

CLINICAL FOCUS REPORT



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COMMISSION

Hospital-Associated Venous Thromboembolism



MEDICATION SAFETY
AND QUALITY
VTE Prevention

Patient
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Any enquiries about or comments on this publication should be directed to:

Clinical Excellence Commission
Locked Bag 8
Haymarket NSW 1240
Phone: (02) 9269 5500
Email: cec-info@health.nsw.gov.au

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BACKGROUND

A venous thromboembolism (VTE), commonly referred to as a blood clot, occurs when blood pools and thickens inside normal, healthy veins blocking the flow of blood through the body. Blood clots that form in the deep veins are known as deep vein thrombosis (DVT), and clots that become lodged in the lungs are known as pulmonary embolism (PE).

VTE is a leading cause of morbidity and mortality in Australia with more than 14,000 Australians diagnosed with a VTE each year, and more than 5,000 cases resulting in death¹. VTE has been shown to cause more deaths than all transport accidents and falls combined and more deaths than bowel or breast cancer¹. In 2008, the total hospital inpatient expenditure on VTE in Australia was estimated as \$81.2 million¹. This does not take into account health care costs associated with the long-term effects of VTE once patients are managed within the community setting.

Hospitalisation has been found to be a major risk factor in the development of VTE, where the incidence of VTE among hospitalised patients was found to be more than 100 times greater than the incidence among community residents². Of all deaths in Australian hospitals, seven per cent are due to VTE¹.

In 2010, the NSW Ministry of Health released the *Prevention of Venous Thromboembolism* policy directive (PD2010_077) that mandated routine VTE risk assessment for all admitted adult patients and the provision of appropriate prophylaxis for those at risk. This policy directive was updated in September 2014 (PD2014_032).

VTE continues to cause significant patient harm. The 2013 Quality Systems Assessment (QSA) data estimates that only 40 per cent of patients are assessed for VTE risk at admission, and only 70 per cent of those at risk are provided with appropriate prophylaxis³. This is consistent with several international studies that have found that generally only 30 to 50 per cent of patients at risk of VTE receive appropriate prophylaxis⁴⁻⁶.

Studies have indicated that under-utilisation of VTE prevention methods are mainly due to a lack of awareness of the risks and harms of VTE, a lack of clinician buy-in, limited guidelines and protocols, a general under estimation of clotting risk and an over estimation of bleeding risk⁴. A multifaceted approach to VTE prevention is required to overcome the potential barriers in reducing VTE rates.

The Clinical Excellence Commission is committed to addressing this patient safety priority for NSW. In order to inform the development of a strategy and make appropriate recommendations with a view toward improving the assessment and management of VTE risk, a detailed review of available data was conducted to identify cases of DVT and PE occurring during hospitalisation.

The data reviewed included:

- Severity Assessment Code (SAC) 1 Root Cause Analysis (RCA) reports
- Incident Information Management System (IIMS) data
- NSW Health Information Exchange data
- Collaborating Hospitals Audit of Surgical Mortality (CHASM) report data.

This Clinical Focus Report has been prepared for NSW health services. In order to provide some insight into the occurrence of VTE in NSW hospitalised patients, this report summarises findings from the review of existing data, and provides recommendations based on this review. It also identifies the need to improve limitations in the existing data set in order to understand the true incidence and impact of hospital-associated VTE.

METHOD

A description of the data sources used to compile this report and the methodologies used to extract data is provided below:

SAC1 RCA Reports and IIMS Data

Description

Root Cause Analysis (RCA) investigation is a method used to identify the underlying cause and contributing factors of an incident. It also aims to develop appropriate clinical and management responses and system improvements which could prevent similar incidents in the future. RCA teams include experienced clinicians appropriate for the incident being investigated. All clinical incidents classified as SAC1 i.e. rated with a Severity Assessment Code of 1 (and SAC2, SAC3 or SAC4 incidents deemed to benefit from the RCA process) undergo a RCA investigation. In nearly all cases, underlying system failures are found to have contributed to, or failed to stop, errors during complex care processes.

The Incident Information Management System (IIMS) database was implemented across NSW public health facilities in 2005. The associated Incident Management Policy - PD2005_634 (now PD2014_004) mandates that all adverse events or near misses are entered into the reporting system. Clinical incidents notified in IIMS are allocated a Severity Assessment Code (SAC) rating in accordance with NSW Health Incident Management Policy PD2014_004. The Severity Assessment Code Matrix used to allocate SAC ratings takes into account the consequences associated with incidents and their likelihood to occur again. The most serious types of clinical incidents are rated as SAC1 (the other possible scores are SAC2, SAC3 or SAC4 in declining order of severity). The key purpose of the SAC is to determine the level of investigation and action required. While IIMS data is useful in understanding the nature of incidents, literature suggests that it can underrepresent the extent of a problem due to significant underreporting. Furthermore, the reliability of IIMS data is dependent on the quality of information inputted by the reporter.

