An audit of the management of peri-operative anticoagulation at Salisbury NHS Foundation Trust

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An audit on the management of perioperative anticoagulation
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Introduction
It is of high importance to manage anticoagulation adequately before and after surgery to minimise the risks of bleeding as well as keeping the risk of clotting low and maximising patient safety.

Aims and objectives
To assess whether patients with planned surgical admissions were managed correctly with regards to their anticoagulant therapy in accordance with standards based on the relevant Salisbury District Hospital guidelines. A secondary aim was to assess if standards have improved since the previous audit in 2006.

Audit standards
6 standards were adapted from the relevant clinical guideline and these covered all aspects of the perioperative management of warfarin patients having planned major surgery.

Method
Pharmacists and technicians were asked to report patients who were having major elective surgery and were on warfarin. The notes were then collected from medical records and adherence to the standards scrutinised.

Results
71% of patients of patients had their warfarin stopped prior to surgery in accordance with the policy, 73% of patients received the correct covering anticoagulation before surgery, 100% of patient’s INRs were <1.5 pre-surgery, and 40% of high risk patients had their covering anticoagulation continued until their INR was in range post-operatively, as compared to 65% for low risk patients. Only 8% of patients were reloaded with warfarin completely correctly as per the guidelines post-operatively.

Discussion
There was confusion between low and high risk categories, with some high risk patients receiving dalteparin doses that were indicated for low risk patients. There were some problems reloading warfarin correctly, where mostly the guidance was ignored. However, there were a few instances where this was clinically justified. Standards regarding the cessation of anticoagulant therapy before surgery were well adhered to. There were limitations to the audit design as it is retrospective.

Conclusion
There were some strong areas where standards achieved were high, and these mostly concerned stopping warfarin at the appropriate time and ensuring the INR was <1.5 before surgery. However, covering anticoagulation therapy in high risk patients was relatively poor. Low risk patients fared better post-operatively, with 65% receiving a prophylactic dose of dalteparin as per the guidelines.

Recommendations
A visually attractive treatment pathway should be designed upon discussion with the thrombosis committee. Re-education of foundation years 1 and 2 doctors should be carried out, possibly by pharmacists. A re-audit should be carried out after changes have been implemented.
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1. Introduction

The management of anticoagulation before, during and after surgery is of high importance from a patient safety perspective due to the increased risk of bleeding during surgery, and the increased risk of clotting after surgery, if the correct medical management is not instigated. It is important, therefore, to balance the risk of bleeding with the risk of clotting.

At Salisbury District Hospital, there are guidelines recommending the correct management of patients requiring anticoagulation depending on their clotting risk, bleeding risk and the type of surgery undertaken (e.g. emergency, dental, elective minor or major surgeries). These guidelines give recommendations as to which patients should be considered to be at a low or high risk of a thrombotic event – these are designated as the risk stratification categories (Appendix 2). The guidelines advise on when and how to stop warfarin therapy in order to achieve an INR of <1.5 before surgery, and are based on guidance from the British Committee for Standards in Haematology [1]. Bridging anticoagulation therapy, an area of uncertainty in the wider literature [2], is also covered in the local guidelines. The BRIDGE study (Bridging Anticoagulation in Patients Who Require Temporary Interruption of Warfarin Therapy for an Elective Invasive Procedure or Surgery) is currently taking place, which aims to determine whether bridging anticoagulation therapy is needed during warfarin interruption.

The majority of patients in the community in the areas surrounding Salisbury District Hospital are managed by the anticoagulation clinic based in the hospital. This is an anticoagulation nurse-led clinic which can also advise on warfarin dosing peri-operatively.

A previous audit was carried out in 2006 on the subject of peri-operative anticoagulation, although the standards were slightly different and the guidelines they were based on have since been revised and have changed.

2. Aims and objectives

The aim of this audit was to assess whether patients with planned surgical admissions were managed correctly with regards to their anticoagulation therapy in accordance with standards based on the relevant Salisbury District Hospital guidelines. Another aim was to compare this audit with a previous audit on oral anticoagulation therapy from 2006, although the standards used were slightly different.

