

# CPIP Mission Statement



**To achieve inpatient warfarin titration to therapeutic range (INR 2-3) from 11 days to within 5 days in 90% of patients in TTSH within 6 months, at the same time, reducing under- or over-anticoagulation to <10% of patients**

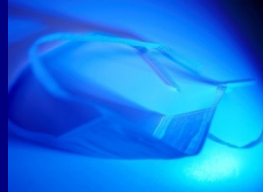
# Team Members & Role



	Name	Designation	Role in this project
1.	Dr Tay Jam Chin	Senior Consultant, GMD	Leader
2.	Ms Wong Yee May	Senior Pharmacist	Co-leader
3.	Dr Pankaj Handa	Associate Consultant, GMD	Member
4.	Dr Veerendra Chadachan	Registrar, GMD	Member
5.	Dr Andre Cheah Eu Jin	Medical Officer, GSD	Member
6.	Dr Chan Meng Fai	House Officer, ORT	Member
7.	NO Loon Sow Kuen	Nursing Officer, Ward 5C	Member
8.	Ms Quek Yu Ning	Pharmacist	Member

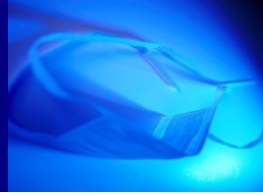


# Evidence for there being a problem worth solving



- Prolonged titration can lead to increased length of stay
- Over-anticoagulation can lead to increased risk of bleeding
- Under-anticoagulation can lead to increased risk of recurrent thromboembolism

# Evidence for there being a problem worth solving

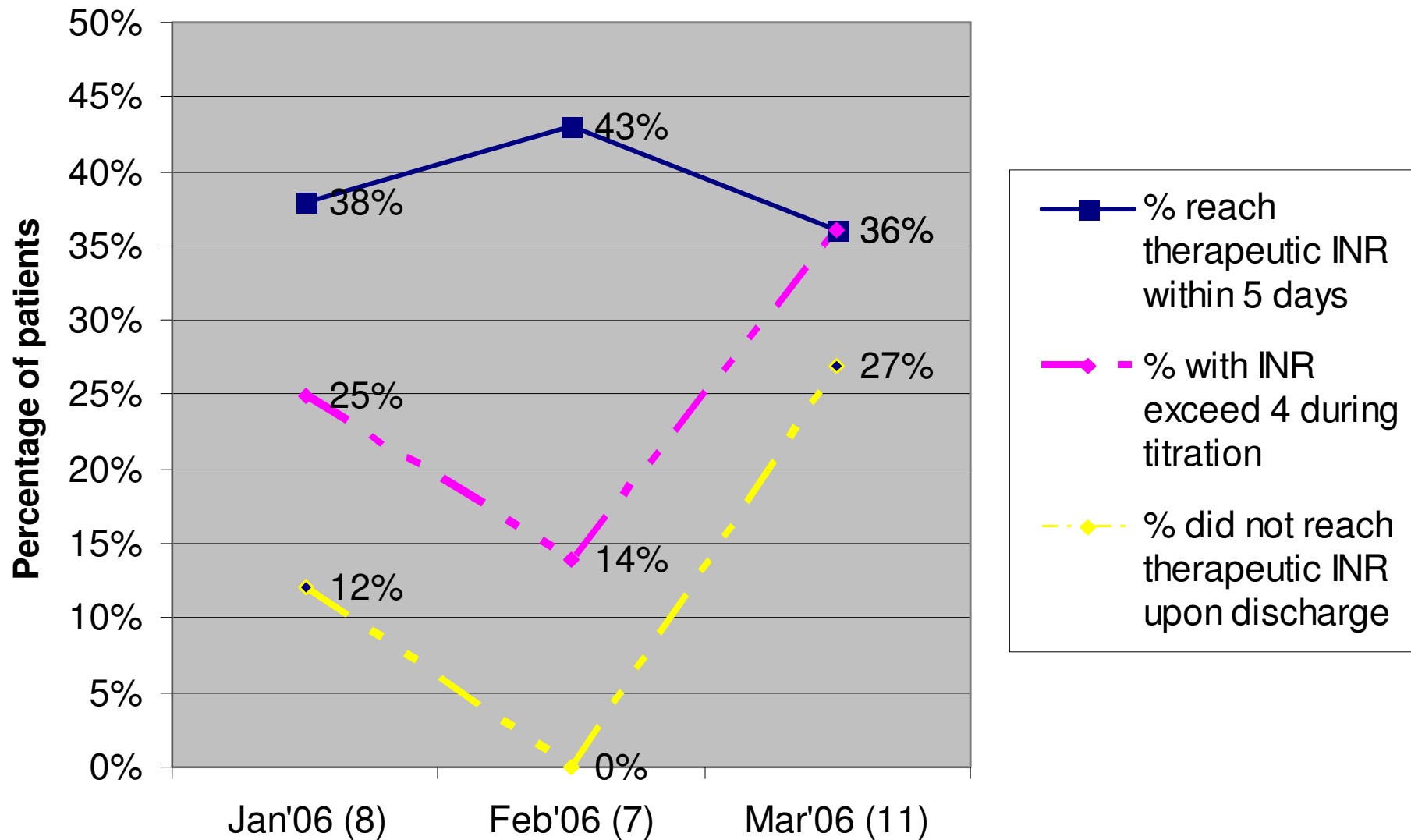
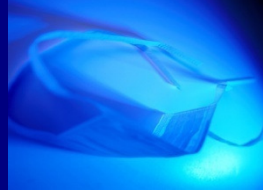


