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NIMC VTE Phase 2 Pilot Final Report

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The Commission acknowledges the contribution of members of the Commission's Anticoagulation Working Group which advised on conduct of the pilot and its Health Services Medication Advisory Group which provided strategic advice on the project.

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1. Executive summary

Introduction

Venous thromboembolism (VTE) is a major source of morbidity and mortality for both surgical and medical adult patients admitted to hospital. VTE is estimated to account for 7% of all deaths in Australian hospitals[1] and is the most common preventable cause of hospital-related death. Despite the availability of clinical guidelines in Australia[2-3] and internationally[4-5], use of VTE prophylaxis remains sub-optimal.

Various strategies have been used to improve the use of VTE prophylaxis in hospitalised patients with varying degrees of success. Both paper-based and computerised interventions have been shown to improve rates of VTE prophylaxis.[6-9]

In Australia hospitals have shown that inclusion of a VTE prophylaxis prescribing prompt in the NIMC could improve the prescription of VTE prophylaxis according to hospital guidelines.[6] Based on these findings the National Inpatient Medication Chart Venous Thromboembolism Pilot was conducted by the Australian Commission on Safety and Quality in Health Care (the Commission) to evaluate the effect of including a pre-printed venous thromboembolism (VTE) prophylaxis section in the National Inpatient Medication Chart (NIMC) on the quality and safety of VTE prophylaxis use in adult patients admitted to a range of hospitals across Australia.

Testing of the proposition formed the basis for Phase 1 of the NIMC VTE Pilot which was conducted from August 2010 until February 2011 and was reported in an interim report.[10]

The Commission's Anticoagulation Working Group and its Health Services Medication Expert Advisory Group reviewed the report and recommended:

- retaining a tripartite VTE prophylaxis section in the NIMC with some minor modifications to the Phase 1 pilot version. The section would include: segments for documenting risk assessment and ordering and recording pharmacological and mechanical prophylaxis
- extending the pilot into a second phase to ensure sufficiently robust data on which to base any subsequent recommendations for changes to the NIMC.

The NIMC VTE Phase 2 pilot was conducted from April to December 2012 and the outcomes form the content of this report and the basis for its recommendations.

Aims, objectives and methodology

The aim of the NIMC VTE Pilot Phase 2 was to evaluate the efficacy and safety of a pre-printed VTE risk assessment and prescribing section in the NIMC on VTE risk assessment documentation and prophylaxis prescribing (pharmacological and mechanical) in adult patients admitted to a range of hospitals.

The objectives of the Phase 2 Pilot were to assess the:

- utility and acceptability of the pre-printed VTE prophylaxis section for documenting the completion of VTE risk assessment
- effect of the pre-printed VTE prophylaxis section on the rate of VTE prophylaxis prescribing for patients at risk of developing a VTE
- unintended consequences of the pre-printed VTE prophylaxis section including:
    - duplicate prescribing of VTE prophylaxis in any part of the NIMC
    - VTE prophylaxis prescription and administration errors.

The Phase 2 Pilot built on the methodology of the Phase 1 Pilot. The intervention comprised introduction of the pilot NIMC with VTE prophylaxis section with education. The education component preceded the introduction of the pilot NIMC. Post implementation data was collected 5 - 6 months after introducing the chart to provide hospitals with sufficient time to effect a change in practice.

Hospitals were recruited through an expression of interest process.

Evaluation

There were three components to the evaluation:

- quantitative study
- implementation experience survey
- issues register.

Hospitals were required to collect pre-implementation audit data for the quantitative study prior to introducing the pilot chart. Staff were educated about the pilot chart using materials provided by the Commission. Five to six months after introducing the chart, a post-implementation audit was conducted. Hospitals were asked to complete an online survey of their experience while implementing the pilot chart at the time of the second audit. They were also asked to report any issues they had with the pilot chart during piloting and these were recorded in an issues register.

1. Quantitative study

The Phase 2 Pilot used similar evaluation measures to the Phase 1 Pilot but with two additional measures to assess prescribing in accordance with the local policy on VTE prevention as a measure of appropriateness. Hospitals measured changes in documentation of VTE risk assessment, VTE prophylaxis prescribing (pharmacological and mechanical) and prescribing in accordance with hospital VTE prevention guidelines. It also assessed the effect of the VTE section on other safety features of the pilot chart and the rate of administration errors. Hospitals were provided with an automated Excel audit tool to collect pre and post-implementation audit data and received education on how to use the tool and submit data to the Commission.

2. Implementation experience survey

An implementation experience survey was conducted to obtain feedback from hospitals on the experience of introducing the pilot NIMC and the context in which the intervention occurred. An online survey was distributed to sites in December 2012 for completion by the project coordinators at each hospital.

The survey questions covered three main areas:

- hospital's VTE risk prevention policy and forms used
- hospital implementation experience – education, issues, barriers, unintended consequences and lessons learnt
- feedback on the NIMC VTE section and the audit parameters and tool, user guide and implementation resources provided by the Commission.

3. Issues Register

An issues register was established for sites to report problems (including adverse events resulting from inclusion of the VTE section on the NIMC) and suggest improvements. Issues were emailed to the Commission and reviewed by the Anticoagulation Working Party.

Results

Nineteen hospitals participated in the Phase 2 Pilot and included public and private hospitals from five states and territories.

The total number of pilot charts audited for the Phase 2 Pilot pre-implementation audit was 1429, and 1327 for the post-implementation audit.

Quantitative study

Patient category

There were 54.1% and 55.5% of medical patients and 37.0% and 39.2% of surgical patients in the pre and post-implementation audits respectively.

VTE risk assessment documentation

There was a significant increase in VTE risk assessment documented between the pre and post-implementation audits, from 35.9% to 57.2%, an increase of 21.3% (95% CI: 16.6, 26.0 p<0.001).

VTE risk assessment was documented in a number of places in the patient record including risk assessment forms, progress notes, clinical pathways, progress notes and care plans.

VTE prophylaxis prescribing

There was a significant increase in the rate of pharmacological prophylaxis prescribing (59.4% pre-implementation vs. 64.4% post-implementation (p=0.035). Overall VTE prophylaxis prescribing (pharmacological and/or mechanical) increased from 65.2% to 69.3%.

Almost two-thirds (64.5%) of all patients had pharmacological VTE prophylaxis prescribed.

There was no change in the use of mechanical prophylaxis prescribing between the pre- and post-implementation audits: 33.6% compared to 32.3% (not significant)

There was significant variation between hospitals in all the measures.

Prescribing according to hospital guidelines

Data from 10 hospitals was used to assess prescribing according to local guidelines. In the pre-implementation audit, 66.6% of patients (range 25% to 93%) were treated according to the hospital's VTE prevention guidelines versus 74.7% patients in the post-implementation audit (range 45% to 100%), an increase of 8.2% (95% CI 3.0%, 13.4% p=0.002). There were a number of limitations to this component of the study.

Effect on other NIMC safety features

The inclusion of the VTE section did not increase the number of medication charts per patient (average of 1.56 per patient across both audits) and the safety risks associated with multiple charts.

Overall there was no evidence that the introduction of the pilot chart increased the risk of duplicate prophylactic anticoagulants being prescribed or the number of patients having active orders for both prophylactic and therapeutic anticoagulation.

Administration errors

There were similar numbers of doses of anticoagulant ordered that were not signed as administered between the pre-implementation and the post-implementation audits: 4.4% vs. 3.6%.

There was a significant decrease in the number of checks performed on mechanical prophylaxis devices that were documented (75.1% of total checks signed for pre-implementation compared to 68.9% post-implementation (-6.2% [-8.8%, -3.7%] $P < 0.001$). The Phase 2 Pilot audits provided additional data on where mechanical VTE prophylaxis is ordered and checks are documented. As with VTE risk assessment, mechanical VTE prophylaxis is documented in a number of places in the patient's record including the NIMC regular medications section, clinical pathways, progress notes and care plans. Introduction of the VTE section on the pilot chart substantially increased documentation of mechanical prophylaxis on the NIMC from 36.3% pre-implementation to 53.1% post-implementation.

Implementation experience survey

Nineteen sites completed the online survey between December 2012 and early January 2013.

Twelve hospitals (63%) introduced the pilot chart into all areas of the hospitals whilst the remainder chose to implement the chart in selected wards only.

Pilot hospitals had the pilot chart in place for a period of 3 to 6 months, with the majority using it for around 5 months.

All but one hospital reported that they had a formal VTE prevention policy.

Forty-two percent of hospitals agreed, whilst 21% disagreed or strongly disagreed, that the pilot NIMC was well accepted by clinicians. Whilst 10 hospitals agreed or strongly agreed that the pilot NIMC with VTE section had improved the appropriate prescribing of VTE prophylaxis for patients at risk of VTE. Collecting this data allowed hospitals to understand gaps in their current VTE prevention practice and to develop plans for future continuing education and quality improvement activities.

Thirteen hospitals reported some barriers to implementation of the pilot chart including:

- clinician unwillingness to document a VTE risk assessment
- clinicians unaware of the correct process
- lack of standardised practice across the hospital.
- lack of clinical leadership or executive support
- limited resources for education and/or project coordination
- the requirement to educate clinicians continually because of staff turnover and frequent rotation of medical staff
- the issue of old charts (without the VTE section) coming back into circulation
- difficulties implementing the charts on selected wards as both the pilot and the regular NIMC charts were in circulation.

Nine hospitals provided feedback on poor compliance with completing the VTE section, with documenting a VTE risk assessment on the chart the most frequent comment. Reasons included:

- documentation that risk had been assessed was redundant when VTE prophylaxis was ordered .
- confusion with the contraindications section.
- reluctance of nurses to document on the chart as they had already documented in the patient's notes e.g. on a risk assessment form or clinical pathway.
- lack of education on conducting a VTE risk assessment.

There were few reported unintended consequences associated with the use of the VTE prophylaxis section. None resulted in any patient harm.

Six hospitals recommended some changes to the VTE section.

Hospitals provided short educational sessions to medical, nursing and pharmacy staff,15 to 30 minutes in length. The number of sessions delivered varied between the hospitals. Hospitals reported the educational materials provided by the Commission were useful with the brochure and poster rated as the most useful overall.

Sites reported the main lessons learnt were:

- improving use of VTE prophylaxis requires the commitment and support of the hospital executive and clinical leaders; and
- allocating sufficient resources for training and ongoing education was essential to support any sustained change in practice.

Issues register

Three hospitals reported issues to the issues register. These issues were also reported in the qualitative survey

Discussion

Effect of VTE prophylaxis section on NIMC

Documentation of a VTE risk assessment increased by 21.3% (35.9% pre-implementation vs 57.2% post-implementation%, 95% CI: 16.6, 26.0 p<0.001), a substantial improvement over the Phase 1 Pilot where the corresponding rates were 9.4% pre-implementation and 17.2% at post-implementation (95% CI: 5.0%,10.5% p<0.0001) indicating the modified design of the risk assessment section in the Phase 2 Pilot was more acceptable to clinicians.

Pharmacological prophylaxis prescribing overall increased by 5% (59.4% pre-implementation vs. 64.4% post-implementation (p=0.035) a similar result to the Phase 1 Pilot (55.1% pre-implementation vs 62.4% post-implementation p=0.003). Six hospitals reported increases between 10 - 23%. VTE prophylaxis prescribing overall (pharmacological and/or mechanical) increased from 65.2% to 69.3% (not significant) a slight improvement on the Phase 1 Pilot results of 58.1% pre-implementation vs. 65.6% post-implementation.

In the ten hospitals measuring prescribing according to the hospital's VTE prevention guidelines the increase was significantly higher, 66.65% pre-implementation vs 74.7% post-implementation, an increase of 8.2%, 95% CI 3.0%, 13.4% p=0.002. However there was marked variation in the results across hospitals.

Mechanical VTE prophylaxis ordering remained unchanged between the pre and post-implementation audits (33.6% pre- implementation vs. 32.3% post- implementation P = 0.596). This was an improvement over the Phase 1 Pilot (18.6% pre-implementation versus 19.2% post-implementation). However, only 54% percentage of orders for mechanical prophylaxis were documented on the NIMC post-implementation indicating a reluctance of nursing staff to document on the NIMC, particularly if they normally documented mechanical prophylaxis in other areas of the medical record, such as care plans.

The increase in overall rates of VTE risk assessment documentation and prophylaxis prescribing provide evidence that the pre-printed VTE prophylaxis section acts as a prompt to remind prescribers to undertake a VTE risk assessment and prescribe appropriate prophylaxis on admission. This adds to the evidence from other studies that have shown that the use of pre-printed stickers, reminders and standardised risk assessment tools can improve rates of appropriate VTE prophylaxis. [6,11-12]

Safety of VTE prophylaxis section on NIMC

Inclusion of the pre-printed VTE prophylaxis section in the NIMC did not increase the average number of charts per patient or increase the risks associated with multiple medication chart use. There were very few reported incidents of duplicate prescribing of anticoagulants and prescribing of VTE prophylaxis when contraindicated in the post-implementation audit. These results were similar to the findings in the Phase 1 Pilot. See table 1.1

Overall there was no evidence that the introduction of the pilot chart increased the risk of patients being prescribed anticoagulant therapy when it was contraindicated, duplicate anticoagulant therapy, or having active orders for both prophylaxis and therapeutic anticoagulation.

There were similar numbers of doses of anticoagulant ordered that were not signed as administered between the pre-implementation and the post-implementation audits: 4.4% vs. 3.6%, indicating having a separate VTE prophylaxis section did not result in a larger number of missed dses. These results were an improvement on the Phase 1 Pilot results: 12.9% pre-implementation vs. 12.7% post-implementation.

The number of checks performed on mechanical prophylaxis devices documented decreased following introduction of the chart (75.1% of total checks signed for pre-implementation compared to 68.9% post-implementation (-6.2% [-8.8%, -3.7%] $P < 0.001$). Although These results are an improvement on the Phase 1 Pilot (74% pre-implementation vs. 43% post-implementation) they continue to reflect the reluctance of staff to document mechanical checks on the pilot NIMC where the hospital has an established practice of documenting mechanical checks in other areas of the patient's record.

No significant harm events were reported to the Commission for recording on the Issues Register. Overall there were fewer issues reported to the issues register compared to the Phase 1 Pilot and less reported incorrect usage of the VTE prophylaxis prescribing section.

Table 1.1 Summary: Quantitative audit results for phase 1 and 2 pilots

Audit parameter	**Phase 1 Pilot pre-impl.**	**Phase 1 Pilot post-impl.**	**Phase 2 Pilot pre-impl.**	**Phase 2 Pilot post-impl.**
Documentation of VTE risk assessment in VTE section	0%	17.2%	0%	44.7%
VTE prophylaxis prescribing	58.1%	65.6%	65.2 %	69.3%
Pharmacological VTE prophylaxis prescribing	55.1%	62.4%	59.4%	64.4%
Pharmacological VTE prophylaxis prescribed in VTE section	n.c	66%	n/a	78.6%
Mechanical VTE prophylaxis prescribing	18.6%	19.2%	33.6%	32.3%
% patients who were prescribed pharmacological VTE prophylaxis according to hospital guidelines	n.c	n.c	82.8%	86.8%
% patients who were prescribed mechanical VTE prophylaxis according to hospital guidelines	n.c	n.c	82.1%	82.5%
Safety features and administration errors (raw numbers)				
Audit parameter	**Phase 1 Pilot pre-impl.**	**Phase 1 Pilot post-impl.**	**Phase 2 Pilot pre-impl.**	**Phase 2 Pilot post-impl.**
Average charts per patient	1.54	1.51	1.56	1.56
Patients with pharmacological VTE prophylaxis prescribed in both VTE and regular section	n/c	24	n.c	2
More than one active order for pharmacological VTE prophylaxis	6	4	n.c	2

Patients with active orders for both pharmacological VTE prophylaxis and therapeutic anticoagulant	23	29	n.c	2
Mechanical VTE prophylaxis ordered when contraindicated	n.c	n.c	3	2
Pharmacological VTE prophylaxis ordered when contraindicated	n.c	15	8	4
% anticoagulant doses documented as given	87.1%	87.3%	95.6%	96.4%
% checks of mechanical VTE prophylaxis documented	74%	43%	75.1%	68.9%

n.c. indicates data was not collected

Factors for success

The response to the intervention varied between participating hospitals suggesting that there are other critical success factors required for a successful, hospital-wide VTE prevention program.

Hospitals described similar barriers to implementation in both Phase 1 and Phase 2 Pilots and reported that introducing initiatives such as the VTE section on the NIMC to improve the use of VTE prophylaxis requires the commitment and support of the hospital executive and clinical leaders and sufficient resources for training and ongoing education. These findings support those in the international literature and are in line with the recommendations in the Commission and NHMRC publication *Stop the Clot. Integrating VTE prevention guideline recommendations into routine hospital care.* [13-14]

Feedback from the Phase 2 Pilot suggested that compliance would further improve once the NIMC with VTE prophylaxis section was implemented nationally as this would increase health professional familiarity with the VTE prophylaxis section and staff would have greater confidence in assessing VTE risk and prescribing appropriately to patient risk profiles.

Limitations

There were several limitations to the Phase 2 Pilot. Hospitals were recruited through an expression of interest process which may have resulted in some bias towards hospitals with a pre-existing commitment to, and interest in, VTE prevention. Patients were not specifically matched on key demographic variables (age, gender), presenting condition and VTE risk factors present across the pre and post-implementation audits. Hospitals were instructed to audit a random sample of inpatients across the same wards and using the same auditors to ensure data collection consistency. This may not have occurred. Auditors completing the questions on compliance according to hospitals guidelines reported that it was difficult in some cases to judge whether the VTE prophylaxis prescribed (or not prescribed) was appropriate

Hospital project coordinators completed the implementation experience survey. Directly surveying the end users may have provided a more accurate picture of clinician feedback.

Conclusion

The introduction of a NIMC pre-printed VTE prophylaxis section in the NIMC combined with clinician education, prompted clinicians to assess and document patient VTE risk on admission and to prescribe VTE prophylaxis in a range of hospitals across Australia. This resulted in improved rates of VTE risk assessment documentation and pharmacological prophylaxis prescribing. Importantly, the intervention did not increase the risk of duplicate anticoagulant therapy being prescribed or the risks associated with patients having multiple active charts.

Incorporation of a pre-printed VTE prophylaxis section in the NIMC would assist hospitals address the patient safety risk represented by hospital-associated VTE. Minor changes to the risk assessment section would improve its acceptability.

To optimise the use of the pre-printed VTE prophylaxis section as a tool to improve the quality and safety of VTE prophylaxis, hospitals should implement the chart within a quality improvement framework that includes:

- a hospital-wide VTE prevention policy
- guidance on VTE risk assessment
- senior corporate and clinical governance support
- senior clinician leadership
- education of staff and an ongoing commitment to education to re-enforce the importance of VTE prophylaxis
- evaluation and feedback.