3. Audit standards

All standards were taken from the perioperative management of patients taking warfarin guidelines (Appendix 2) and set at 100%. Specifically, the following standards were used:

3.1 Warfarin is stopped at the appropriate time pre-surgery
3.2 An appropriate dose of dalteparin or unfractionated heparin has been started at the appropriate time after warfarin has been stopped prior to surgery for both low and high risk patients
3.3 INR and APTT are <1.5 before surgery
3.4 Therapeutic dalteparin or unfractionated heparin is continued after surgery until the INR is in therapeutic range for high risk patients
3.5 Warfarin is restarted at the appropriate time and dose for both high and low risk patients
3.6 The appropriate dose of dalteparin is given at the appropriate time for low risk patients post-operatively

4. Method

Firstly, the audit was applied for and approved via the trust’s online system for clinical audit (OSCA) by the audit department at Salisbury District Hospital. Pharmacists and Medicines Management Technicians were then asked to record patients, using their initials and hospital numbers, who qualified for the audit using a data collection form. These hospital numbers were accumulated from 20/10/11 until 02/02/12. With help from the audit department, the notes were requested from medical records and a data collection sheet was developed for recording specific information from the patient’s notes (Appendix 1). Each set of notes were analysed in turn for adherence to the standards set in this audit. As such, this was a retrospective data collection audit. Occasionally, the hospitals information system for retrieving patient biochemistry results was used to check INRs on specific dates.

Several patients had to be excluded from the audit. In a few cases, surgery had been cancelled for the patients that had already been noted down on the collection sheet by Pharmacists or Technicians. Any patients that had not had their surgery planned were excluded. Patients undergoing diagnostic procedures instead of surgical procedures were excluded.

5. Results

A total of 15 patients were included in the audit. 100% of patients were from both surgical wards, i.e, Britford or Downton, and 100% of patients were undergoing planned major surgeries. Of the 15 patients, 8 patients (53%) were classified as low risk according to the guidelines risk stratification and 7 (47%) were classified as high risk. There were no patients managed using unfractionated heparin. The following table summarises the results found in the audit with the relevant standards.
<table>
<thead>
<tr>
<th>Standard number</th>
<th>Standard</th>
<th>Percentage aim</th>
<th>Percentage achieved</th>
<th>Discussion section</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Warfarin is stopped at the appropriate time pre-surgery</td>
<td>100%</td>
<td>71%</td>
<td>6.1.1</td>
</tr>
<tr>
<td>3.2</td>
<td>An appropriate dose of dalteparin or unfractionated heparin (UFH) has been started at the appropriate time after warfarin has been stopped prior to surgery for both low and high risk patients</td>
<td>100%</td>
<td>73%</td>
<td>6.1.2</td>
</tr>
<tr>
<td>3.3</td>
<td>INR is &lt;1.5 before surgery</td>
<td>100%</td>
<td>100%</td>
<td>6.1.3</td>
</tr>
<tr>
<td>3.4</td>
<td>The appropriate dose of dalteparin or unfractionated heparin is continued after surgery until the INR is in therapeutic range for high risk patients only</td>
<td>100%</td>
<td>40%</td>
<td>6.1.4</td>
</tr>
<tr>
<td>3.5</td>
<td>Warfarin is restarted at the appropriate time and dose for both high and low risk patients</td>
<td>100%</td>
<td>8%</td>
<td>6.1.5</td>
</tr>
<tr>
<td>3.6</td>
<td>The appropriate dose of dalteparin is given at the appropriate time for low risk patients post-operatively</td>
<td>100%</td>
<td>65%</td>
<td>6.1.6</td>
</tr>
</tbody>
</table>

Table 1: Percentages of patients achieving each standard in comparison to the percentage aims. Also, a reference to each corresponding section of the discussion for each result.

6. Discussion

6.1 Discussion of the results

6.1.1

A total of 71% of patients (10) were found to have stopped warfarin 5 days before the surgery as per the guidelines. The concept of missing warfarin for 5 days appeared to be well known according to surgical notes and correspondence to patients and GPs. The main reason why a few patients failed this standard was because they themselves had stopped the warfarin slightly early or slightly late. It is unclear whether this was due to misinterpretation by the patient of the advice given to them.
about stopping their warfarin. The notation in the surgical notes with regards to when the patient last took their warfarin dose was generally good. One patient had to be excluded from this standard because there was no indication that he had stopped his warfarin in any of the notes. The patients INR, however, was <1.5 and surgery went ahead. As such, in some cases it was difficult to be sure either way whether some patients did or did not adhere to the guideline due to lack of notation, so the failure rate for this standard may be artificially high. One patient failed this standard because they stopped their warfarin 4 days before surgery. The INR was still <1.5, however.

