National Inpatient Medication Chart
VTE Prophylaxis Pilot Project
Interim Report

October 2011
Suggested citation

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1. Executive Summary

Introduction
The aim of the NIMC VTE Prophylaxis Pilot Project (the Pilot) was to pilot and evaluate the effect of a pre-printed venous thromboembolism (VTE) risk assessment and prescribing space in the National Inpatient Medication Chart (NIMC) on VTE risk assessment and prophylaxis prescribing for adult patients in a range of hospitals.

The design and placement of the VTE risk assessment and prophylaxis prescribing and administering section in the NIMC was informed by the work undertaken by the Safe Medication Management Unit in Queensland and in Victorian hospitals.

The Pilot was conducted from August 2010 to February 2011. Nineteen hospitals participated including public and private hospitals from three states.

There were three components to the study:

1. Quantitative study;
2. Qualitative study; and
3. Issues register.

Hospitals were required to collect baseline data for the quantitative study prior to introducing the chart with education using resource materials provided by the Australian Commission on Safety and Quality in Health Care (ACSQHC). Three months after introducing the chart a second audit was conducted. Hospitals were asked to complete an online survey of their experience in implementing the chart at the time of the second audit. They were also instructed to report any issues they had with the chart and these were recorded in an issues register.

1. Quantitative Analysis
This study measured changes in documentation of VTE risk assessment, VTE prophylaxis prescribing as well as the effect of the VTE section on the safety features of the chart and administration errors.

In the final analysis, data from two hospitals were excluded because their samples did not conform to the pilot requirements. The total number of charts (NIMCs) audited for the baseline audit was 1,888 and for the post-implementation audit it was 1,777. Both audits exceeded the minimum required sample size of 1,200 NIMCs outlined in the original project plan.

χ² tests (with a 5% significance level) were used to test for differences in proportions. 95% confidence intervals for proportions or differences in proportions were calculated based on a large sample approximation.

Results

Documentation of VTE risk assessment
There was a significant increase between the pre and post-implementation audits from 9.4% to 17.2%, an increase of 7.75 % (95% CI: 5.0%,10.5% p<0.0001). Notwithstanding
this increase the post-implementation rate remained disappointingly low with only about 1 in 6 patients having a VTE risk assessment documented in the VTE section of the chart.

**VTE prophylaxis prescribing**

There were significant increases in:

- The rate of VTE prophylaxis prescribing (58.1% in the baseline audit vs. 65.6% in the post-implementation audit (p=0.0002); and
- The rate of pharmacological prophylaxis prescribing (55.1% in the baseline vs. 62.4% in the post-implementation audit (p=0.003).

The rate of pharmacological prophylaxis prescribing increased by 7.3% (95% CI: 3.3%, 11.2%) between the pre and post-implementation audits. There was no change in use of mechanical prophylaxis prescribing (18.6% in the baseline audit vs. 19.2% in the post-implementation audit).

62.4% of all patients had pharmacological VTE prophylaxis prescribed. Of these patients 66% of their anticoagulant orders were written in the pre-printed VTE prophylaxis section of the chart.

**Effect on safety features of the NIMC**

The inclusion of the VTE section did not increase the number of medication charts per patient (1.54 pre-implementation versus 1.51 post-implementation) and the risks associated with multiple charts.

There was no evidence of an increased risk of duplicate anticoagulant therapy being prescribed (6 patients pre-implementation versus 4 patients post-implementation) or the number of patients having active orders for both prophylaxis and therapeutic anticoagulant (23 versus 29 patients, respectively). While there was some confusion around these audit elements making it difficult to establish the “true” rates of any duplicate prescribing, the results indicate that having a specific VTE prophylaxis section in the NIMC did not increase the risk of patients being prescribed both prophylactic and therapeutic doses of anticoagulants.

Fifteen patients (2.1%) were recorded as having prophylaxis ordered when their risk assessment indicated it was contraindicated. There was no pre-implementation data available to compare with this result as it was not documented on the NIMC.

In the post-implementation audit five patients were prescribed VTE prophylaxis who were documented as “not at risk”.

**Administration errors**

There was no change in the number of doses of anticoagulant ordered that were not administered between the baseline and the post-implementation audits - 12.9% vs. 12.7%.

However there was a significant decrease in the number of checks performed on mechanical prophylaxis devices that were documented (74% at baseline compared to 43% in the post-implementation audit).
2. Qualitative Survey

An online qualitative survey was distributed to sites in mid-January 2011 and all 19 sites completed the survey. The survey contained closed and open ended questions and for some questions a Likert rating scale was used. Project coordinators were instructed to complete the survey liaising with other staff members, where necessary, to ensure the survey responses represented an accurate record of the hospital’s experience.

The survey questions covered three main areas:

a. The hospital’s VTE risk prevention policy and forms used;

b. Hospital implementation experience – education, issues, barriers, unintended consequences and lessons learnt; and

c. Feedback on the NIMC VTE audit tool, user guide and implementation resources provided by ACSQHC.

Results

All nineteen sites completed the online survey between mid-January and late February 2011.

Sixty three percent of hospitals introduced the NIMC VTE pilot chart into all areas of the hospital while the remainder chose to implement the chart into selected wards only.

VTE risk prevention policies and forms

Seventy four percent of hospitals reported that they had a formal VTE prevention policy however only three hospitals reported using the NHMRC guidelines as the basis for their policy. Fifteen of the 19 hospitals (79%) reported they used a VTE risk assessment form.

NIMC VTE pilot implementation experience

Thirty seven percent of hospitals agreed whilst 21% disagreed or strongly disagreed that the pilot NIMC with VTE section was well accepted by clinicians.

Barriers to implementation

The main barrier was education. The main issues were: difficulties with educating large numbers of medical and nursing staff, reaching junior medical officers when rosters changed, presence of locum medical officers and the limited resources available for conducting ongoing education.

Other barriers were: supply of pilot charts, reluctance of senior medical officers to use the VTE section and a tendency to continue to use the regular section of the chart for prescribing of VTE prophylaxis.

Risk assessment section

Eleven hospitals provided feedback and several themes emerged:

- Lack of compliance in documenting the risk on the chart;
- Doctors unwilling to deem a patient “not at risk”;
• Section too small, mistaken as a border;
• Placement of the tick boxes in relation to the words “at risk” and “not at risk” was confusing;
• No place for the person completing the assessment to sign; and
• 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.

Unintended consequences of inclusion of the VTE section in the NIMC

A number of hospitals reported confusion around the use of the pharmacological and mechanical prophylaxis prescribing sections. The most common error was doctors/nurses signing for pharmacological prophylaxis in the mechanical prophylaxis section.

One hospital reported that a treatment dose of enoxaparin was charted in the VTE section and another hospital reported some missed doses of VTE prophylaxis as patients with multiple charts did not have their order rewritten on the new chart. The qualitative study confirmed the quantitative study findings that many doctors continued to use the regular section of the chart for VTE prophylaxis.

Suggested design improvements

Suggestions included: making the risk assessment section larger and more prominent, changing the wording of “at risk/not at risk” and placing check boxes after the words.