Data Extraction

A search of SAC 1 Root Cause Analysis (RCA) reports completed during the period 1 January 2012 to 31 December 2013, which noted 'Embolism – DVT', 'Thromboprophylaxis complications' and 'Embolism – pulmonary' as a clinical risk group was conducted. A total of 21 cases were identified for the 24-month period. Upon review of the cases, six were excluded as the VTE was not the primary cause of death e.g. death was due to a major bleed following treatment of VTE with therapeutic anticoagulation. The remaining 15 cases were used in the analysis.

Additionally, data from IIMS was extracted for the period 1 January 2012 to 25 March 2014 for Principal Incident Types 'Medication/IV fluid' and 'Clinical Management', using the search terms "DVT", "Deep vein thromb", "VTE", "Venous thromb", "Blood clot", "Pulmonary embolism", "Embolism", "Thromb", and "Embolus".

A total of 721 incidents were identified. As this review was concerned with cases of DVT and PE occurring during hospitalisation, 627 of these incidents were excluded. Specific reasons for exclusion included:

- the incident involved the treatment of a non-STEMI / STEMI/ PE / DVT patient
- the incident involved an air embolus
- the incident involved a blood clot which was not a VTE, e.g. clot passed during labour
- the incident involved a bleed following anticoagulation therapy

- the incident involved a prescribing issue which did not result in patient harm e.g. VTE prophylaxis not ordered or dose was inappropriate
- duplicated reporting

The remaining 94 IIMS incidents were used in the analysis. As five of the 15 RCA cases identified were also identified through IIMS extracted data, a total of 104 cases were reviewed in detail for the purpose of this report. A summary of the identified incidents is shown in Table 1.

Table 1: Number of incidents

Report Type	Date Range	Number identified in initial search	Number used in analysis
IIMS Incident Reports	1 January 2012 to 25 March 2014	721	94*
SAC 1 - RCA reports	1 January 2012 to 31 December 2013	21	15

*includes five of the SAC1 - RCA reports

NSW Health Information Exchange Data

Description

The NSW Health Information Exchange (HIE) is a state data warehouse containing information from Local Health Districts and the NSW Ministry of Health. The data set includes International Classification of Diseases, version 10 (ICD-10) coded data and is based on episode of care. The quality of the data is affected by coding accuracy and the diligence of clinicians documenting outcomes in the patient's health record.

Other limitations include:

- The recording of whether the VTE was present at the beginning of the current episode of care or absent but arose during the episode is not a mandatory reporting item in the Health Information Exchange (HIE) data set and three local health districts do not have this reporting capability.
- The HIE data set does not identify cases of hospital-associated VTE requiring readmission.
- Coded data does not identify whether the VTE case was preventable or not.

Data Extraction

Data from the Health Information Exchange (HIE) was extracted using ICD-10 (International Classification of Diseases, version 10) codes to identify the number of patients with diagnosed VTE in NSW public hospitals. Principal and all other diagnosis codes were included in the extraction. Appendix 1 details the ICD-10 codes used to extract this data.

Data was extracted for the period 1 January 2012 to 31 December 2013, using the following parameters:

- LHD: All
- Service Type: All
- VTE Type: All (includes Pulmonary Embolism; Embolism and Thrombosis; Obstetric VTE and Blood Clot Embolism)
- Condition with onset during the episode of admitted patient care: 'Yes' AND 'Not Reported'

CHASM Data

Description

CHASM (Collaborating Hospitals Audit of Surgical Mortality) is a systematic peer-review audit of deaths of patients, who were under the care of a surgeon at some time during their hospital stay in NSW, regardless of whether an operation was performed.

Data Extraction

Between 1 January 2008 and 24 February 2014, patient deaths audited by CHASM were reviewed for cases of PE as either a cause of death or as a post-operative complication.

RESULTS

Findings from SAC1 RCA Reports and IIMS Data

The incidents from IIMS ranged in severity from Severity Assessment Code (SAC) rating 1 to 4. These SAC ratings were allocated by those investigating the incident within the health service involved. Table 2 displays the SAC ratings of the 94 IIMS incidents which were examined.

Table 2: Incidents by SAC ratings

SAC Rating	Number of IIMS Incidents
SAC 1	6*
SAC 2	13
SAC 3	50
SAC 4	19
No SAC Allocated	6
TOTAL	94

*10 additional SAC 1 RCA cases were not identified during IIMS review because:

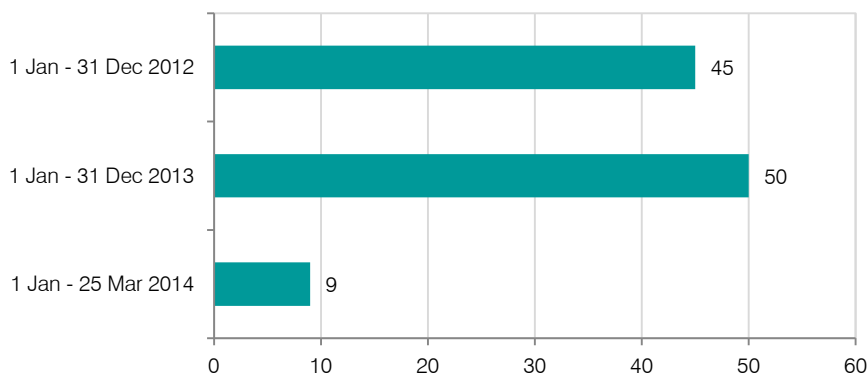
- The Principal Incident Type was not classified as 'Medication/IV fluid' or 'Clinical Management'
- There was no mention of the venous thromboembolism in the original IIMS report; or
- The key search terms used to extract the IIMS data were not used by the reporter/investigator.