6.1.2

High risk patients should be given treatment dose dalteparin cover when stopping their warfarin before surgery, whilst low risk patients receive no dalteparin pre-operatively if they are not admitted as an inpatient or prophylactic dose dalteparin if they are. Of the 8 low risk patients, 6 passed this standard. Low risk patients who were admitted as inpatients were given dalteparin 5000 units subcutaneously each day, apart from 2 patients who did not for reasons that were not ascertainable. Of the high risk patients (7), 5 received the correct dose of dalteparin at the correct time before surgery and this was clearly recorded in the surgical notes. The other 2 patient’s notes were unclear, and although correspondence was sent to their GP about starting dalteparin treatment dose, the pre-op assessment and surgical notes lacked specific information regarding whether the patients had used it, so these failed the standard. As such, lack of notation has been considered as one of the limitations of this standard.

6.1.3

100% of patients had an INR of <1.5 before surgery. INR before surgery was generally very well recorded. In 2 patients, results reporting was consulted to find the pre-operative INR. APTT was less well recorded, with it being recorded on only 4 patients surgical notes, but this was not audited.

6.1.4

This standard concerned high risk patients only, and so all low risk patients (8) were excluded. Of the 7 high risk patients, 1 patient was excluded because dalteparin was held off due to a bleed. Another patient was excluded because there was no clinical need for anticoagulation after the operation as the operation was correctional for that specific condition. Of the remaining 5 patients, 2 (40%) completely correctly received covering treatment dose dalteparin after surgery and carried this on until their INR was in therapeutic range for 2 days. 2 patients that failed this standard had received prophylactic dose dalteparin post-surgery even though they were at high risk according to the risk stratifications, but this was then corrected to treatment dose when the pharmacist saw the patients. 1 patient was started on treatment dose dalteparin, but more than 12 hours after his surgery. The patient was then discharged on dalteparin and told to take warfarin concomitantly, but this would have been before his INR was therapeutic. This then relies on the patient’s GP to follow the patient up by measuring the INR and stopping the dalteparin when the INR is in therapeutic range.

6.1.5

Only 8% of patients achieved this standard, making it the least achieved standard of the six. This highlights a large dichotomy between what prescribers think about warfarin reloading and what the
guidelines advise. The majority of patients failed this standard because they were reloaded back on their maintenance dose of warfarin even though their INRs were below 1.5. According to the guideline, the patient should be given double the maintenance dose on the first day of warfarin reloading if their INR is below 1.5. 1 patient was excluded because warfarin reloading was delayed due to a bleed. Another patient had to be excluded because their warfarin chart was not in the notes, and was not prescribed and recorded on the main drug chart. Another patient was excluded because they were discharged with treatment dose dalteparin and the discharge summary referred the patient to the anticoagulation clinic rather than specifically re-prescribing warfarin, and the patient’s warfarin chart was missing. It was, therefore, unclear whether they had restarted warfarin at discharge with the treatment dose dalteparin. Of the 12 patients that remained included in this standard, only 1 was managed completely correctly (8%), with the warfarin being reloaded at double the normal dose on the day after surgery when the patient was taking fluids orally. One patient received their maintenance dose on the first day post-surgery, and then appeared to have been discharged with double their maintenance dose the next day on the discharge summary. This was possibly because the doctor writing the discharge summary had forgotten to read the warfarin chart and thought that the patient had not yet commenced warfarin reloading. Normally, patients are not dosed on discharge summaries – the summary will, in most cases, instruct the patient to follow the advice of the anticoagulation clinic. Another patient who failed this standard received her maintenance dose as a reloading course over 3 days, but this was recorded in the notes as the patient had been in for previous surgery and had been reloaded in three days as per the guidelines and her INR had increased to over 7. This highlights the role clinical judgement can have and could perhaps explain why a lot of patients failed this standard. However, in most cases it appeared to be due to a lack of knowledge of the guidelines. This could be an area for re-education of the prescribers in the future.