The educational materials and audit tool developed for the NIMC VTE pilot are suitable to use as the basis for development of additional national implementation resources for all Australian hospitals. Consideration should be given to developing and implementing a standardised VTE risk assessment tool.

Recommendations

It is recommended that:

- a pre-printed VTE prophylaxis section be incorporated into the NIMC
- the NIMC VTE prophylaxis section comprise three components:
    - VTE risk assessment section to record that an assessment has been conducted
    - pharmacological prophylaxis ordering and administration recording section
    - mechanical prophylaxis ordering and checking section.
- the VTE risk assessment component piloted by hospitals in Phase 2 be modified to accommodate recommendations from pilot sites.

2. Introduction

Burden of VTE in Australia

Venous thromboembolism (VTE) is a major source of morbidity and mortality for both surgical and medical inpatients. VTE is estimated to account for 7% of all deaths in Australian hospitals.[1] In addition, non-fatal VTE events are associated with significant morbidities and costs.

In 2008 it was estimated that the total financial cost of VTE in Australia was $1.72 billion[1]. Eighty percent of the cost was estimated to be productivity loss primarily due to the premature death of Australians with VTE and $148 million was direct health system expenditure.

VTE is the most common preventable cause of hospital-related death. However, and despite the availability of clinical guidelines in Australia[2-3] and internationally[4-5], use of VTE prophylaxis remains sub-optimal. It has been identified as one of the top ten "strongly encouraged" patient safety practices by the Agency for Health Care Research and Quality.[15]

Pharmacological and mechanical VTE prophylaxis have been demonstrated to be safe and effective in preventing VTE and are advocated by national and international guidelines.[2-5] Even though the majority of medical and surgical inpatients have one or more risk factors for VTE, studies continue to demonstrate that prophylaxis is significantly under-utilised.[16-20] In 2008 a study conducted across thirty-two countries found that only 59% of at risk surgical and 40% of at risk medical patients received guideline-recommended VTE prophylaxis.[16]

Reasons cited to explain VTE prophylaxis under-utilisation include:

- low awareness of the incidence of VTE
- underestimation of VTE risk
- uncertainty about how to assess for VTE risk and how to prescribe appropriate prophylaxis based on the risk category
- unfamiliarity, or disagreement, with evidence-based guidelines (particularly for medical patients)
- concern about bleeding
- lack of hospital-wide explicit policies and protocols for VTE prevention.[7,12]

Improving VTE prophylaxis use

Various strategies have been used to improve the use of VTE prophylaxis in hospitalised patients with varying degrees of success. Both paper-based and computerised interventions have been shown to improve rates of VTE prophylaxis.[6-9] A recent review conducted by Lau and Haut found that "education combined with other quality improvement strategies and information technology approaches such as alerts and mandatory computerised clinical decision support, appear to offer the most effective approaches to promote best practice prophylaxis use and prevent patient harm resulting from VTE".[21]

National Institute of Clinical Studies VTE prevention programs

Between November 2005 and October 2009, Australia's National Institute of Clinical Studies conducted the Public Hospital VTE Prevention Program in forty hospitals nationally to improve rates of appropriate VTE prophylaxis in hospitalised patients. Subsequently, the Commission funded the implementation of the program in thirty-six private hospitals from August 2008 to August 2009. Australia's national VTE prevention programs achieved sustainable improvements in VTE prevention practices.[12]

The Public Hospital VTE Prevention Program coincided with implementation of Australia's National Inpatient Medication Chart (NIMC). The National Inpatient Medication Chart (NIMC) was developed to standardise inpatient medication communication in Australian hospitals in 2006. It is a paper-based medication chart. Some hospitals participating in the Public Hospital VTE Prevention Program included VTE risk assessment and VTE prophylaxis prescribing prompts in the NIMC.

Changing the NIMC

In 2008, the Commission-managed NIMC Quality Assurance Project identified significant interest in hospitals for inclusion of VTE prophylaxis prompts in the NIMC. The Commission's Health Services Medication Expert Advisory Group (and which advises the Commission on NIMC and related matters), recommended that the Commission undertake preliminary research work.

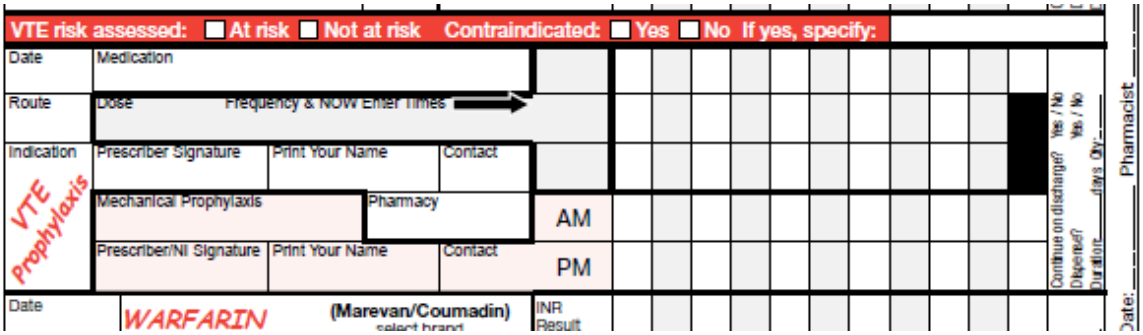
Significant work in Queensland informed the Commission's work. Queensland Health had developed a pre-printed VTE prophylaxis section and trialled it extensively. In addition, several Victorian hospitals which had participated in the Public Hospital VTE Prevention Program had incorporated a variety of VTE prophylaxis prompts in their medication charts. Qualitative and quantitative data from Queensland and Victoria hospitals using medication charts with VTE assessment and prescribing sections demonstrated an improvement in VTE prophylaxis prescribing in accordance with hospital guidelines.

NIMC VTE Phase 1 Pilot

In April 2010, the Commission's Health Services Medication Expert Advisory Group agreed to pilot a draft NIMC incorporating a pre-printed VTE prophylaxis section to test its suitability for national implementation.

The design and placement of the VTE risk assessment and prophylaxis prescribing and administering section on the NIMC was informed by the evidence from the Queensland and Victorian hospitals using VTE prophylaxis prompts on medication charts. The section (see Figure 2.1 below) also reflected the National Health and Medical Research Council's 2009 Clinical Practice Guideline for the Prevention of Venous Thromboembolism in Patients admitted to Australian Hospitals[1].

Figure 2.1 NIMC VTE Pilot Phase 1 pre-printed VTE risk assessment and prophylaxis prescribing section



The objectives of Phase 1 of the NIMC VTE Pilot (the Phase 1 Pilot) were to:

- assess the utility and acceptability of the pre-printed VTE prophylaxis section for documenting the risk of VTE
- assess the effect of the pre-printed VTE prophylaxis section on the rate of VTE prophylaxis prescribing for patients at risk of VTE

- assess unintended consequences of the pre-printed VTE prophylaxis section including:
    - prescribing for patients not at risk
    - duplicate prescribing of VTE prophylaxis in any part of the NIMC
    - measure VTE prophylaxis prescription and administration errors.

The Phase 1 Pilot involved nineteen hospitals in three states and was conducted from August 2010 to February 2011. The pilot demonstrated a significant increase in VTE risk assessment documentation and pharmacological VTE prophylaxis prescribing. The rate of mechanical VTE prophylaxis ordering was unchanged.

A full report of the Phase 1 NIMC VTE Pilot results is available on the Commission web site.[22] and a summary of key outcomes is provided in Table 2.1 below.

Table 2.1 NIMC VTE Pilot Phase 1 results

Results	**Pre-implementation (baseline) audit**	**Post-implementation audit**
Number of charts audited	1,888	1,777
Documentation of VTE risk assessment	9.4%	17.2% *(p<0.0001)*
Pharmacological prophylaxis prescribed	55.1%	62.4% *(p=0.003)*
Mechanical prophylaxis prescribed	18.6%	19.2%

Following the Phase 1 Pilot, the Commission's Health Services Medication Expert Advisory Group agreed to:

- extend the pilot to a second phase to:
    - obtain stronger evidence for recommending possible changes to the NIMC
    - allow hospitals wanting to incorporate a VTE prophylaxis section in the NIMC to do so by participating in the second phase of the national pilot.
- retain a tripartite VTE section comprising risk assessment and pharmacological and mechanical prophylaxis prescribing with some design changes based on feedback from Phase 1 Pilot participants.

Outcomes from the NIMC VTE Phase 2 pilot are the subject of this final report.

3. Aims, objectives and method

Aims

The aim of the NIMC VTE Pilot Phase 2 was to evaluate the efficacy and safety of a pre-printed VTE risk assessment and prescribing section in the NIMC on VTE risk assessment documentation and prophylaxis prescribing (pharmacological and mechanical) in adult patients admitted to a range of hospitals.

Objectives

The objectives of the Phase 2 Pilot were to assess the:

- utility and acceptability of the pre-printed VTE prophylaxis section for documenting the completion of VTE risk assessment
- effect of the pre-printed VTE prophylaxis section on the rate of VTE prophylaxis prescribing for patients at risk of developing a VTE
- unintended consequences of the pre-printed VTE prophylaxis section including:
    - duplicate prescribing of VTE prophylaxis in any part of the NIMC
    - VTE prophylaxis prescription and administration errors.

Method

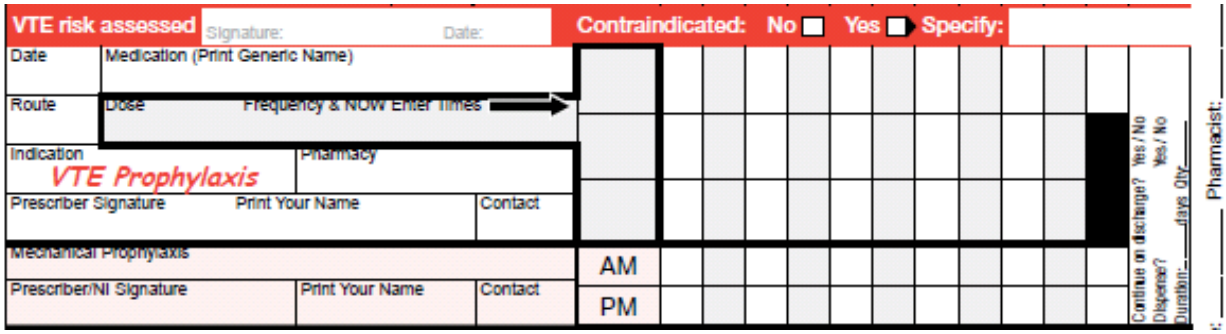
Hospitals were recruited through an expression of interest to participate in the Phase 2 Pilot in January 2012. Participating hospitals were required to:

- currently use the NIMC
- have senior management support for the pilot
- have clinician involvement and support for the pilot
- pilot the chart (version 2, See figure 3.1 below) in all or part of the facility
- nominate a project officer to manage:
    - involvement with the pilot
    - distribution of educational and other pilot materials
    - education of staff on the use of the pre-printed VTE prophylaxis section
    - pre and post-implementation auditing within specified timeframes
    - completion of an online implementation experience survey
    - communications with the Commission and local clinicians.

Paediatric patients and wards using the long-stay NIMC were to be excluded.

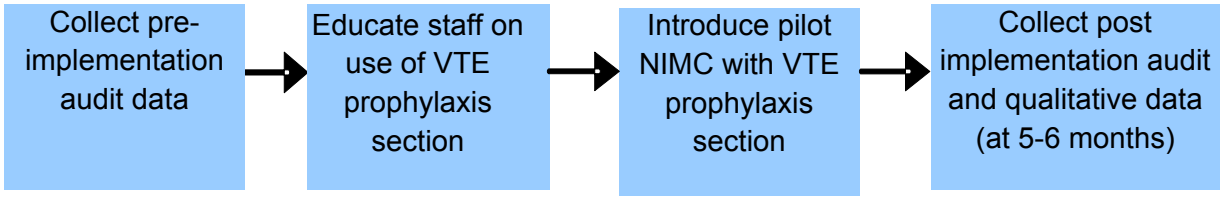
The pre-printed VTE prophylaxis section used in the Phase 2 Pilot (see Figure 2.2 below) included modifications which addressed issues identified in the Phase 1 Pilot.

Figure 3.1 Pre-printed VTE risk assessment and prophylaxis prescribing section in the Phase 2 Pilot chart



The intervention comprised introduction of the pilot NIMC with VTE prophylaxis section with education of medical, nursing and pharmacy staff using materials provided by the Commission.. The education component preceded the introduction of the pilot NIMC. The post implementation data was collected 5 -6 months after introducing the chart to provide hospitals with sufficient time to effect a change in practice. See figure 3.2. Hospitals could report issues throughout the life of the pilot..

Figure 3.2 NIMC VTE Pilot Phase 2 methodology



The Anticoagulation Working Party provided advice on the methodology and conduct of the pilot.

4. Evaluation

There were three components to the evaluation strategy, one quantitative and two qualitative. Participants were required to:

- audit medication charts pre and post-implementation of the pilot NIMC against set criteria
- complete an implementation experience survey after the post-implementation audit
- report any issues to an issues register throughout the pilot.

1. Quantitative study

The quantitative study involved auditing existing medication charts prior to staff education and introduction of the pilot NIMC then auditing the pilot NIMC five to six months after implementation.

An automated Excel audit tool was provided for hospitals to collect pre and post-implementation audit data. The tool measured use of, or compliance with, the different elements of the pre-printed VTE prophylaxis section in the pilot chart. This included:

- VTE risk assessment documenting
- pharmacological and mechanical prophylaxis prescribing
- anticoagulant therapy administration documenting
- mechanical devices checking.

Measures were also included to assess the potential for the section to cause harm by affecting other safety features of the pilot chart or by leading to duplicate or unnecessary prescribing of anticoagulation.

Two measures to assess prescribing in accordance with local hospital VTE prevention policy or guidelines were introduced in the Phase 2 Pilot. This component of the audit was voluntary and was undertaken by hospitals with existing VTE prevention policies or guidelines in place. Hospitals were asked to provide the Commission with a copy of their existing VTE prevention policy. The measures included the percentage of patients with pharmacological VTE prophylaxis, and percentage of patients with mechanical VTE prophylaxis prescribed in accordance with local hospital guidelines. Auditors were instructed to assess appropriateness of therapy taking into account the patient's:

- clinical category and admission diagnosis
- VTE risk factors
- any contraindications to VTE prophylaxis.

Where a VTE risk assessment was not documented, auditors were required to undertake a risk assessment to assess appropriateness of therapy. Auditors were instructed to assess appropriateness of therapy whether VTE prophylaxis was prescribed or not and consult with a clinician (senior medical officer, physician) where they were unsure about whether the prescribed therapy was appropriate according to guidelines or not. A paper-based supplementary audit tool developed by The Canberra Hospital was provided to assist auditors "walk through" the VTE risk assessment and record the outcome for each patient (see Appendix 3). Hospitals were instructed to modify the paper-based audit tool where necessary to reflect their local hospital VTE prevention guidelines. A teleconference and on line training session was provided by the Commission to train auditors on how to audit appropriateness and use the tool.

Hospitals were provided with pre and post-implementation audit tools, a user guide and resource materials to educate staff. The audit tool was an automated Excel spreadsheet that allowed hospitals to record and submit their audit results. Coordinators were able to send the file electronically to a corporate email address at the Commission when the audit was completed

Two online education sessions were provided to familiarise project coordinators or teams with the data elements and the audit tool. The audit was to be conducted by two clinicians together, preferably the project officer and a registered nurse (if the project officer was not a nurse), pharmacist or medical officer. The data was submitted electronically to the Commission.

Each hospital was required to audit a random sample of current inpatients of greater than twenty-four hours admission using a NIMC. Post-implementation inpatients with a pilot chart were audited. The sample size was a minimum of 60 patients per site (all patients if less than sixty patients were identified) or 20% of patients, whichever was greater. Data collection occurred over a four week period. The pre-implementation audit was to be completed before staff education was provided.

Paediatric patients and patients in wards using the long-stay NIMC were excluded.

Pre-implementation auditing included measuring the rate of VTE risk assessment as recorded consistent with local hospital policy or guidelines (e.g. noted on a general risk assessment form or VTE risk assessment form).

For post-implementation auditing, participating hospitals were required to audit the same number of pilot charts and use the same wards. Hospitals were asked to use the same team to complete both audits for consistency of data collection. The post-implementation audit was to be completed five to six months after implementation of the pilot chart.

To measure risk assessment and mechanical prophylaxis prescribing for the pre-implementation audit, hospitals measured compliance with local hospital policies for documenting risk assessment and mechanical prophylaxis ordering. This was compared to the post-implementation audit rate of VTE risk assessment that was documented in the risk assessment section of the pilot chart. In addition, hospitals were asked to record where the VTE risk assessment and mechanical VTE prophylaxis orders were documented in both clinical audits.

A copy of the audit parameters forms Appendix 2 to this report.

2. Implementation experience survey

An implementation experience survey was conducted to obtain feedback from hospitals on the experience of introducing the pilot NIMC and the context in which the intervention occurred.

The objectives of the survey were to:

- gain an understanding of the issues involved and resources required to implement an NIMC with a dedicated VTE prophylaxis section across a broad range of Australian hospitals
- identify barriers to implementation as well as strategies for overcoming these barriers
- inform the development of a national implementation strategy for a NIMC with a pre-printed VTE prophylaxis section

The survey included a series of questions that covered four main areas:

- existing VTE risk prevention policies and forms
- feedback on the pilot educational materials supplied by the Commission
- feedback on the pilot audit parameters, audit tool and audit tool user guide
- implementation experience including issues and barriers, unintended consequences from using the pilot NIMC, lessons learnt and recommendations for changes to the VTE section.

The survey was administered as an online survey using proprietary survey software. The survey contained closed and open ended questions and, for some questions, a Likert rating scale was used (see Appendix 6 for a copy of the survey instrument).

One of the pilot site hospitals tested the survey to ensure the questions were clear and the online tool was functional and easy to use.

The survey was conducted in December 2012. An email with the link to the survey was sent to all project coordinators after sites had completed their post-implementation audits. Project coordinators were instructed to complete the survey liaising with other staff members and, where necessary, ensuring the survey responses represented an accurate record of the hospital's experience.

3. Issues Register

An issues register was established for sites to report issues (including adverse events resulting from inclusion of the VTE section on the NIMC) and suggest improvements. Issues were emailed to the Commission and reviewed by the Anticoagulation Working Party.

4. Data analysis

Data were summarised using descriptive statistics. Differences in proportions between pre and post-implementation audits were examined using chi-square tests at 5% significance level. Ninety-five percent confidence intervals for proportions or differences in proportions were calculated using the normal approximation. Sensitivity analysis was conducted to assess the effects of hospital clustering on the tests of differences between proportions (results were not materially changed except for slightly wider confidence intervals). All data were analysed using SAS 9.2 (SAS Institute, USA).