The main design improvement requested was clearer separation of the pharmacological and mechanical prophylaxis sections in the prescribing section.

Lessons learnt

Improving use of VTE prophylaxis requires the support of the executive and clinical leaders across the whole hospital and sufficient resources for training and ongoing education to support any sustained change in practice. A “Big bang” approach to introducing the chart was recommended.

Education

ACSQHC provided a range of materials to assist hospitals to educate staff about the chart. These included a brochure, a poster and a PowerPoint presentation. Hospitals reported that the education materials provided by ACSQHC were useful with the poster and brochure rated as the most useful overall.

All hospitals conducted short education sessions on how to use the pilot chart with the VTE section with medical, nursing and pharmacy/allied health staff.
3. Issues register

Seven hospitals reported issues to the Issues Register via email to the Senior Project Officer. All but one of these issues was also reported in the qualitative survey.

The issues raised were:

a. Risk assessment section was too small and therefore overlooked (two hospitals);
b. Treatment dose of enoxaparin was charted in VTE section (one hospital);
c. Pharmacological and mechanical boxes were too close together and not well differentiated (four hospitals):
   - Orders for anticoagulants signed by medical officer in mechanical section (2 hospitals);
   - Nurses signing for drugs in mechanical section (4 hospitals); and
   - Risk of once daily enoxaparin given twice daily (1 hospital);
d. One hospital made a request for long-stay NIMC to include a risk assessment section.

4. Conclusion

The introduction of a VTE prophylaxis section in the NIMC in a range of hospitals of varying sizes and complexity of services significantly increased the rate of VTE prophylaxis prescribing whilst not increasing the risk of duplicate anticoagulant therapy being prescribed. The inclusion of the VTE section did not increase the number of medication charts per patient and the risks associated with multiple charts.

The results provide support for the inclusion of a VTE prophylaxis section in the next version of the short-stay NIMC. However the design of the VTE section needs to be modified to improve the useability and the acceptability of the VTE section.

The low rates of documentation of risk assessment and mechanical prophylaxis prescribing in the post-implementation audit does not support the inclusion of these items in the NIMC. Furthermore, hospitals reported a number of significant barriers to including these items in the NIMC.

The current design of the VTE prophylaxis section will be revised and heuristically (human factor) analysed before national roll out.

The successful introduction of the NIMC with a pre-printed VTE section will require a significant commitment to training staff to familiarise clinicians with the chart and how to safely use the VTE section. The materials developed for the pilot will be useful resources to assist hospitals in this process.
2. Background

In April 2010, the ACSQHC’s National Inpatient Medication Chart Oversight Committee agreed to pilot nationally a draft National Inpatient Medication Chart (NIMC) pre-printed with a VTE prophylaxis section (pilot NIMC) to test its suitability for national implementation. The decision followed the evaluation of quantitative and qualitative data derived from trialling and piloting of inpatient medication charts with a VTE prophylaxis section in Queensland and Victorian hospitals.

The aim of the NIMC VTE Prophylaxis Pilot Project was to pilot and evaluate the effect of a pre-printed venous thromboembolism (VTE) risk assessment and prescribing space in the National Inpatient Medication Chart on VTE risk assessment and prophylaxis prescribing for adult patients in a range of hospitals.

The design and placement of the VTE risk assessment and prophylaxis prescribing and administering section on the NIMC was informed by the work undertaken by the Safe Medication Management Unit in Queensland and in Victorian hospitals. The content reflected the 2009 Clinical Practice Guideline for the Prevention of Venous Thromboembolism in Patients admitted to Australian Hospitals.¹

Figure 2.1 – Pre-printed VTE risk assessment and prophylaxis prescribing section in the pilot NIMC

The objectives of the NIMC VTE Prophylaxis Pilot Project (the Pilot) were to:

a. Assess the utility and acceptability of the pre-printed VTE prophylaxis section for documenting the risk of VTE;

b. Assess the effect of the pre-printed VTE prophylaxis section on the rate of VTE prophylaxis prescribing for patients at risk of VTE;

c. Assess unintended consequences of the pre-printed VTE prophylaxis section including:
   i. Prescribing for patients not at risk; and
   ii. Duplicate prescribing of VTE prophylaxis in any part of the NIMC;

d. Measure VTE prophylaxis prescription and administration errors.

Expressions of interest

Expressions of interest were sought from public and private hospitals willing to participate in the project in June 2010. 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 draft NIMC (see Figure 2.1) 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 audit, and a twelve month post-implementation audit; and
  • Communications with ACSQHC and local clinicians.

Paediatric patients were excluded.

The Pilot was to commence in July 2010 and be completed by the end of November 2010.

Twenty nine expressions of interest were received. Three hospitals were unable to participate because they did not use the standard version of the NIMC. Twenty six hospitals were accepted into the study. Several of the hospitals subsequently withdrew from the study as they were unable to obtain printed charts with a VTE prophylaxis section in the required project time frames. One hospital was unable to proceed because the GPs who provided medical services to the acute care unit decided that they were unwilling to hand write on charts as they had recently started to use the NIMC that is generated through electronic GP prescribing software. Nineteen hospitals completed the project.

The pilot project plan contained three components of the evaluation:

1. A quantitative study undertaken by a range of hospitals from three states;
2. A qualitative survey of sites participating in the quantitative study; and
3. A review of the issues register contributed to by sites participating in the pilot study.
3. Quantitative Study

Pilot methodology

The methodology of the NIMC VTE Pilot Project involved baseline data collection and introduction of the pilot NIMC with VTE prophylaxis section through education of hospital staff on the use of the chart followed by post implementation data collection.

Collect baseline data  Educate staff on use of VTE section  Introduce pilot NIMC with VTE section  Collect post implementation data (at 3 & 12 months)

Figure 3.1: Methodology of the NIMC VTE pilot project

An audit tool was developed for hospitals to collect data for the quantitative study. The tool included elements to measure compliance with the different elements of the VTE prophylaxis section in the pilot NIMC. This included documentation of VTE risk assessment, prescription of pharmacological and mechanical prophylaxis, documentation of administration of anticoagulant therapy and checks of mechanical devices. Elements were also included that would measure the potential for the section to cause harm by affecting the safety of other features of the chart and lead to duplicate or unnecessary prescribing of anticoagulation. Hospitals were required to audit their existing NIMCs to collect baseline data over a one month period. The NIMC with VTE prophylaxis section (pilot NIMC) was then introduced with education of medical, nursing and pharmacy staff using materials provided by ACSQHC. Three months after introducing the pilot NIMC the post-implementation data was collected. A second third post implementation data collection was to be undertaken 12 months after introducing the pilot NIMC.

Hospitals were provided with the pre- and post implementation audit tools, a user guide and resource materials to educate staff. An online education session was provided to familiarise Project Coordinators/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 ACSQHC.

Each hospital was required to audit a random sample of current inpatients of greater than 24 hours admission using a NIMC. Post-implementation inpatients with a NIMC with pre-printed VTE section were audited. The sample size was a minimum of 60 patients per site (all patients if less than 60 patients were identified) or 20% of patients whichever was greater. Data collection was undertaken over a four week period. The baseline/pre-implementation audit was completed before education was provided.

