



# Preventing VTE (Blood Clots) in Hospitals

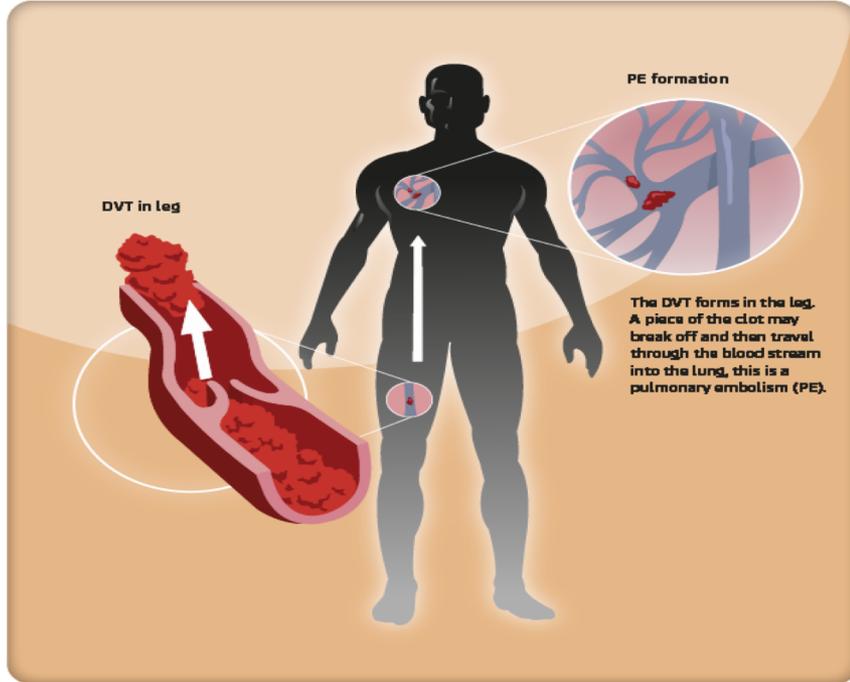
## Irish National Improvement Collaborative

# Why an improvement collaborative?

- Medication safety programme goal
  - ▣ Reduce patient harm with medication or its omission
    - High-risk medication
- Opportunity to reduce harm at scale
- Build on successes, share learning
- Equip teams with QI skills



# Venous Thromboembolism, VTE



- Blood clot (thrombus) forms within deep veins (DVT, Deep Vein Thrombosis)
- Can fragment and travel to lungs leading to Pulmonary Embolism (PE)

# Hospital-acquired VTE

- Accounts for
  - ▣ 60-63% of all VTE
  - ▣ 10% of hospital deaths
  - ▣ 0.4-3.8% of public hospital budgets in Europe (OECD)
- 70% preventable by prophylaxis Geerts et al 2001 and 2004



## Mum of five dies suddenly from blood clot a week after giving birth to triplets

12:47, 9 MAR 2016    UPDATED 13:29, 9 MAR 2016    BY RHIAN LUBIN

Cassia Rott, 36, gave birth to triplets on January 29 but died suddenly a week later, leaving her husband Joe to raise their five children.



Enter your e-mail for our daily newsletter

Subscribe



## Mother died nine days after routine surgery, inquest hears

Karen McCabe (46) suffered blood clot after undergoing procedure to remove varicose veins

© Thu, Feb 18, 2016, 19:04

## Sports reporter Johnny Lyons was in 'severe pain' days before death

Today FM presenter had been recovering from a fall a month earlier, inquest told

© Mon, Jan 30, 2017, 14:35    Updated: Mon, Jan 30, 2017, 14:37

Louise Roseingrave



Sports broadcaster Johnny Lyons was found dead at his apartment on August 19th 2015.



Karen McCabe (46) of Ballymore Drive, Lucan, Co Dublin, underwent radiofrequency ablation, a minimally invasive procedure to remove varicose veins at the Bons Secours Hospital in Dublin on August 6th, 2014.

Karen McCabe's mother of three died nine days after routine surgery on varicose veins, an inquest has heard.



Fidhmeannacht na Seirbhíse Sláinte  
Health Service Executive

Quality Improvement Division

# Room for & promise of improvement

- Three Irish hospitals in ENDORSE
  - ▣ Surgical: 59% at risk, 64% received appropriate prophylaxis
  - ▣ Medical: 43% at risk, 47% received appropriate prophylaxis
    - Murphy O et al. Ir Med J. 2012 May;105(5):140-3
  
- 11 Irish acute hospitals in PREVENT-VTE
  - ▣ 30% of at-risk adult **medical** in-patients received LMWH
    - Adamali H et al. Ir Med J. 2013 Nov-Dec; 106(10):302-5



# Some Irish improvements

- Education, posters, guidelines and pre-printed prophylaxis box - 39% appropriate to 57% ( $p < 0.001$ )
- Education - 48% to 63% ( $p = 0.041$ )
- Medical admission proforma reminder - 37.5% appropriate in 2006, 75% in 2009, 86% in 2012
- Drug chart with prompt to assess risk - 38% to 89%
- Drug chart with VTE prophylaxis section – 59-71%
- Computerised tool - 92% risk-assessment

Lyons O et al. Ir Med J. 2013; 106(8):235-8  
Kent BD et al. Ir J Med Sci (2011) 180:163-166  
Osman AE et al. Ir J Med Sci.  
Coleman N et al. Ir Med J. 2014 Jun; 107(6):188  
Cunningham R et al. Ir J Med Sci (2015) 184:469-474  
Cooley, SM et al. Am Journal Obs & Gyne ; 214 (1) , S26 - S27



Fidhmeannacht na Seirbhíse Sláinte  
Health Service Executive

Quality Improvement Division



What and how?



# Pre-collaborative

- Pilot project
- Literature review
- Advisory group
- Survey



# Advisory Group

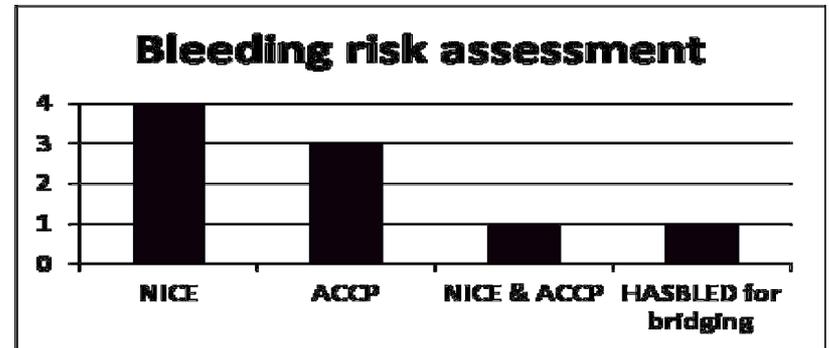
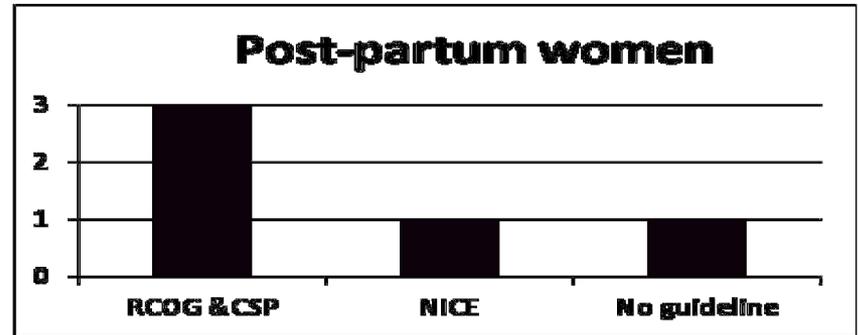
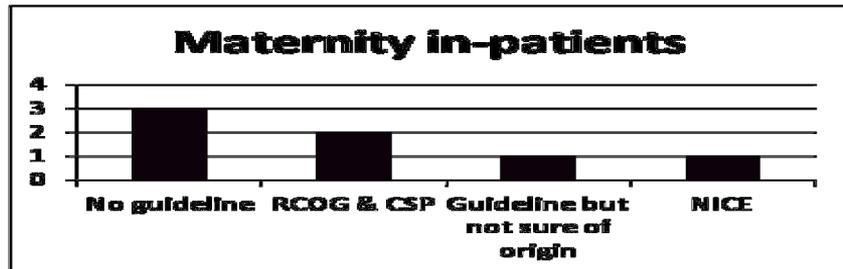
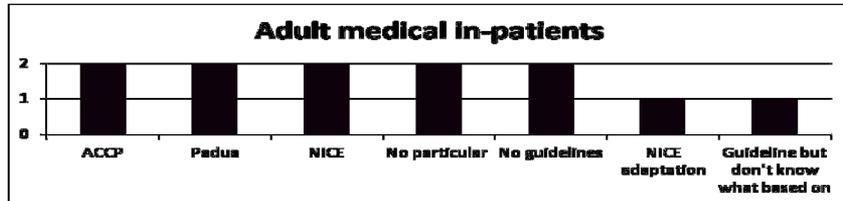
- Philip Crowley
- David Vaughan
- Olivia Sinclair
- Catriona O'Leary
- Teresa Donnelly
- Ciara Kirke
- Maeve Raeside
- John Fitzsimons
- Mary Browne
- Susan O'Shea
- Fionnuala Ní Áinle
- Jeremy Sargent
- Sean Tierney
- Sean Gaine
- Brian Cleary
- Oran Quinn
- Melissa Redmond
- Olive O'Connor

# Which guidelines?

- National guideline in maternity; no others
- Hospitals use different guidelines, some had none
- For medical patients
  - ▣ ACCP recommend risk scoring e.g. Padua
  - ▣ NICE use a risk assessment – all risks equal
  - ▣ Is NICE is simpler, easier to complete correctly?
  - ▣ Will NICE result in more patients being judged at risk?



