048	96.8	0	0	0	0	1	1	0	0	1	1	yes
N072	75.9	0	0	0	0	0	0	0	0	0	1	yes
N080	84.1	0	0	0	0	0	0	0	0	0	1	yes
N081	14	0	1	0	0	0	0	0	0	0	1	yes
N112	64.6	0	0	0	0	1	1	0	0	1	0	no
N138	72.7	0	0	0	0	0	0	0	0	0	1	yes
N158	46.9	0	0	0	0	0	0	0	0	0	1	yes

Time in Therapeutic Range (TTR)

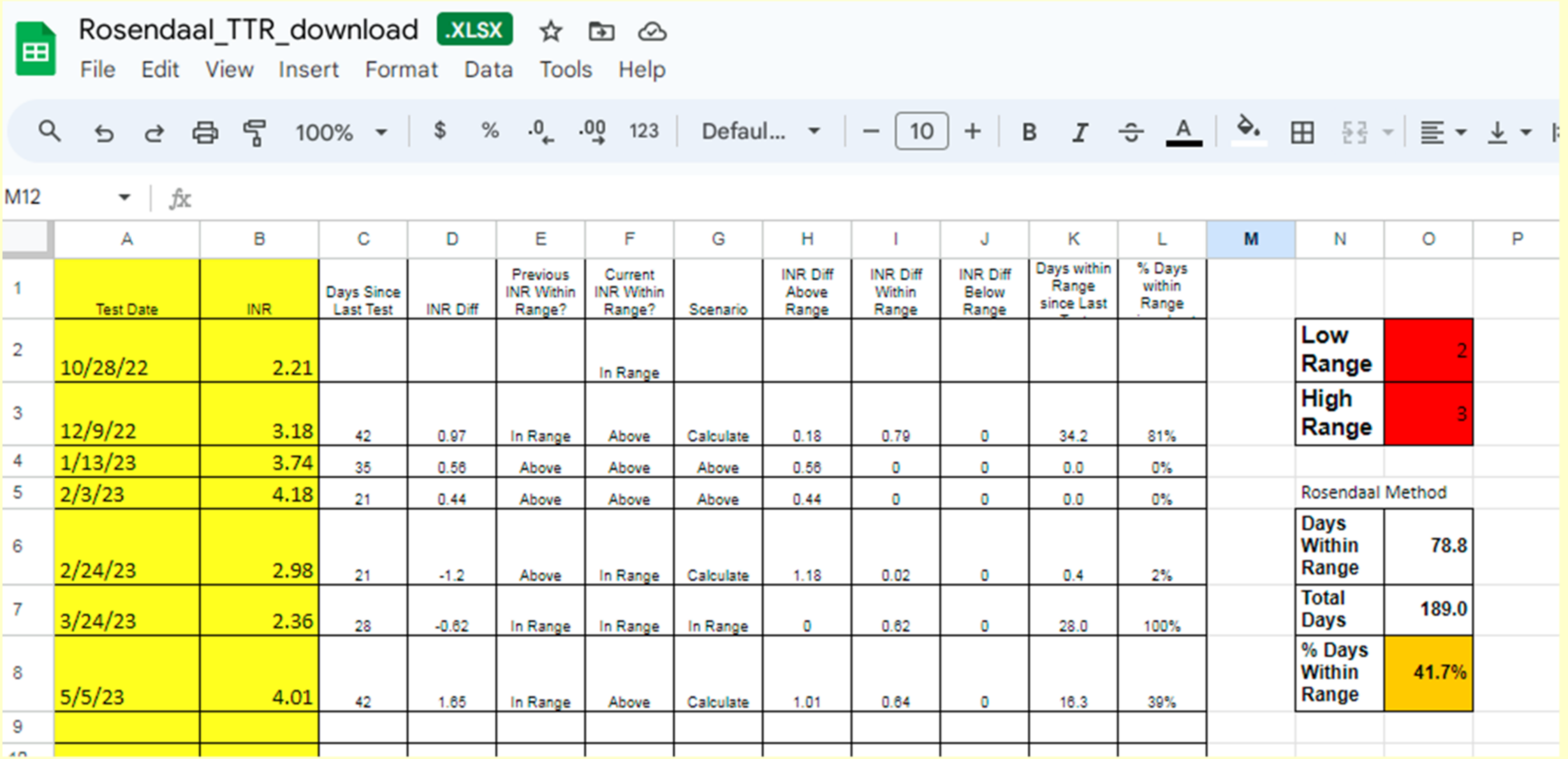
- TTR is calculated using the Rosendaal method
- Rosendaal method: linear interpolation used to calculate estimated **INR** values between dates of observation

$$\text{TTR} = \frac{\text{Days of INR within range}}{\text{Total days of Warfarin treatment}} \times 100\%$$