(Dager *et al.* Optimization of inpatient warfarin therapy: Impact of daily consultation by a pharmacist-managed anticoagulation service. *The Annals of Pharmacotherapy* 2000;34:567-72.)

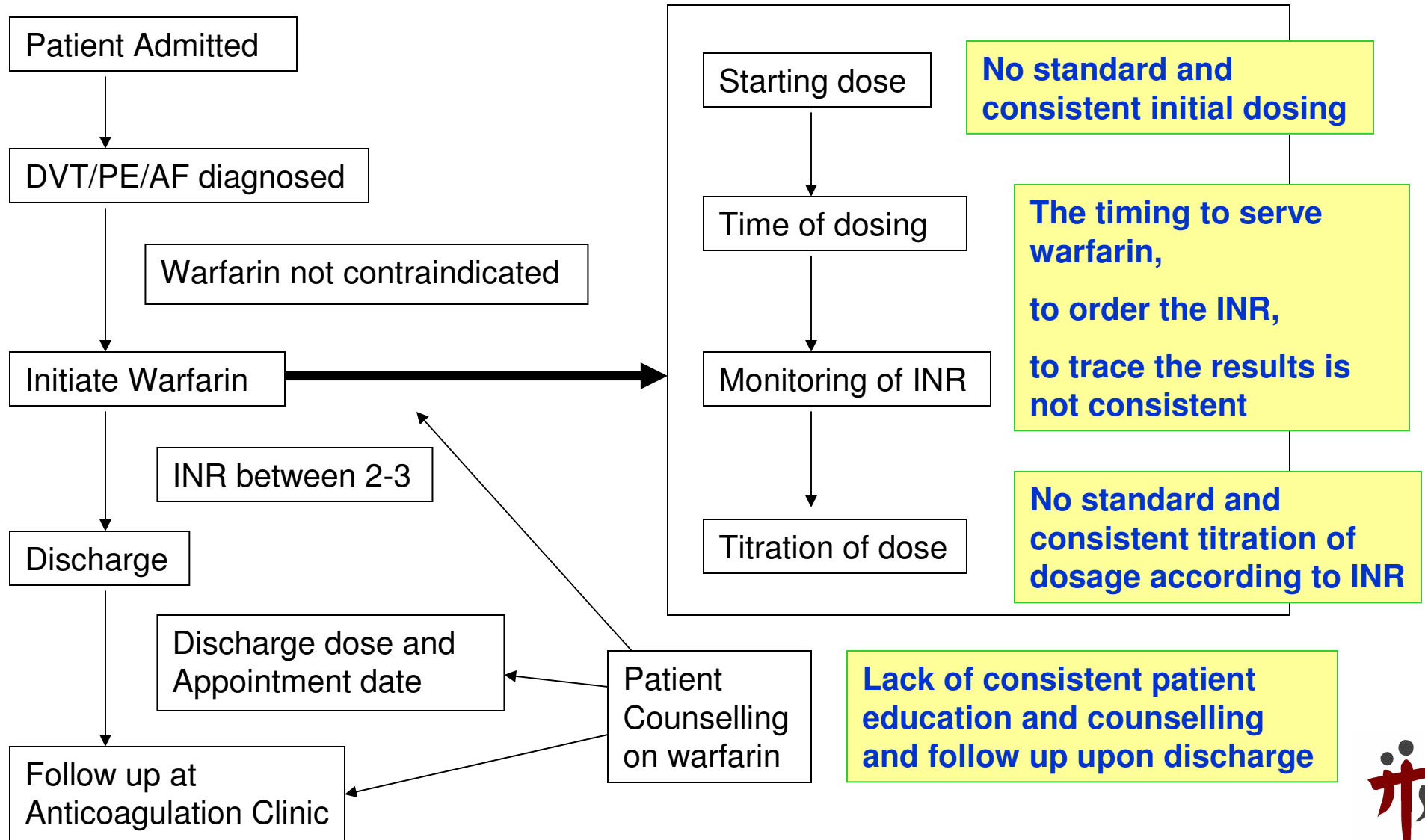
Physician-managed cohort	Pharmacist-managed cohort
27 of 60 patients (45%) required $\geq 8$ days of hospitalization following initiation of warfarin	12 of 60 patients (20%; $p = 0.003$ ) remained in hospital $\geq 8$ days after starting warfarin