In the quantitative analysis, data from two hospitals were excluded because their samples did not conform to pilot requirements. Three hospitals that participated in the phase 1 and 2 pilots, and that had a NIMC with pre-printed VTE section in place for approximately two and a half years, were also excluded from the aggregate analysis to ensure a uniform sample. Data from these three hospitals were analysed separately. The data from remaining fourteen health services (representing fifteen hospitals) have been included in the aggregate analysis on the following pages.

5. Participation

Fifteen health services (representing sixteen hospitals) responded to the expression of interest circulated in late January 2012. One of these was ineligible to participate because they did not use the NIMC.

In addition, eight hospitals from the Phase 1 Pilot agreed to participate in the Phase 2 Pilot. Four of the hospitals subsequently withdrew from the study. Three hospitals could not meet the required timelines for the pilot and the fourth hospital decided to withdraw because senior clinicians at the hospital did not support involvement in the pilot.

All hospitals were required to provide written approval to participate from their area or local hospital Chief Executive Officer.

In eighteen hospitals the project was considered a quality improvement activity that did not require formal human research ethics review. One hospital was required to obtain approval from their human research ethics committee to participate.

5. Results

Pre and post-implementation audits

Audit data were received from eighteen health services (19 hospitals) across five jurisdictions (see Table 5.1 below). The nineteen hospitals included large tertiary referral hospitals, regional/district and metropolitan hospitals, rural hospitals and private hospitals.

Table 5.1 Pilot hospitals

	Public Hospitals	Private Hospitals	Total Hospitals
ACT	1	0	1
New South Wales	6	1	7
Queensland	0	1	1
South Australia	3	0	3
Victoria	5	1	6
TOTAL	**15**	**3**	**18**

Number of medication charts audited

The total number of pilot charts audited was 1429 for the pre-implementation audit and 1327 for the post-implementation audit. Both audits exceeded the minimum required sample size of 1200 NIMCs specified in the original project plan.

The number of patients audited pre-implementation by the hospitals ranged from 44 to 131 with most hospitals auditing around 60 patients. Two small hospitals audited less than 50 patients.

The number of patients per hospital audited post-implementation ranged from 33 to 119. Three hospitals audited less than 50 patients.

Patient population

A total of 1765 patients were audited in this study, 917 in the baseline audit and 848 in the post-implementation audit. The number of patients in each clinical category was similar across both audits (see Table 5.2 below).

Table 5.2 Patients by clinical category

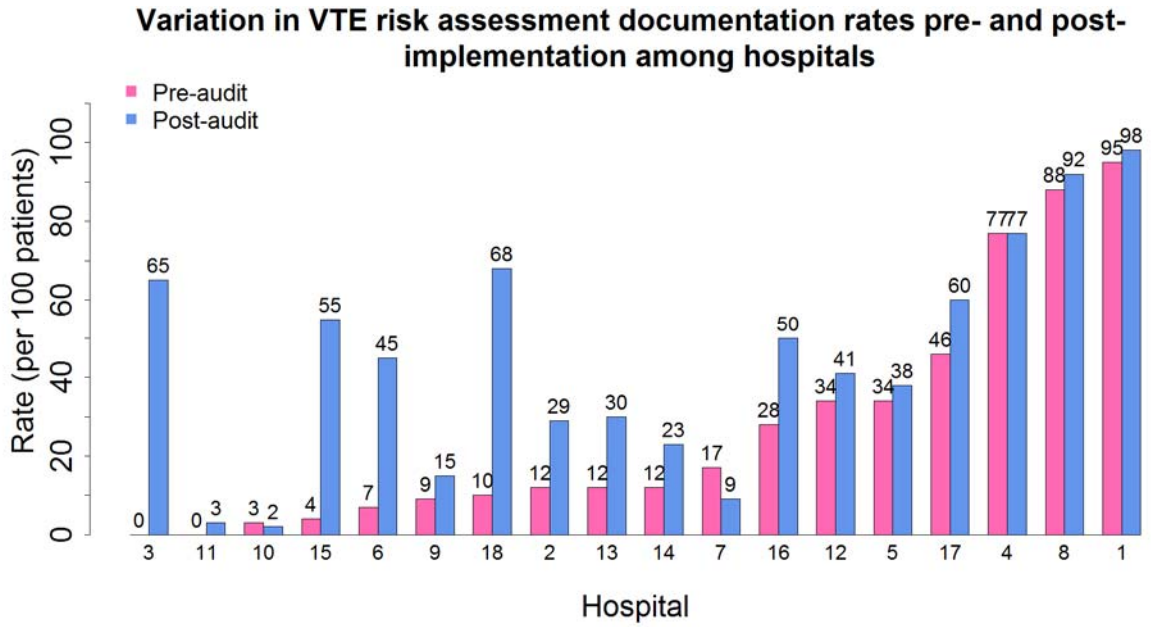
Clinical category	Pre-implementation audit Number of patients (%)	Post-implementation audit Number of patients (%)
Surgical	339 (37.0%)	332 (39.2%)
Medical	496 (54.1 %)	471 (55.5%)
Cancer	25 (2.7%)	24 (2.8%)
Pregnancy/childbirth	19 (2.1%)	14 (1.7%)
Other	37 (4.0%)	1 (0.1%)
Not stated	1 (0%)	6 (0.01%)
Total patients	**917**	**848**

VTE risk assessment documentation

Following introduction of the pilot NIMC, there was a significant increase in documentation of a VTE risk assessment from 35.9% to 57.2%, an increase of 21.3% (95% CI: 16.6, 26.0 p<0.001).

While VTE risk assessment documentation increased overall there was large variation in the rates across hospitals in both audits. VTE risk assessment documentation ranged from 0% to 95% in the baseline audit and from 2% to 98% in the post-implementation audit (see Figure 5.1 below). Three hospitals had documentation rates over 75% in both audits while another seven hospitals had a substantial increase in the documentation of VTE risk between the pre and post-implementation audit.

Figure 5.1

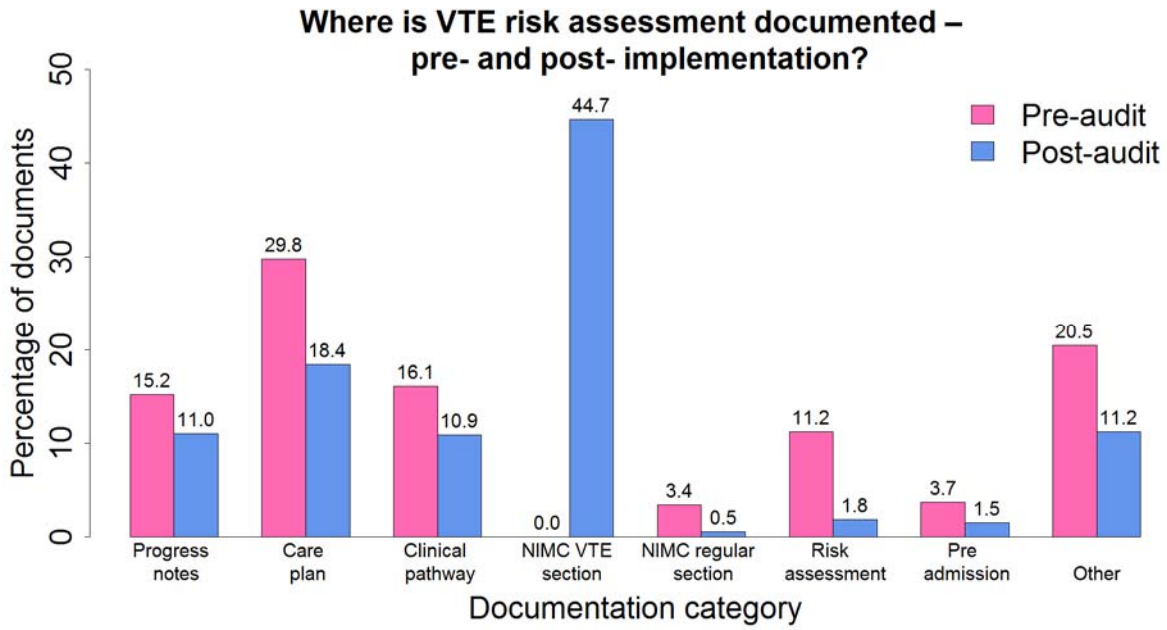


Forty-five percent of patients had their VTE risk documented in the risk assessment section of the pilot chart in the post-implementation audit (see Figure 5.2 below). Audit data indicates that VTE risk is documented in a number of other places including:

- in the clinical record such as the care plan (18.4%)
- progress notes (11.0%)
- clinical pathways (10.9%)
- risk assessment/pre-admission forms (1.8% & 1.5%).

Some patients had their VTE risk recorded in multiple locations (16.7%). Documentation in other areas of the clinical record decreased slightly between pre and post-implementation audits as evidenced in Figure 5.2 below. These results indicate that there is significant variation in hospital practice of documenting VTE risk assessment.

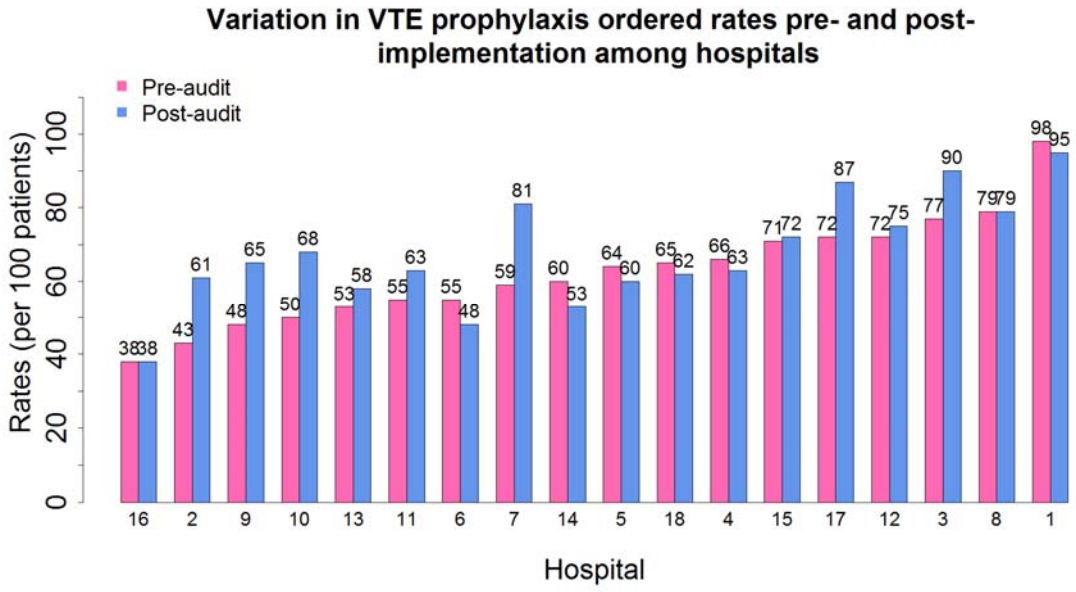
Figure 5.2



VTE prophylaxis prescribing

VTE prophylaxis prescribing increased overall from 65.1% to 69.3% (P=0.0724) (see Figure 5.3 below for individual hospital results). As with documentation of VTE risk assessment, there is significant variation in hospitals' rates of VTE prophylaxis, from 38 to 98% in the baseline and from 38% to 95% in the post-implementation audit. Six hospitals had baseline rates of prophylaxis over 70% which were maintained or improved in the post-implementation audit and six hospitals had substantial increases in their rates.

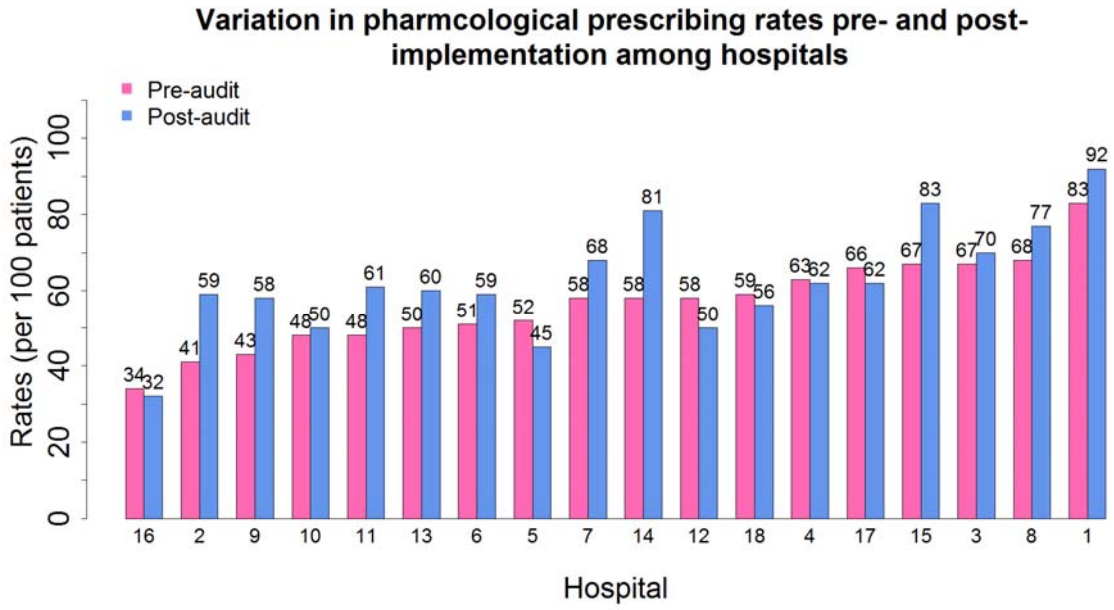
Figure 4.3



Pharmacological VTE prophylaxis prescribing

The rate of pharmacological prophylaxis prescribing increased significantly from 59.4% pre-implementation to 64.4% post-implementation (0.3%, 9.6%, *P* = 0.035) (see Figure 5.5 for individual hospital results). Four hospitals had rates over 70% in the post-implementation audit and 6 hospitals had substantial improvements between baseline and post-implementation.

Figure 5.5



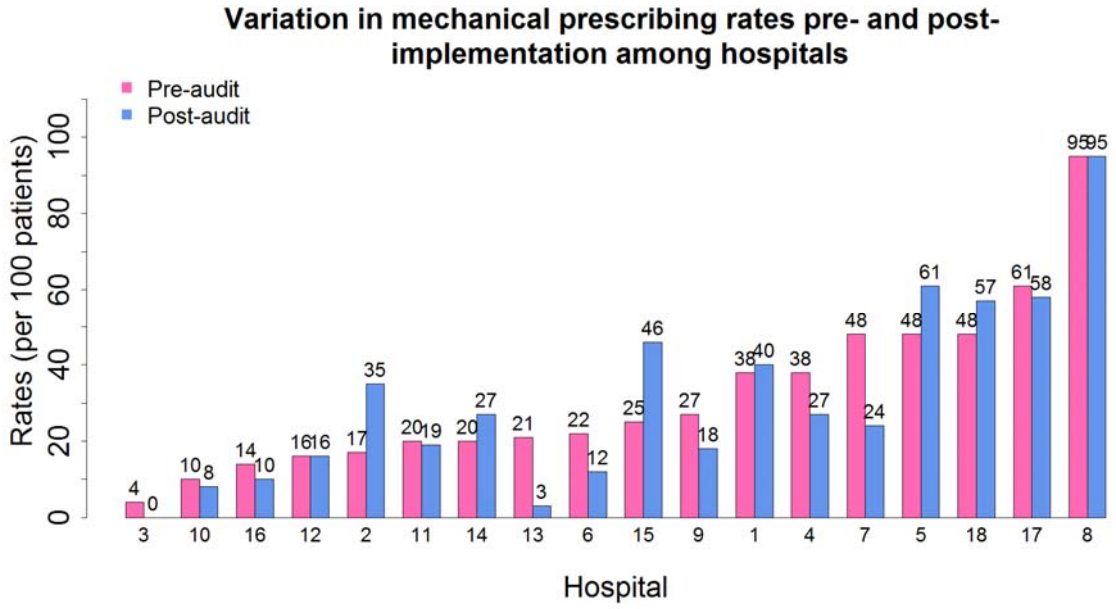
Pharmacological VTE prophylaxis prescribing in the VTE section

Almost two-thirds (64.5%) of all patients audited had pharmacological VTE prophylaxis prescribed. Of these patients, 78.4% of their anticoagulant orders were correctly written in the pre-printed VTE prophylaxis section of the chart.

Mechanical VTE prophylaxis prescribing

There was no change in the use of mechanical prophylaxis prescribing between the pre and post-implementation audits: 33.6% compared to 32.3% (not significant). However, there was significant variation in the rates of mechanical prophylaxis across the pilot hospitals. Three hospitals had a substantial increase in the rates of mechanical prophylaxis prescribing between the pre and post-implementation audits (see Figure 5.6 for individual hospital results).

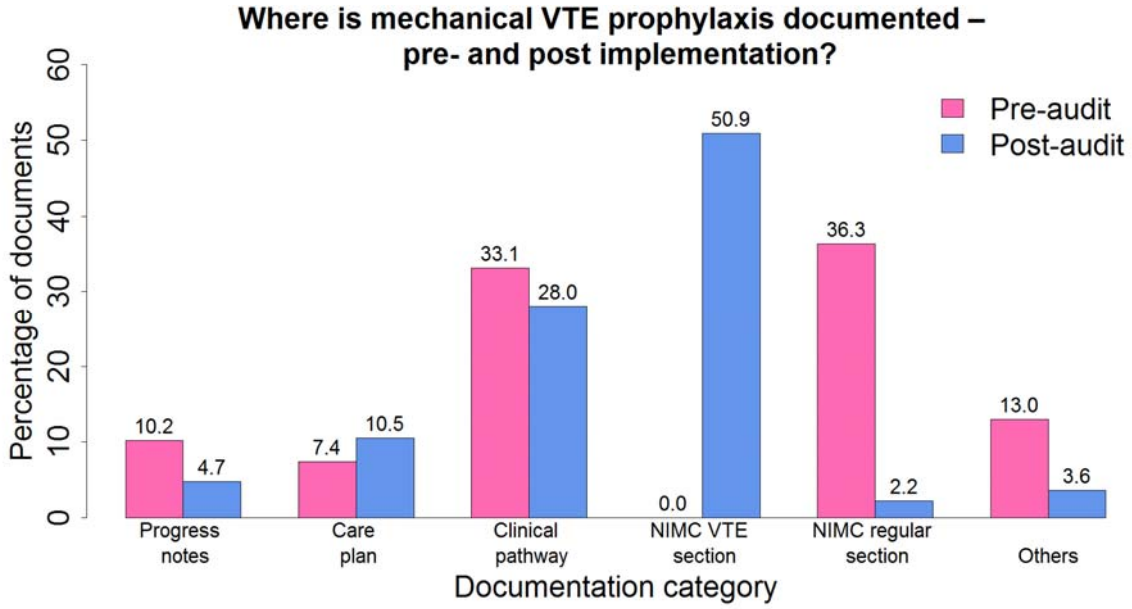
Figure 5.6



Location of mechanical prophylaxis prescribing

Phase 2 Pilot provided additional data on where mechanical VTE prophylaxis was documented. As with VTE risk assessment documentation, mechanical VTE prophylaxis orders and checks were documented in a number of places in the patient record including the regular medicines section of the NIMC, clinical pathways, progress notes and care plans (see Figure 5.7 below). Introduction of the VTE section substantially increased documentation of mechanical VTE prophylaxis on the NIMC (36.3% pre-implementation vs. 53.1% post-implementation).