# Guidelines



# Need to choose wisely

- Thromboprophylaxis of medical in-patients
  - ▣ Reduced PE (OR, 0.70 [CI, 0.56 to 0.87])
  - ▣ Total mortality (RR, 0.93 [CI, 0.86 to 1.00]; p=0.056)
  - ▣ Increased all bleeding (RR, 1.28 [CI, 1.05 to 1.56])
  - ▣ Increased major bleeding (OR, 1.61 [CI, 1.23 to 2.10])
  - ▣ Absolute reduction 3 PEs, absolute increase of 9 bleeding events of which 4 were major per 1000 patients treated with heparin

■ Lederle. Ann Intern Med. 2011;155:602-615

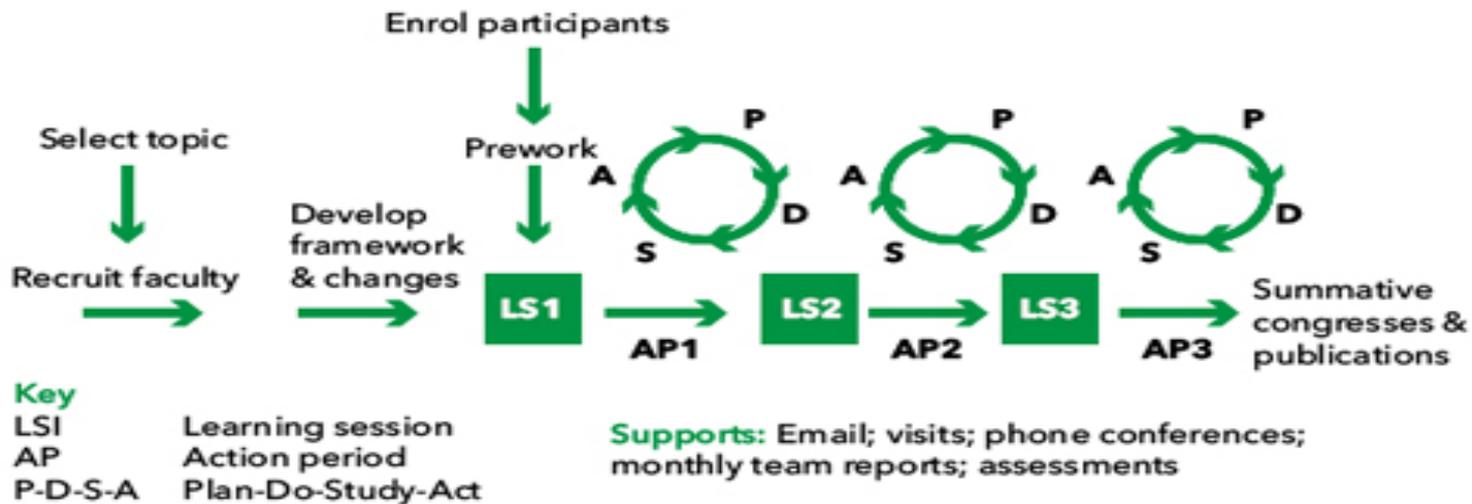
© Ciara Kirke & HSE



Fidhmeannacht na Seirbhíse Sláinte  
Health Service Executive

Quality Improvement Division

# Improvement collaborative



Reference: Institute for Healthcare Improvement, Boston, MA, USA ([www.ihl.org](http://www.ihl.org))



# Hospital teams

- CEO, DONM, Chief Pharmacist and Clinical Director
- Sponsor – management team/clinical – support and champion
- Improvement team – 3 (e.g. doctor, nurse, pharmacist) – attend learning sessions, carry out day to day improvement work
- Wider project team – subject-matter, process and quality improvement expertise, e.g. haematologist, surgeon; QI coach...
- Defined local governance and reporting
- Model for Understanding Success in Quality

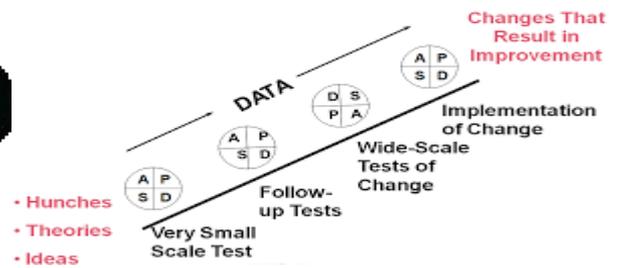
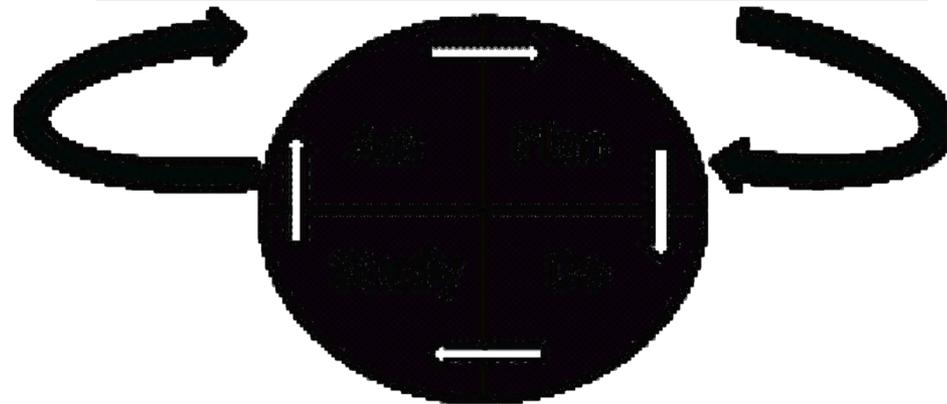
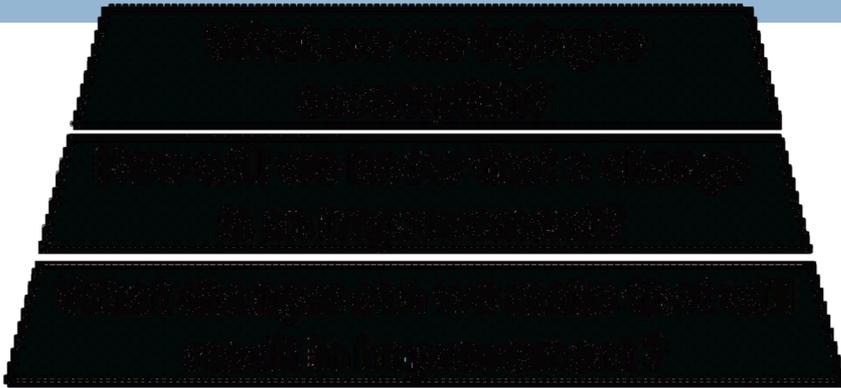
□ Kaplan H, Provost L, Froehle C, Margolis P. BMJ Qual Saf 2012

© Ciara Kirke & HSE



Féidhmeannacht na Seirbhíse Sláinte  
Health Service Executive

Quality Improvement Division



# What are we trying to accomplish?

- Prevent hospital-acquired VTE and harm from unnecessary prophylaxis by ensuring
- Appropriate\* thromboprophylaxis prescribed and administered within 24 hours of admission for [hospital defined subset of] in-patients

*\*In line with hospital guidelines*



# How will we know that a change is an improvement?

## Preventing VTE in Hospitals Improvement Collaborative Measurement Guide



### 1. Get a list (census) of your patient population

- a. What sub-group of adult in-patients are you looking at?  
E.g. all medical/ all surgical/ all post-partum, acute
- b. Define admission time, e.g. time medical/surgical team con assessment and decide patient is to be admitted, time elec an in-patient on iPIMS system etc
- c. Admitted in previous 7 days (if taking a weekly sample) or 1 fortnightly sample). admission greater than 24 hours. You n