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

In the post-implementation audit sites were required to audit the same number of charts and use the same wards. For consistency in data collection they were requested to use the same team to complete both audits. The post-implementation audit was to be completed 12 weeks after the introduction of the pilot chart.

A full outline of the methodology for the study is outlined in the NIMC VTE Prophylaxis Pilot Manual for Hospital September 2010. ²
Statistical analysis

χ² tests (with a 5% significance level) were used to test for differences in proportions. 95% confidence intervals for proportions or differences in proportions were calculated based on a large sample approximation.

Results

Audit data were received from nineteen hospitals across three states. The nineteen hospitals included large tertiary referral hospitals, regional/district and metropolitan hospitals, rural hospitals and private hospitals (see table 3.1 below).

Table 3.1 Pilot hospitals

<table>
<thead>
<tr>
<th>Public Hospitals</th>
<th>Private Hospitals</th>
<th>Total Hospitals</th>
</tr>
</thead>
<tbody>
<tr>
<td>New South Wales</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>South Australia</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Victoria</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

This analysis includes results from the pre-implementation audit and the three month audit post-implementation.

The total number of NIMCs audited for the baseline audit was 1,888 and for the post-implementation audit it was 1,777. Both audits exceeded the minimum required sample size of 1,200 NIMCs outlined in the original project plan.³

The number of charts audited by the hospital ranged from 21 to 176 charts in the baseline audit. Most hospitals audited around 60 charts however there were three large hospitals that audited 100 or more charts and two small hospitals that audited less than 40 charts in the baseline audit.

The number of charts audited in the post-implementation audit ranged from 19 to 177 charts. As with the baseline audit, in the post-implementation audit there were three hospitals that audited over 100 charts as well as three small hospitals that audited less than 40 charts.

The number of patients in each clinical category was similar in both audits. See table 3.2.

Table 3.2 Patients by clinical category

<table>
<thead>
<tr>
<th>Clinical category</th>
<th>Pre-implementation audit</th>
<th>Post-implementation audit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. patients (%)</td>
<td>No. patients (%)</td>
</tr>
<tr>
<td>Surgical</td>
<td>383 (31.0%)</td>
<td>400 (34.1%)</td>
</tr>
<tr>
<td>Medical</td>
<td>698 (56.1%)</td>
<td>657 (56%)</td>
</tr>
<tr>
<td>Cancer</td>
<td>48 (4.0%)</td>
<td>52 (4.4%)</td>
</tr>
<tr>
<td>Pregnancy/childbirth</td>
<td>80 (6.5%)</td>
<td>57 (4.9%)</td>
</tr>
<tr>
<td>Other</td>
<td>15 (1.0%)</td>
<td>7 (0.6%)</td>
</tr>
<tr>
<td>Not stated</td>
<td>4 (0.33%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Total No patients</td>
<td>1228</td>
<td>1173</td>
</tr>
</tbody>
</table>
NSW public hospitals and one Victorian hospital experienced significant delays in receiving the pilot charts from their supplier. Two of these hospitals only introduced the pilot NIMC in early to mid-January 2011. This meant they had shorter timeframes for conducting the intervention and the post-implementation audit. However, these two sites were able to achieve a similar-sized sample in their pre and post-implementation audits. Due to these delays the project which was originally scheduled to be completed by the end of November 2010 was extended through to the end of February 2011.

Table 3.3 on the following pages details the national average results and compares the pre-implementation audit results (using the existing NIMC) with the post-implementation results using the pilot NIMC. For the risk assessment at baseline, hospitals were instructed to measure compliance with their hospital’s policy for documenting risk assessment. This was compared to the post pilot rate of VTE risk assessment that was documented in the risk assessment section of the pilot NIMC with VTE prophylaxis section.

In the final analysis, data from two hospitals were excluded because their samples did not conform to the pilot requirements in terms of selecting a random sample or a similar sample across their pre and post-implementation audits. Figures for Items 2, 3, 4 and 5 on documentation of risk assessment were excluded for one hospital as their results were confounded by their pre-implementation audit processes for documentation of VTE risk.
Table 3.3 National results of quantitative study