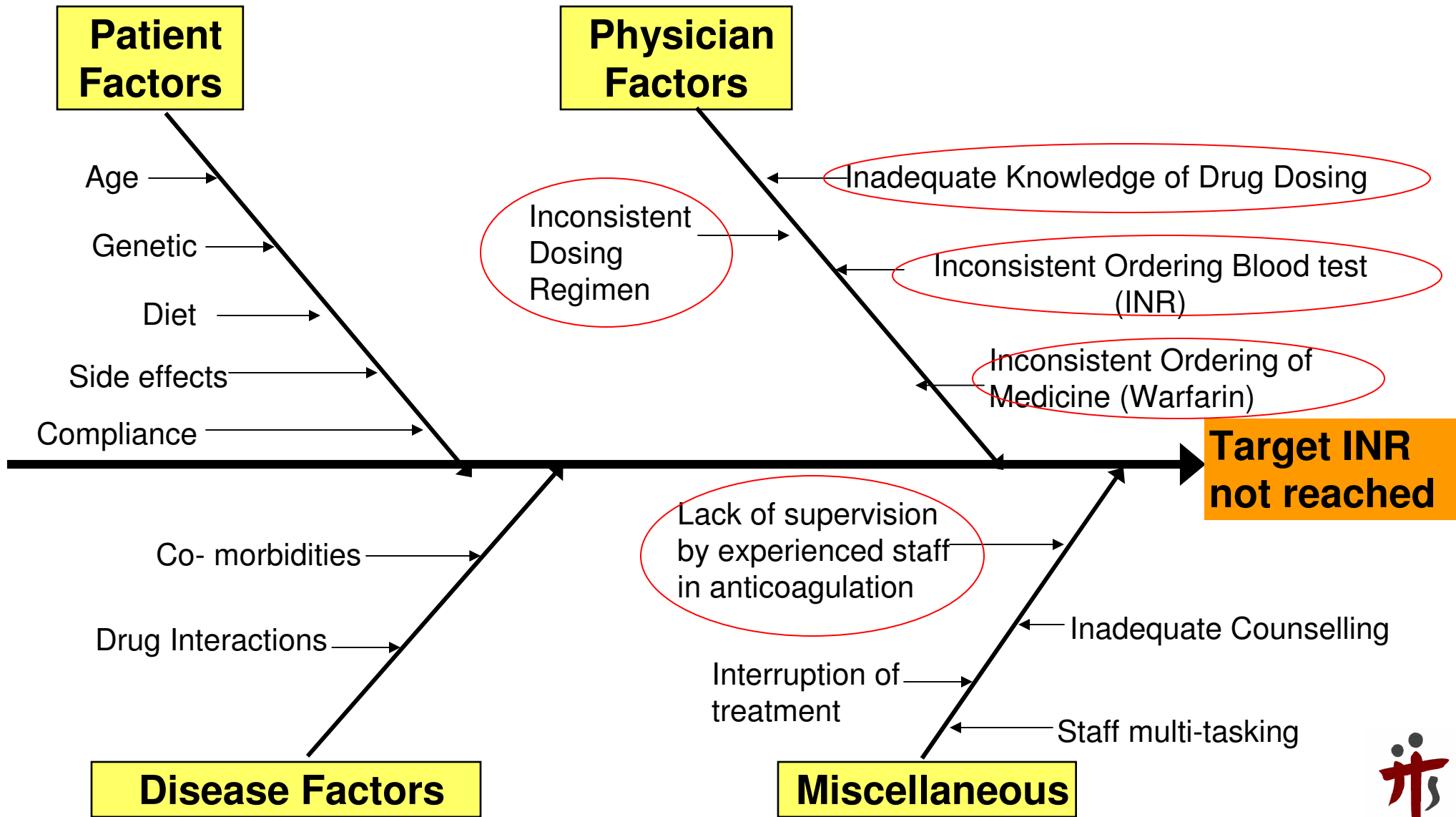
# Evidence for there being a problem worth solving