Figure 5.7

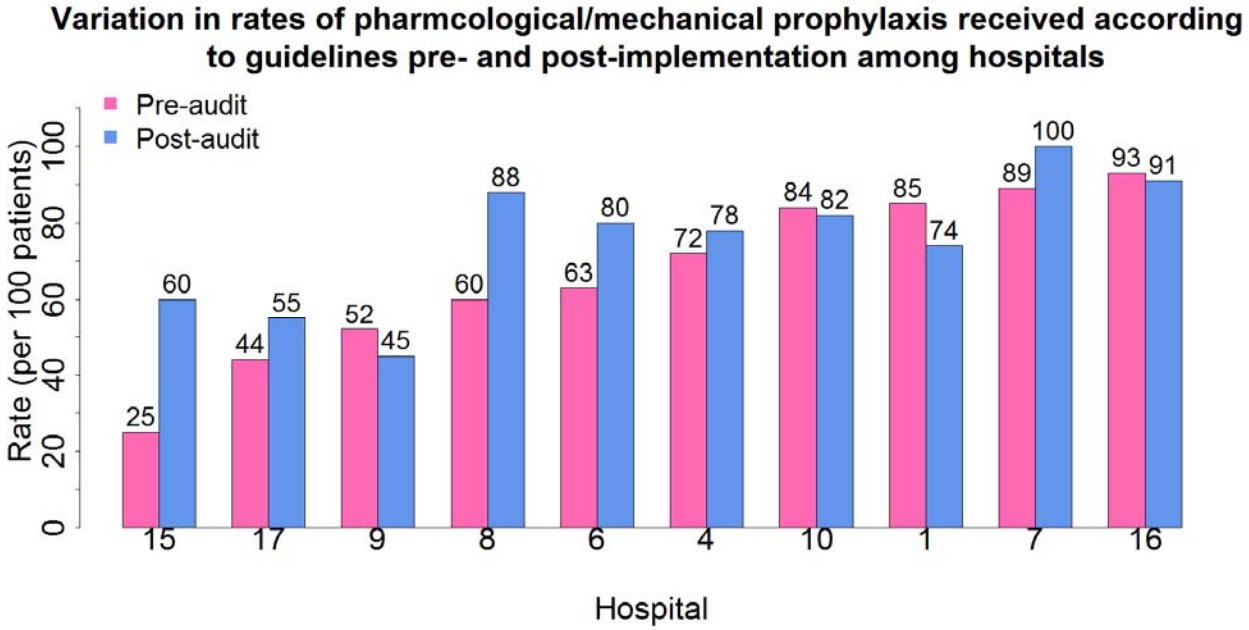


Prescribing in accordance with hospital VTE prevention policy

Only ten of the eighteen health services with VTE prevention policies completed the audits as instructed. Eight hospitals failed to provide complete data by only assessing appropriateness where some form of VTE prevention therapy was ordered in either the pre or post-implementation audit or both. These data were excluded from the analysis.

In the pre-implementation audit, 66.6% (432/649 patients) were treated according to the hospital's VTE prevention guidelines. This increased to 74.7% (441/590 patients) in the post-implementation audit, an increase of 8.2%, 95% CI 3.0%, 13.4% p=0.002. There was marked variation in the results across hospitals (see Figure 5.8 below). Overall appropriateness of therapy ranged from 25% to 93% in the baseline audit and from 45% to 100% in the post-implementation audit. Six hospitals improved while four hospitals had similar or worse results between the pre and post-implementation audits. There were a number of limitations to the interpretation of this data.These are discussed in Section 5.

Figure 5.8*



*Note that hospitals 2, 3, 5, 11, 12,13, 14 and 18 were excluded from this analysis due to missing data.

Effect on safety features of the NIMC

An important objective of the pilot was to assess whether including a pre-printed VTE prophylaxis section on the NIMC would negatively affect other safety features of the NIMC with the potential to cause patient harm.

There were concerns that designating a specific section of the NIMC for VTE prophylaxis may increase the number of active medication charts per patient. Multiple charts carry a risk of medicines not being administered as the additional chart(s) may be misplaced or filed away. They may also increase the risk of duplicate orders for anticoagulants.

The audit results indicate that the number of charts used per patient did not increase. The average number of charts per patient was 1.56 pre-implementation compared with 1.56 post-implementation. Almost two-thirds of the patients in the pilot were prescribed prophylaxis indicating that the majority of patients in hospital for more than twenty-four hours had VTE prophylaxis ordered on their chart although there was significant variation in rates across the participating hospitals.

Unintended consequences of the pre-printed VTE prophylaxis section

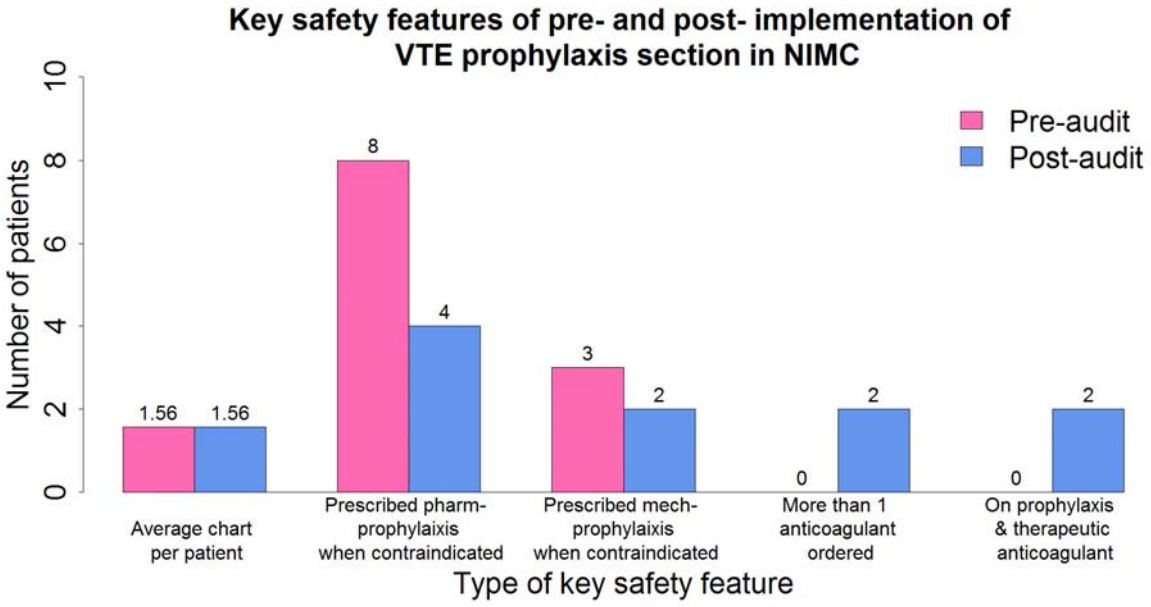
Potential safety risks of including the VTE prophylaxis section are presented in Figure 5.9 below.

There were two patients in the post-implementation audit with current pharmacological VTE prophylaxis orders in both the VTE and regular medicine sections. Comments on one of these orders indicated that the duplication was picked up and one of the orders was ceased.

Two patients had active orders for both pharmacological VTE prophylaxis and therapeutic anticoagulant therapy in the post-implementation audit. Both of these patients were reported to be on a combination of warfarin and VTE prophylaxis. There was no pre-implementation data available to compare with these results.

There were eight patients prescribed pharmacological prophylaxis whose medical records indicated it was contraindicated in the pre-implementation audit and four in the post-implementation audit. There were three patients prescribed mechanical prophylaxis whose medical records noted a contraindication in the pre-implementation audit and two post-implementation.

Figure 5.9



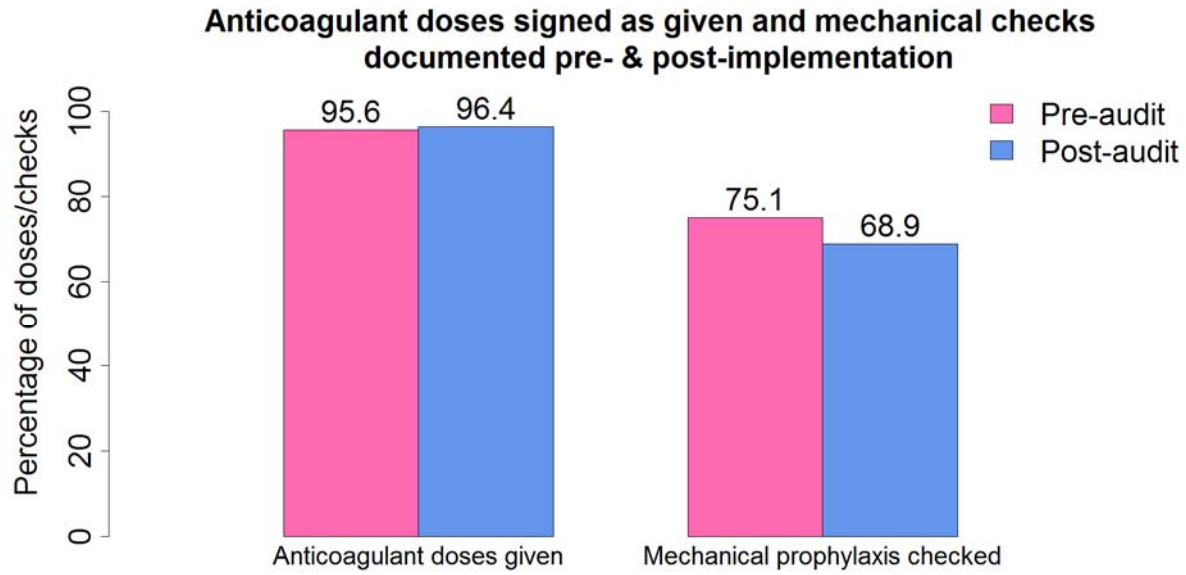
Note. 0 indicates data was not collected.

Administration errors

The final objective of the study was to measure VTE prophylaxis prescription and administration errors. The latter was measured as the number of doses not documented as administered (see Figure 5.10 below). There were similar numbers of doses of anticoagulant ordered that were not signed as administered between the pre-implementation and the post-implementation audits: 4.4% vs. 3.6%.

There was a significant decrease in the number of checks performed on mechanical prophylaxis devices that were documented (75.1% of total checks signed for pre-implementation compared to 68.9% post-implementation (-6.2% [-8.8%, -3.7%] $P < 0.001$). As noted above, mechanical VTE prophylaxis was documented in a number of places in the medical record (see Figure 5.7). Introduction of the pre-printed VTE prophylaxis section substantially reduced documentation of mechanical prophylaxis in the regular medicine section of the NIMC (36.3% pre-implementation vs. 2.2% post-implementation).

Figure 5.10



Implementation experience survey

All eighteen health services completed the implementation experience survey between December 2012 and early January 2013.

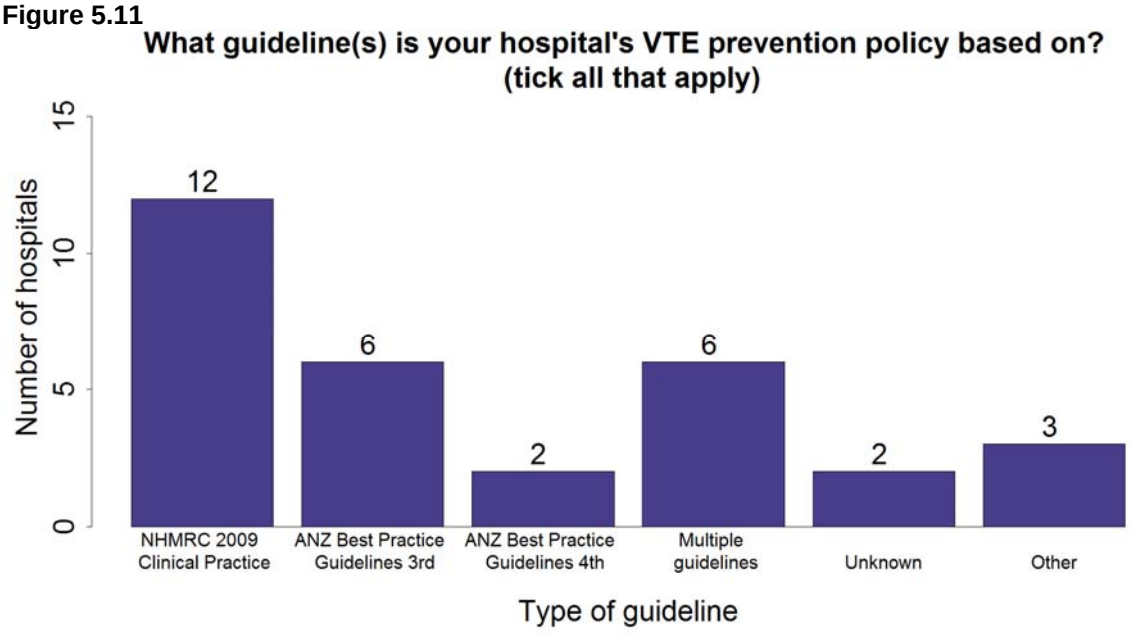
Partial versus full implementation of the pilot NIMC with VTE prophylaxis section

Twelve hospitals introduced the pilot chart into all areas of the hospital while seven implemented the chart in selected wards only. Where implementation occurred in selected wards only, the number of wards where the pilot NIMC with VTE section was implemented varied from one to seven and included general, medical, surgical, cardiac, aged care and rehabilitation wards or units.

Hospital VTE prevention policies and forms

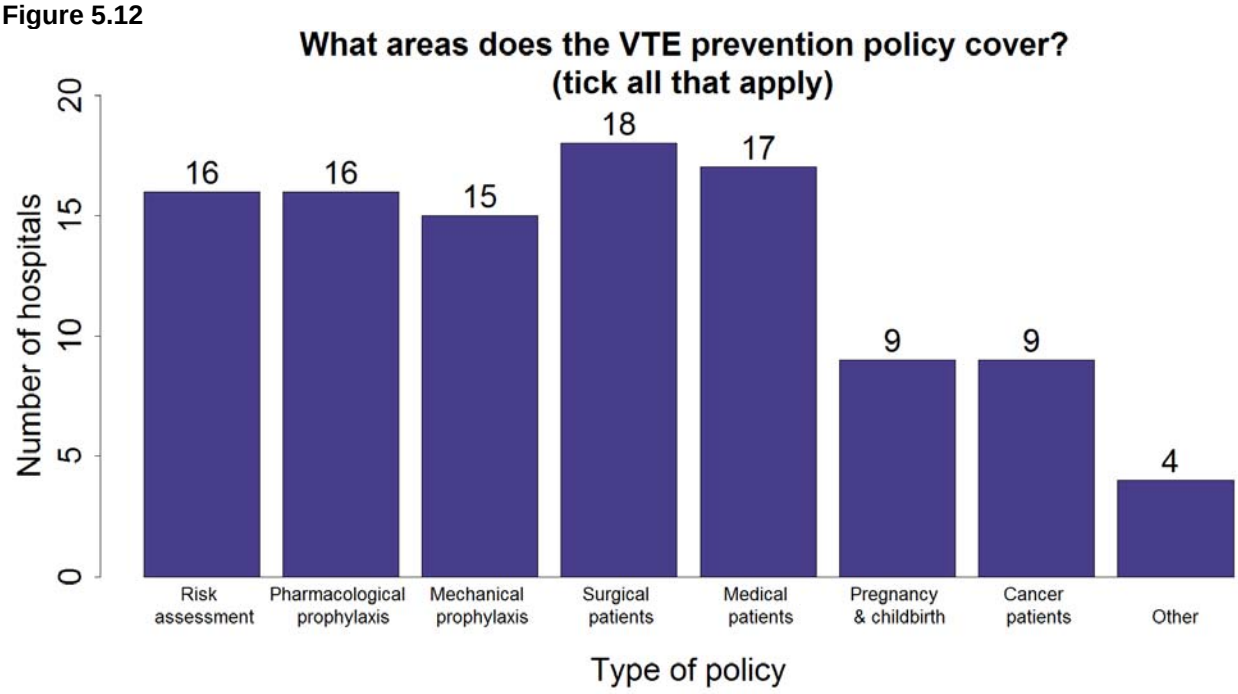
Eighteen hospitals reported that they had a formal VTE prevention policy. Twelve hospitals (67%) reported that their policy referenced the 2009 Clinical Practice Guideline for the Prevention of VTE in Patients Admitted to Australian Hospitals. Some hospital policies referenced several clinical guidelines. Two hospitals reported not knowing what guideline their policy was based on. In the "other" category, two hospitals reported a state policy directive as the relevant VTE prevention policy. (see Figure 5.11 below)

Figure 5.11



Hospitals reported that their VTE prevention policies covered a number of practice areas with all policies covering surgical patients and nearly all covering medical patients (see Figure 5.12 below).

Figure 5.12

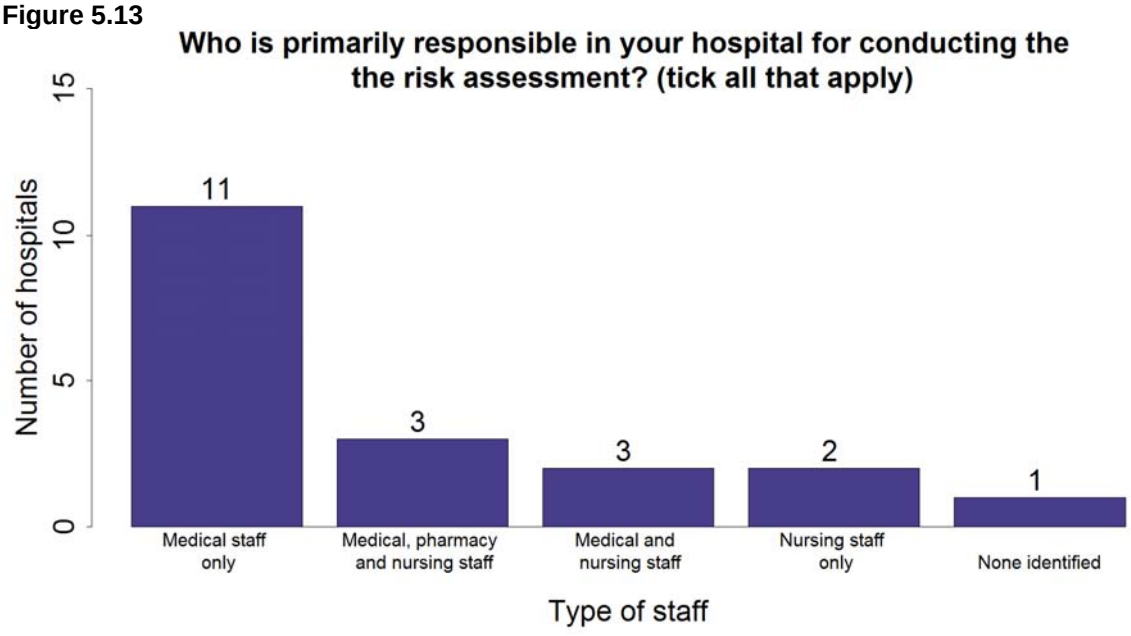


Ten hospitals reported having a VTE risk assessment form in use in their hospital.