### VTE risk assessment and prophylaxis data collection form. V3

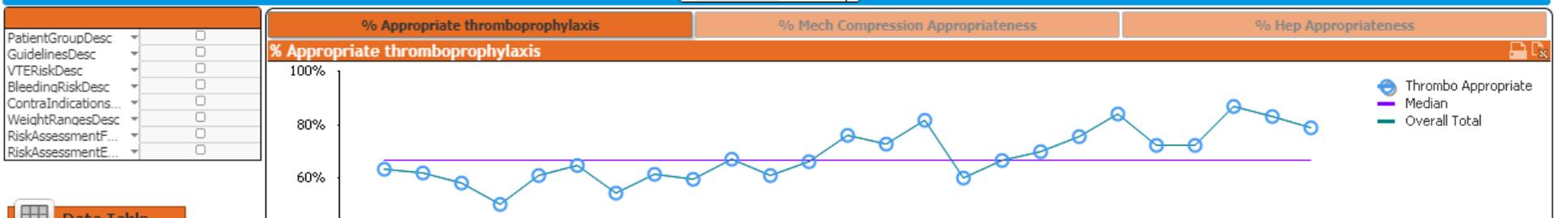
Date			
Fortnight ending Friday			
Patient group	Medical <input type="checkbox"/>	Orthopaedic <input type="checkbox"/>	Surgical (non-ortho) <input type="checkbox"/>
	Post-partum <input type="checkbox"/>	Pregnant in-patient <input type="checkbox"/>	Other <input type="checkbox"/>
Guidelines used	NICE <input type="checkbox"/>	Padua <input type="checkbox"/>	Caprini <input type="checkbox"/>
	ACCP <input type="checkbox"/>	Local <input type="checkbox"/>	Other <input type="checkbox"/>
Patient reference number			
At risk of VTE?	Low risk <input type="checkbox"/>	At risk (/High risk) <input type="checkbox"/>	Medium risk <input type="checkbox"/>
Bleeding risk?	No <input type="checkbox"/>	Yes <input type="checkbox"/>	Not assessed as not applicable <input type="checkbox"/>
Contraindication to stockings?	No <input type="checkbox"/>	Yes <input type="checkbox"/>	Not assessed as not applicable <input type="checkbox"/>
Renal impairment (GFR below threshold for dose reduction in your guidelines)	Normal <input type="checkbox"/>	Renal impairment <input type="checkbox"/>	Not known <input type="checkbox"/>
Weight?	Normal (50-100 kg) <input type="checkbox"/>	High (over 100 kg) <input type="checkbox"/>	Low (weight under 50 kg) <input type="checkbox"/>
	Low (weight under 50 kg) <input type="checkbox"/>	Not known <input type="checkbox"/>	
The appropriate thromboprophylaxis for this patient should be	LMWH/Heparin <input type="checkbox"/>	No mechanical compression <input type="checkbox"/>	Compression stockings <input type="checkbox"/>
	Drug Dose Frequency	Intermittent compression device <input type="checkbox"/>	

A	D	E	G	I	J	L	N	P
Hospital Name	Version 4							
Date collected (DD/MM/YYYY)	Fortnight ending (DD/MM/YYYY) Friday	Patient group	Guidelines used	Local patient reference number	At risk of VTE?	Bleeding Risk?	Contra-indication to stockings	Renal impairment (dose reduction needed with your
	30/09/2016							Weight
	30/09/2016							
	30/09/2016							



Date	24 Hour Script	Bleeding R...	ContraIndications	Guidelines	Group	Renal Impairment	Risk Assessment	Risk Assessment Form	VTE Risk	Weight Ranges	Thrombo...	HepAppro...	Mech...
2017-09-01	N/A	N/A	N/A	NICE	Medical	N/A	N/A	N/A	At risk/(High risk)	N/A	1520	1700	1978
2016-09-30	N/A	N/A	N/A	NICE	Medical	N/A	N/A	N/A	Low risk	N/A	0	0	0
2016-09-30	N/A	N/A	N/A	NICE	Medical	N/A	N/A	N/A	Medium risk	N/A	0	0	0
2016-11-25	N/A	N/A	N/A	Padua	Medical	N/A	No	No form available	At risk/(High risk)	N/A	1	1	1
2017-03-17	None	N/A	N/A	Padua	Medical	Normal	Yes - other evide...	No form available	At risk/(High risk)	Normal (50-100 kg)	0	0	0
2017-03-31	Enoxaparin 20	N/A	N/A	Padua	Medical	Renal impairment	Yes - other evide...	No form available	At risk/(High risk)	Normal (50-100 kg)	1	1	1
2017-02-17	None	N/A	No	Padua	Medical	N/A	N/A	N/A	Low risk	Normal (50-100 kg)	1	1	1
2017-04-14	N/A	N/A	No	Padua	Medical	Normal	No	N/A	At risk/(High risk)	Normal (50-100 kg)	1	1	1
2016-09-30	Enoxaparin 40	N/A	No	Padua	Medical	Normal	No	No form available	At risk/(High risk)	Not known	1	1	1

<b>Hospital Name</b> ALL HOSPITALS BEAUMONT CAPPAGH COOMBE CORK UNIVERSITY HOLLES STREET KILKENNY LETTERKENNY LOUGHLINSTOWN	<b>ContraIndications-Stockings</b> N/A No Not assessed because not applicable Yes	<b>Risk Assessment Evidence</b> N/A No Not assessed Yes - form completed Yes - other evidence Yes (old)	<b>Renal Impairment</b> N/A Normal Not known Renal impairment	<b>Risk Assessment Form</b> N/A No - available but not completed No form available Yes - completed	<b>Weight Ranges</b> High (over 100 kg) Low (under 50 kg) N/A Normal (50-100 kg) Not known	<b>Patient Group</b> Surgical non-ortho Medical Obstetric (old) Orthopaedic surgical Post-partum Other Surgical (old)
	<b>Guidelines</b> NICE Local Padua Other		<b>Bleeding Risk</b> N/A No Not assessed because not a...	<b>VTE Risk</b> At risk/(High risk) Low risk Medium risk		



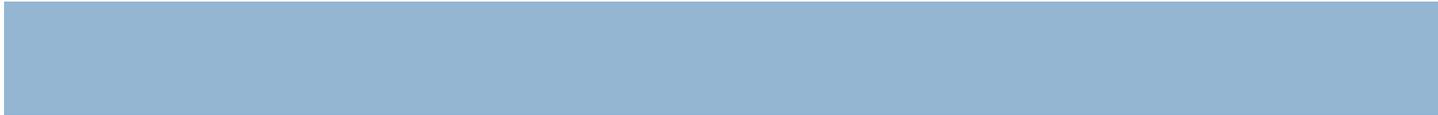
# What changes were tested?

- Reminders, preprinted prescriptions
- Risk assessment & prophylaxis guidelines
- Risk assessment forms
- Information, education, staff engagement, awareness
- Patient engagement, information, awareness
- Governance, leadership, reporting, feedback...





What did we achieve?