6.1.6
This standard concerned low risk patients only, and so all high risk patients (7) were excluded. Of the 8 low risk patients, 6 had received a prophylactic dose of dalteparin within 12 hours of having their surgery as per the guideline. In the other 2 patients, prophylactic dose dalteparin was not administered within 12 hours or not at all for reasons that are not clear from the notes.

6.2 Potential limitations of the guidelines
Limitations in the clinical guidelines helps explain why they are not always followed and why some standards were not very well adhered to. Firstly, the guideline makes little definition of the meaning of major and minor surgery. Whilst this audit is concerned with major planned surgery only, it was often difficult to check whether the surgery was actually major surgery or not whilst analysing the notes. Often, I had to gauge from the treatment that the surgery was major, as there is no strict definition of what is major surgery according to the guidelines. If the guideline is intended for a multidisciplinary team, it is important that every healthcare professional is clear as to what constitutes major surgery so that the correct guidelines can be followed every time.
One reason why the Salisbury District Hospital guidelines might not be followed all the time is because they are quite cumbersome to read. The second table on the guidelines appears as blocks of
text which can make it difficult to follow the information needed in a logical manner. It is interesting to note that the Royal United Hospital, Bath, have flow charts as well as blocks of text to illustrate the treatment pathways in perioperative anticoagulation [3]. Colour coded flow charts, for example, could be more attractive, easier to follow, and could be used as a learning tool for younger doctors.

6.3 Potential limitations of the audit

To get a full and complete picture of the perioperative management of oral anticoagulants, it was necessary to analyse patient data after they had left the hospital. This type of data collection is retrospective. There are inevitably some drawbacks to retrospective data collection audits. One of the major drawbacks that applies to this audit is because by asking pharmacists and technicians to increase their vigilance with regards to warfarin patients being admitted for surgery, there is possibly an increased chance that any mishandlings in the management of these patients is noticed simply because the pharmacist or technician is aware an audit is being carried out, and may take the opportunity to re-familiarise themselves with the guidelines. This may increase the interventions they may make, and skew the results in a positive manner. There is also the possibility that the pharmacist or technician has selectively picked cases which have been managed in a particular way. In this audit, there was a general bias towards the general surgical wards Britford and Downton, and so conclusions drawn from this audit of those wards cannot necessarily be applied to other wards where warfarin patients may also have surgery, e.g., orthopaedic wards.

Another limitation that became apparent whilst analysing the notes is that clinical rationale may not always be written down and explained in a straight forward manner. For this reason, it is possible that whilst it appears that patients have failed to adhere to some of the standards listed, the clinician may have intentionally used their clinical judgement to deviate from the guidelines, which is justifiable on an individual case basis. While the guidelines are guidelines, medical practitioners are expected to deviate from them when necessary and this allows them to consider a patients individual needs.

A more practical limitation to a retrospective audit is that warfarin charts are sometimes not included in the patients notes as they can get lost, or occasionally specific times of doses of anticoagulants are not recorded. This can make it difficult to obtain a full picture of what is going on with each patient, and can lead to some patients being excluded from standards. In turn, this can lead to skewing of the results as fewer patients are considered for each standard. Furthermore, only 15 patients were analysed for this audit. Ideally, this would be more in order to obtain a more accurate picture.

Limitations for specific standards in this audit mostly came about due to omissions in notes such as when exactly the patient stopped their warfarin. This is another disadvantage of retrospective audits as compared to audits performed when the patient would have been in the hospital – the patient could have been used as a source in this case. It was also difficult to ascertain whether some patients had actually used their pre-operative dalteparin due to some omissions in the correspondence notes to the patient’s GPs. Again, consulting the patient would have been a way around this problem. For this audit, however, real time monitoring of the patients therapy with regards to their anticoagulation therapy would have posed problems as the auditor would have been compelled to intervene when problems were identified. This would therefore skew the audit to a more positive result and could mask potential shortcomings in day to day clinical practice.

There were other methods that became clear later on in the audit that could have been exercised in
order to collect more patient records. Anticoagulation charts go through the pharmacy department in Salisbury District Hospital, and this could have been utilised as an opportunity to gain access to a large amount of patients taking warfarin. However, this poses the problem of having to sort through which patients were having elective surgery because the warfarin charts alone would not indicate this. A strategy to overcome this problem may have been to look each individual patient up on Consultant’s view, the hospitals information system which allows patients admission data to be viewed, in correspondence with the charts intercepted from anticoagulation. Furthermore, the time to do this would be limited by a need for the warfarin charts to arrive at the wards as soon as possible and the auditor would have to take care not to interrupt this system to the detriment of patient care.