Responsibility for undertaking the VTE risk assessment

Medical staff were solely responsible for assessing VTE risk in 11 hospitals. Nursing staff had sole responsibility for assessing VTE risk in two hospitals and joint responsibility for assessing VTE risk, with either medical or pharmacy staff, in another five hospitals. In one hospital, no primary responsibility was identified. The numbers exceed total number of responding hospitals as the question allowed for multiple responses (Figure 5.13 below).

Figure 5.13



Staff education

Hospitals reported providing short education sessions on the pilot NIMC with VTE prophylaxis section to nursing, medical and pharmacy staff.

Eight hospitals reported the education sessions were up to fifteen minutes in length while another eleven reported sessions of between fifteen and thirty minutes. Hospitals ran a mixture of group and one-on-one sessions. The number of sessions per hospital ranged from one to twenty-eight with an average of eight sessions.

Most hospitals conducted some other education activities in association with the VTE pilot including:

- VTE awareness day/week (two hospitals)
- inclusion in regular medical/nursing orientation days (three hospitals)
- frequent emails, articles, or newsletters (four hospitals)
- introduction of standard risk assessment tool and/or policy (five hospitals)
- audit and feedback (two hospitals)
- one on one mentoring of medical staff (two hospitals)
- VTE poster competition (one hospital)

Educational resources provided by the Commission

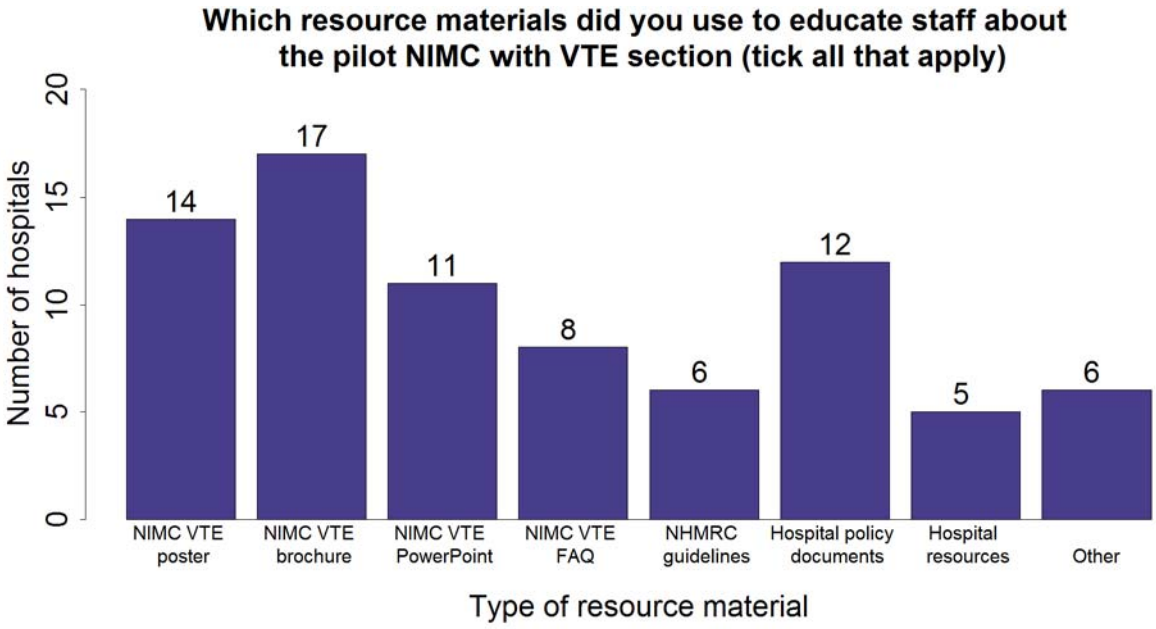
Commission-provided educational materials included a poster, brochure, PowerPoint training presentation and frequently asked questions document. All of these materials were rated as being useful with the NIMC VTE brochure and poster as the most useful overall.

Fourteen hospitals reported using the poster to educate staff and seventeen reported using the brochure (see Figure 5.14 below). Twelve hospitals reported using hospital policy documents together with the Commission resources to educate staff about the NIMC with VTE section indicating that the majority used the VTE pilot as an opportunity to educate staff more broadly on the hospital's VTE prevention policy/guidelines.

Comments from hospital project coordinators:

- "I did like the brochure as this was widely distributed to all medical staff from interns through to orthopaedic surgeons"
- "Posters were good as they could be displayed in staff areas"
- "The powerpoint presentation was a very useful resource as most of our education occurred via large group inservices. Having this already prepared by the Commission removed a potentially time-consuming part of the education process. We were also able to send the presentation to the CDNs [clinical development nurse] for use for ongoing education/inservices…"

Figure 5.14



Phase 2 Pilot audit tool and user guide

Hospitals were provided with the pre and post-implementation audit tools, a user guide and staff educational materials. A screenshot of the pre-implementation audit tool is provided below in Figure 5.15.

Figure 5.15 Phase 2 Pilot pre-implementation audit tool

Audit Item	Audit Result	Comments
Number of current medication charts		Count of charts
What is the category of prophylaxis?	Surgical Medical Cancer Pregnancy & Childbirth Other Please Specify	Specify if other
VTE Risk Assessment Questions		
Is VTE risk assessment documented anywhere ?	○ Yes ○ No	Yes/No
If VTE risk is documented where is it documented?	Progress Notes Care Plan Clinical Pathway NIMC VTE Section NIMC Regular Section Risk Assessment Form Pre Admission Checklist Not Documented Anywhere Other Please Specify	Specify if other
Is pharmacological VTE prophylaxis documented as contraindicated?	○ Yes ○ No	Yes/No
If pharmacological prophylaxis is contraindicated, is contraindication specified?	○ Yes ○ No	If yes specify contraindication
Is mechanical VTE prophylaxis documented as contraindicated?	○ Yes ○ No	
If mechanical prophylaxis is contraindicated, is contraindication specified?	○ Yes ○ No	If yes specify contraindication
VTE prophylaxis ordered Question		
Is VTE prophylaxis ordered? (pharmacological and/or mechanical)	○ Yes ○ No	Yes/No
Pharmacological VTE Prophylaxis Questions		
Is pharmacological VTE prophylaxis prescribed anywhere?	○ Yes ○ No	Yes/No
Is the recommended pharmacological VTE prophylaxis prescribed in accordance with your hospital guidelines?	○ Yes ○ No	Yes/No
What is the number of doses of anticoagulant required?		count of doses
What is the number of doses of anticoagulant documented as given?		count of doses
Mechanical VTE Prophylaxis Questions		
	○ Yes ○ No	

VTE_Audit / Data_Template / Data Sent 17-May-12 /

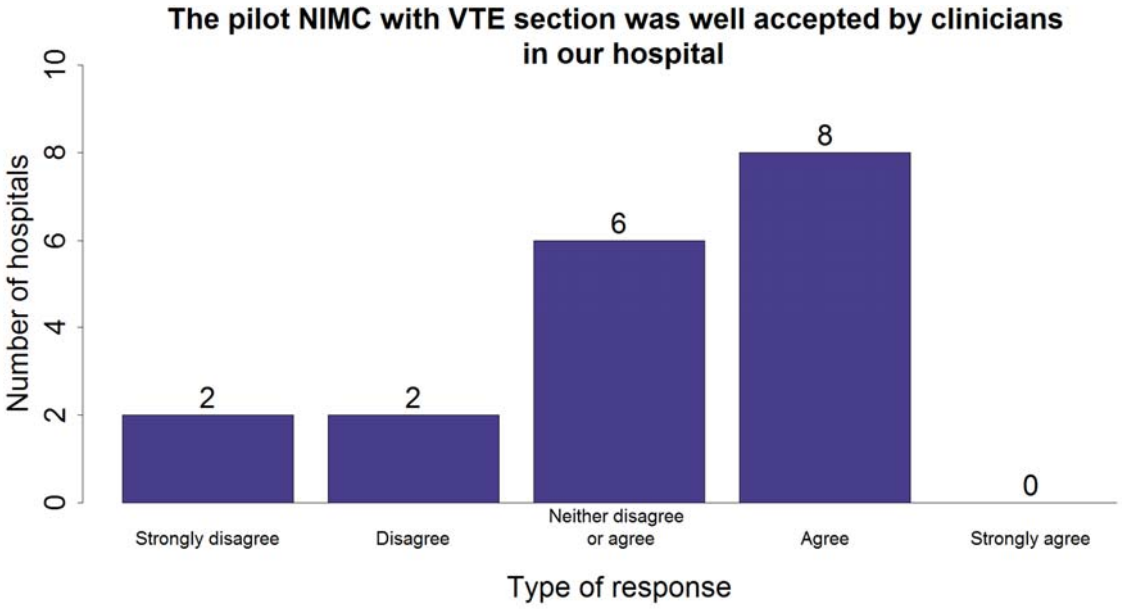
Fourteen hospitals either strongly agreed or agreed that the audit tool was easy to use and thirteen hospitals strongly agreed or agreed that the user guide provided clear guidance on how to complete the audit.

Thirteen hospitals reported that the audit data elements were easy to collect. One hospital reported a lack of resources to undertake the audit and another hospital reported that it was not clear how to complete the audit when the patient was fully anti-coagulated.

NIMC VTE Phase 2 Pilot implementation experience

When asked to rate the level of clinician acceptance of the pilot chart, eight hospitals agreed that the pilot chart was well accepted by clinicians, six were neutral and four disagreed or strongly disagreed.

Figure 5.16



Prescribing VTE prophylaxis according to hospital guidelines

Hospital views were sought on the two data items, the supplementary audit tool and the process used to assess VTE prophylaxis prescribing according to hospital guidelines.

Eighteen hospitals collected the audit parameters and sixteen hospitals responded to these questions in the survey. Thirteen hospitals reported the supplementary audit tool was easy to use and eleven hospitals reported that the audit parameters allowed them to assess their hospital's practice accurately. Based on the results, eleven hospitals reported they had "more work to do" to improve rates of appropriate VTE prophylaxis.

A few hospitals reported some issues using the supplementary audit tool. For example, when a VTE risk assessment was not documented, the auditor was required to judge whether the VTE prophylaxis prescribed (or not prescribed) was appropriate. This was reported to be difficult if there was no documentation on why the clinician had, or had not, prescribed prophylaxis. In other cases, it was difficult for the auditor to determine if the reported contraindications were severe enough to exclude mechanical prophylaxis without actually assessing the patient e.g. peripheral vascular disease, leg ulcers, etc. It was also difficult to assess appropriateness where the hospital guidelines did not cover specific patient groups, specific anticoagulants or clinical situations.

Fourteen hospitals reported they would undertake further quality improvement activities in the area of VTE prevention. These activities included:

- ongoing audits for compliance and improvement (six hospitals)

- education on mechanical prophylaxis and appropriate documentation (five hospitals)
- education on VTE risk assessment or development of a standardised risk assessment tool (four hospitals)
- more education at orientation for medical officers (five hospitals)
- education on dosage adjustment in renal failure (one hospital).

Ten hospitals agreed, or strongly agreed, that the pre-printed VTE prophylaxis section had improved appropriate prescribing of VTE prophylaxis for patients at risk of VTE.

Barriers to implementation

Project teams were asked to report on specific barriers that they encountered in implementing the pilot NIMC. Thirteen hospitals reported some barriers to implementation of the pilot NIMC.

Unwillingness to document a VTE risk assessment was reported as a barrier in a number of hospitals. In some cases it was reported that clinicians were unaware of the correct process, or that they needed to document a risk assessment when no VTE prophylaxis was ordered. In some hospitals this was reported as a lack of standardised practice across the hospital.

Comments from project coordinators:

- "Main barrier is change of practice for our nursing, medical and pharmacy staff in documenting risk assessment on the medication chart, and their perception of the risk in doing so. This will require ongoing education to build confidence and consistency in the process…."
- "Not realising that all patients need to have risk assessment completed, not just the ones where they prescribe prophylaxis (despite this being part of hospital guideline).."
- "We don't have a specific VTE risk tool so risk assessment is done differently by each clinician and sometimes overlooked."

Other reported barriers were the lack of clinical or executive support, limited resources for education and/or project coordination and support and the requirement to continually educate clinicians because of staff turnover and rotations,.

- "Difficulty in gaining medical buy-in to provide education and support. Frequent transitioning of staff through clinical areas".

NIMCs without the VTE section re-entering wards was also reported as a barrier by some sites. Similarly, implementing the pilot NIMC on selected wards proved difficult as both the pilot and the regular NIMC charts were in circulation.

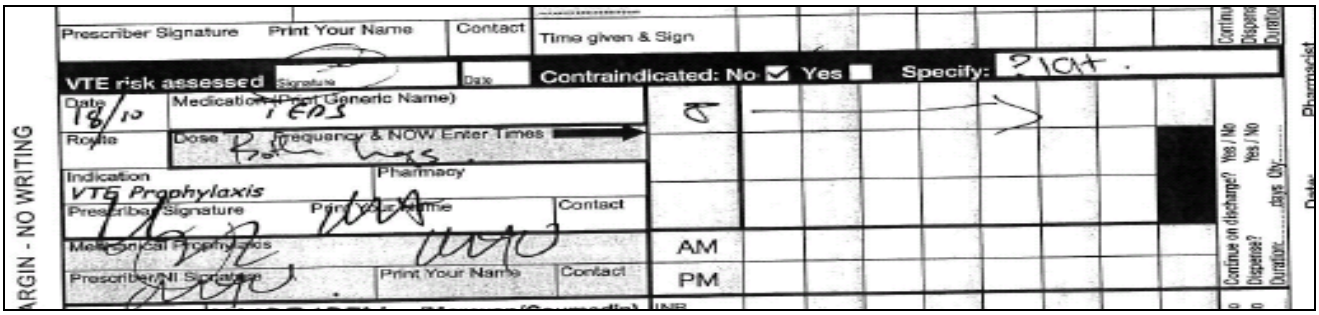
- "Conducting the pilot on selected wards was logistically difficult as both the piloted and the regular NIMC charts were being used."

Unintended consequences

Very few incidents were reported and are provided below:

- enoxaparin was charted in the variable dose section of the NIMC (one hospital)
- therapeutic anticoagulation was prescribed in the VTE prophylaxis section (with no adverse consequences) (one hospital)
- incorrect usage of the VTE section (TED stockings charted in pharmacological prophylaxis section, see Example 1 below) (one hospital)
- patient prescribed TED stockings when not indicated (one hospital)
- increased number of charts used (one hospital). (At an individual hospital and aggregate level this was not supported by the audit results)

Figure 5.17 Mechanical prophylaxis ordered in the pharmacological prophylaxis section



VTE risk assessment section

Hospitals were asked to provide specific feedback on the VTE risk assessment section. Nine hospitals provided feedback and several themes emerged.

Three hospitals reported that prescribing of VTE prophylaxis indicated that the patient was risk assessed and hence there was no need to document this.

- "They don't like having to sign the risk assessment section when they have already signed the pharmacological prescription. It should be assumed they say that the risk assessment has been done if a drug or mechanical Rx is prescribed."

One hospital reported that nurses and pharmacists were not confident completing VTE risk assessment and further education was required.

Another hospital reported confusion with the contraindications field.

- "There was some confusion about the contraindications section (does it need to be filled out if the patient does not require prophylaxis). Also, does the contraindication section cover both pharmacological and mechanical prophylaxis. Some clinicians asked about whether or not the risk assessment section needs to be filled out on all charts if the patient has multiple charts."

One hospital reported that the risk assessment section was considered inadequate.

- "Medical and nursing staff both fed back that the area for risk assessment signature was meaningless. In our hospital we use a risk assessment tool which is applied to the NIMC that allows clinicians to allocate a risk level (high or lower) which then informs their prescribing. The piloted risk assessment section as a signature only did not adequately assess risk. We would suggest further modifications in future versions."

Suggested design improvements to the VTE section

Six hospitals recommended some changes to the VTE section.

Two hospitals suggested that the risk assessment section should include an area where a risk level or score could be documented. Two hospitals recommended making the contraindications section clearer to indicate if the contraindication was to pharmacological or mechanical prophylaxis or both. Two hospitals recommended that the risk assessment section should include wording to indicate that a risk assessment had been completed and VTE prophylaxis was not required.

One hospital recommended a clearer separation of the pharmacological and mechanical prophylaxis sections in the prescribing section to prevent medical officers signing in the wrong field. This design suggestion was also reported in the Phase 1 Pilot by several hospitals and had been addressed by the inclusion of a dark line between the pharmacological and mechanical prophylaxis sections.

Lessons learned

Improving use of VTE prophylaxis requires the commitment and support of hospital executive and clinical leaders. Allocating sufficient resources for training and ongoing education is essential to support any sustained change in practice.

A project coordinator from a large teaching hospital provided the following comment:

- "Prescribers need regular prompting for some time to fill the VTE sections appropriately. I think compliance improves over time as the chart's use becomes more familiar and accepted, however continuing education is necessary for some time at the beginning."

There was the suggestion that compliance would further improve once the VTE section was included in the national NIMC as this would mean that doctors on rotation from larger teaching hospitals would be familiar with the VTE section and hence more likely to use it:

- "…(B)eing part of a project when other health services were not. Medical staff come to our organisation for a short period of time from a health service that does not do this, so they can't see why we do it here, and they are not here long so don't get into the way of doing it as they are leaving again. National implementation may result in a better compliance".

Issues register

Three hospitals reported issues to the Commission. These issues were also reported in the implementation experience survey. They included:

- confusion with how to use the VTE risk assessment/contraindications section (three hospitals)
- concern that the risk assessment section represents a 'sign off' rather than a process of clinical decision making (one hospital)
- treatment dose of enoxaparin charted in VTE section (one hospital)
- prescribing of enoxaparin and TED stockings as a single order i.e. incorrect use of the VTE section (one hospital).

Confusion reported with the VTE risk assessment section. It was unclear whether the:

- contraindications section included both pharmacological and mechanical prophylaxis and, in the event of contraindications to both, that there was limited space to document details
- VTE risk assessment section (including the contraindications section) needed to be completed if no VTE prophylaxis was prescribed.