<table>
<thead>
<tr>
<th>Data item</th>
<th>Pre-audit result</th>
<th>Post-audit result</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Item 1: Number of current medication charts (i.e. charts in use per patient) | Total number of patients: 1,228  
Total number of charts: 1,888  
Average: 1.54 per patient  | Total number of patients: 1,173  
Total number of charts: 1,777  
Average: 1.51 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 which could pose safety risks. |
| Item 2: VTE risk assessment documented on NIMC                            | 110 yes responses  
9.41% (Range 0 – 41.67%)  | 191 yes responses  
17.16% (Range 0-70.8%) | An increase of 7.75% (95% CI: 5.0%, 10.5%) was observed, providing very strong evidence to reject the hypothesis of no change ($\chi^2 = 29.8, df = 1, p < 0.0001$).  
The range of yes responses varied significantly in the post-implementation audit.  
Note: data collected from patients’ notes, VTE assessment forms in pre-implementation audit. |
| Item 3: Documentation of patients at risk using “at risk” tick box on pilot NIMC | Not collected  | 116 yes responses  
10.42% of all patients had “at risk” ticked on their charts. | 10.42% (95% CI: 8.6%, 12.2%)  
Where a risk assessment was documented in the post-implementation audit it was mainly documented using the tick boxes and/or contraindication fields. |
| Item 4: Documentation of patients not at risk using “not at risk” tick box on pilot NIMC | Not collected  | Total of 12 yes responses  
1.07% of patients had “not at risk” ticked on their charts. | 1.07% (95% CI: 0.5%, 1.7%) |
| Item 5: Prophylaxis marked as contraindicated on pilot NIMC               | Not collected  | Total of 53 patients had the contraindicated box ticked  
(4.76% of all patients)  
15 patients were prescribed pharmacological prophylaxis where contraindicated box ticked.  
(2.1%, 95% CI: 1.0%, 3.1%).} | 4.76% (95% CI: 3.5%, 6.0%)  
A range of contraindications were reported in the pilot NIMC. Examples included:  
• Mechanical prophylaxis contraindicated due to wound or leg ulcer  
• Active bleeding, post-op bleeding, gastric bleeding  
• On therapeutic anticoagulant  
• Palliative care patient  
• ADR to heparin  
• Clotting profile abnormality |
<table>
<thead>
<tr>
<th>Data item</th>
<th>Pre-audit result</th>
<th>Post-audit result</th>
<th>Comments</th>
</tr>
</thead>
</table>
| **Item 6: VTE prophylaxis ordered**                                      | Yes – 714 patients (58.1 % of all patients)   | Yes – 770 patients (65.64% of all patients) | An increase of 7.5% (95% CI: 3.6%, 11.4%) was observed, providing very strong evidence to reject the hypothesis of no change. (χ² = 13.1, df = 1, p = 0.0002).  
When taken as percent of patients prescribed prophylaxis with risk assessment documented: 13.4% pre-implementation and 21.9% post-implementation. An increase of 8.5% (95% CI: 4.6%, 12.4%) was observed, providing strong evidence to reject the hypothesis of no change. (χ² = 17.5, df = 1, p < 0.0001) |
| **Item 7: Pharmacological prophylaxis prescribed (Post-implementation prescribed in VTE or regular sections)** | 677 patients (55.1 % of all patients)         | 732 patients (62.4% of all patients)         | There was a significant increase in the percentage of patients that were prescribed pharmaceutical prophylaxis in the post-implementation audit. An increase of 7.3% (95% CI: 3.3 %, 11.2 %) was observed, providing very strong evidence to reject the hypothesis of no change. (χ² = 13.1, df = 1, p = 0.0003).  
As percent of patients with any prophylaxis ordered: 94.8% pre-implementation and 95.1% post-implementation. A change of 0.2% (95% CI: -2.0%, 2.5%) was observed, but there is little or no evidence to reject the null hypothesis of no change (χ² = 0.04, df = 1, p = 0.82). |
| **Item 8: Pharmacological prophylaxis prescribed in VTE prophylaxis section of pilot NIMC** | Not collected                                  | 485 patients (66.3% of patients that had pharmacological prophylaxis prescribed) | For 66.3% (95% CI: 62.8%, 69.7%) of the patients the VTE section was used when pharmacological prophylaxis was prescribed. |
| **Item 9: Pharmacological prophylaxis prescribed in regular section of pilot NIMC** | Not collected                                  | 244 patients (33.3% patients that had pharmacological prophylaxis prescribed) | For 33.3% (95% CI: 29.9%, 36.7%) of the patients the VTE section was used when pharmacological prophylaxis was prescribed.  
There were 24 charts where yes responses were recorded for pharmacological prophylaxis prescribed in both VTE and regular medication sections. These may have been charts belonging to patients whose VTE therapy had changed. |
<table>
<thead>
<tr>
<th>Data item</th>
<th>Pre-audit result</th>
<th>Post-audit result</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item 10: More than one active order of anticoagulant for VTE prophylaxis</strong></td>
<td>6 orders recorded as yes but comments provided for 2 orders only. Case 1: Enoxaparin 20 mg and Clexane 40 mg Case 2: Heparin and Clexane ordered. Heparin order ceased prior to being given.</td>
<td>4 orders reported as yes but no comments provided.</td>
<td>No significant change. 0.9% pre-implementation and 0.5% post-implementation. A change of -0.3% (95% CI: -1.2%, 0.5%) was observed, but there is little or no evidence to reject the hypothesis of no change ( \chi^2 = 0.58, df = 1, p = 0.45 ). Introducing a separate VTE section did not appear to increase the risk of patients being prescribed duplicate therapy. Note: There was confusion around which medicines were to be reported as “duplicate therapy”. Despite providing clear instructions and a Frequently Asked Question document some hospitals reported combinations of heparin, warfarin, aspirin, clopidogrel in this item and in item 11.</td>
</tr>
<tr>
<td><strong>Item 11: Active orders for both prophylaxis and therapeutic anticoagulant</strong></td>
<td>23 orders recorded as yes. There were 9 comments mostly listing combinations of warfarin and enoxaparin or heparin. Some comments on patient diagnosis e.g. PE, DVT</td>
<td>29 orders recorded as yes. There were 6 comments. Three listing combination of warfarin and enoxaparin for management of DVT, AF.</td>
<td>3.4% pre-implementation and 4.0% post-implementation. A change of 0.6% (95% CI: -1.4%, 2.5%) was observed, but there is little or no evidence to reject the hypothesis of no change ( \chi^2 = 0.32, df = 1, p = 0.57 ). Again there was confusion with this data element around which medicines were considered to be VTE prophylaxis and which were therapeutic anticoagulation.</td>
</tr>
<tr>
<td><strong>VTE prophylaxis ordered in patients Not at risk</strong></td>
<td>No baseline data available</td>
<td>5 patients had pharmaceutical prophylaxis prescribed where the “Not at risk” box was ticked</td>
<td>5 patients may have received pharmacological prophylaxis when not required. This may be prescriber error or due to confusion with documenting the risk assessment with prescriber ticking “Not at risk” when meaning to tick the “At risk”.</td>
</tr>
<tr>
<td><strong>Item 12: Doses of anticoagulant required</strong></td>
<td>3,740</td>
<td>3,811</td>
<td>No change over pre-implementation audit. A change of 0.1% (95% CI: -1.4%, 1.6%) was observed, but there is little or no evidence to reject the hypothesis of no change ( \chi^2 = 0.03, df = 1, p = 0.86 ).</td>
</tr>
<tr>
<td><strong>Item 13: Doses of anticoagulant documented as given</strong></td>
<td>3,259 (87.1% of total doses documented as given)</td>
<td>3,326 (87.3% of total doses documented as given)</td>
<td>No change over pre-implementation audit. A change of 0.1% (95% CI: -1.4%, 1.6%) was observed, but there is little or no evidence to reject the hypothesis of no change ( \chi^2 = 0.03, df = 1, p = 0.86 ).</td>
</tr>
<tr>
<td>Data item</td>
<td>Pre-audit result</td>
<td>Post-audit result</td>
<td>Comments</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>------------------</td>
<td>-------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Item 14: Mechanical VTE prophylaxis prescribed</strong></td>
<td>228 orders</td>
<td>225 orders</td>
<td>18.6% pre-implementation and 19.2% post-implementation. An increase of 0.6% (95% CI: -2.5%, 3.7%) was observed, but there is little or no evidence to reject the null hypothesis of no change. ($\chi^2 = 0.15, df = 1, p = 0.70$) As a percentage of patients with prophylaxis ordered: 31.9% pre-implementation and 29.2% post-implementation. A change of -2.7% (95% CI: -7.4%, 2.0%) but there is little or no evidence to reject the null hypothesis of no change ($\chi^2 = 1.28, df = 1, p = 0.26$).</td>
</tr>
<tr>
<td><strong>Item 15: Mechanical VTE prophylaxis checks required</strong></td>
<td>1,107</td>
<td>1,335</td>
<td></td>
</tr>
<tr>
<td><strong>Item 16: Mechanical prophylaxis checks documented</strong></td>
<td>818</td>
<td>614</td>
<td>73.9% pre-implementation and 46.0% post-implementation. A change of -27.9% (95% CI: -31.6%, -24.2%) was observed, providing very strong evidence to reject the hypothesis of no change ($\chi^2 = 194.24, df = 1, p &lt; 0.0001$).</td>
</tr>
<tr>
<td><strong>Item 18: Patients prescribed both pharmacological and mechanical VTE prophylaxis</strong></td>
<td>14.8%</td>
<td>14.4%</td>
<td>As a percentage of all patients 14.8% pre-implementation and 14.4% post-implementation. A change of -0.4% (95% CI: -3.2%, 2.4%) was observed, providing little or no evidence to reject the hypothesis of no change ($\chi^2 = 0.08, df = 1, p = 0.77$). As a percentage of patients prescribed any VTE prophylaxis: 25.5% pre-implementation and 21.9% post-implementation. A change of -3.5% (95% - 7.9%, 0.8%) was observed, providing weak evidence to reject the hypothesis of no change ($\chi^2 = 2.57, df = 1, p = 0.11$).</td>
</tr>
</tbody>
</table>
4. Qualitative study

The aim of the qualitative study was to obtain feedback on the experience of introducing the pilot NIMC with VTE prophylaxis section in the pilot sites.