6.4 Comparisons with the previous audit

A retrospective audit similar to this one was carried out in 2006. Caution has to be taken when directly comparing the results of this audit to the previous one because the standards are slightly different and have minor surgical patients and emergency surgical cases included, although this was a small proportion of the patient population studied [4]. Some comparisons can still be drawn – standards such as the INR being below the appropriate limit as set by the guideline before surgery were 100% as they were in this audit. It should be noted that the INR used to be required to be <2.0 preoperatively in the older guidelines.

Standard 1, regarding patients having warfarin stopped at the appropriate time as per policy, were similar in achieved percentage in both audits, although it should be noted that the guidance has since been updated to stopping warfarin 5 days before surgery, and not 4 days before surgery as considered in the previous audit. Interestingly, results regarding the correct reloading of warfarin as per the guidelines were identical, both being 8%. This indicates a continual lack of knowledge regarding the reloading of warfarin by prescribers. It is unclear whether this is because prescribers view warfarin reloading as a minor issue or whether they deviate from the guidelines frequently because the risk of overdosing the patient on warfarin is overestimated.

Interestingly, the previous audit points out many occurrences where patients had been over reloaded on warfarin, with clinicians prescribing 10mg, 10mg and 5mg on days 1, 2 and 3 respectively to reload the patient. In this audit, the opposite was found, and it now appears more likely that patients will be under reloaded with their normal maintenance doses post-operatively. It is difficult to compare the standards regarding the dalteparin or UFH cover in the perioperative period from both audits because the standards are set out differently, but it appears that the consensus of the previous audit was that anticoagulation cover was generally performed poorly. This is similar to the results of this audit. One key difference is standard 6, which looked at the percentage of low risk patients having prophylactic dose dalteparin post-operatively as per the guideline. This has improved since the last audit, where there is now a 65% adherence rate.

7. Conclusion

There were a few standards that had a particularly high percentage achievement – 100% of patients had an INR <1.5 before surgery, and the majority patients had stopped warfarin 5 days before surgery. However, the bridging of warfarin was still performed poorly in this audit, as with previous
audits. High risk patients rarely received the completely correct timing and doses with regards to their dalteparin – only 40% of this group of patients were seen to be managed correctly. One problem here was the misidentification of high risk patients as low risk patients, and the under dosing of dalteparin that then occurred. A couple of low risk patients also did not correctly receive the appropriate dose of dalteparin after surgery, but this was better than reported in the previous audit.

An area requiring attention is warfarin reloading post-surgically. Both the timing and the dosing were often not strictly following the relevant guideline. This could possibly have the implication of delaying discharge due to incomplete reloading. Reloading warfarin is often difficult because it takes a number of days. Enhanced recovery programs, designed to allow patients to return home as soon as possible after surgery, often clash with this reloading process. A question should be raised regarding how realistic the reloading policy is in an environment that promotes prompt discharge. It is clear that there are some strong areas of this guideline which are regularly followed as a matter of day to day practice, such as with standard 1, and that there are more difficult areas requiring coordination which is not always straight forward in an acute surgical setting. Perioperative anticoagulation is about specific dosing and specific timing, and it may be that there is a certain lacking of awareness of the guidelines that has persisted since the last audit was performed.

8. Recommendations

1. The clinical guidelines should be put into a more visually attractive and easy to understand treatment pathway and should feature on the surgical wards as a laminated document for quick reference. This recommendation should be considered at future thrombosis committee meetings. The most up to date policy is currently under review.

2. Foundation year 1 and 2 re-education regarding the importance of the correct management of anticoagulation peri-operatively, targeting presentations to the current weak points as revealed by this audit. This is could be a useful role for pharmacists.

3. A re-audit should be carried out after the above changes have been made to assess if standard achievement percentages have improved as a result.

9. References


2. Bridging Anticoagulation: Is it needed when warfarin therapy is interrupted around the time of a surgery or procedure? Duke Clinical Research Institute, Durham, NC. Circulation 2012. 125, e496 – e-498


4. Whittingham, A. An audit of the management of surgical patients taking oral anticoagulants. 2006