6. Discussion

The decision to proceed with a national pilot followed review of other studies[12] which showed that the inclusion of a VTE prophylaxis section in the NIMC improved rates of VTE prophylaxis prescribing.

The aim of the NIMC VTE Phase 2 Pilot was to evaluate the efficacy and safety of a pre-printed VTE risk assessment and prescribing section in the NIMC on VTE risk assessment documentation and prophylaxis prescribing (pharmacological and mechanical) in adult patients admitted to a range of hospitals.

The objectives of the pilot were to assess the:

- utility and acceptability of the pre-printed VTE prophylaxis section for documenting the completion of VTE risk assessment
- effect of the pre-printed VTE prophylaxis section on the rate of VTE prophylaxis prescribing for patients at risk of developing a VTE
- unintended consequences of the pre-printed VTE prophylaxis section including:
    - duplicate prescribing of VTE prophylaxis in any part of the NIMC
    - VTE prophylaxis prescription and administration errors.

The intention was that the Phase 2 Pilot results would build on the results from the Phase 1 Pilot and provide additional evidence for a decision on the inclusion of a VTE prophylaxis prescribing section in the NIMC.

Efficacy of VTE prophylaxis section on NIMC

The inclusion of the VTE prophylaxis section in the NIMC improved the documentation of a VTE risk assessment by 21.3% (35.9% pre-implementation compared to post-implementation 57.2%, 95% CI: 16.6, 26.0 p<0.001). This is a substantial improvement over the Phase 1 Pilot in which the corresponding rates were 9.4% pre-implementation and 17.2% at post-implementation (95% CI: 5.0%,10.5% p<0.0001) indicating the design of the risk assessment section in the Phase 2 Pilot was more acceptable to clinicians. There was a large variation in rates across hospitals.

Pharmacological prophylaxis prescribing overall increased by 5% (59.4% pre-implementation vs. 64.4% post-implementation (p=0.035) a similar result to the Phase 1 Pilot (55.1% pre-implementation vs 62.4% post-implementation p=0.003). Six hospitals reported increases between 10 - 23%. Almost two-thirds (64.5%) of all patients had pharmacological VTE prophylaxis prescribed. Of these patients, 78.4% of their anticoagulant orders were correctly written in the pre-printed VTE prophylaxis section of the chart, an improvement on the Phase 1 Pilot outcomes in which only 66% of post-implementation anticoagulant orders were written in the pre-printed VTE prophylaxis section.

VTE prophylaxis prescribing overall (pharmacological and/or mechanical) increased from 65.2% to 69.3%,(not significant). These results are a slight improvement on the Phase 1 Pilot results in which the corresponding rates of VTE prophylaxis prescribing overall were 58.1% pre-implementation vs. 65.6% post-implementation.

In the ten hospitals measuring prescribing according to hospital's VTE prevention guidelines the increase was significantly higher, 66.65% pre-implementation vs 74.7% post-implementation, an increase of 8.2%, 95% CI 3.0%, 13.4% p=0.002. However there was marked variation in the results across hospitals with six hospitals reporting improvement in appropriate prophylaxis prescribing while four hospitals had similar or worse results following the intervention. There were a number of limitations to this aspect of the evaluation. See limitations section below.

Mechanical VTE prophylaxis ordering remained unchanged between the pre and post-implementation audits (33.6% pre- implementation vs. 32.3% post- implementation *P* = 0.596). This was an improvement over the Phase 1 Pilot where 18.6% of patients had mechanical prophylaxis ordered pre-implementation and 19.2% post-implementation. Only 54% percentage of orders for mechanical prophylaxis were documented on the NIMC post-implementation.There a number of possible reasons for this. Hospitals reported using a variety of places in the medical record to document the ordering and checking of mechanical prophylaxis including care plans, clinical pathways, progress notes and the NIMC VTE prophylaxis section or regular medication space. Many hospital policies require nursing staff to order mechanical prophylaxis and anecdotally, some hospitals reported that this was not always documented. Some hospitals reported that where nurses ordinarily documented mechanical prophylaxis in other areas of the medical record, such as care plans, they were reluctant to also document on the NIMC. Hospitals reported that further education was necessary to overcome this barrier. These results may underestimate the true rate of mechanical prophylaxis being used in participating hospitals.

The increase in overall rates of VTE risk assessment documentation and prophylaxis prescribing provide evidence that the pre-printed VTE prophylaxis section acts as a prompt to remind prescribers to undertake a VTE risk assessment and prescribe appropriate prophylaxis on admission. This adds to the evidence from other studies that have shown that the use of pre-printed stickers, reminders and standardised risk assessment tools can improve rates of appropriate VTE prophylaxis. [6,11-12]

Safety of VTE prophylaxis section on NIMC

Inclusion of the pre-printed VTE prophylaxis section in the NIMC did not increase the average number of charts per patient or increase the risks associated with multiple medication chart use.

Importantly, there were very few reported incidents of duplicate prescribing of anticoagulants and prescribing of VTE prophylaxis when contraindicated in the post-implementation audit. These results were similar to the findings in the Phase 1 Pilot.

Overall there was no evidence that the introduction of the pilot chart increased the risk of patients being prescribed:

- anticoagulant therapy when it was contraindicated
- duplicate anticoagulant therapy
- active orders for both prophylaxis and therapeutic anticoagulant.

The final objective of the study was to measure VTE prophylaxis prescription and administration errors. There were similar numbers of doses of anticoagulant ordered that were not signed as administered between the pre-implementation and the post-implementation audits: 4.4% vs. 3.6%. These results were an improvement on the Phase 1 Pilot results: 12.9% pre-implementation vs. 12.7% post-implementation.

The number of checks performed on mechanical prophylaxis devices documented decreased following introduction of the chart (75.1% of total checks signed for pre-implementation compared to 68.9% post-implementation (-6.2% [-8.8%, -3.7%] *P* < 0.001). Although These results are an improvement on the Phase 1 Pilot (74% pre-implementation vs. 43% post-implementation) they continue to reflect the reluctance of staff to document mechanical checks on the pilot NIMC where the hospital has an established practice of documenting mechanical checks in other areas of the medical record.

No significant harm events were reported to the Commission for recording on the Issues Register. Given this was a large study involving eighteen services and approximately 850 patients (post-implementation audit) these results support the finding that the pre-printed VTE prophylaxis prescribing section in the NIMC can be safely implemented without compromising patient safety.

Table 6.1 Summary: Quantitative audit results for phase 1 and 2 pilots

Audit parameter	**Phase 1 Pilot pre-impl.**	**Phase 1 Pilot post-impl.**	**Phase 2 Pilot pre-impl.**	**Phase 2 Pilot post-impl.**
Documentation of VTE risk assessment in VTE section	0%	17.2%	0%	44.7%
VTE prophylaxis prescribing	58.1%	65.6%	65.2 %	69.3%
Pharmacological VTE prophylaxis prescribing	55.1%	62.4%	59.4%	64.4%
Pharmacological VTE prophylaxis prescribed in VTE section	n.c	66%	n/a	78.6%
Mechanical VTE prophylaxis prescribing	18.6%	19.2%	33.6%	32.3%
% patients who were prescribed pharmacological VTE prophylaxis according to hospital guidelines	n.c	n.c	82.8%	86.8%
% patients who were prescribed mechanical VTE prophylaxis according to hospital guidelines	n.c	n.c	82.1%	82.5%
Safety features and administration errors (raw numbers)				
Audit parameter	**Phase 1 Pilot pre-impl.**	**Phase 1 Pilot post-impl.**	**Phase 2 Pilot pre-impl.**	**Phase 2 Pilot post-impl.**
Average charts per patient	1.54	1.51	1.56	1.56
Patients with pharmacological VTE prophylaxis prescribed in both VTE and regular section	n/c	24	n.c	2
More than one active order for pharmacological VTE prophylaxis	6	4	n.c	2
Patients with active orders for both pharmacological VTE prophylaxis and therapeutic anticoagulant	23	29	n.c	2
Mechanical VTE prophylaxis ordered when contraindicated	n.c	n.c	3	2
Pharmacological VTE prophylaxis ordered when contraindicated	n.c	15	8	4
% anticoagulant doses documented as given	87.1%	87.3%	95.6%	96.4%
% checks of mechanical VTE prophylaxis documented	74%	43%	75.1%	68.9%

n.c. indicates data was not collected.

Acceptability of the VTE prophylaxis section on NIMC

The pilot chart was well accepted by clinicians in eight hospitals, six were neutral and four disagreed or strongly disagreed. These results were similar to the Phase 1 Pilot.

Overall there were fewer issues reported to the issues register compared to the Phase 1 Pilot and less reported incorrect usage of the VTE prophylaxis prescribing section.

Context of implementation

The implementation of a hospital wide policy or protocol that describes how to assess and minimize the risk of VTE and recommends treatment options is considered an essential component of a hospital VTE prevention program.[13-14] Eighteen of the 19 hospitals reported that they had a formal VTE prevention policy. Two thirds reported their policy referenced the 2009 Clinical Practice Guideline for the Prevention of VTE in Patients Admitted to Australian Hospitals compared to 20% in the Phase 1 Pilot. Hospital VTE prevention policies covered a number of practice areas with all policies covering surgical patients and nearly all covering medical patients.

Hospitals used a variety of forms for documenting the VTE risk assessment including care plans, clinical pathways risk assessment for as well as progress notes. Ten hospitals used a risk assessment form. In over half of the hospitals (61%) medical staff were solely responsible for assessing VTE risk, nursing staff had sole responsibility in two hospitals and joint responsibility for assessing VTE risk, with either medical or pharmacy staff, in another five hospitals. There was also variation in the level of education provided at each site ranging from one session to 28 sessions.

Some hospitals had participated in previous national VTE prevention projects.

Barriers to implementation of the VTE section were similar to those reported in the Phase 1 study and included:

- unwillingness to document a VTE risk assessment
- lack of awareness of the correct process
- lack of clinical leadership or executive support
- limited resources for education and/or project coordination and support
- the requirement to educate clinicians continually because of staff turnover and rotations.
- old charts (without the VTE section) coming back into circulation
- difficulties implementing the charts on selected wards as both the pilot and the regular NIMC charts were in circulation.

Variation in outcomes at hospital level

The response to this intervention varied amongst participating hospitals. Some hospitals achieved substantial improvements in VTE risk assessment and VTE prophylaxis ordering while there was little or no effect seen in other hospitals. Hospitals with higher rates of documentation of VTE risk assessment tended to have higher rates of VTE prophylaxis.

A small number of participating hospitals had very high rates of VTE risk assessment and prophylaxis prescribing pre-implementation which were maintained or improved with the intervention. These hospitals used two or more professionals groups to document risk assessment and delivered a larger number of education sessions. Two hospitals provided over 25 education sessions.

Three hospitals that participated in both pilots, and that had a NIMC with VTE section in place (for approximately two and a half years), did not report higher rates of VTE risk assessment documentation and VTE prophylaxis when compared with hospitals that only participated in the second phase of the project (for approximately six months duration). One of these hospitals only provided one education session.

Factors for success

The response to the intervention varied between participating hospitals suggesting that there are other critical success factors required for a successful, hospital-wide VTE prevention program.

Recent international studies suggest that a multi-faceted approach that combines a simple, standardised risk assessment tool that links VTE risk level to prophylaxis choice, is embedded into clinician workflow and supported by a quality improvement framework that includes support from the hospital executive, multidisciplinary VTE prophylaxis teams, continuous education and training of all health care providers with regular audit and feedback. provides the best strategy to reduce hospital-acquired VTE. [21-23]

Hospitals described similar barriers to implementation in both Phase 1 and Phase 2 Pilots and reported that introducing initiatives such as the VTE section on the NIMC to improve the use of VTE prophylaxis requires the commitment and support of the hospital executive and clinical leaders and sufficient resources for training and ongoing education. These findings support those in the international literature and are in line with the recommendations in the Commission and NHMRC publication *Stop the Clot. Integrating VTE prevention guideline recommendations into routine hospital care.* [13-14]

Feedback from the Phase 2 Pilot suggested that compliance would further improve once the NIMC with VTE prophylaxis section was implemented nationally as this would increase health professional familiarity with the VTE prophylaxis section and staff would have greater confidence in assessing VTE risk and prescribing appropriately to patient risk profiles.

Limitations

There were several limitations to Phase 2 Pilot results.

Hospitals were recruited through an expression of interest process which may have resulted in some bias towards hospitals with a pre-existing commitment to, and interest in, VTE prevention. Therefore the results obtained may not be reflective of results that would be achieved if a NIMC with a pre-printed VTE prophylaxis section were introduced nationally.

Patients were not specifically matched on key demographic variables (age, gender), presenting condition and VTE risk factors present across the pre and post-implementation audits. Instead, hospitals were instructed to audit a random sample of inpatients across the same wards and using the same auditors to ensure data collection consistency.

Two hospitals reported that key staff members left the organisation between the pre and post-implementation audits which may have negatively affected their results. Anecdotally some hospitals reported that the same team did not undertake the pre and post-implementation audits which may have affected the interpretation of the audit elements and the audit results at those hospitals.

Two sites reported issues with standard NIMCs without the pre-printed VTE prophylaxis section appearing on wards which may have negatively affected their results.

Hospital project coordinators who were responsible for overseeing the pilot completed the implementation experience survey. While they were instructed to liaise with clinicians to ensure the survey responses represented an accurate report of the hospital's experience, there was potential for bias and directly surveying the end users themselves may have provided a more accurate picture..

Hospitals were instructed to submit any problems associated with implementing the pilot NIMC to the Commission for inclusion in the issues register. It is possible that some minor issues involving incorrect usage of the VTE prophylaxis section were not reported to the Commission.

Appropriateness of VTE prophylaxis

Hospital VTE prevention policies varied across participating hospitals. For example some private hospitals in the study had VTE prevention policies in place but generally allowed visiting medical officers to prescribe their preferred VTE prophylaxis for each patient and condition. This lack of a standardised risk assessment process and VTE prophylaxis guidance may have influenced the results.

Auditors were instructed to assess whether the prophylaxis was in accordance with their hospital policy and "appropriateness" may have been interpreted differently across participating hospitals. Some auditors reported that they closely followed hospital guidelines including documenting the reasons why the prescribed therapy was not appropriate according to hospital guidelines. Other hospitals with policies that allowed visiting medical officers to prescribe their chosen therapy found it more difficult to assess appropriateness of prophylaxis prescribed.. Furthermore, auditors reported that it was difficult in some cases to judge whether the VTE prophylaxis prescribed (or not prescribed) was appropriate

This data should therefore be interpreted with caution. It also reinforces the importance of having appropriately skilled clinicians undertake this type of auditing.

7. Conclusion

The introduction of a NIMC pre-printed VTE prophylaxis section in the NIMC combined with clinician education, prompted clinicians to assess and document patient VTE risk on admission and to prescribe VTE prophylaxis in a range of hospitals across Australia. This resulted in improved rates of VTE risk assessment documentation and pharmacological prophylaxis prescribing. Importantly, the intervention did not increase the risk of duplicate anticoagulant therapy being prescribed or the risks associated with patients having multiple active charts.

Incorporation of a pre-printed VTE prophylaxis section in the NIMC would assist hospitals address the patient safety risk represented by hospital-associated VTE. Minor changes to the risk assessment section would improve its acceptability.

To optimise the use of the pre-printed VTE prophylaxis section as a tool to improve the quality and safety of VTE prophylaxis hospitals should implement the chart within a quality improvement framework that includes:

- a hospital-wide VTE prevention policy
- guidance on VTE risk assessment
- senior corporate and clinical governance support
- senior clinician leadership
- education of staff and an ongoing commitment to education to re-enforce the importance of VTE prophylaxis
- evaluation and feedback.

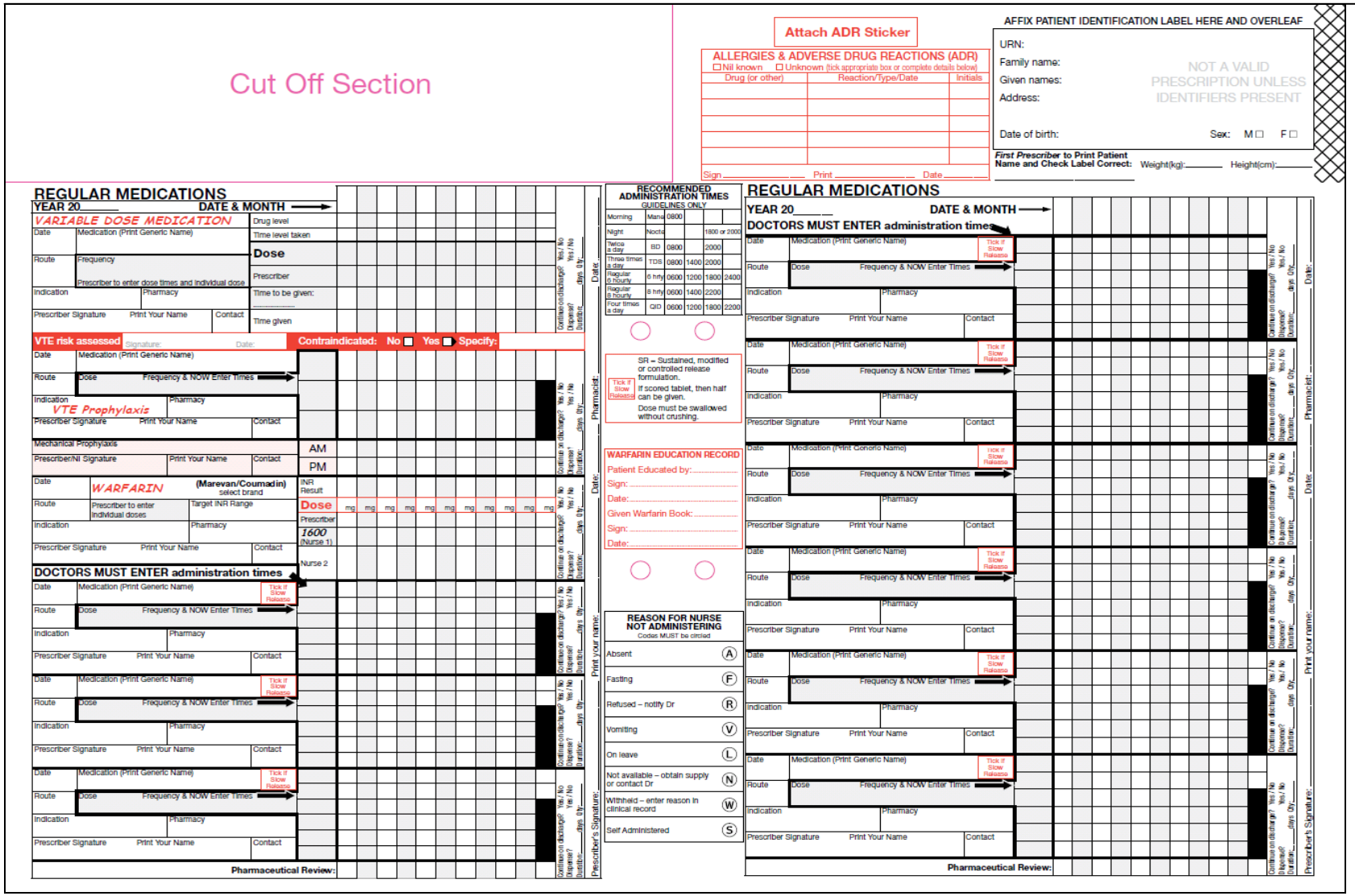
The educational materials and audit tool developed for the NIMC VTE pilot are suitable to use as the basis for development of additional national implementation resources for all Australian hospitals. Consideration should be given to developing and implementing a standardised VTE risk assessment tool.