The objectives were 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.

The survey covered three main areas:
   1. The hospital’s existing VTE risk prevention policies and forms;
   2. Feedback on the project materials supplied by ACSQHC including a range of educational materials and the audit tool and audit tool user guide; and
   3. Feedback on the implementation experience including issues and barriers, unintended consequences from using the chart, lessons learned and recommendations for changes to the VTE section.

Together with the pre and post implementation audit data, the qualitative survey results would 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.

Survey methodology

The survey questionnaire was developed and uploaded to www.FreeOnlineSurveys.com, an online survey tool similar to the SurveyMonkey®. The survey contained closed and open ended questions and for some questions a Likert rating scale was used. See Appendix 2 for copy of the survey. One of the pilot site hospitals piloted the survey to ensure the questions were clear and the online tool was functional and easy to use.

An email with the link to the survey was sent to all project coordinators in January 2011 after sites had implemented the pilot NIMC. Project coordinators were instructed to complete the survey liaising with other staff members, where necessary, to ensure the survey responses represented an accurate record of the hospital’s experience.

Results

All nineteen sites completed the online survey between mid-January and late February 2011.

Sixty three percent of hospitals introduced the NIMC VTE pilot chart into all areas of the hospital while 37% chose to implement the chart into selected wards only.

Hospital VTE Prevention Policies and Forms

Seventy four percent of hospitals reported that they had a formal VTE prevention policy. Of those hospitals that did not have a formal policy all but one were planning to introduce a formal policy in the future.
Most hospitals reported that their policy was based on the *Best Practice Guidelines for Australian and New Zealand for the Prevention of Venous Thromboembolism* 4th edition (32%) or multiple references (24%). Only one in five hospitals reported that their policy referenced the NHMRC 2009 *Clinical Practice Guidelines for the Prevention of VTE in patients admitted to Australian Hospitals* (see figure 1 below).

![Figure 4.1. Guidelines the VTE Prevention Policy is based on](image)

- Best Practice Guidelines for Australia and New Zealand for Prevention of Venous Thromboembolism (4th edition)
- Multiple references/guidelines
- NHMRC 2009 Clinical Practice Guideline for the Prevention of Venous Thromboembolism in Patients admitted to Australian Hospitals
- Other
- Best Practice Guidelines for Australia and New Zealand for Prevention of Venous Thromboembolism (3rd edition)
- Don't know what guideline it is based on

n=15

Hospitals reported that their VTE Prevention policies covered a number of areas with all policies covering VTE risk assessment and pharmacological prophylaxis. The majority of hospital policies also covered mechanical prophylaxis (see Figure 2 below).

![Figure 4.2. VTE Prevention Policies - areas covered (%) (tick all that apply)](image)

- Risk assessment: 100%
- Pharmacological prophylaxis: 100%
- Mechanical prophylaxis: 93%
- Surgical patients: 93%
- Medical patients: 84%
- Pregnancy & childbirth: 50%
- Cancer: 50%
- Other: 14%

n=14
Four out of five hospitals reported having a VTE risk assessment form in use in their hospital. Medical staff were responsible for conducting the VTE risk assessment in the majority of hospitals (79%) while nursing staff had sole responsibility for this role in three hospitals and joint responsibility for the VTE risk assessment with either medical or pharmacy staff, in another three hospitals.

**Staff education and use of educational resources provided by ACSQHC**

Hospitals reported providing short education sessions on the pilot NIMC VTE chart to nursing, medical and pharmacy staff. Sixty three percent of hospitals reported the education sessions were up to 15 minutes in length while another 32% reported sessions of between 15 and 30 minutes.

The educational materials provided by ACSQHC included a poster, brochure, PowerPoint training presentation and a Frequently Asked Questions document. All of these materials were rated as being useful with the NIMC VTE poster and brochure being reported as the most useful overall. Ninety five percent of hospitals reported using the poster to educate staff and 84 percent reported using the brochure.

**NIMC VTE Poster**

![NIMC VTE Poster](image)

**NIMC VTE Brochure**

![NIMC VTE Brochure](image)
NIMC VTE pilot audit tool and user guide

An audit tool was developed for hospitals to use to collect data for the quantitative study. The VTE audit tool was an automated excel spreadsheet that allowed hospitals to record the answers to the audit questions for each patient’s data. On completion of the audit project co-ordinators were able to send the file electronically to a corporate email address at ACSQHC.

Hospitals were provided with the pre- and post implementation audit tools, a user guide and educational materials to use to educate staff. An online education session was provided to hospital project staff on how to conduct the audit and use the audit tool (a screenshot of the pre-implementation audit tool is provided below).

Eighty nine percent of hospitals either strongly agreed or agreed that the audit tool was easy to use and 58% strongly agreed or agreed that the user guide provided clear guidance on how to complete the audit.

Seventy nine percent of hospitals reported that the audit data elements were easy to collect. However feedback from this survey and questions raised by hospitals when completing the audit confirm that there was some confusion around two of the data elements, namely Item 10 - “More than one active order of anticoagulant for VTE prophylaxis” and Item 11 - “Active orders for both prophylaxis and therapeutic anticoagulant”. Auditors were confused about which medicines to include in these data elements and despite providing clear instructions and a Frequently Asked Question document some hospitals still reported combinations of heparin or enoxaparin with agents such as warfarin, aspirin, clopidogrel making it difficult to establish the “true” rates of any duplicate prescribing in the quantitative audit.
NIMC VTE Pilot implementation experience

Barriers to implementation

Project teams were asked to report on specific barriers that they encountered in implementing the pilot chart with VTE section in their hospital.

While all sites reported that they had conducted some education sessions with staff, education was identified as a barrier to implementation of the pilot chart with VTE section. A number of issues were reported including difficulties associated with educating large numbers of medical and nursing staff, difficulties reaching all the junior medical officers (JMOs) when rosters changed, issues associated with the use of locum medical officers and the limited resources available for conducting ongoing education.

As the intervention ran over the Christmas/New Year period and into January 2011 for many of the hospitals this meant some key staff members were on leave and there were limited resources available for education when the new intake of JMOs arrived in January.