Of the six SAC 1 cases identified from IIMS, five were also identified during RCA data extraction. The remaining case is currently being investigated and the RCA review is yet to be completed.

This illustrates the limitations of the IIMS data set as only 33 per cent (five out of 15) of the known SAC1 incidents were identified from IIMS extraction. This limitation may also extend to non-SAC1 cases, where only a portion of VTE incidents reported through IIMS may have been identified.

The incidents were divided by date range, as shown in *Figure 1*, to enable later comparison with HIE extracted data.

Figure 1: IIMS (n=94) and additional RCA incidents (n=10) by date range



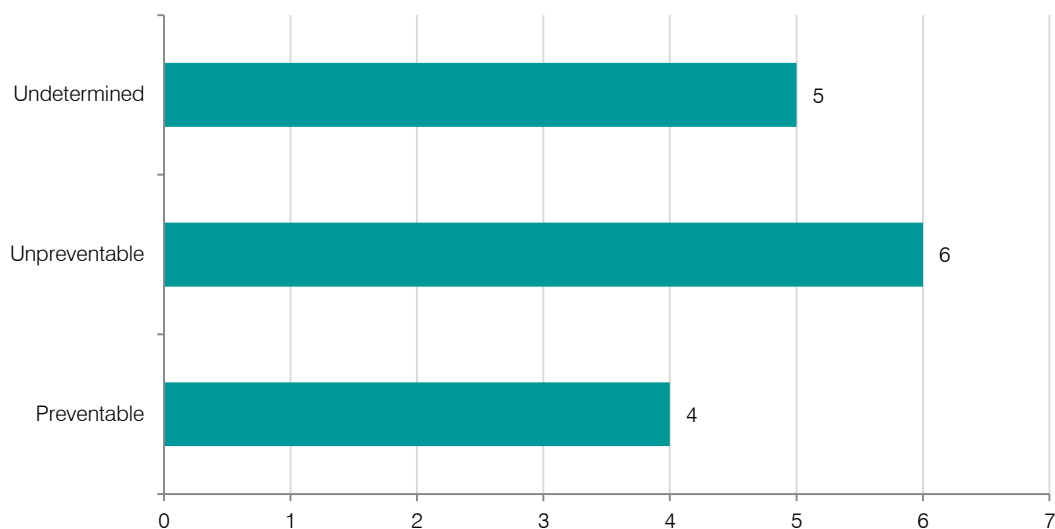
Assessing Preventability of SAC 1 Incidents

The SAC 1 incidents that underwent RCA review were categorised into whether the VTE was preventable or not preventable according to the findings of the RCA team. As displayed in *Figure 2*, of the 15 incidents:

- five (33 per cent) were inconclusive as there was insufficient information to determine whether the VTE was preventable or not
- six (40 per cent) were determined to be not preventable as appropriate precautions had been observed; and
- four (27 per cent) were preventable as it was considered the patient's death could have been avoided had the appropriate measures been taken.

It should be noted that one SAC 1 incident was not included in this analysis as final recommendations following RCA review were still pending.

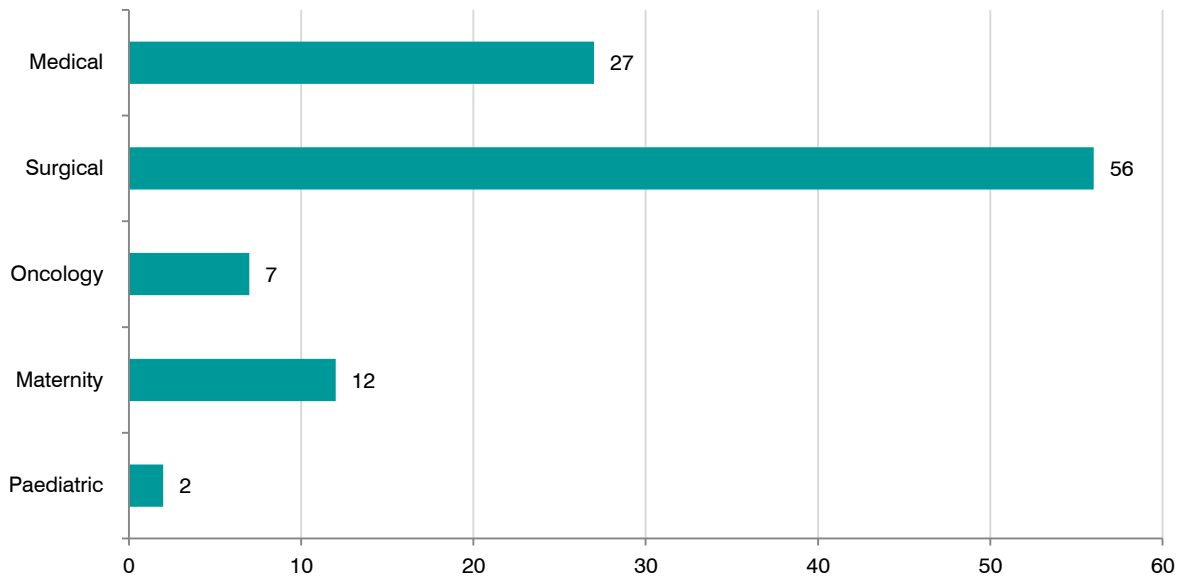
Figure 2: Total SAC1 RCA Incidents (n=15) by preventability category