Rosendaal Linear Interpolation



[Gateman D , Trojnar ME, Agarwal G. 2017]



Rosendaal_TTR_download .XLSX

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M12

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Test Date	INR	Days Since Last Test	INR Diff	Previous INR Within Range?	Current INR Within Range?	Scenario	INR Diff Above Range	INR Diff Within Range	INR Diff Below Range	Days within Range since Last	% Days within Range				
2	10/28/22	2.21				In Range								Low Range	2	
3	12/9/22	3.18	42	0.97	In Range	Above	Calculate	0.18	0.79	0	34.2	81%		High Range	3	
4	1/13/23	3.74	35	0.56	Above	Above	Above	0.56	0	0	0.0	0%				
5	2/3/23	4.18	21	0.44	Above	Above	Above	0.44	0	0	0.0	0%		Rosendaal Method		
6	2/24/23	2.98	21	-1.2	Above	In Range	Calculate	1.18	0.02	0	0.4	2%		Days Within Range	78.8	
7	3/24/23	2.36	28	-0.62	In Range	In Range	In Range	0	0.62	0	28.0	100%		Total Days	189.0	
8	5/5/23	4.01	42	1.65	In Range	Above	Calculate	1.01	0.64	0	16.3	39%		% Days Within Range	41.7%	
9																

WARFARIN MTAC

ACMTAC Presentation slides:
https://drive.google.com/drive/folders/12YhqYHs0ru6jA9rQikxe8p9tbJAppw0T?usp=drive_link

ACMTAC References:
https://drive.google.com/drive/folders/1pEy35PZlbS86h9dEDZ0yNmadJpQjyO3o?usp=drive_link

ACMTAC Training Materials:
https://drive.google.com/drive/folders/1m1nF7vGxIxY2vVCGdzCOajWY0LYXPrID?usp=

SOP & Protokol ACMTAC:
https://drive.google.com/drive/folders/16bpG9jWa71Z3rAzF3qMU2l93f4gy73z-?usp=drive_link

Compilation TTR 2023
https://docs.google.com/spreadsheets/d/1exCXN6t39rkun3agFP3JVf-HX4wvkLVu/edit?usp=drivesdk&ouid=104683860492702754090&rtpof=true&sd=true

docs.google.com/spreadsheets/d/1exCXN6t39rkun3agFP3JVf-HX4wvkLVu/ec

compilation TTR 2023 lifelong warfarin .XLSX

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S12

	A	B	C	D	E	F	G
1	Ref	Age	Gender	Race	Indication	Duration	TTR 2023
2	A005	63	male	malay	valve replacement	lifelong	60.5
3	A008	63	male	malay	valve replacement	lifelong	86.9
4	A017	79	male	malay	valve replacement	lifelong	56.8
5	A021	31	male	malay	valvular or non-valvular AF	lifelong	10.8
6	A022	78	male	malay	valvular or non-valvular AF	lifelong	52.5
7	A035	65	male	malay	valve replacement	lifelong	100
8	A036	88	male	malay	valvular or non-valvular AF	lifelong	100
9	A055	75	male	malay	valvular or non-valvular AF	lifelong	47.4
10	A056	53	male	malay	valve replacement	lifelong	56.8
11	A064	54	male	malay	valvular or non-valvular AF	lifelong	74
12	A072	61	male	malay	valve replacement	lifelong	50.2
13	A076	67	female	malay	valvular or non-valvular AF	lifelong	48.1
14	A077	66	female	malay	valvular or non-valvular AF	lifelong	69.7
15	A081	63	female	malay	valve replacement	lifelong	51.3
16	A086	78	male	malay	DVT (recurrent)	lifelong	71
17	A088	85	male	malay	valvular or non-valvular AF	lifelong	61.2
18	A091	54	male	malay	valve replacement	lifelong	33
19	A093	27	female	malay	valve replacement	lifelong	48.2

Sheet1

Use of Prothrombin Complex Concentrates (PCC)

Year	No of Patients Prescribed with PCC	Total Cost
2020	11	RM 14,904
2021	5	RM 7452
2022	6	RM 10,557
2023	5	RM 11,799

1 vial of 500iu/20ml = RM 621