"Mainly due to the high volume use of locum medical officers who come for one to two days and the rotation of junior medical officers every 10 weeks - you just get on group working well with the NIMC and then a new rotation starts and you are back to square one. Limited support through encouragement to complete assessment from senior medical officers. Limited resources in our facility to devote time to ongoing education and limited support from the medical officers who do not perceive the documentation of risk as their responsibility. Introduction time for the pilot at the end of the year has had an impact due to senior personnel being on leave and limited staff during holiday." (Project Coordinator – NIMC VTE pilot hospital)

Problems with the supply of pilot charts was identified as a barrier at some hospitals. Some sites experienced delays in receiving the pilot charts with VTE section while other sites found that existing charts kept appearing on pilot wards. This led to confusion and reversion to the existing charts in some cases.
“Often some of the charts without the VTE section would creep back into circulation on the trial wards making it confusing and a barrier to compliance.” (Project Coordinator – NIMC VTE pilot hospital).

Some hospitals reported that Senior Medical Officers were reluctant to use the VTE section either because they were not in agreement with the guidelines for the use of pharmacological prophylaxis or because of lack of familiarity with the new VTE section and a tendency to continue to use the regular section of the chart for prescribing of VTE prophylaxis.

“The effectiveness of Chemical prophylaxis versus adverse effects is still hotly debated amongst clinicians in some wards.” (Project Coordinator – NIMC VTE pilot hospital).

Two hospitals reported that Medical Officers did not perceive the documentation of risk as their responsibility and they were unwilling to complete the VTE risk assessment section.

Unintended Consequences

Seven hospitals reported some unintended consequences as a result of including a VTE section in the NIMC. The most commonly reported error was confusion about how to document prophylaxis correctly in the VTE section and several sites provided examples:

- Medical Officer signing in the mechanical prophylaxis section not the pharmacological section when heparin/enoxaparin charted (see example one below);
- Timing for administration of heparin/Clexane written in the mechanical prophylaxis area next to AM, PM (see example 2 below); and
- Administration of heparin/Clexane documented in mechanical prophylaxis area (example 1 and 2)

One respondent cited the potential for a once daily dose [of enoxaparin] to be give twice daily as the mechanical and pharmacological boxes were too close together and the line separating the sections not clear.

Example 1: Prescriber has signed and printed their name in mechanical prophylaxis section

![Example 1](image1)

Example 2: Prescriber has entered dose administration times for the heparin in the mechanical prophylaxis section

![Example 2](image2)
Three hospitals reported some missed doses of VTE prophylaxis. In one case the patient had multiple charts and the VTE prophylaxis order had not been re-written on the new chart. In the second case it was reported as being due to a lack of space for recording administration and therefore the auditor was unsure if the medication had been given or not. The third hospital reported that doses had been missed due to the location of the VTE prophylaxis order on the chart:

“…..nurses are not used to looking for orders between two blank sections as it’s counterintuitive. Charts are customarily completed from top to bottom not randomly with blank sections everywhere”. (NIMC VTE Pilot site)

One hospital reported a treatment dose of Clexane had been recorded in the VTE section.

As described above, another common finding was that medical officers continued to write VTE prophylaxis orders in the regular section of the chart despite receiving education about the VTE prophylaxis section. This was generally reported as a lack of familiarity with the new practice and was seen as likely to improve over time and with some ongoing education and reminders about the VTE prophylaxis section.

Risk assessment section

Hospitals were also asked to provide specific feedback on the risk assessment section. Eleven hospitals provided feedback and several themes emerged. The section was reported as being too small and was often mistaken as a border. One hospital reported that the placement of the tick boxes in relation to the words “at risk” and “not at risk” was seen to be confusing, suggesting that the boxes should be placed after the statements to which they refer.

“ “VTE Risk Assessed “ section has a check-box immediately following this, which looks as though you check it to say you have assessed risk. Though it refers to the following statement: “at risk”. Check boxes should be after the statements to which they refer.” (NIMC VTE Pilot site)

There were also concerns that there was nowhere to sign who had completed the risk assessment and this may be a medico-legal issue. In some hospitals doctors were reported to be unwilling to deem a patient was “not at risk” as all hospitalised patients were considered to have some degree of risk of developing a VTE. This led to a lack of compliance in documenting the risk on the chart with medical officers continuing to document the risk assessment in the patient’s notes rather than on the chart.

In some hospitals nursing staff were responsible for documenting the risk assessment and this was recorded on a clinical pathway in the patient’s notes or on a separate risk assessment form. Implementing the pilot chart with VTE section therefore meant a change of practice for these nursing staff who were unwilling to document the risk assessment in the VTE section either because this was seen as the doctor’s domain or because they did not want to document the risk assessment twice.

Suggested design improvements to the VTE section

Eleven hospitals made suggestions for improvements to the VTE section. Some were general comments about the section as a whole while others focused on specific issues.

Three hospitals suggested that the section should be made larger as there was a lot of information to record in the section.

“A little more space. Often one type of prophylaxis is written in the VTE section but prescribers find the space too small to write both” (NIMC VTE Pilot hospital).
The “saw tooth” design of the prescribing section was reported to be confusing as evidenced by the signing of pharmacological prophylaxis in the mechanical prophylaxis section. It was suggested that a revised design should clearly separate the pharmacological and mechanical prophylaxis sections.

One hospital suggested removing the AM and PM from the mechanical prophylaxis prescribing section as this design had led staff to using this space to indicate medication administration times.

In a hospital where nursing staff record the risk assessment the suggestion was to remove the risk assessment section completely as it led to double documentation or alternatively it was not used at all.

One hospital suggested adding a tick box within the VTE section to indicate if the patient had therapeutic anticoagulation charted on a separate IV chart e.g. IV heparin, as this would avoid duplicate therapies being prescribed.

Other suggestions included placing the VTE prophylaxis section beneath the warfarin section so as to reduce the risk of missed doses and having a space to record separate dates for prescribing mechanical and pharmacological prophylaxis.

**Lessons Learnt**

Hospitals reported some key lessons arising from the experience of implementing the pilot chart. As a “whole of hospital” issue VTE prophylaxis requires the support of the executive and clinical leaders across the whole hospital. Several hospitals identified the need for the hospital executive to provide sufficient resources for training and ongoing education to support any sustained change in practice.

One hospital that introduced the chart into some wards only found this was less than ideal and reported that a “Big bang” approach that targeted the whole hospital would have been a better approach.

A Project Coordinator from a large teaching hospital summarised their experience as follows:

“…..As with any change I feel it is important to include the executive and try to engage them to take an active interest, if only to email and announce the change to pre-warn department heads etc. This hospital is large with many challenges to communication. I would suggest making a check list of executive staff in the hospital that should be notified and [given] a brief introduction and seek guidance to expedite support from the beginning.

Our pilot team made arrangements to meet with senior nurses such as CNC's, CNE's, physiotherapists, and senior medical staff. We have made presentations with the JMO group and emails were sent to every medical officer via the DMS. During these meetings and presentations we used the flyers, the powerpoint presentation and posters from the commission. It would have good to have had the charts - even a draft version. We had the posters printed in colour and laminated and delivered to every participating ward. In addition we sent emails with pilot information to NUM's and we also have staff who support the NUM's who are called CSO's - they order charts among their duties in some wards. Ward clerks in some wards order charts and some don't. This was an issue because communication across so many staff made the initial contact messy. [Project coordinators] visited each ward in person to assess progress along the way, which was useful because during those personal contacts we realised that email communication was not 100% successful in reaching everyone concerned…..” (NIMC VTE Pilot site - large teaching hospital)
5. Issues Register

Seven hospitals reported issues in the Issues Register that was provided in a secure section on ACSQHC’s website. All but one of these issues was also reported in the qualitative survey.