Incidents by Specific Clinical Service

Incidents were more common in surgical patients as seen in *Figure 3*. This may be due to higher activity levels or greater recognition of VTE and therefore higher reporting rates, rather than a higher frequency of incidents.

Figure 3: IIMS (n=94) and additional RCA incidents (n=10) by Specific Clinical Service



Analysis of Incidents and Contributing Factors

The following are abridged examples of the SAC 1 cases which were identified through RCA review:

CASE 1
 Patient with previous cardiac history was admitted and underwent elective transurethral resection of the prostate (TURP) surgery. No VTE risk assessment undertaken nor was any pharmacological prophylaxis given, however TED stockings were prescribed. Patient suddenly deteriorated and had a cardiac arrest. The cause of death was found to be secondary to pulmonary embolism.

CASE 2
 Patient underwent bilateral knee arthroscopy and was discharged home. The patient was readmitted two days later following collapse at home from a cardiac arrest. Most likely cause was a massive pulmonary embolism. The patient was intubated and transferred to ICU, however died the following day.
 This case was still under investigation at the time of publication of this report

An analysis of both SAC 1 and non-SAC 1 incidents identified a number of potential contributing factors to the development of hospital-associated VTE. The identified factors are shown in *Figure 4*.

There were 45 cases (48 per cent) where there was insufficient information provided by the person reporting the incident to determine the underlying contributing factor. This suggests that a more standardised method of investigating these incidents is required.

The following non-SAC 1 cases illustrate the circumstances in which some of these contributing factors were identified:

NO RISK ASSESSMENT AND/OR PROVISION OF APPROPRIATE PROVISION OF PROPHYLAXIS

CASE 3 (SAC 2)

A 60 year old patient was admitted with hand trauma and left foot fracture requiring the use of a boot to immobilise the foot. Use of the boot caused decreased mobility. Seven days after admission, Doppler studies confirmed three deep vein thromboses (DVT). Despite several risk factors for VTE, including age, decreased mobility and lower leg injury, no VTE prophylaxis had been prescribed.

CASE 4 (SAC 2)

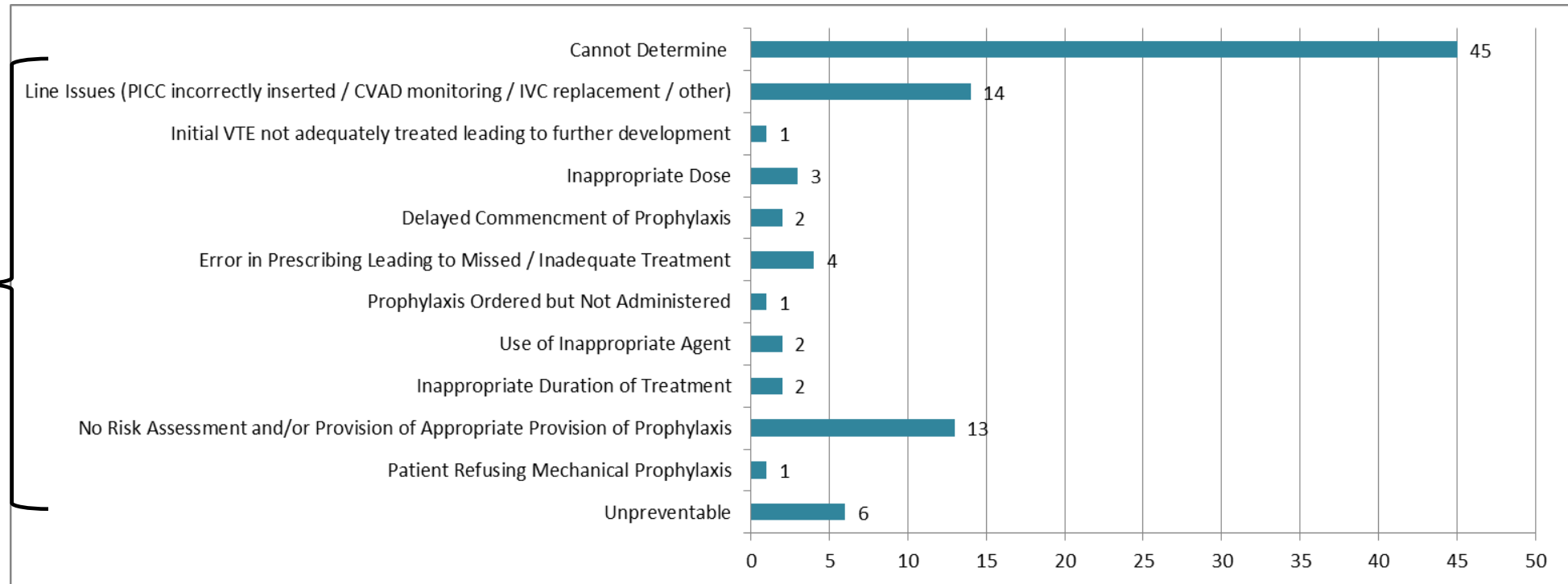
A patient was admitted for treatment of a urinary tract infection and cellulitis. The patient was not prescribed VTE prophylaxis despite being at high risk of VTE with immobility and acute medical illness. The patient was readmitted nine days after discharge for swelling and erythema to the left lower leg. Doppler ultrasound revealed an extensive occlusive left leg DVT. Patient required admission for five days for intravenous heparin and was commenced on warfarin.