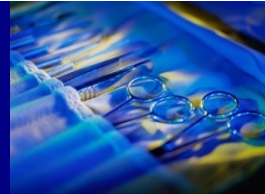
# Flow Chart of Process



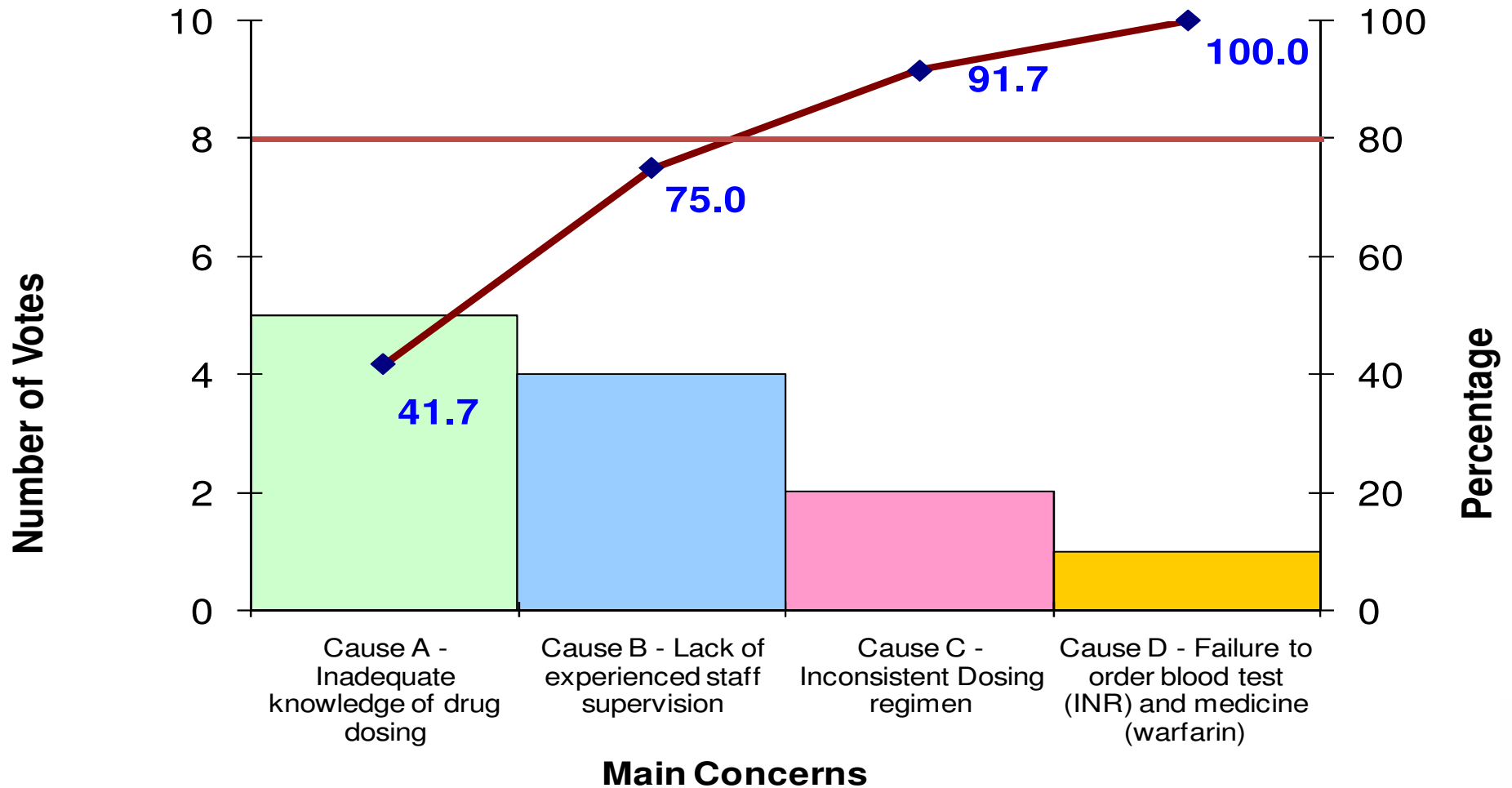
# Cause & Effect Diagram



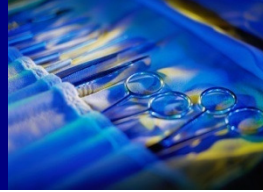
# Pareto Chart



## Causes for inability to achieve target INR



# Interventions



## Interventions:

### 1. In-patient Pharmacist ACC service

#### - Supervisory role

- assist junior staff in warfarin titration
- ensure correct consistent dosing (correct dose ordered and served)
- ensure INR done and results traced

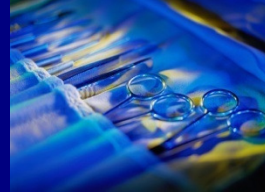
#### - Warfarin counselling to patient before discharge

#### - Improve transition from in-patient to out-patient ACC follow up

### 2. Standard Warfarin titration protocol

- Educate and Standardise Warfarin dosing for junior staff
- Assist junior staff on practical aspects of warfarin titration
- Circulate to all doctors, nurses and pharmacists