The issues raised were:

1. Risk assessment section was too small and therefore is overlooked (two hospitals);
2. Treatment dose of enoxaparin was charted in VTE section (one hospital);
3. Pharmacological and mechanical boxes were too close together and not well differentiated (four hospitals):
   I. Orders signed by Medical Officer in mechanical section (2 hospitals);
   II. Nurses signing for drugs in mechanical section (4 hospitals); and
   III. Risk of once daily enoxaparin given twice daily (1 hospital);
4. A request for long-stay NIMC to include a risk assessment section (1 hospital).
6. Discussion

The objectives of the quantitative component of the pilot were to:

- 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.

This information was supplemented by the feedback obtained through the qualitative survey and the issues register.

Effect of VTE prophylaxis section on documentation of VTE risk assessment

The number of patients with VTE risk assessment documented on the medication chart increased from 9.4% in the baseline audit to 17.2% in the post-implementation audit. Although the increase of 7.75% was statistically significant ((95% CI: 5.0%, 10.5%. p<0.0001) the figure is still low with one in six patients having their risk assessment documented on the pilot NIMC There was a wide variation in the use of this section among hospitals ranging from 0% to 70.8%. See figure 6.1.

Feedback from the qualitative survey conducted towards the end of the project reported reluctance by medical and nursing staff to document in the section. Medical staff were reported as being unwilling to designate patients “not at risk”. In a number of sites some nurses documented the risk assessment in other sections of the patient record and were unwilling to document twice.

![Figure 6.1. % of patients with risk assessment documented pre and post-implementation by hospital](image)
**Effect of on rate of VTE prophylaxis prescribing**

The rate of VTE prophylaxis prescribing increased significantly from 58.1% to 65.6%, an increase of 7.5% (95% CI: 3.6%, 11.4% p=0.0002);. See figure 6.2 for individual hospital results.

![Figure 6.2. % patients documented as receiving any VTE prophylaxis pre and post-implementation by hospital](image)

When taken as a percentage of patients prescribed VTE prophylaxis who had a risk assessment documented, the rate increased from 13.4% in the pre-implementation audit to 21.9% in the three month post-implementation audit.

![Figure 6.3. % patients documented as receiving pharmacological prophylaxis pre and post-implementation by hospital](image)
The rate of pharmacological prophylaxis prescribing increased by 7.3% (95% CI: 3.3%, 11.2% p=0.0003) between 55.1% in the pre-implementation audit and 62.4% in the post-implementation audits (see figure 6.3 for hospital results). There was no assessment of whether prescribing was in accordance with hospital policy or guidelines as not all hospitals participating in the pilot had a VTE prevention policy or guidelines.

Using national aggregate data, there was no change in the documentation of mechanical prophylaxis prescribing overall (18.6% in the baseline audit vs. 19.2% in the post-implementation audit) (see figure 6.4 for hospital results). Some hospitals showing a decrease in mechanical prophylaxis had a pre-existing process for documenting mechanical prophylaxis which they continued to use after introducing the pilot NIMC.

These results demonstrate that the presence of the VTE prophylaxis section on the chart increased the rate of VTE prophylaxis prescribing in a range of hospitals in a number of states. This was despite several hospitals having the pilot NIMCs in place less than three months before the post-implementation audit. These results confirm the findings from other Australian studies measuring the effect of a VTE prophylaxis section in the medication chart on improving the rate of VTE prophylaxis prescribing. This includes sites participating in the National Health and Medical Research Council – National Institute for Clinical Studies’ Public Hospital VTE Prevention Program in 2006-7.

**Effect on safety features of the NIMC**

The second objective of the pilot was to assess whether including a VTE prophylaxis section on the NIMC would negatively affect other safety features of the NIMC.

There were concerns that designating a specific section for VTE prophylaxis may increase the number of active medication charts that a patient may have. Multiple charts carry a risk of medicines not being administered as the additional chart(s) may be misplaced or filed away. The results indicate that the number of charts used per patient did not increase. The average number of charts per patient was 1.54 in the baseline audit compared with 1.51 in the three month post-implementation audit. Almost two thirds of the patients in the study were prescribed prophylaxis indicating that the majority of patients in hospital for more than 24 hours would have VTE prophylaxis ordered on their chart.
Unintended consequences of the pre-printed VTE prophylaxis section

The potential safety risks of including the VTE prophylaxis section are presented in figure 6.5. In the post-implementation audit five patients were prescribed VTE prophylaxes who were documented as “not at risk”. Feedback obtained though the qualitative survey indicated there was some confusion with the use of the risk assessment section because of the placement of the tick box and some doctors may have ticked the “Not at risk” box when meaning to tick the “At risk” box. There were six patients in the baseline audit and four patients in the post-implementation audit who were prescribed duplicate therapy for VTE prophylaxis providing no evidence to suggest that the introduction of the VTE section in the pilot NIMC increases the risk of patients being prescribed duplicate anticoagulant therapy.

![Figure 6.5. Key Safety features of Pre-& Post-implementation of VTE Prophylaxis in NIMC](image)

Similarly there were 23 patients in the baseline and 29 patients in the post-implementation audit reported as having active orders for both prophylactic and therapeutic anticoagulant(s). The 0.6% increase observed was not statistically significant. Where medication details were provided, the majority of these patients were on combinations of warfarin and heparin or warfarin and enoxaparin for the management of venous thromboembolism and not receiving both prophylactic and therapeutic doses of heparin and/or low molecular weight heparin. These results and the feedback from the qualitative survey indicate that there was some confusion about which medicines to include in the data element item 10 - “More than one active order of anticoagulant for VTE prophylaxis” and Item 11 - “Active orders for both prophylaxis and therapeutic anticoagulant”. Despite providing clear instructions and a Frequently Asked Question document some hospitals still reported combinations of heparin or enoxaparin with agents such as warfarin, aspirin, clopidogrel making it difficult to establish the “true” rates of any duplicate prescribing. Despite this confusion, the results indicate that having a specific VTE prophylaxis section on the NIMC did not increase the risk of patients being prescribed both prophylactic and therapeutic doses of anticoagulants.

Fifteen patients (2.1%) were recorded as having prophylaxis ordered when their risk assessment indicated it was contraindicated. There was no pre-implementation data available to compare with this result.
**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 missed doses (see Figure 6.6). There was no change in the number of doses of anticoagulant ordered that were not administered between baseline and the post-implementation study 12.9% vs. 12.7%. These results did not support the perception expressed in the qualitative survey that the placement of the VTE prophylaxis section resulted in more doses of pharmacological prophylaxis being missed. However there was a significant decrease in the number of checks performed on mechanical prophylaxis devices that were documented from 74% at baseline to 46% in the post-implementation study. In several sites nursing staff documented their checks in another section of the patients’ notes. This was counted in the baseline study but not in the post-implementation study. However the study does indicate that there was poor usage by nursing staff of the administration section for recording checks of mechanical devices.