INAPPROPRIATE DURATION OF TREATMENT

CASE 5 (SAC 2)

A patient was admitted with worsening rectal abscess requiring surgical intervention. The patient received pharmacological and mechanical prophylaxis post-operatively. When the patient was discharged two days later, VTE prophylaxis was ceased despite local guidelines recommending therapy for seven to 10 days post-operatively. Two days following discharge, the patient was readmitted with extensive DVT.

Figure 4: Potential Contributing Factors to the Development of Hospital-Associated VTE of the 94 IIMS cases examined



Preventable contributing factors

USE OF INAPPROPRIATE AGENT

CASE 6 (SAC 2)

A patient underwent a total knee replacement and was discharged 16 days post-operatively. The patient collapsed at home one day post discharge, was found hypotensive and readmitted to hospital. Findings were consistent with a pulmonary embolism and sepsis, for which the patient was treated accordingly in ICU. It was discovered that one immediate dose of enoxaparin was administered post-operatively, then aspirin 150mg daily for four weeks commenced.

CASE 7 (SAC 3)

Patient underwent left total knee replacement and two days post-operatively was found to have a DVT in the left femoral vein. The patient was not given VTE prophylaxis post-operatively; however the surgical team had prescribed aspirin 200mg twice daily for 'DVT prevention'.

It should be noted that despite common use post-operatively, aspirin is not recommended for VTE prevention. Evidence suggests using aspirin in hip fracture surgery but only in combination with other more effective pharmacological prophylactic agents⁷. Aspirin is not indicated in any other setting for the prevention of VTE. A number of hospital-associated VTE incidents identified aspirin as the sole agent used for VTE prophylaxis.

LINE ISSUES

CASE 8 (SAC 3)

Patient developed basilic vein thrombus in the setting of a peripherally inserted central catheter (PICC). The PICC was found to be placed in the cubital fossa. Placement higher up the upper arm may have reduced the trauma on the vessel as the vessels are larger in the upper arm and there is far less movement of the catheter with the bending of the elbow.

CASE 9 (SAC 4)

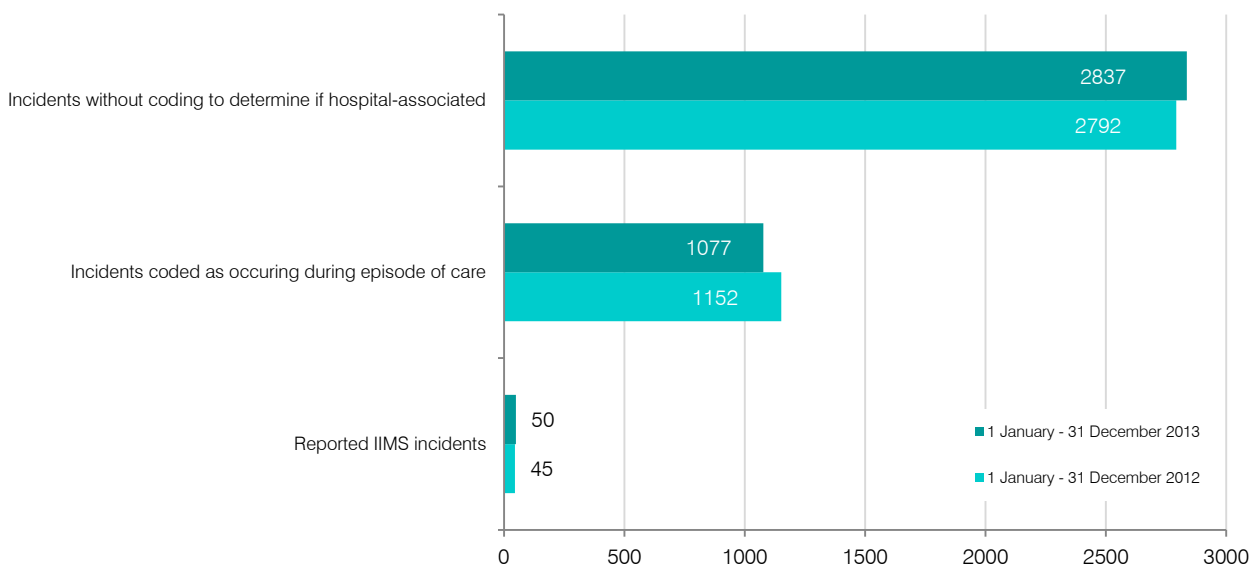
A PICC line was inserted on the patient's right upper limb and chest x-ray for position revealed PICC was in internal jugular vein. The PICC was pulled back 4cm and clinician indicated it was then safe to use. No repeat chest x-ray was taken specifically to review PICC position. Four days later, the patient developed a DVT in the right upper limb where the PICC was located. Repeat chest x-ray revealed the PICC was still in the internal jugular vein.