# Interventions

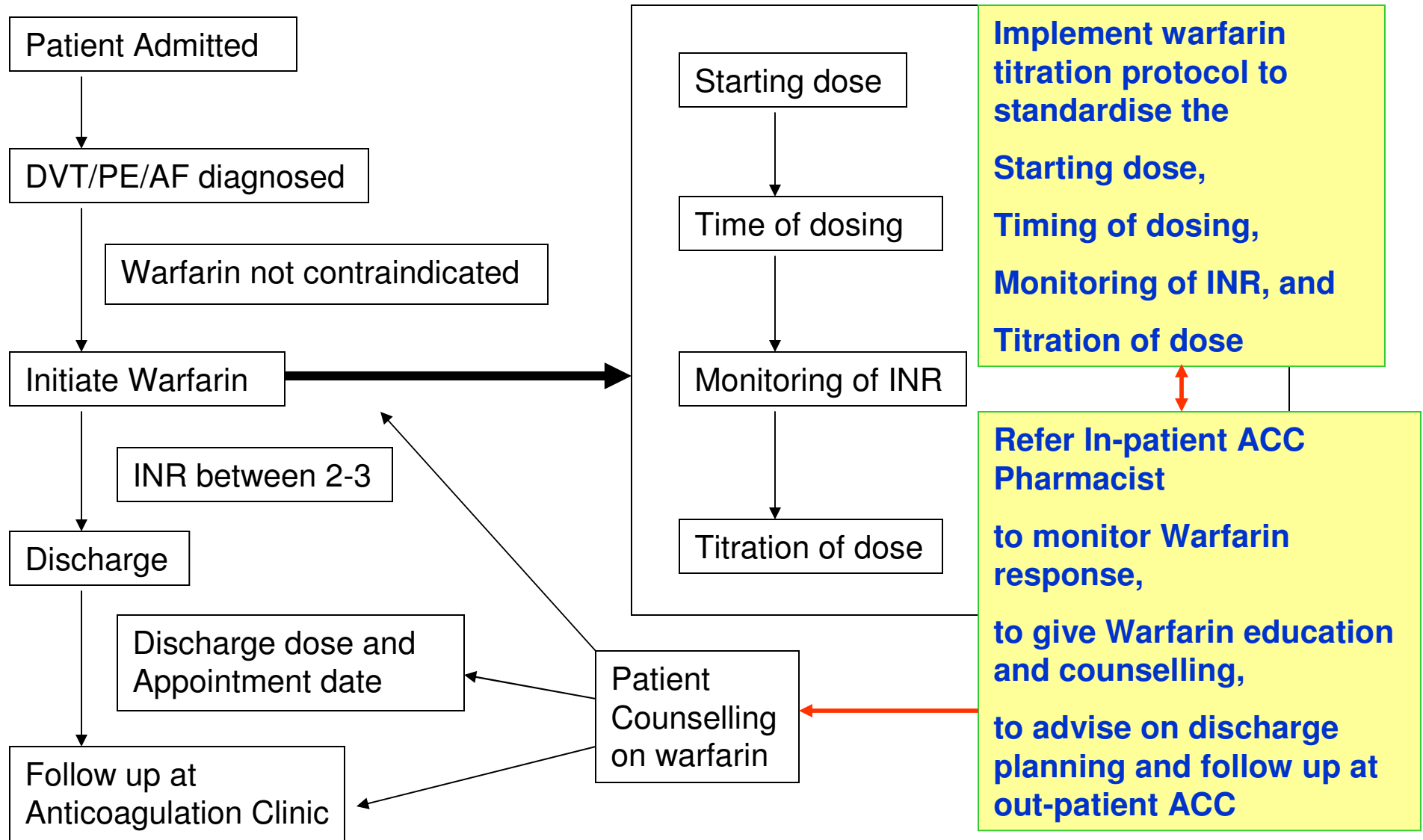


Starting Warfarin For <75 YO		
Day	INR	Dose (mg)
1		5
2		5
3	< 1.2	6-8*
	1.2 - <1.5	5
	1.5 - <2.0	3
	2.0 - <3.0	2
	≥3.0	NIL
4**	< 1.3	6
	1.3 - <1.5	5
	1.5 - <1.7	4
	1.7 - <2.0	3
	2.0 - <2.5	2.5
	2.5 - <3.0	2.0
	3.0 - <3.5	1.5
	3.5 - <4.0	Omit for 1 day, then 1mg
≥4.0		Omit for 2 days, then 0.5mg
≥5		Refer to pharmacist entry in casenotes