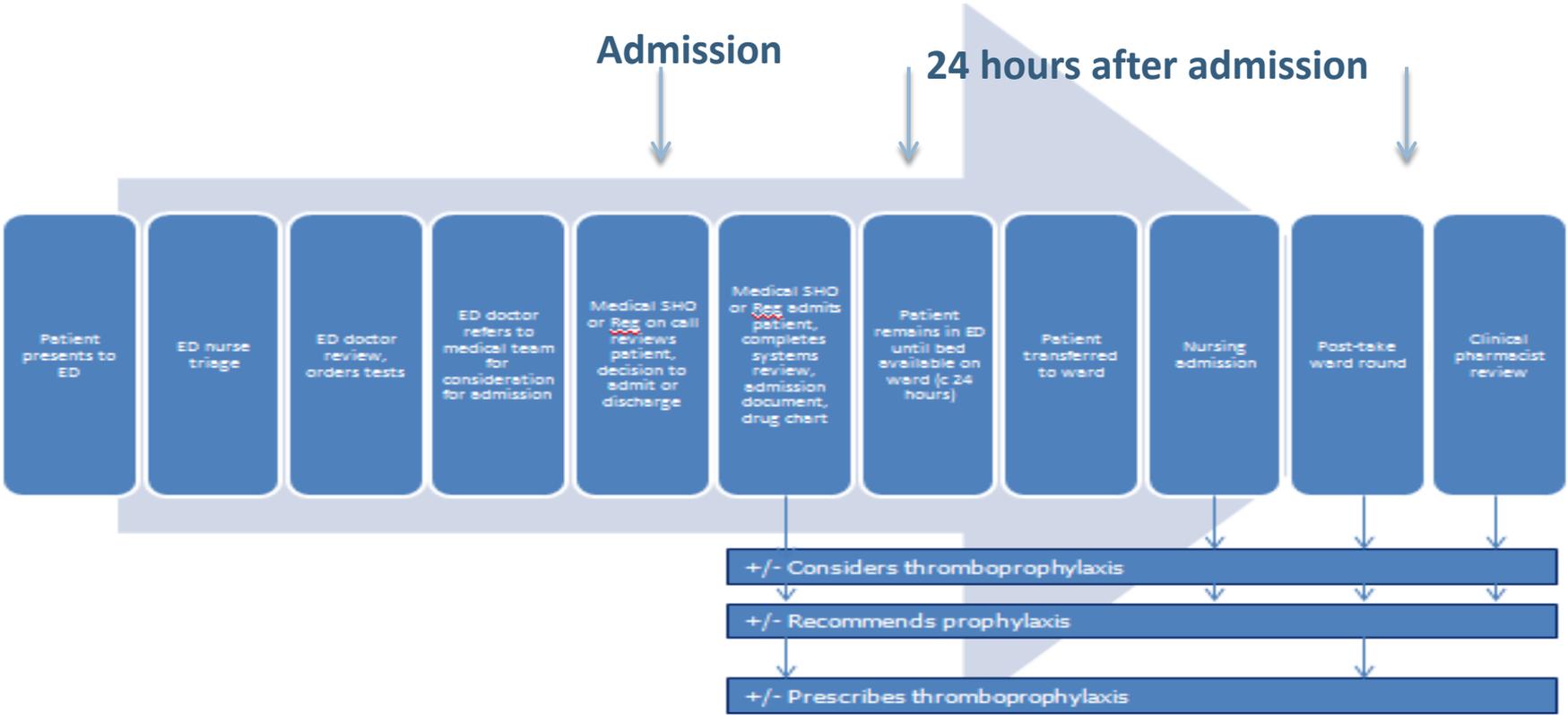


# Demographics

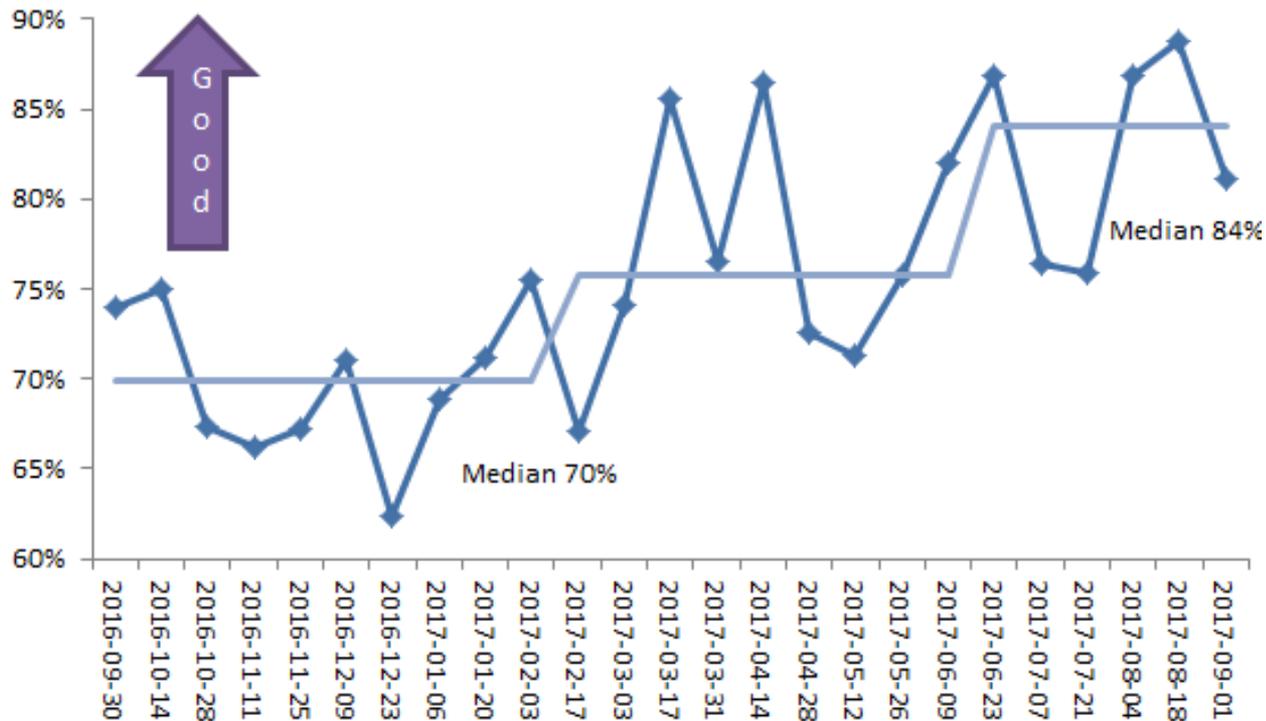
- Participation from 27 hospitals, accounting for 77% of adult acute in-patient discharges
- Data from 22 of these on QlikView, n=2260
- Additional attendance from 6 hospitals
- Most hospitals have not yet fully implemented all planned changes