Comparison of NSW Health Information Exchange Data and IIMS Data

Only 3.9 per cent (45 out of 1152) of VTE incidents coded as hospital-associated in the HIE data (condition with onset during the episode of admitted patient care flag selected) were reported in the IIMS reporting system during 2012. In 2013, 4.6 per cent (50 out of 1077) of incidents were reported through IIMS. This does not include the high number of incidents whereby coding does not clarify whether the incident was hospital-associated or not (condition with onset during the episode of admitted patient care not reported) (*Figure 5*).

Figure 5 illustrates the limitations in the data set. Incidents of hospital-associated VTE are often viewed as complications and rarely reported as incidents. There is a clear need to address this area and encourage reporting of this highly preventable adverse event.

Figure 5: Reported Incidents vs HIE Coded Incidents for 2012 and 2013



Findings from CHASM Data

During the period from 1 January 2008 to 24 February 2014, there were 12,372 total notifications of surgical deaths of which, 7,922 (64 per cent) were audited by CHASM. Among them, 160 (2 per cent) patient deaths reported PE as either a cause of death, or as a post-operative complication.

The following points should be noted regarding data obtained from CHASM:

- CHASM data captures mortality events only, whereas the data evaluated from IIMS and HIE data represented both morbidity and mortality data
- there is mortality data not audited by CHASM i.e. during 1 January 2008 and 24 February 2014, 4,450 deaths (36 per cent) were not audited. These were not reviewed as 953 (8 per cent) cases were still in progress and 3,497 (28 per cent) received no response from the treating surgeon
- CHASM data undergoes assessment through a peer-review process.

Patient demographics and VTE prophylaxis of the 160 patient deaths are presented below.

Age and Gender

The median age was 75.5 years (range 28 years – 99 years). There were 84 (52.5 per cent) male patients and 76 (47.5 per cent) female patients.

Admission Type and Surgical Speciality

An emergency admission was recorded in 108 (67.5 per cent) audited deaths, and an elective admission in 46 (28.7 per cent).

The following table shows the distribution of the 160 audited deaths with PE by surgical speciality:

Table 3: Distribution of 160 Audited Deaths with PE by Surgical Speciality

Surgical Speciality	Number	Percentage
General Surgery	61	38
Orthopaedics	40	25
Neurosurgery	20	12
Urology	16	10
Vascular Surgery	9	6
Cardiothoracic	9	6
Plastic	3	2
ENT	2	1
Total	160	100

The Prevalence of VTE Prophylaxis

VTE prophylaxis use was recorded in 148 (92 per cent) of the 160 audited deaths.

Table 4 below shows the frequency distribution of the VTE prophylaxis used in these 148 cases.

Table 4: Frequency distribution of the VTE prophylaxis used

VTE prophylaxis	Frequency	Percentage
Heparin	124	84
TEDS	105	71
Compression	74	50
Aspirin	8	5
Warfarin	7	5
Other*	4	3
Total	322	

* Other includes: early ambulation (1), TPA (1), intraoperative compression devices (2)

Total frequency is more than 148 as some patients had more than one type of VTE prophylaxis.

The type and combination of VTE prophylaxis recorded is summarised in Table 5.

Table 5: Type and Combination of VTE prophylaxis

VTE Used	Frequency
Heparin, Compression, TEDS	50
Heparin, TEDS	28
Heparin only	28
Compression, TEDS	13
Heparin, Compression	4
Heparin, Warfarin, TEDS	3
Heparin, Aspirin	2
Heparin, Aspirin, Compression, TEDS	2
Heparin, TEDS, Other (intraoperative compression device)	2
Heparin, Warfarin	2
TEDS	2
Aspirin only	1
Aspirin, Compression, TEDS	1
Aspirin, TEDS	1
Compression, Other (early ambulation)	1
Heparin, Aspirin, Compression	1
Heparin, Compression, Other (TPA)	1
Heparin, Warfarin, Compression, TEDS	1
Warfarin Only	1
Missing	4

The CHASM assessors were asked to report whether they considered that use or non-use of VTE prophylaxis was appropriate. Assessors reported that 137 (86 per cent) of cases had appropriate use/non-use of VTE prophylaxis, and that seven (4 per cent) of cases had inappropriate use/non-use of VTE prophylaxis.