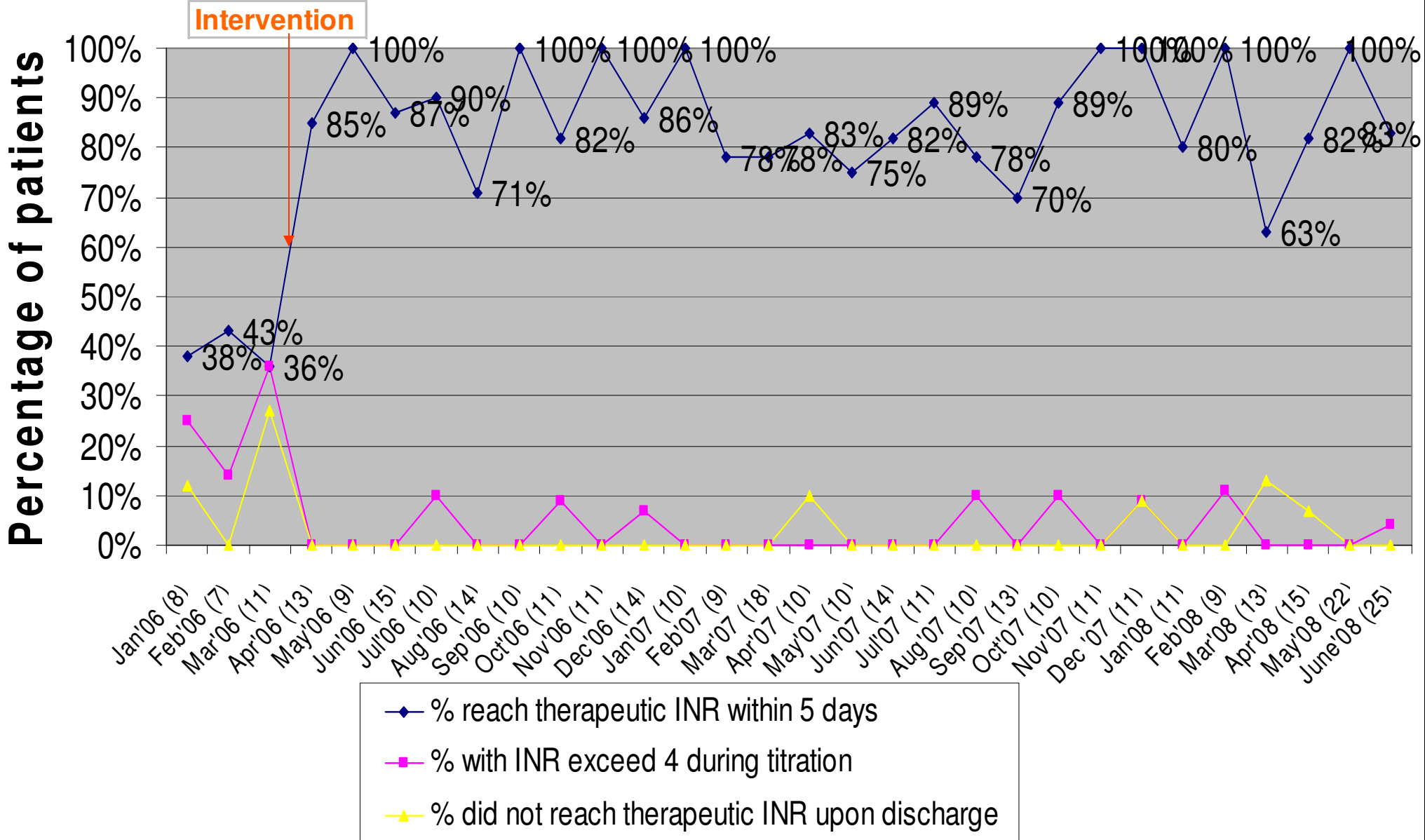
Starting Warfarin For >75 YO		
Day	INR	Dose (mg)
1		3
2		3
3	< 1.5	3
	1.5 - <2.0	2
	2.0 - <3.0	1
	≥3.0	NIL
4	< 1.3	5
	1.3 - <1.5	4
	1.5 - <1.7	3
	1.7 - <2.0	2
	2.0 - <2.5	1.5
	2.5 - <3.0	1.0
	3.0 - <4.0	Omit for 1 day, then 1mg
	≥4.0	Omit for 2 days, then 0.5mg
≥5		Refer to pharmacist entry in casenotes

Ref: Fennerty A, et al. Flexible induction dose regimen for warfarin and prediction of maintenance dose. BMJ 1984;288:1268