8. Recommendations

It is recommended that:

- a pre-printed VTE prophylaxis section be incorporated into the NIMC
- the NIMC VTE prophylaxis section comprise three components:
    - VTE risk assessment section to record that an assessment has been conducted
    - pharmacological prophylaxis ordering and administration recording section
    - mechanical prophylaxis ordering and checking section.
- the VTE risk assessment component piloted by hospitals in Phase 2 be modified to accommodate recommendations from pilot sites.

Appendix 1: Phase 2 Pilot NIMC with pre-printed VTE section



Appendix 2: Audit parameters (from Audit Tool User Guide)

The objective of the quantitative audits is to evaluate the effect of introducing the pilot NIMC with pre-printed VTE section and compare (pre and post-implementation):

1. Rates of VTE risk assessment documentation (and where VTE risk is documented)
2. Rates of VTE prophylaxis prescribing (pharmacological and mechanical)
3. Number of current medication charts per patient
4. Percentage of patients with duplicate orders for anti-thrombotic therapy
5. Doses of VTE prophylaxis missed (not signed as administered)
6. Percentage of patients prescribed VTE prophylaxis when documented as contraindicated

Hospitals will also assess (pre and post-implementation) whether VTE prophylaxis prescribing is in accordance with the hospital's VTE prevention policy/guidelines.

VTE Pilot post-implementation audit

Audit Element	Definition
Number of current medication charts	Record the total number of current medication charts (NIMCs) i.e. charts in use on the day of the audit. Only standard NIMCs to be counted, do not include other charts eg IV drug charts
What is the category of prophylaxis?	Select the patient category for the VTE prophylaxis from the drop down menu. • Surgical • Medical • Cancer • Pregnancy and childbirth • Other If 'Other' is selected record the details in the Comments field.
Is VTE risk assessment documented anywhere?	Click 'yes' if the VTE risk assessment has been documented according to local hospital policy (e.g. recorded on a specific VTE risk assessment form or general risk assessment form). In the absence of a local hospital policy if the VTE risk assessment has been clearly documented somewhere select 'yes'. If no risk assessment has been recorded, select 'no'. For hospitals that participated in the NIMC VTE Phase 1 Pilot and who continue to use the pilot chart (Version 1) this can include the VTE prophylaxis section on the NIMC.
If VTE risk is documented where is it documented?	Select the correct documentation category from the list provided e.g. *Clinical Pathway*, *Risk Assessment Form.* **NOTE:** This question allows for multiple responses. To select two or more options hold down the Ctrl button while making your selection.
Is pharmacological VTE prophylaxis documented as contraindicated?	Click 'yes' if there is documentation to indicate that pharmacological VTE prophylaxis is contraindicated. Click 'no' if there is no evidence to indicate that pharmacological VTE prophylaxis is contraindicated.

If pharmacological prophylaxis is contraindicated, is contraindication specified?	Record 'yes' if documentation indicates the specific contraindication to pharmacological VTE prophylaxis e.g. *active bleeding* and record the contraindication in the Comments field. Record 'No" if there is no documentation to indicate what the contraindication is.
Is mechanical VTE prophylaxis documented as contraindicated?	Click 'yes' if there is documentation to indicate that mechanical VTE prophylaxis is contraindicated. Click 'no' if there is no evidence to indicate that mechanical VTE prophylaxis is contraindicated.
If mechanical prophylaxis is contraindicated, is contraindication specified?	Record 'yes' if documentation indicates the specific contraindication to mechanical VTE prophylaxis e.g. *Leg ulcer,* and record the contraindication in the Comments field. Record 'No" if there is no documentation to indicate what the contraindication is.
Is VTE prophylaxis ordered? (pharmacological and/or mechanical)	Record yes if any VTE prophylaxis is prescribed on the NIMC - pharmacological, mechanical or both.
Is pharmacological VTE prophylaxis prescribed anywhere?	Record yes if pharmacological VTE prophylaxis is prescribed anywhere on the NIMC.
Is the recommended pharmacological VTE prophylaxis prescribed in accordance with your hospital guidelines?	Record yes if the pharmacological VTE prophylaxis is prescribed in accordance with your hospital guidelines or local policy that is, prophylaxis is prescribed as recommended in the hospital policy and in accordance with the patient's risk factors and contraindications *(see supplementary audit tool information below)*
What is the number of doses of anticoagulant required?	Record the number of doses of anticoagulant ordered for VTE prophylaxis that **should have been administered.** Count all doses that **should** have been administered from the commencement of the chart to the time of the audit by counting the administration boxes.
What is the number of doses of anticoagulant documented as given?	Record the number of doses of anticoagulant ordered for VTE prophylaxis that **have been signed as administered,** including doses that have a 'reason for not administering' code documented (for further information on recording administration of doses and reasons for not administering codes refer to the NIMC User Guide available on the Commission website at http://www.safetyandquality.gov.au/wp-content/uploads/2012/02/NIMC-User-Guide2.pdf
Is mechanical VTE prophylaxis prescribed anywhere?	Record yes if mechanical VTE prophylaxis is prescribed/ordered.
Where is mechanical VTE prophylaxis documented?	Select the correct documentation category from the list provided e.g. *Clinical Pathway, Progress Notes* **NOTE:** This question allows for multiple responses. To select two or more options hold down the Ctrl button while making your selection.

Is the recommended mechanical VTE prophylaxis prescribed in accordance with your hospital guidelines?	Record yes if the mechanical VTE prophylaxis is prescribed in accordance with your hospital guidelines or local policy that is, prophylaxis is prescribed as recommended in the hospital policy and in accordance with the patient's risk factors and contraindications *(see supplementary audit tool information below)*
What is the number of mechanical VTE prophylaxis checks required?	Record the number of times mechanical VTE prophylaxis **should be checked**. Count all times that the stockings, IPC **should** be **checked** from the commencement of the order to the time of the audit.
What is the number of mechanical VTE prophylaxis checks documented?	Record the number of mechanical prophylaxis checks that **have been documented.**

VTE Pilot post-implementation audit

Audit Element	Definition
Number of current medication charts	Record the total number of current medication charts (pilot NIMCs with VTE section only) i.e. charts in use on the day of the audit
What is the category of prophylaxis?	Select the patient category for the VTE prophylaxis from the drop down menu. • Surgical • Medical • Cancer • Pregnancy and childbirth • Other If 'Other' is selected record the details in the Comments field.
Is VTE risk assessment documented anywhere?	Click 'yes' if the VTE risk assessment has been documented somewhere.
If VTE risk is documented where is it documented?	Select the correct documentation category from the list provided e.g. *risk assessment form* **NOTE:** This question allows for multiple responses. To select two or more options hold down the Ctrl button while making your selection.
Is the VTE risk assessment section signed?	Record 'yes' if the VTE risk assessment section on the pilot NIMC has been signed by an authorised clinician.
Is the VTE risk assessment section dated?	Record 'yes' if the VTE risk assessment section on the pilot NIMC has been dated by an authorised clinician.
Is pharmacological VTE prophylaxis documented as contraindicated?	Click 'yes' if there is documentation on the VTE prophylaxis section of the pilot NIMC to indicate that pharmacological VTE prophylaxis is contraindicated. Click 'no' if there is no evidence to indicate that pharmacological VTE prophylaxis is contraindicated.

If pharmacological prophylaxis is contraindicated, is contraindication specified?	Record 'yes' if documentation indicates the specific contraindication to pharmacological VTE prophylaxis e.g. *active bleeding* and record the contraindication in the Comments field. Record 'No" if there is no documentation to indicate what the contraindication is.
Is mechanical VTE prophylaxis documented as contraindicated?	Click 'yes' if there is documentation on the VTE prophylaxis section of the pilot NIMC to indicate that mechanical VTE prophylaxis is contraindicated. Click 'no' if there is no evidence to indicate that mechanical VTE prophylaxis is contraindicated.
If mechanical prophylaxis is contraindicated, is contraindication specified?	Record 'yes' if documentation indicates the specific contraindication to mechanical VTE prophylaxis e.g. *Leg ulcer,* and record the contraindication in the Comments field. Record 'No" if there is no documentation to indicate what the contraindication is.
Is VTE prophylaxis ordered? (pharmacological and/or mechanical)	Record yes if any VTE prophylaxis is prescribed on the pilot NIMC - pharmacological, mechanical or both.
Is pharmacological VTE prophylaxis prescribed anywhere?	Record yes if pharmacological VTE prophylaxis is prescribed anywhere on the pilot NIMC.
Is the recommended pharmacological VTE prophylaxis prescribed in accordance with your hospital guidelines?	Record yes if the pharmacological VTE prophylaxis is prescribed in accordance with your hospital guidelines or local policy that is, prophylaxis is prescribed as recommended in the hospital policy and in accordance with the patient's risk factors and contraindications *(see supplementary audit tool information below)*
Is pharmacological prophylaxis prescribed in the VTE section? (if multiple VTE prophylaxis orders, at least one in the VTE section)	Record yes if the pharmacological VTE prophylaxis is prescribed in the VTE section of the pilot NIMC.
Is pharmacological prophylaxis prescribed in the regular medications section?	Record yes if the pharmacological VTE prophylaxis is prescribed in the regular section of the pilot NIMC.
Are there current pharmacological VTE prophylaxis orders in both the VTE and regular medication sections? (i.e. VTE prophylaxis ordered twice in error)	Record yes if there is more than one **active** order of anticoagulant for pharmacological VTE prophylaxis (i.e. duplicate therapy that has been prescribed in error). Auditors are requested to enter details of the orders in the **comments** field (e.g. enoxaparin 40mg daily + heparin 5000units BD, or heparin ordered twice)**.**
Is pharmacological VTE prophylaxis ordered at the same time as therapeutic anticoagulation in error?	Record yes if there are active orders for both pharmacological VTE prophylaxis and therapeutic anticoagulant therapy on the current medication chart(s). Auditors are requested to enter details of the orders in the **comments** field (e.g. heparin 5000units BD for prophylaxis + enoxaparin 60mg BD for treatment).

What is the number of doses of anticoagulant required?	Record the number of doses of anticoagulant ordered for VTE prophylaxis that **should have been administered.** Count all doses that **should** have been administered from the commencement of the chart to the time of the audit by counting the administration boxes.
What is the number of doses of anticoagulant documented as given?	Record the number of doses of anticoagulant ordered for VTE prophylaxis that **have been signed as administered,** including doses that have a 'reason for not administering' code documented (for further information on recording administration of doses and reasons for not administering codes refer to the NIMC User Guide available on the Commission website at http://www.safetyandquality.gov.au/wp-content/uploads/2012/02/NIMC-User-Guide2.pdf
Is mechanical VTE prophylaxis prescribed anywhere?	Record yes if mechanical VTE prophylaxis is prescribed/ordered.
Where is mechanical VTE prophylaxis documented?	Select the correct documentation category from the list provided e.g. *NIMC VTE section* **NOTE:** This question allows for multiple responses. To select two or more options hold down the Ctrl button while making your selection.
Is the recommended mechanical VTE prophylaxis prescribed in accordance with your hospital guidelines?	Record yes if the mechanical VTE prophylaxis is prescribed in accordance with your hospital guidelines or local policy that is, prophylaxis is prescribed as recommended in the hospital policy and in accordance with the patient's risk factors and contraindications *(see supplementary audit tool information below)*
What is the number of mechanical VTE prophylaxis checks required?	Record the number of times mechanical VTE prophylaxis **should be checked**. Count all times that the stockings, IPC **should** be **checked** from the commencement of the order to the time of the audit.
What is the number of mechanical VTE prophylaxis checks documented?	Record the number of mechanical prophylaxis checks that **have been documented.**

Note: Data elements shaded in blue in the table above are specific to the post-implementation audit

Appendix 3: Supplementary Audit Tool on VTE prophylaxis consistent with hospital policy

This paper-based tool has been provided to assist auditors to answer the following two questions in the excel audit tool.

- ***Is the recommended pharmacological VTE prophylaxis prescribed in accordance with your hospital guidelines?***
- ***Is the recommended mechanical VTE prophylaxis prescribed in accordance with your hospital guidelines?***

This paper-based tool has been adapted from The Canberra Hospital's VTE Prevention Audit Tool.

ACSQHC would like to acknowledge The Canberra Hospital's assistance in providing this resource to other hospitals participating in the NIMC VTE Audit.

Data collector:	**Audit date:**

Step 1: Demographics					
Admitting specialty:		**Ward:**	**MRN:**		**AGE:**
Reason for admission:					
Category (circle category)	**Surgical**	**Medical**	**Cancer**	**Pregnancy & Childbirth**	**Other, please specify**
Date of admission:	**Date of surgery (if applicable):**				

Step 2: Assessment of VTE Risk and Prophylaxis					
2.1 Tick if one or more risk factors for VTE apply (add additional risk factors as required based on hospital VTE prevention policy)					
Surgical VTE Risk	Tick	Medical VTE Risk	Tick	Other VTE Risk	Tick
Total Hip Replacement		Ischaemic Stroke		Previous VTE	
Hip Fracture Surgery		Haemorrhagic Stroke		Active cancer	
Total Knee Replacement		Myocardial Infarction		Age (incidence rises with each decade over 40)	
Knee Arthroscopy		Cancer (non-surgical)		Prolonged severe immobility	
Lower Leg Fractures / Injuries with Immobilisation in a Brace or Plaster Cast		Pregnancy and Childbirth (non-caesarean)		Pregnancy and the puerperium	
General Surgery				Oestrogen-containing hormone replacement therapy (HRT) or oral contraceptive	
Urological Surgery				Certain types of thrombophilia	
Gynaecological Surgery				Marked obesity	
Abdominal Surgery				General anaesthesia (versus regional anaesthesia).	
Cardiac, Thoracic and Vascular Surgery				Acute / acute-on-chronic chest infection	
Neurosurgery				Heart failure	
Trauma and Spinal Surgery				Some forms of cancer chemotherapy	
Cancer Patients having General, Abdominal, Pelvic or Neurosurgery				Acute inflammatory bowel disease	
Head and Neck Cancer Patients having Head and Neck Surgery					
Caesarean Section					
Inadequate documentation for auditor to establish risk status (tick)					

Step 2: Assessment of VTE Risk and Prophylaxis (continued)						
2.2 Documentation			2.3 Indicate contraindications to pharmacological or mechanical prophylaxis below (edit as required based on local hospital policy)			
Was the patient's risk status documented? If yes where?		Tick	Contraindications			
Yes	Medication chart		To pharmacological prophylaxis	Tick	To mechanical prophylaxis	Tick
	NIMC Regular section					
	NIMC VTE section					
	Progress notes		Significant renal impairment		Any factor that prevents correct fitting of stockings (e.g. morbid obesity)	
	Care Plan		Current active major bleeding (i.e. at least 2 units of blood/blood products transfused in 24 hours)		Inflammatory conditions of the lower leg	
	Clinical Pathway		Current chronic, clinically significant and measurable bleeding over 48 hours		Severe peripheral artery disease	
	Pre-admission Checklist		Inherited or acquired bleeding disorders e.g. haemophilia or other coagulation factor abnormality, coagulopathy or disseminated intravascular coagulation		Diabetic neuropathy	
	Risk Assessment Form		Severe platelet function disorder or Thrombocytopenia (pharmacological prophylaxis not recommended with platelet count < 50000/uL		Severe oedema of the legs	
	Other location (please specify)		Recent central nervous system bleeding		Severe lower limb deformity or inability to correctly fit stockings	
No			Intracranial or spinal lesion		Intermittent pneumatic compression or foot pumps can exacerbate peripheral arterial disease or arterial ulcers	
			Recent major surgical procedure of high bleeding risk			
			Active peptic ulcer or active ulcerative gastrointestinal disease			
			Liver failure or prolonged obstructive jaundice			
			Concomitant use of medications that may affect clotting			
			Neuraxial block or recent lumbar puncture			

Step 2: Assessment of VTE Risk and Prophylaxis (continued)			
2.4 Tick which VTE prophylaxis management measures are evident when auditing (edit as required based on local hospital policy)			
Prophylaxis management			
Pharmacological	Tick	Mechanical	Tick
Enoxaparin (LMWH) 40mg / day		Graduated compression stockings	
Enoxaparin (LMWH) 20mg / day		Intermittent pneumatic compression	
Other dose / frequency – please state		Other mechanical prophylaxis – please state	
Dalteparin (LMWH) 5000 units / day			
Dalteparin (LMWH) 2500 units / day			
Other dose / frequency – please state			
Fondaparinux 2.5mg / day			
UFH 5000 units TDS			
UFH 5000 units BD			
Other dose / frequency – please state			
Rivaroxaban 10mg / day			
Dabigatran 220mg / day			
Other pharmacological prophylaxis – please state			

Step 3: Summary of audit findings		
3.1 Is the patient on a VTE prophylaxis regime that is consistent with your hospital policy?		Tick
Yes	On appropriate prophylaxis for the risk category (includes contraindicated / on therapeutic anticoagulant / or nil required – where no VTE prophylaxis prescribed)	
No	At risk but not on any VTE prophylaxis (please indicate reason if known)	
	Missing mechanical prophylaxis (& not contraindicated)	
	Missing pharmacological prophylaxis (& not contraindicated)	
	Mechanical prophylaxis inadequate	
	Pharmacological prophylaxis inadequate	
	Pharmacological and mechanical prophylaxis both inadequate	
	On VTE prophylaxis but not indicated	

Step 3: Summary of audit findings (continued)		
3.2 If 'No' is ticked in Step 3.1 above, then the auditor should answer "No" to the relevant questions in the excel tool		
3.3 Was the documented risk assessment consistent with your hospital policy (circle yes or no)	Yes	No