Table 6: CHASM Assessors' Response on Appropriateness of Use or Non-use of VTE Prophylaxis

	Assessor response			Total
	Appropriate use/ non-use	Inappropriate use/ non-use	Not reported	
With VTE prophylaxis	128	5	15	148
Without VTE prophylaxis	9	2	0	11
Not reported	0	0	1	1
Total	137	7	16	160

The following is a case of a surgical death due to a PE, which was reviewed in the CHASM data:

CASE 10

A 71 year old man presented to hospital with left hip pain on the background of a left total hip replacement. He underwent surgery (closed reduction) and had a left knee Zimmer splint applied post-operatively to prevent dislocation. He had difficulty mobilising. Ten days post-operatively, it was noticed that he had no prescribed VTE prophylaxis despite his immobility. Prophylaxis was prescribed, however later that day, while with the physiotherapist, he collapsed and lost consciousness, resulting in a MET call. The patient later passed away from cardiac arrest. The Coroner's preliminary report suggests pulmonary embolism at time of death.

The Prevalence of Appropriate VTE Prophylaxis in all Audited Deaths

Between 2008 and 2012, there were 10,085 total notifications of surgical deaths; of these 5, 059 (50 per cent) were audited by CHASM. Assessors considered the use or non-use of VTE prophylaxis appropriate in 3856 (76 per cent) of these deaths. *Table 7* below provides a breakdown of the proportion of audited deaths with appropriate use or non-use of prophylaxis against VTE by year and admission.

Table 7: Proportion of Audited Deaths with Appropriate Use or Non-use of Prophylaxis against VTE⁸

	2008	2009	2010	2011	2012
Elective Admissions (n = 726)	61%	64%	65%	72%	73%
Emergency Admissions (n = 4227)	70%	77%	80%	81%	80%
Total (n = 5059)*	69%	76%	77%	80%	80%

*the 'total' is the sum of elective and emergency surgeries undertaken, not admissions, as a number of patients may have undergone both elective and emergency surgery during the same episode of admission.

In 2010, the CEC published the CHASM Casebook July 2009 – June 2010⁸, after identifying VTE prophylaxis as a priority for surgical learning. Three illustrative cases and an article on VTE prophylaxis were published, and it was proposed that VTE risk assessment be conducted for all patients. For surgical patients, it was recommended that mechanical prophylaxis be continued following discharge until the patient is mobile.

CONCLUSION

This review has identified that there is great opportunity to improve VTE prevention strategies in NSW and to reduce the morbidity and mortality burden this largely preventable adverse event places on the health system. It has also identified limitations within the current data set. These include:

- VTE is often thought of as a complication and not an adverse event
- the HIE data set does not capture missed diagnoses of VTE or positive radiological diagnoses which are not documented in the health record
- the origin of the VTE (whether the condition was present at the beginning of the current episode of care or absent but arose during the episode) is not a mandatory reporting item in the Health Information Exchange (HIE) data set. Further to this, three local health districts do not have this reporting capability. This may have resulted in the under reporting of hospital-associated VTE incidences in the HIE data set
- while approximately half to two-thirds of VTE cases are preventable^{9, 10}, data sets, like coding data, do not identify whether the case was preventable or not
- there is an under reporting of hospital-associated VTE incidents in IIMS
- pulmonary embolism (PE) as a cause of death is not always obvious or evident, particularly due to decreased numbers of autopsies
- cases of hospital-associated VTE following discharge which either lead to death or require treatment in the community setting are often not reported
- cases of hospital-associated VTE requiring readmission to a different (or in some cases, the same) facility are often not reported; and
- cases that are peer reviewed may be biased towards common practice rather than best practice based on clinical guidelines, particularly where evidence based guidelines are limited¹¹.

It should be noted however, that limitations such as the under reporting of hospital-associated VTE incidents in IIMS and the lack of coding indicating the origin of the VTE (via the condition of onset flag) are not unique to VTE and exist in data collection systems in the broader health environment.

HIE coding data identified a large number of hospital-associated VTE in 2012 and 2013, with 1152 and 1077 cases respectively. Data further identified 2792 and 2837 cases where coding could not determine whether the incident occurred during the admission. These figures coupled with low rates of risk assessment completion (40 per cent) as shown in QSA data suggest a gap and the need to embed risk assessment and VTE prophylaxis processes into clinical practice. It must also be noted that data about rates of readmission due to hospital-associated VTE is lacking; identification of subsequent presentation to hospital due to a VTE as a consequence of recent admission would add to the number of cases identified in this report.

There is a demonstrated need to improve the reporting rates of hospital-associated VTE incidents, as only 3.9 per cent and 4.6 per cent of the known incidents of hospital-associated VTE were reported in IIMS in 2012 and 2013, respectively. The need to standardise the way these incidents are investigated is also evident as 47.9 per cent of cases had insufficient information to determine the underlying contributing factor. Standardising the process of investigation will ensure that the right questions are asked when determining the underlying causes of preventable VTE cases.

Despite the fact that CHASM-audited deaths associated with PE illustrated a low rate of inappropriate use of prophylaxis (4 per cent), review of all audited deaths demonstrates that a gap in practice still remains. The data for total surgical admissions in 2012 indicated that 20 per cent of patients were inappropriately managed for VTE prevention. Since the release of the CHASM casebook in 2010, CHASM data has shown an increase in the percentage of patients with elective admissions receiving appropriate use or non-use of prophylaxis (from 65 to 72 per cent), however there has been little change over all surgical admissions. As the audited deaths in the CHASM data is only a proportion of total deaths and the data only reflects mortality and not morbidity relating to VTE, a total representation of appropriate use or non-use of VTE prophylaxis in surgical patients is not known. Due to the higher risk of VTE amongst surgical patients¹², efforts to continually improve implementation of VTE prevention strategies within the surgical setting are still warranted.