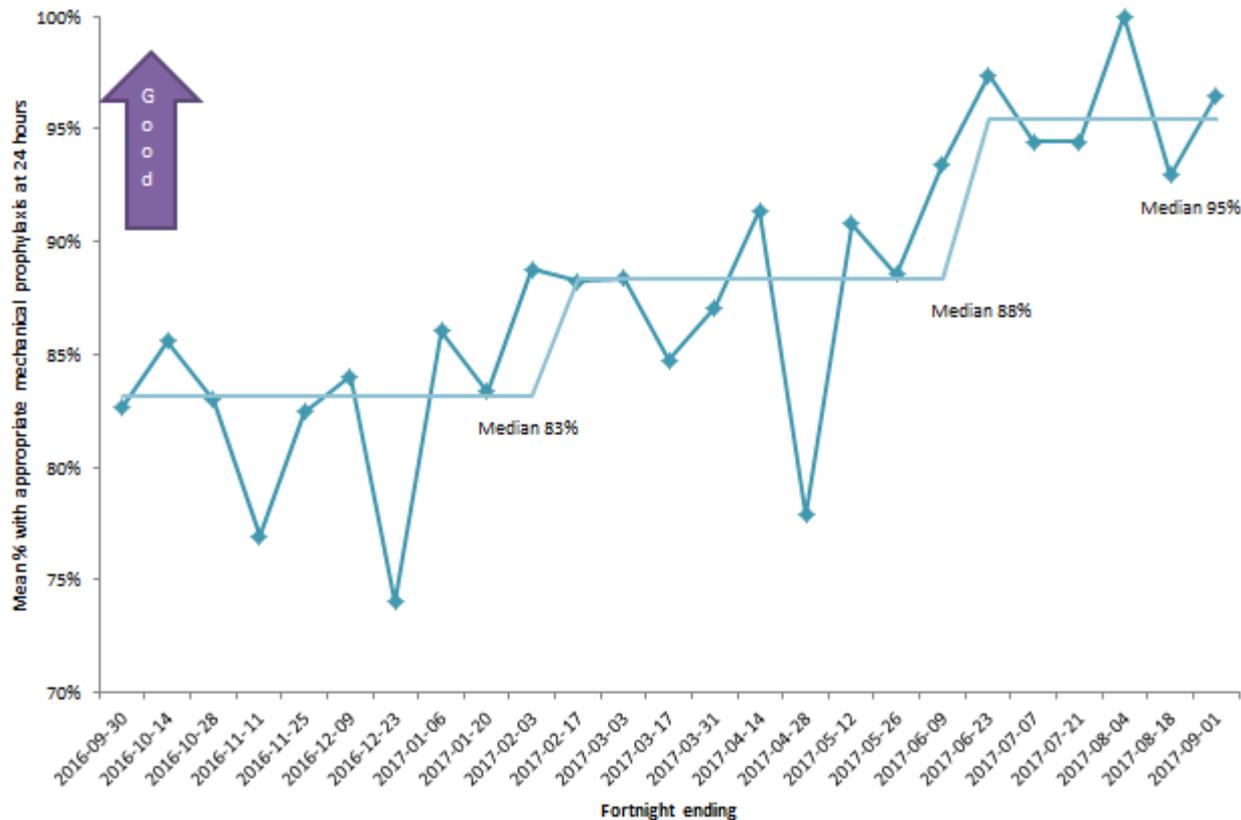
# Processes and reliability



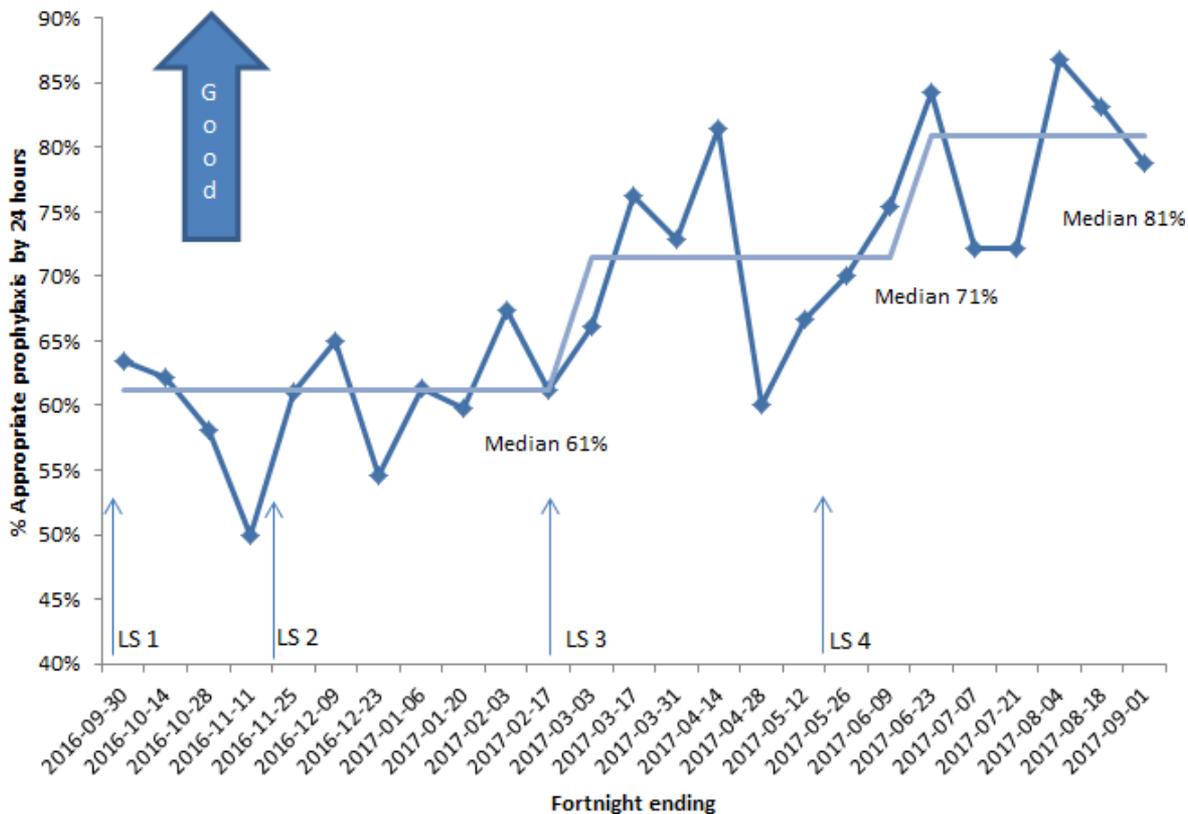
# More appropriate heparins



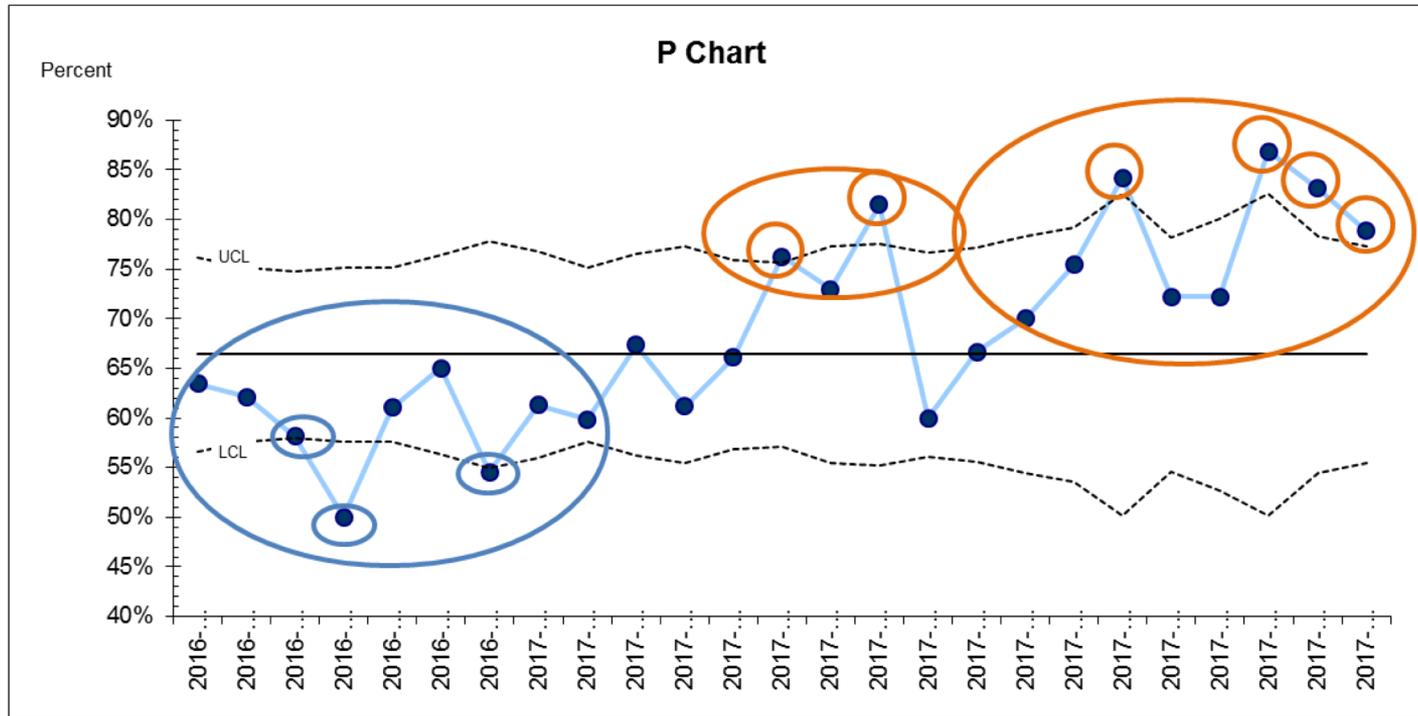
# More appropriate compression



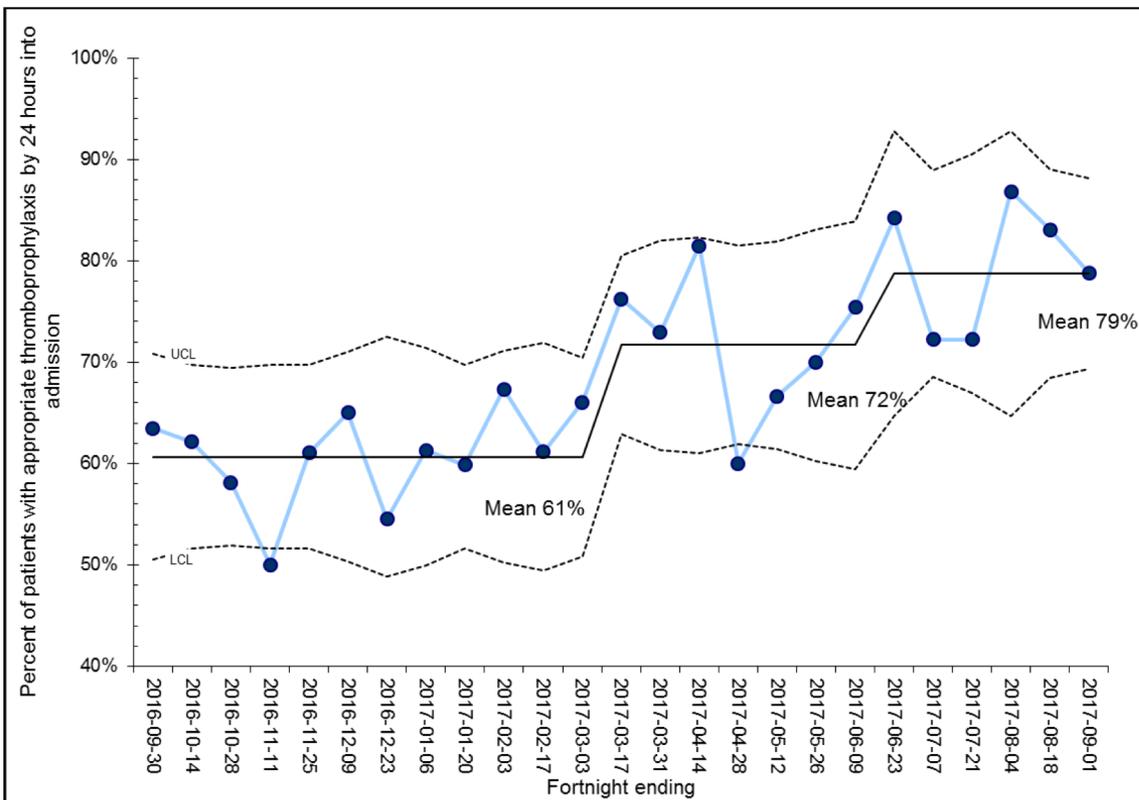
# More appropriate prophylaxis



# Special cause variation



# Mean appropriateness