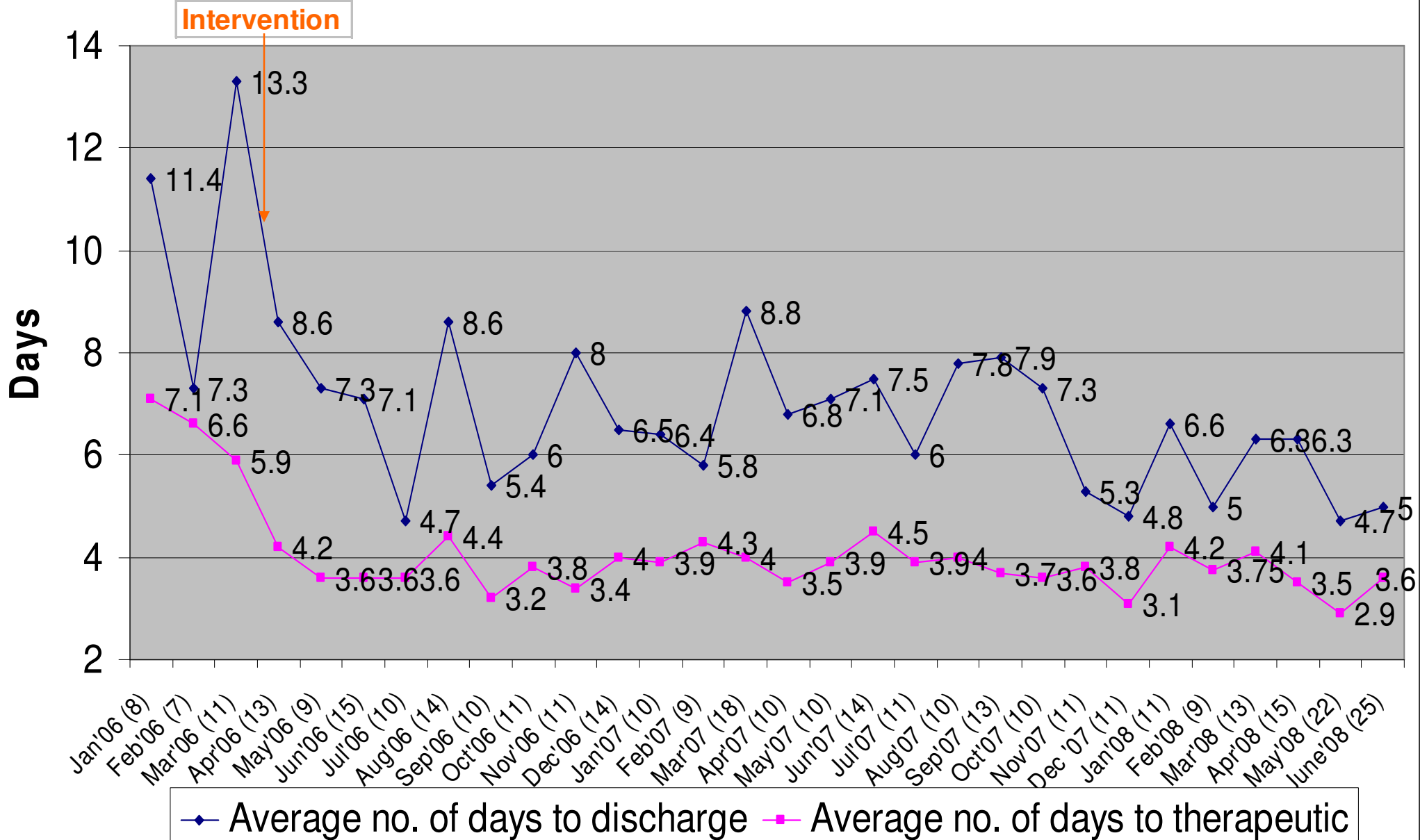
# Flow Chart of Process



# Run Chart



# Reduce Length of Stay



# Outcomes – First 6 months



## 1. Clinical

- Improve process
  - Reduce mean no. days to therapeutic INR from 7 to 4 days (less 3 days)
  - Reduce mean no. of days to discharge (ALOS) from 9.7 to 6.5 days (save 3.2 days)
- Improve Patient Safety
  - Reduce in-patient overanticoagulation (INR>4) from 25% to 1.7%
  - Reduce subtherapeutic INR discharge from 13% to 0%

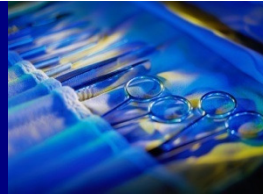
## 2. Cost Saving

- Patient
  - Reduce hospitalisation and complications
- Hospital
  - Cost of a one-day stay for DVT care is S\$345
  - 150 patients newly admitted for DVT, anticipated cost avoidance S\$165,600 per year
  - Cost of a pharmacist S\$61,440 per year, for every \$1 spent, \$2.7 is saved

## 3. Better Care to All patients

- Inpatient education and counselling
- Continuity of Care from in-patient to out-patient ACC Service

# PDSA Cycles - Implementation



## 1. Standard Warfarin titration protocol

- based on literature search and local data
- approved by the Medication Safety Committee
- available in the TTSH intranet to all TTSH staff

## 2. In-patient Pharmacist ACC service

- MOH-funded pharmacist
- TTSH medical board-approved
- All in-patient anticoagulation is referred appropriately to the service

## 3. Project

- start in GM, GS and Ortho
- make minor adjustments (PDSA) to Warfarin Protocol and processes
- expand to all disciplines in TTSH/NNI

# Strategies for Spreading



## 1. Share the In-patient Pharmacist ACC service Model, the Warfarin titration protocol and Outcomes

- To all departments in TTSH, physicians
- To other institutions, physicians and pharmacists

## 2. Leadership

- Endorsement and support
- Medical Board / Clinical Heads meeting
- CMB meeting

# Lessons Learnt



- **Leadership support**
- **Understand and work together to change the work process**
- **Continuous monitoring of and sustaining change in the process**

# Moving Forward



- **Earlier hospital discharge**
  - **Self-injection**
  
- **Out-patient DVT Management**
  - **ED to ACC out-patient**



**Thank You**