Implementation of standard workflow processes which encourage VTE risk assessment of all adult inpatients would guide the provision of appropriate prophylaxis, and reduce the incidence of hospital-associated VTE. Though there has been a policy directive in place since 2010 that mandates routine VTE risk assessment and the appropriate use of prophylaxis, this report identifies that this is not widespread across the system. This report highlights that in order to improve the uptake of assessment and prophylaxis, clinicians and patients need to become more aware of the largely preventable nature of VTE and the monitoring and reporting of VTE incidents needs to improve.

RECOMMENDATIONS

To reduce the incidence of hospital-associated VTE and improve VTE reporting, it is recommended that all NSW health services:

1. ensure that all relevant patients are assessed for risk of VTE as per policy PD2014_032
2. regularly monitor and locally report rates of VTE risk assessment completion in compliance with PD2014_032
3. regularly monitor rates of appropriate prescribing of VTE prophylaxis
4. reassess local procedures surrounding the use of aspirin for VTE prophylaxis post-operatively and address any inappropriate use
5. educate all clinical staff regarding VTE risk assessment and provision of appropriate prophylaxis as a standard process in clinical workflow
6. ensure that all confirmed cases of hospital-associated VTE are flagged and reported in an incident management system e.g. IIMS, in compliance with PD2014_032
7. ensure that all confirmed cases of hospital-associated VTE be investigated to determine whether all appropriate actions have been taken to prevent VTE
8. implement a standardised method of investigating incidents of hospital-associated VTE.

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APPENDIX 1

ICD-10 (International Classification of Diseases, version 10) codes used to develop the NSW VTE database

I26 Pulmonary embolism

Includes:

- pulmonary (artery)(vein):
 - infarction
 - thromboembolism
 - thrombosis

Excludes:

- complicating:
 - abortion or ectopic or molar pregnancy (O00-O07, O08.2)
 - pregnancy, childbirth and the puerperium (O88.-)

I26.0 Pulmonary embolism with mention of acute cor pulmonale

Includes:

- Acute cor pulmonale NOS

I26.9 Pulmonary embolism without mention of acute cor pulmonale

Includes:

- Pulmonary embolism NOS

I80.2 Phlebitis and thrombophlebitis of other deep vessels of lower extremities

Includes:

- Deep vein thrombosis NOS

I80.3 Phlebitis and thrombophlebitis of lower extremities, unspecified

Includes:

- Embolism or thrombosis of lower extremity NOS

I82 Other venous embolism and thrombosis

Excludes:

- venous embolism and thrombosis (of):
 - cerebral (I63.6, I67.6)
 - complicating:
 - abortion or ectopic or molar pregnancy (O00-O07, O08.7)
 - pregnancy, childbirth and the puerperium (O22.-, O87.-)
 - coronary (I21-I25)

- intracranial and intraspinal, septic or NOS (G08)
- intracranial, nonpyogenic (I67.6)
- intraspinal, nonpyogenic (G95.1)
- lower extremities (I80.-)
- mesenteric (K55.0)
- portal (I81)
- pulmonary (I26.-)

I82.0 Budd-Chiari syndrome

I82.1 Thrombophlebitis migrans

I82.2 Embolism and thrombosis of vena cava

I82.3 Embolism and thrombosis of renal vein

I82.8 Embolism and thrombosis of other specified veins

I82.9 Embolism and thrombosis of unspecified vein

Includes:

- Embolism of vein NOS
- Thrombosis (vein) NOS

O07.2 Failed medical abortion, complicated by embolism

Includes:

- With conditions in O08.2

O07.7 Other and unspecified failed attempted abortion, complicated by embolism

Includes:

- With conditions in O08.2

O08.2 Embolism following abortion and ectopic and molar pregnancy

Includes:

Embolism:

- NOS
- air
- amniotic fluid
- blood-clot
- pulmonary
- pyaemic
- septic or septicopyaemic
- soap

following conditions
classifiable to O00-O07

O22.3 Deep phlebothrombosis in pregnancy

Includes:

- Deep-vein thrombosis, antepartum

O22.8 Other venous complications in pregnancy

O22.9 Venous complication in pregnancy, unspecified

Includes:

- Gestational:
 - phlebitis NOS
 - phlebopathy NOS
 - thrombosis NOS

O87.1 Deep phlebothrombosis in the puerperium

Includes:

- Deep-vein thrombosis, postpartum
- Pelvic thrombophlebitis, postpartum

O87.3 Cerebral venous thrombosis in the puerperium

Includes:

- Cerebrovenous sinus thrombosis in the puerperium

O88.2 Obstetric blood-clot embolism

Includes:

- Obstetric (pulmonary) embolism NOS
- Puerperal (pulmonary) embolism NOS

Clinical Excellence Commission
Locked Bag 8
HAYMARKET NSW 1240
p. +61 2 9269 5500
w. www.cec.health.nsw.gov.au



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