now 79%

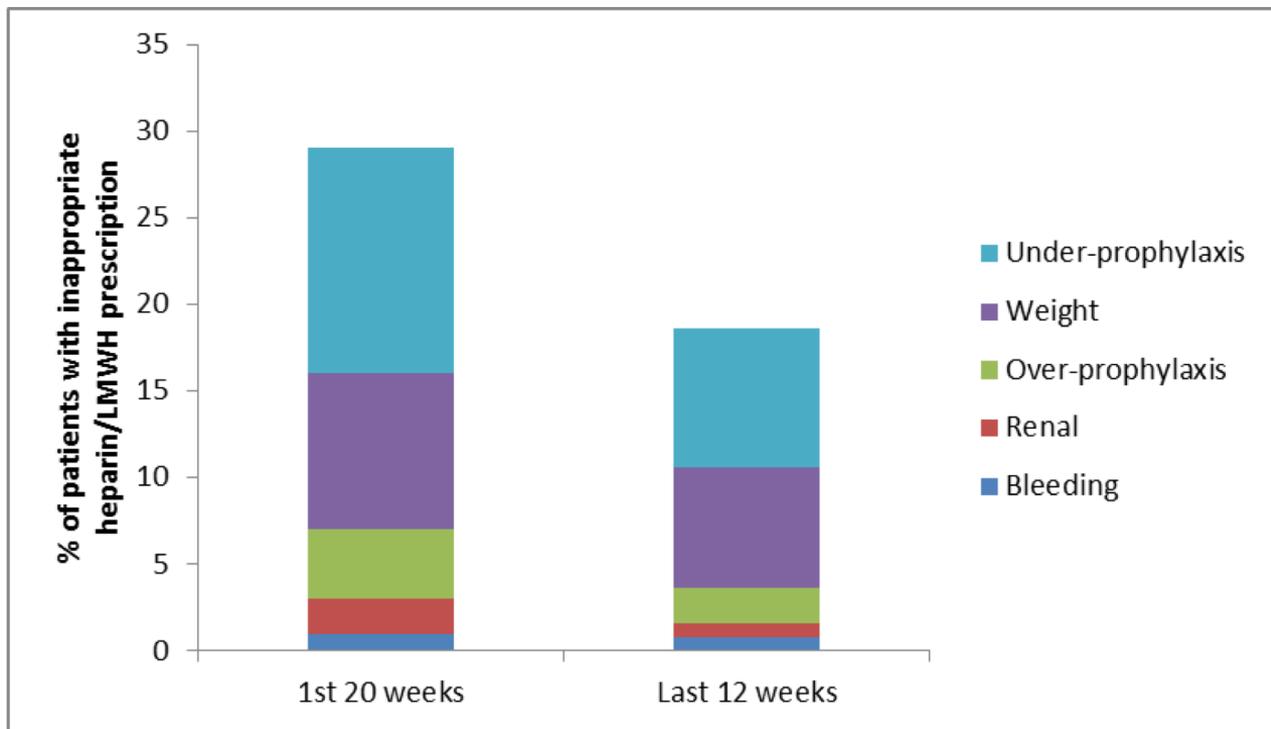


# What does this mean to patients?

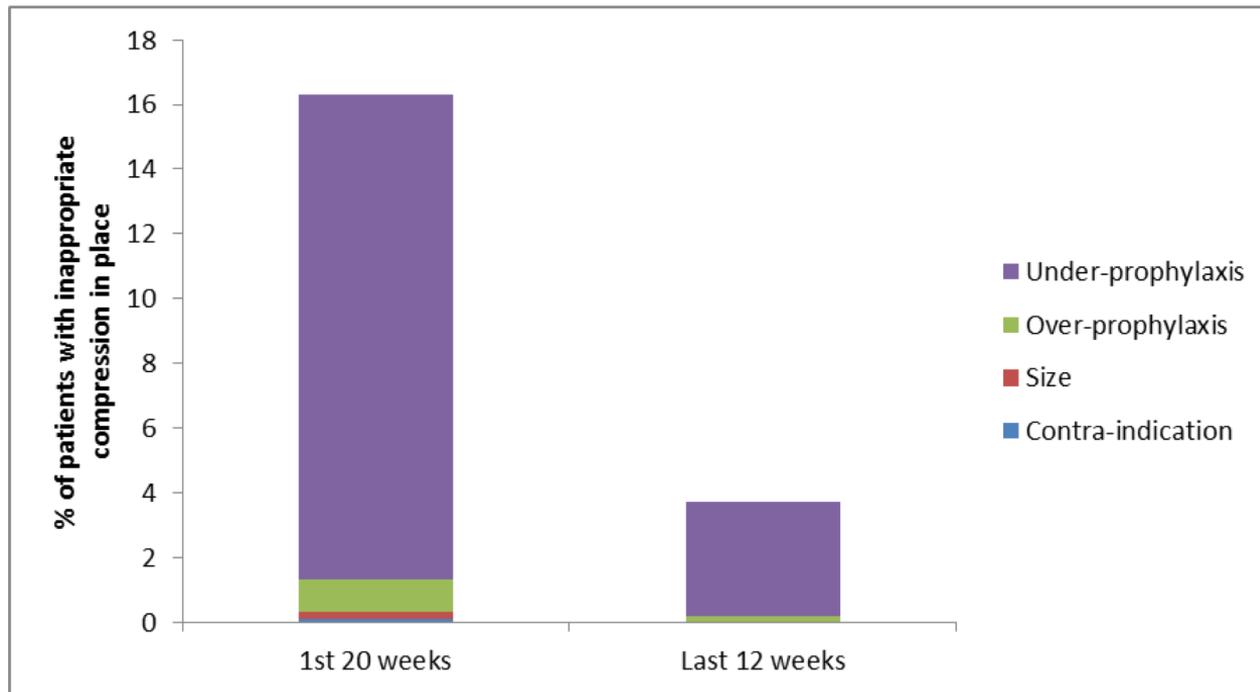
- In the hospitals in the collaborative
- In the patient groups they're working with
- **35,000 more patients will receive appropriate VTE prophylaxis in the next year**
- 500 fewer blood clots? tbc