There was some feedback from the qualitative study that some prescribers were signing for pharmacological prescribing in the mechanical prophylaxis section and nursing staff were signing the administration of pharmacological prophylaxis in the mechanical prophylaxis administration section. Similar issues were reported in the NIMC VTE Pilot Issues Register. This indicates the need to modify the design of the VTE prophylaxis section prior to inclusion in the NIMC.

**Education Materials**

All sites used the educational materials provided by ACSQHC and found them to be useful with the brochure and poster reported as the most useful.

**Limitations**

Delays for NSW public hospitals and one Victorian hospital in receiving charts meant that some hospitals experienced delays between the time the education was conducted and the time the charts were introduced.
Some sites had issues with NIMCs without the VTE section appearing on wards and in others difficulties with supply of charts which resulted at times in wards having to revert to using NIMCs without the VTE section.

Other issues that would have influenced the uptake of the intervention included the problem of medical staff working as locums or newly rostered to the hospital not being familiar with how to use the VTE section. Because of delays with charts the twelve week intervention ran over the Christmas/New Year period for the majority of hospitals and this meant that large numbers of staff were taking leave during this period.

All these issues may have affected the use and uptake of the VTE section.

The pilot was for a three month period which is a short time to familiarise clinicians with a new process and effect significant changes in practice. For several hospitals the timeframe was even shorter and this could have influenced the results.
7. Conclusion

The introduction of a VTE prophylaxis section in the NIMC in a range of hospitals of varying sizes and complexity of services significantly increased the rate of VTE prophylaxis prescribing whilst not increasing the risk of duplicate anticoagulant therapy being prescribed. The inclusion of the VTE section did not increase the number of medication charts per patient and the risks associated with multiple charts.

The results provide support for the inclusion of a VTE prophylaxis section in the next version of the short-stay NIMC. However the design of the VTE section needs to be modified to improve the useability and the acceptability of the VTE section.

The low rates of documentation of risk assessment and mechanical prophylaxis prescribing in the post-implementation audit does not support the inclusion of these items in the NIMC. Furthermore, hospitals reported a number of significant barriers to including these items in the chart.

The current design of the VTE prophylaxis section will be revised and heuristically (human factor) analysed before recommendations are made in relation to national implementation.

The successful introduction of the NIMC with a pre-printed VTE section will require a significant commitment to training staff to familiarise clinicians with the chart and how to safely use the VTE section. The materials developed for the pilot will be useful resources to assist hospitals in this process.
8. References


3. Project Plan for the piloting of a National Inpatient Medication Chart with a pre-printed venous thromboembolism risk assessment and prescribing space. 30 May 2010

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

1) Your Contact Details

<table>
<thead>
<tr>
<th>Your Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Your Position</td>
<td></td>
</tr>
<tr>
<td>Contact E-mail</td>
<td></td>
</tr>
<tr>
<td>Contact Telephone Number</td>
<td></td>
</tr>
<tr>
<td>Hospital Name</td>
<td></td>
</tr>
</tbody>
</table>

2) Your Contact Details

<table>
<thead>
<tr>
<th>Your Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Your Position</td>
<td></td>
</tr>
<tr>
<td>Contact E-mail</td>
<td></td>
</tr>
<tr>
<td>Contact Telephone Number</td>
<td></td>
</tr>
<tr>
<td>Hospital Name</td>
<td></td>
</tr>
</tbody>
</table>

3) Area of the hospital where the NIMC VTE pilot chart was implemented (select most appropriate response)

<table>
<thead>
<tr>
<th>Selected ward(s)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The whole hospital</td>
<td></td>
</tr>
</tbody>
</table>

4) Does your hospital have a formal policy on VTE prevention?

<table>
<thead>
<tr>
<th>Yes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>
5) 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):

6) 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
- Don’t know what guideline it is based on
- Other (Please Specify):  

7) If your hospital does not have a formal policy, do you intend to implement a formal VTE prevention policy in the future?

- Yes
- No
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>8) Do you have a specific VTE risk assessment form in your hospital?</td>
<td>Yes, No, Don't know</td>
</tr>
<tr>
<td>9) Who is responsible in your hospital for conducting the VTE risk assessment? (tick all that apply)</td>
<td>Medical staff, Nursing Staff, Pharmacy staff, Other (Please Specify):</td>
</tr>
<tr>
<td>10) Which staff in your hospital received training on the pilot NIMC with VTE section? (tick all that apply)</td>
<td>Medical staff, Nursing staff, Pharmacy staff, Other (Please Specify):</td>
</tr>
<tr>
<td>11) Which resource materials did you use to educate staff about the pilot NIMC with VTE section? (tick all that apply)</td>
<td>NIMC VTE poster supplied by the Commission, NIMC VTE brochure supplied by the Commission, NIMC VTE PowerPoint presentation supplied the Commission</td>
</tr>
</tbody>
</table>
12) Which resource materials did you find the most useful for training staff?

<table>
<thead>
<tr>
<th>Resource Materials</th>
<th>Very useful</th>
<th>Somewhat useful</th>
<th>Not at all useful</th>
<th>Did not use</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIMC VTE FAQ document supplied by the Commission</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NHMRC guidelines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital policy documents/forms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital-developed resource materials, please provide details</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (Please Specify):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13) Do you have any general comments about the training materials provided for the NIMC VTE pilot? E.g. what worked best and why?
14) How long were your education sessions?

<table>
<thead>
<tr>
<th>Category</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 15 minutes</td>
<td></td>
</tr>
<tr>
<td>15 to 30 minutes</td>
<td></td>
</tr>
<tr>
<td>Over 30 minutes</td>
<td></td>
</tr>
</tbody>
</table>

15) The pilot NIMC with VTE section was well accepted by clinicians (Select the most appropriate response)

<table>
<thead>
<tr>
<th>Response</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td></td>
</tr>
<tr>
<td>Neither disagree or agree</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td></td>
</tr>
<tr>
<td>Strongly disagree</td>
<td></td>
</tr>
</tbody>
</table>

16) Have you received any specific feedback from clinicians about the VTE risk assessment section of the pilot NIMC?

<table>
<thead>
<tr>
<th>Response</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

17) If you have received specific feedback about the risk assessment section please provide details

[Blank space for details]

18) Have there been any barriers to implementation of the NIMC with VTE section? If yes, please provide details

[Blank space for details]
19) 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 NIMCs due to reduced space for regular medications? *Please provide details*

20) 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*

Yes

No

21) If you answered yes to question 19 what changes would you make? *Please provide details*

22) 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*

23) The automated excel audit tool used to collect and submit the audit data was easy to use. *(Select the most appropriate response)*

<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neither disagree or agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
24) The Audit Tool Application User Guide provided clear guidance on how to complete the audit.  
*(Select the most appropriate response)*

<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neither disagree or agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
</table>

25) The audit data elements were easy to collect.  
*(Select the most appropriate response)*

<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neither disagree or agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
</table>

26) 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 3: Participating hospitals

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