Appendix 4: Quantitative Audit Results			
VTE risk assessment			
Data item	**Pre-audit result**	**Post-audit result**	**Comments**
Number of current medication charts (i.e. charts in use per patient)	Total number of patients: 917 Total number of charts: 1429 Average: 1.56 per patient	Total number of patients: 848 Total number of charts: 1327 Average: 1.56 per patient	Results suggest that the number of charts used per patient **has not increased** with introduction of the pilot chart with VTE section. There were concerns that using a regular medication box for the VTE prophylaxis section would increase the number of current charts used per patient and which could pose safety risks.
VTE risk assessment documented	329 yes responses (35.9% of all patients)	485 yes responses (57.2% of all patients)	An increase of 21.3% [16.6%, 26.0%] $P < 0.001$
VTE risk assessment documented in the NIMC VTE section	Not collected	268 responses 44.7% (of 599 documentations)	44.7% [40.7%, 48.8%] VTE risk assessment documentations are not mutually exclusive. Some patients had a risk assessment documented in more than one place (81/485, 16.7%) and some patients were not allocated a category (8/485, 1.6%). Total no. patients with a risk assessment documented = 485
Is NIMC VTE risk assessm. section signed or dated ?	Not collected	250 (51.5% of patients with risk assessment documented)	51.5% [47.0%, 56.1%]
If VTE risk is documented, where is it documented?	Progress notes 15.2% Care Plan 29.8% Clinical Pathway 16.1% NIMC VTE section 0.0% NIMC regular section 3.4% Risk Assess. Form 11.2% Preadm. checklist 3.7% Other 20.5%	Progress notes 11.0% Care Plan 18.4% Clinical Pathway 10.9% NIMC VTE section 44.7% NIMC regular section 0.5% Risk Assess. Form 1.8% Preadm. checklist 1.5% Other 11.2%	VTE risk documented in a range of places in the pre and post-audit showing little standardisation across hospitals. In some cases patients have multiple documentations. Tendency to decrease documentation in other areas with introduction of the VTE risk assessment section. However this is it dependent on existing processes in hospitals. “Other” category included use of VTE stickers, documentation in the EMR, pre-operative and surgical safety checklists, etc

Data item	Pre-audit result	Post-audit result	Comments
Pharmacological VTE prophylaxis documented as contraindicated	Total of 78 patients had contraindications documented in the medical record (8.5% of all patients) 8 patients were prescribed pharmacological prophylaxis when contraindication documented in the medical record (1.5%, 95% CI: 0.7%, 3.0%).	Total of 47 patients had the contraindications box ticked (5.5% of all patients) 4 patients were prescribed pharmacological prophylaxis where contraindication box ticked (0.7%, 95% CI: 0.2%, 2.0%).	-3.0% [-5.5%, -0.5%] *P* = 0.018 See comments below.
Pharmacological contraindications were specified	Total of 84 patients had a contraindication specified in medical record (9.2% of all patients)	Total of 50 patients had a contraindication specified in VTE section (5.9% of all patients)	-3.3% [-5.8%, -0.7%] *P* = 0.012 Generally contraindications were poorly documented. More patients with contraindications to VTE prophylaxis were identified by the auditors than were documented on the NIMC or in the patient notes. Examples included: therapeutic anticoagulation, active bleeding, liver cirrhosis, acute or chronic renal failure, CVA, clotting disorder, increased INR etc
Mechanical VTE prophylaxis documented as contraindicated	Total of 38 patients had contraindications documented in the medical record (4.1% of all patients) 3 patients were prescribed mechanical prophylaxis where the medical record indicated it was contraindicated (1.0%, 95% CI: 0.2%, 3.1%).	Total of 10 patients had the contraindicated box ticked (1.2% of all patients) 2 patients were prescribed mechanical prophylaxis where contraindicated box ticked (0.7%, 95% CI: 0.1%, 2.9%).	-3.0% [-4.6%, -1.4%] *P* < 0.001 Some confusion reported in implementation experience survey about whether the contraindications field is for pharmacological or both pharmacological and mechanical prophylaxis. A comment noted that there is limited space for both.
Mechanical contraindications were specified	Total of 40 patients had contraindications specified in the medical record (4.4% of all patients)	Total of 9 patients had contraindications documented in the NIMC VTE section (1.1% of all patients)	-3.3% [-4.9%, -1.7%] *P* < 0.001 Generally contraindications were poorly documented. More patients with contraindications were identified by the auditors than were documented on the NIMC or in the patient notes. Examples included cellulitis, peripheral vascular disease, fractured ankle preventing correct fitting of stockings, ankle oedema, lymphoedema, patient refused

VTE prophylaxis orders			
Data item	**Pre-audit result**	**Post-audit result**	**Comments**
VTE prophylaxis ordered	598 yes responses (65.2% of all patients)	588 yes responses (69.3% of all patients)	4.1% [-0.4%, 8.6%] *P* = 0.074
Pharmacological prophylaxis prescribed (post-implementation prescribed in VTE or regular sections)	545 patients (59.4% of all patients)	546 patients (64.4% of all patients)	5.0% [0.3%, 9.6%] *P* = 0.035 As percent of *patients with any prophylaxis ordered*: 91.1% pre-implementation and 92.9% post-implementation. 1.7% [-1.5%, 5.0%] *P* = 0.301
Pharmacological prophylaxis prescribed in VTE prophylaxis section of pilot NIMC	Not collected	429 patients (78.6% of patients that had pharmacological prophylaxis prescribed)	78.6% [74.9%, 81.9%]
Pharmacological prophylaxis prescribed in regular section of pilot NIMC	Not collected	82 patients (15.0% of patients that had pharmacological prophylaxis prescribed)	15.0% [12.2%, 18.3%]
Current pharmacological VTE prophylaxis orders in both the VTE and regular medication sections? (i.e. VTE prophylaxis ordered twice in error)	Not collected	2 orders recorded as yes (0.4% of patients that had pharmacological prophylaxis prescribed)	0.4% [0.1%, 1.5%] Only 1 comment was provided: *VTE section order ceased restarted in regular section*.
Pharmacological VTE prophylaxis ordered at the same time as therapeutic anticoagulation in error	Not collected	2 orders recorded as yes. (0.4% out of patients that had pharmacological prophylaxis prescribed)	0.4% [0.1%, 1.5%] Case 1: Warfarinised. Case 2: Clexane and warfarin.
Doses of anticoagulant required	2,993	2,475	
Doses of anticoagulant documented as given	2,861 (95.6% of total doses documented as given)	2,385 (96.4% of total doses documented as given)	0.8% [-0.3%, 1.9%] *P* = 0.169

Data item	Pre-audit result	Post-audit result	Comments
Mechanical VTE prophylaxis prescribed	308 (33.6% of all patients)	274 (32.3% of all patients)	-1.3% [-5.8%, 3.2%] *P* = 0.596 As percent of *patients with any prophylaxis ordered*: 51.6% pre-implementation and 46.6% post-implementation. -5.0% [-10.8%, 0.9%] *P* = 0.096
Where is mechanical VTE prophylaxis documented?	Progress notes 1.0% Care Plan 7.4% Clinical Pathway 33.1% NIMC VTE section 0.0% NIMC regular section 36.3% Other 13.0%	Progress notes 4.7% Care Plan 10.5% Clinical Pathway 28.0% NIMC VTE section 50.9% NIMC regular section 2.2% Other 3.6%	Mechanical prophylaxis prescribing is documented in a range of places in the medical record. With introduction of the VTE section use of the regular section of the NIMC for mechanical prophylaxis prescribing has decreased from 36.3% to 2.2%. "Other" category included use of VTE stickers, documentation in the EMR, pre-operative checklist, post-anaesthetic care document, pre-admission checklist, theatre nurse notes etc
Mechanical VTE prophylaxis checks required	2,361	2,425	
Mechanical VTE prophylaxis checks documented	1,774 (75.1% of total checks documented as given)	1,671 (68.9% of total checks documented as given)	-6.2% [-8.8%, -3.7%] *P* < 0.001
Patients prescribed both pharmacological and mechanical VTE prophylaxis	255 (27.8% of all patients)	233 (27.5% of all patients)	-0.3% [-4.6%, 4.0%] *P* = 0.9307 As percent of *patients with any prophylaxis ordered*: 42.6% pre-implementation and 39.6% post-implementation. -3.0% [-8.8%, 2.8%] *P* = 0.307
% patients without VTE risk assessment documented who were prescribed pharmacological VTE prophylaxis	306 (51.8% patients prescribed pharmacological prophylaxis)	155 (42.7% of patients prescribed pharmacological prophylaxis)	-9.1 [-15.8, -2.4] P = 0.008 Post-implementation, fewer patients without documented VTE assessment received pharmacological prophylaxis.

Data item	Pre-audit result	Post-audit result	Comments
% patients without VTE risk assessment documented who were prescribed mechanical VTE prophylaxis	151 (25.5% patients prescribed mechanical prophylaxis))	72 (19.8% of patients prescribed mechanical prophylaxis)	-5.7 [-11.3, -0.1] P < .001 Post implementation fewer patients without documented VTE assessment received pharmacological prophylaxis.

Appendix 5: Participating hospitals

Phase 2 Pilot

Armidale Hospital	NSW
Bankstown-Lidcombe Hospital	NSW
Bass Coast Regional Health	Victoria
Central Gippsland Health Service	Victoria
Flinders Medical Centre	South Australia
Goulburn Base Hospital	NSW
Hornsby & Kuringai Health Service	NSW
Manly and Mona Vale Hospitals	NSW
Prince of Wales Hospital	NSW
Lyell McEwin Hospital	South Australia
Masada Private Hospital	Victoria
Mater Private Hospital, North Sydney	NSW
Noosa Hospital	Queensland
St Vincent's Hospital Melbourne	Victoria
The Canberra Hospital	ACT
The Queen Elizabeth Hospital	South Australia
South West Healthcare	Victoria
Werribee Mercy Hospital	Victoria
Western District Health Service	Victoria

Phase 1 Pilot

Armidale Hospital	NSW
Bankstown-Lidcombe Hospital	NSW
Belmont Hospital	NSW
Broken Hill Health Service	NSW
Central Gippsland Health Service	Victoria
Epworth Freemasons	Victoria
Kyabram & District Health Service	Victoria
Lyell McEwin Hospital	South Australia
Mater Private Hospital, North Sydney	NSW
Modbury Hospital	South Australia
Mount Gambier & Districts Health Service	South Australia
Noarlunga Hospital	South Australia
Royal North Shore Hospital	NSW
Southern Hospital	Victoria
St George Hospital	NSW
Sydney Adventist Hospital	NSW
Tamworth Hospital	NSW
The Queen Elizabeth Hospital	South Australia
Werribee Mercy Hospital	Victoria

Appendix 6: Survey Questionnaire

Introduction to the NIMC VTE Pilot Implementation Experience Survey

This online survey is being undertaken as part of the NIMC VTE Phase 2 pilot being coordinated by the Australian Commission on Safety and Quality in Health Care (the Commission).

The aim of the survey is to obtain feedback on the experience of hospitals of introducing the pilot NIMC with VTE prophylaxis section and the context in which it was introduced. The survey covers the following areas:

- The hospital's VTE prevention policies/guidelines/forms;
- Implementation of the pilot NIMC with VTE section;
- NIMC VTE Pilot resources; and
- NIMC VTE Pilot audit data elements, audit tool and user guide.

The survey requests some basic demographic information including contact details of the person completing the survey. The latter information is required so that the Senior Project Officer at the Commission can follow up specific survey responses where a response(s) requires clarification. The aggregate survey results will be de-identified and no personal details will be disclosed.

Objectives

The objectives of the survey are to:

(a) gain an understanding of the issues involved and resources required to implement an NIMC with dedicated VTE prophylaxis section across a broad range of Australian hospitals;
(b) identify barriers to implementation as well as strategies for overcoming these barriers; and
(c) assess possible unintended consequences from including a dedicated VTE prophylaxis section in the NIMC.

Together with the pre and post implementation audit data, the online survey results will be used to:

- assess the effect of a pilot NIMC with VTE prophylaxis section on the rate of VTE risk assessment and prophylaxis prescribing for adult patients in a range of hospitals; and
- assist with the development of a national implementation strategy for a NIMC with dedicated VTE prophylaxis section.

Timeframe

The questionnaire should take no more than 10 to 15 minutes to complete.

Survey responses are required as soon as possible.

Closing date for responses is Friday 14 December 2012.

A summary of the survey findings will be sent to pilot sites in early February 2013.

Who should complete the survey?

The Project Coordinator at each site should complete the survey. They should liaise with other staff members as necessary when completing the survey to ensure the survey responses represent an accurate record of the hospital's experience.

Questions

If you have any questions related to the survey please contact Helen Stark on 02 9126 3521 or email helen.stark@safetyandquality.gov.au

NIMC VTE Pilot Online Questionnaire

Demographics

1. Name	
2. Position/title	
3 Contact email	
4 Contact telephone number	
5 Hospital name	
6 Area of the hospital where the NIMC VTE pilot chart was implemented *(select most appropriate response)*	□ The whole hospital □ Selected ward (s) If implemented in selected wards, in how many wards and in which wards was the NIMC VTE pilot chart implemented?

Your hospital's VTE risk prevention policy

8. Does your hospital have a formal policy on VTE prevention? *(If no, please go to question 11)*	□ Yes □ No
9. What areas does the policy cover? *(tick all that apply)*	□ Risk assessment □ Pharmaceutical prophylaxis □ Mechanical prophylaxis □ Surgical patients □ Medical patients □ Pregnancy & Childbirth □ Cancer □ Other, please specify
10. What guideline(s) is your hospital's VTE prevention policy based on?	□ NHMRC 2009 *Clinical Practice Guideline for the Prevention of Venous Thromboembolism in Patients admitted to Australian Hospitals* □ *Best Practice Guidelines for Australia and New Zealand for Prevention of Venous Thromboembolism (4th edition)* □ *Best Practice Guidelines for Australia and New Zealand for Prevention of Venous Thromboembolism (3rd edition)* □ Multiple references/guidelines □ Other, please specify □ Don't know what guideline it is based on
11. If your hospital does not have a formal policy, do you intend to implement a formal VTE prevention policy in the future?	□ Yes □ No □ Don't know Comments:
12. Do you have a specific VTE risk assessment form in your hospital?	□ Yes □ No
13. Who is primarily responsible in your hospital for conducting the VTE risk assessment? *(tick all that apply)*	□ Medical staff □ Nursing Staff □ Pharmacy staff □ Other, please specify

Implementation of the pilot NIMC with VTE section in your hospital

14. When did you introduce the pilot NIMC with VTE section into your hospital? *(please provide date)*	
15. Which staff in your hospital received training on the pilot NIMC with VTE section? *(tick all that apply)*	□ Medical staff □ Nursing staff □ Pharmacy staff □ Other, please specify
16. Which resource materials did you use to educate staff about the pilot NIMC with VTE section? *(tick all that apply)*	□ NIMC VTE poster □ NIMC VTE brochure □ NIMC VTE Powerpoint presentation □ NIMC VTE FAQ document □ NHMRC guidelines □ Hospital policy documents/forms □ Hospital-developed resource materials, please provide details □ Other, please specify
17. Which resource materials did you find the most useful? *(Select one option from the following for each resource)* □ Very useful □ Somewhat useful □ Not at all useful □ Did not use	□ NIMC VTE poster □ NIMC VTE brochure □ NIMC VTE Powerpoint presentation □ NIMC VTE FAQ document □ NHMRC guidelines □ Hospital policy documents/forms □ Hospital-developed resource materials □ Other, please specify
18. Do you have any general comments about the resource materials provided for the NIMC VTE pilot? E.g. what worked best and why?	
19. How long were your education sessions?	□ Up to 15 minutes □ 15 to 30 minutes □ Over 30 minutes
20. How many education sessions did you run?	
21. Did you conduct other educational activities in association with the conduct of the pilot? Eg. Introduction of VTE prevention policy, activities to promote VTE risk assessment *(please provide details of any additional activities undertaken during the pilot)*	
22. When did you undertake the post-implementation audit? *(please provide starting date)*	
23. The pilot NIMC with VTE section was well accepted by clinicians in our hospital *(Select the most appropriate response)*	□ Strongly disagree □ Disagree □ Neither disagree or agree □ Agree □ Strongly agree Comments:

24. Have you received any specific feedback from clinicians about the VTE risk assessment section of the pilot NIMC?	□ No □ Yes, please specify
25. Have there been any barriers to implementation? *If yes, please provide details*	□ No □ Yes, please specify
26. The pre-printed VTE prophylaxis and prescribing section in the NIMC has improved the appropriate prescribing of VTE prophylaxis for patients at risk of VTE. *(Select the most appropriate response)*	□ Strongly disagree □ Disagree □ Neither disagree or agree □ Agree □ Strongly agree Comments:
27. Have there been any unintended consequences as a result of including a VTE section in the NIMC? E.g. missed doses of medications, duplicate therapy of VTE prophylaxis, use of multiple charts due to reduced space for regular medications? *Please provide details*	
28. Would you make changes to the format of the VTE section in the chart based on the pilot and feedback from clinicians? *Please provide details*	□ No □ Yes, please specify
29. Are there any lessons you have learned from introducing the VTE section in the NIMC that you would like to share with other hospitals? *Please provide details*	
30. Based on the NIMC VTE pilot are there additional resources you would like the Commission to provide in the area of VTE prevention?	

VTE prophylaxis prescribing according to hospital guidelines

31. Did you audit VTE prophylaxis prescribing according to your hospital guidelines?	□ Yes □ No
32. Was the supplementary audit tool on VTE prophylaxis prescribing according to local hospital guidelines easy to use?	□ Yes □ No Comments:
33. Were the two data elements on prescribing in accordance with hospital guidelines easy to collect? *(questions provided below for referral)* *Is the recommended pharmacological VTE prophylaxis prescribed in accordance with your hospital guidelines?* *Is the recommended mechanical VTE prophylaxis prescribed in accordance with your hospital guidelines?*	□ Yes □ No □ We did not collect these data elements Comments:
34. Did these data elements allow you to accurately assess your hospital's practice in terms of VTE prophylaxis prescribing according to hospital guidelines?	□ Yes □ No □ Unsure Comments:
35. Based on the results, our hospital has more work to do to improve rates of appropriate VTE prophylaxis prescribing according to hospital guidelines	□ Strongly disagree □ Disagree □ Neither disagree or agree □ Agree □ Strongly agree Comments:
36. As a result of the NIMC VTE pilot do you plan to undertake additional quality improvement activities in the area of VTE prevention?	□ No □ Yes (please specify)

37. The automated Excel® audit tool used to collect and submit the audit data was easy to use. *(Select the most appropriate response)*	□ Strongly disagree □ Disagree □ Neither disagree or agree □ Agree □ Strongly agree Comments:
38. The *Audit Tool Application User Guide* provided clear guidance on how to complete the audit. *(Select the most appropriate response)*	□ Strongly disagree □ Disagree □ Neither disagree or agree □ Agree □ Strongly agree Comments:
39. The audit data elements were easy to collect. *(Select the most appropriate response)*	□ Strongly disagree □ Disagree □ Neither disagree or agree □ Agree □ Strongly agree Comments:
40. Do you have any other comments about the process for data collection, data entry and submission of data to the Commission? *Please provide details*	

Appendix 7: References

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