# Heparin / LMWH



# Compression



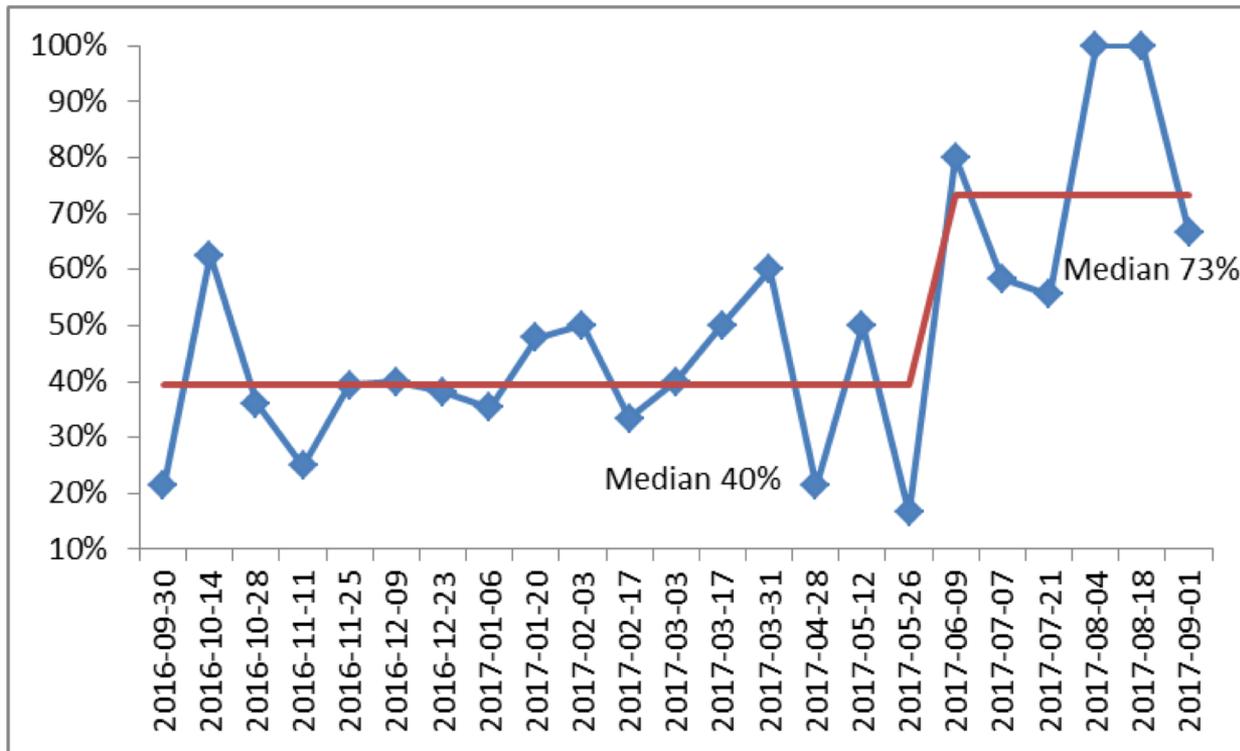
# Improvements for medical patients



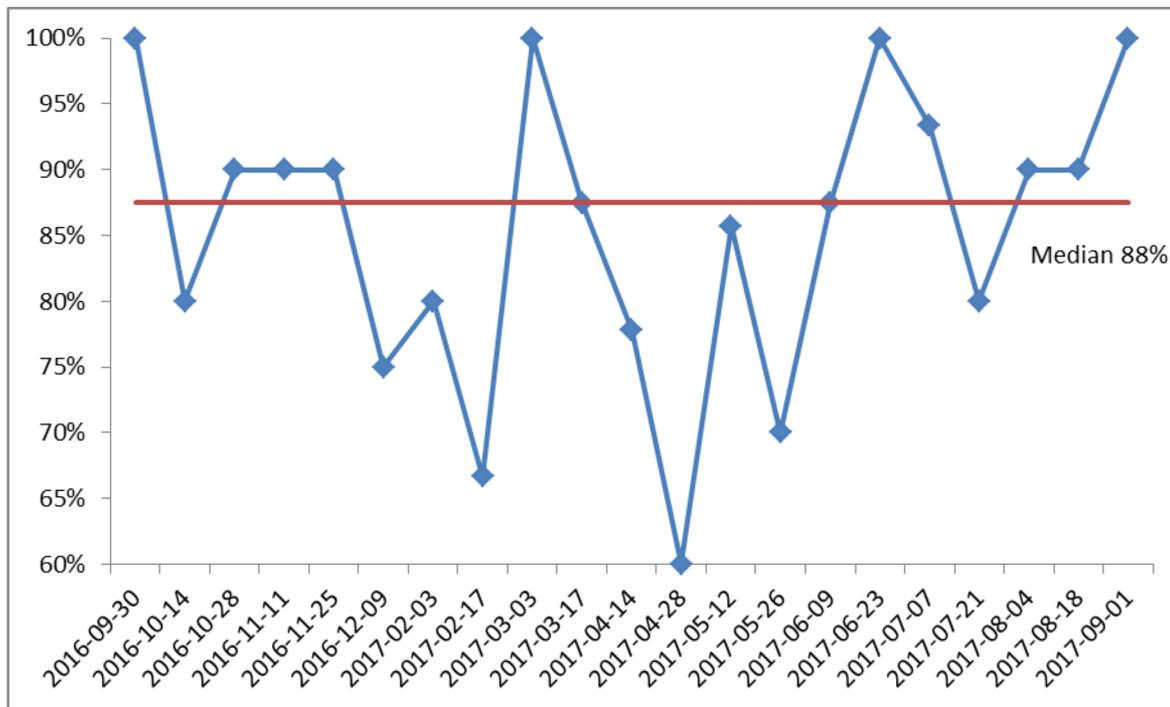
Feidhmeannacht na Seirbhíse Sláinte  
Health Service Executive

Quality Improvement Division

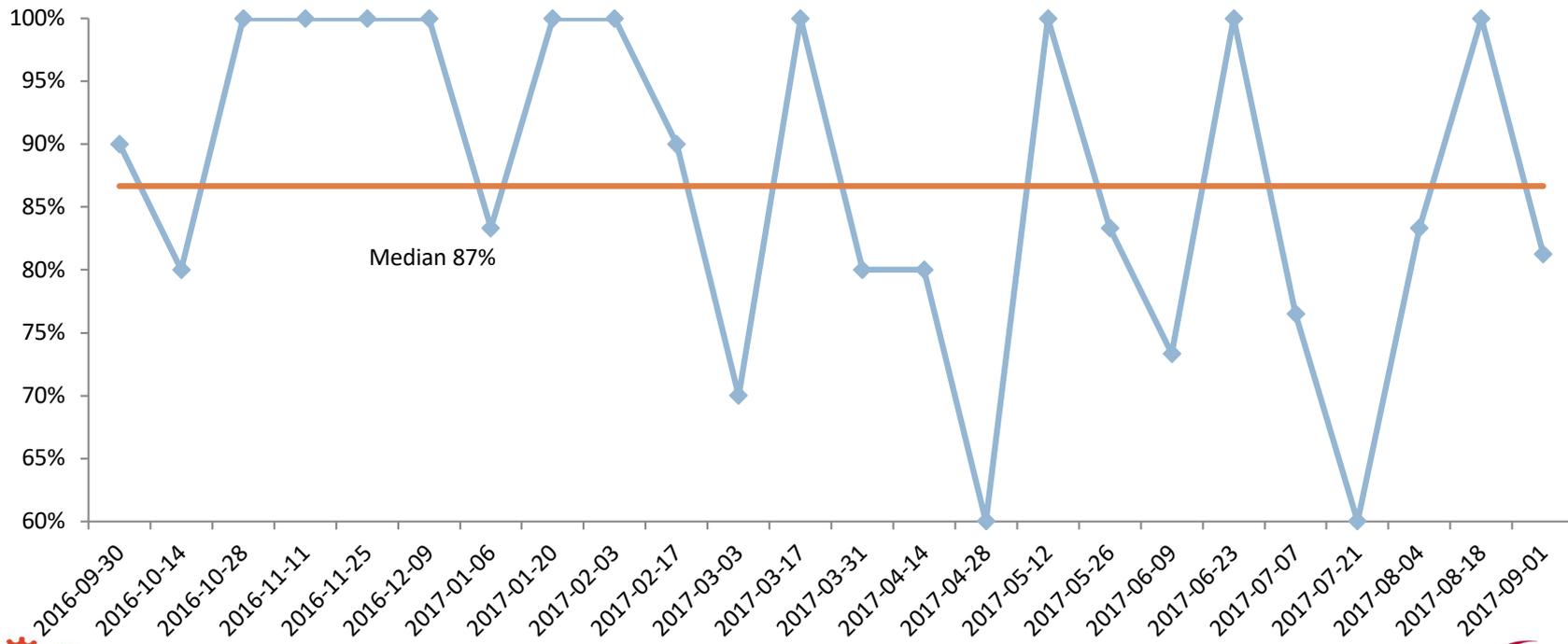
# Surgical non-orthopaedic



# Post-partum high appropriateness



# Orthopaedics high appropriateness





What have we learned?



# Dramatic improvement vs not

- It takes time: 507 hours vs 301 hours, 60% on testing and implementing changes, education etc
- Engaged and educated staff and patients more
- Had VTE protocol
- Had or tested preprinted Rx or prompts
- Had or introduced routine pharmacist check



# Key learning

- Multi-faceted interventions most effective, including having a VTE protocol, prompts/alerts and education
- Helpful
  - ▣ Collaborative, pharmacist leadership, teamwork, consultant and clinical director support, hard work
- Challenges
  - ▣ TIME
  - ▣ Availability of staff, lack of or changeover of NCHDs



# Can you risk assess without a form?

- Form available in 7 hospitals (n = 870)
  - 34% completed; 73% appropriate prophylaxis
  - 67% not completed; 71% appropriate prophylaxis
  - Appropriateness of prophylaxis is not associated with whether form is filled in or not (Fisher's exact,  $p=0.48$ )
  - Doctor preference not to fill in a form



# Form conclusions

- Need an agreed hospital VTE protocol
- Needs to be accessible
- Do not recommend a form (unless proven in that hospital to be filled in and increase appropriateness)
- Consider pre-printed prescription(s) with a box to tick to indicate assessed



## VTE Prophylaxis Protocol Template – Adult In-Patients <Modify for local use>

Assess all patients within 24 hours, repeat regularly and if clinical condition changes

Step 1: VTE risk assessment	Medical score	Surgical/trauma risk factor	Local decision where guidelines recommendations differ. Medical scores in brackets are based on relative risk, but are not in the original Padua Prediction Score.	Medical score	Surgical/trauma risk factor
Surgical: Surgery/anaesthesia 90 mins or greater, or to pelvis or lower limb 60 mins or greater <sup>1</sup>					
Surgical: Acute surgical admission with inflammatory condition or intra-abdominal condition <sup>1</sup>					
Immobility expected for at least 3 days <sup>1-4</sup> (confined to bed +/- bathroom <sup>23</sup> )	3		Ischaemic stroke <sup>1-4</sup> (discuss with stroke team) or Acute MI <sup>1-4</sup>	1	
Active cancer or treatment (chemo- or radiotherapy within 6 months or metastases) <sup>1-4</sup>	3		Acute infection <sup>1-4</sup> or Acute or chronic inflammatory disorder <sup>1-4</sup>	1	
Previous DVT/PE <sup>1-4</sup>	3		Local decision: Aged 70 or over <sup>23</sup> or 60 or over <sup>1</sup>	1	
Thrombophilia <sup>1-4</sup>	3		Local decision: Surgery in previous 30 days <sup>23</sup>	2	
Taking oestrogen-containing contraceptive or HRT <sup>1-4</sup>	1		Local decision: Pregnant or up to 6 weeks post-partum <sup>1,4</sup>	(3)	
BMI 30 or greater (obese) <sup>1-4</sup>	1		Local decision: Central venous catheter <sup>1</sup>	(3)	
Heart or respiratory failure <sup>1-4</sup>	1		Local decision: Varicose veins <sup>1</sup> with phlebitis <sup>1</sup>	(1)	
High risk: Surgical: Any risk factor; Medical: Score 4 or greater					

Step 2: Bleeding risk assessment (any risk factor below = contra-indication to LMWH / heparin)	
Active bleeding <sup>1,2</sup>	Epidural or spinal or lumbar puncture in last 4 hours or expected in next 12 hours <sup>1,4</sup>
Platelets less than 50 x 10 <sup>9</sup> /L <sup>3</sup> (or local decision: 75 x 10 <sup>9</sup> /L <sup>1</sup> )	
Bleeding disorder, e.g. haemophilia	Undergoing procedure with high bleeding risk, e.g. neurosurgery, spinal or eye surgery <sup>1,2</sup>
Acquired bleeding disorder e.g. liver failure with PT over 15 <sup>1,2</sup>	History of Heparin-Induced Thrombocytopenia (HIT): Contact haematology or pharmacy
Acute stroke (discuss with stroke team) <sup>1,2</sup>	Already receiving anticoagulant at therapeutic levels/dose
Blood pressure 230 systolic or 120 diastolic <sup>1,2</sup> or greater	e.g. warfarin, dabigatran, rivaroxaban, edoxaban, apixaban, heparin, enoxaparin: No additional prophylaxis



Step 3: Recommended prophylaxis (local decision re duration; e.g. until low-risk for VTE on risk assessment, until discharged, or prolonged e.g. post-total hip replacement, total knee replacement or major abdominal surgery for cancer)

All patients	Adequate hydration, early mobilisation, leg exercises			
All surgical patients (or at-risk surgical patients)	Mechanical compression: Anti-embolism stockings* +/- intermittent pneumatic compression devices / foot pumps			
High-risk medical (score 4 or greater) with C/I to heparins	* Do not use in severe peripheral vascular disease, severe dermatitis, massive leg oedema, leg deformity, peripheral neuropathy, recent skin graft, allergy to fabric or acute stroke.			
	Weight 50-100 kg and GFR over 30 mL/min	Weight 101-150 kg	Weight less than 50 kg	GFR less than 30 mL/min
High-risk medical (score 4 or greater), no C/I	Tinzaparin 4500 units <sup>5</sup> or enoxaparin 40 mg once daily <sup>5</sup>	Consider tinzaparin 4500 units bd or enoxaparin 40 mg bd	Consider tinzaparin 3500 units or enoxaparin 20mg once daily	Heparin 5000 units twice daily or Tinzaparin 3500 units daily (caution <sup>2</sup> ) or enoxaparin 20 mg daily <sup>5</sup> (contra-indicated in GFR less than 15 mL/min <sup>5</sup> )
High-risk surgical (any risk factor), no C/I				
Moderate-risk surgical (local decision: delete if no moderate-risk category)	Tinzaparin 3500 units <sup>5</sup> or enoxaparin 20 mg once daily <sup>5</sup>	Consider tinzaparin 4500 units once daily or enoxaparin 40 mg once daily		
Low-risk medical (score 3 or lower) or Low-risk surgical (no risk factor)	No heparin or low molecular weight heparin Medical patients: no mechanical compression unless patient is high-risk with contra-indication to heparins Surgical patients: local decision: mechanical compression in at-risk or all surgical patients			

Step 4: Prescribe appropriate prophylaxis on medication record

1. Venous thromboembolism: reducing the risk (NICE Clinical Guideline 92); January 2010
2. Barbar S et al. ...The Padua Prediction Score. J Thromb Haemost 2010; 8:2450-7
3. Kahn SR et al. Chest 2012; 141, 2 Suppl. (ACCP 9th Edition)

4. SIGN guideline 122; December 2010
5. Summaries of Product Characteristics, www.hpra.ie



# Guidelines – what we found

- Does guideline affect % at risk?
  - ▣ 73% at risk with NICE
  - ▣ 67% at risk with Padua
  - ▣ Yes, fewer judged at risk with Padua ( $p=0.01$ )
- Is NICE easier to use, i.e. higher appropriateness?
  - ▣ 67% appropriate with NICE
  - ▣ 62% appropriate with Padua
  - ▣ No, similar appropriateness ( $p=0.06$ )



## Regular Prescriptions

(Prescribe antimicrobials in antimicrobials section)

			Year	Day & Month DD/MM									
<b>Prescriber circle time or enter variable time in second column</b>													
Pharmacological Thromboprophylaxis (name) Prescribe only if indicated and patient has no contraindications			6										
			8										
Route	Dose	Frequency & Prescriber circle time	10										
<b>Special Instructions</b>		Reviewed By	12										
		Date	14										
Prescriber Sig	Reg No	Date	18										
Stop Date	Reason	Signature	22										

Mechanical Thromboprophylaxis (name) Prescribe only if indicated and patient has no contraindications			6									
			8									
<b>Special Instructions</b>		Reviewed By	10									
Measure to select appropriate size Assess fit, compliance and skin integrity daily and sign		Date	12									
		Date	14									
Prescriber Sig	Reg No	Date	18									
Stop Date	Reason	Signature	22									







Next steps



# Next steps

- Report, recommendations, toolkit
  - ▣ Launch, distribution, on website June 2018
- Patient information cards
  - ▣ With Thrombosis Ireland, piloted in 7 hospitals
- Key performance indicator
  - ▣ Hospital-acquired in-hospital VTE



# Learning from collaborative

- Huge commitment in hospitals to safer patient care
- Challenges – resources, guideline, standardising and merging data, 27 sites, duration
- Fabulous results with a real impact on patients

Lots of learning to share



# Thank you to teams from

- Beaumont, Cappagh, Coombe, Cork, Letterkenny
- Mallow, Mater, Mayo, Mercy, Mullingar
- Naas, NRH, NMH Holles Street, Drogheda
- Portlaoise, Roscommon, Rotunda, SIVUH
- South Tipperary, Loughlinstown, St James's
- St John's, St Luke's Kilkenny, St Vincent's
- Tallaght, Tullamore, Wexford



# Thank you

- Philip Crowley, Maeve Raeside, Alison Cronin, Lorraine Gilligan
- David Vaughan, Olivia Sinclair, Melissa Redmond, Philip Crowley, Ann Marie and Thrombosis Ireland, Johnny McHugh, Brian Cleary, Paul Rafferty, Audrey Purcell, Oran Quinn, John Fitzsimons, Mary Browne
- Advisory group
- Anne-Marie Cushen, Nuala Doyle, Peter Branagan & Beaumont
- Eoin Darcy, Jennifer Veale, Malcolm Cooke



[www.hse.ie/eng/about/who/qid](http://www.hse.ie/eng/about/who/qid)



QI talktime



Féidhmeannacht na Seirbhíse Sláinte  
Health Service Executive

Quality Improvement Division



[www.safermeds.ie](http://www.safermeds.ie)

[Twitter@ciarakirke](https://twitter.com/ciarakirke)

Email: [safermeds@hse.ie](mailto:safermeds@hse.ie)