

**ANTICOAGULATION
THERAPY
MANAGEMENT SOFTWARE**

DAWN^{AC}

**PROCEEDINGS OF THE 19th
USER GROUP MEETING**

10th/11th October 2011



**BETTER CARE FOR LESS EFFORT
FROM THE COMPANY THAT REALLY CARES**

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SUMMARY

Dr David Wright, Consultant Haematologist, Pontefract Hospital, Pontefract
Dr Eric J Watts, Consultant Haematologist, Basildon & Thurrock Hospitals, Basildon

Syd Stewart, Managing Director, 4S DAWN Clinical Software opened the first afternoon session by welcoming everyone to the DAWN AC Nineteenth User Group Meeting.

Dr David Wright chaired the first Monday afternoon session

Thelma Bell, Senior Clinical Nurse Specialist, Nottingham University Hospitals NHS Trust and Alistair Stewart, 4S DAWN Clinical Software covered the introduction of the DAWN DVT module into Nottingham to replace a paper based system for managing DVT risk assessments. Although their workflow will not change, they will no longer waste time looking for information as it will all be collected into the system, and they will be able to measure key performance indicators without having to manually track data. Alistair then gave a short introduction to the DAWN DVT module.

Dr Eric Watts chaired the second Monday afternoon session

Syd Stewart, Managing Director, 4S DAWN Clinical Software gave an overview of the processes and theory behind how DAWN AC calculates the next dose and test interval. He presented a benchmark of a very good centre (78% TIR) versus a centre with TIR of 66%. There seemed to be evidence suggesting a move to shorter test intervals might be why the very good centre achieved such good results.

Dr Eric Watts chaired the first Tuesday morning session

Pall Torfi Onundarson M.D., Professor of Haematology, Department of Laboratory Haematology and Haemostasis Centre, Landspítali University Hospital and University of Iceland School of Medicine 101 Reykjavik, Iceland gave a thought provoking talk. He initially discussed the efficacy of the new anticoagulants compared to Warfarin. He then considered if better control of Warfarin anticoagulation was possible and whether prothrombin time was an adequate test for measuring control. He has helped develop a new test (Fiix) based on Factors II and X which may reflect more truly the control of events and bleeding and fluctuates less than INR. It has the benefit of excluding the spurious fluctuations caused by Factor VII, which do not reflect the real problems being treated. A randomised trial is now underway to prove the value of the Fiix test.

Dr Matt Fay, G.P. at Westcliffe Medical Centre & National Clinical Lead in the AF/stroke prevention programme described the use of QIPP (Quality, Innovation, Productivity and Prevention) to help drive improvements in AF detection and treatment, leading to stroke prevention. Part of the problem is to cheaply and efficiently detect all AF patients. Dr Fay covered several practical ways to test more patients, and whether scoring techniques (e.g. CHADS₂ & CHADSVASc) were adequate. Next is ensuring patients get a cost effective and efficacious treatment. Dr Fay questioned the prescription of aspirin and the claims for new anticoagulants, explaining why he felt well controlled Warfarin treatment was best.

Jane Pitfield, FIBMS, Clinic Manager, Royal Berkshire Hospital took us through how they used DAWN AC to monitor the NPSA's required safety indicators, despite running a very busy and heavily used service. She also covered the importance of training all relevant staff, and educating patients to improve Warfarin control and create a safer service. Written procedures and clinical protocols were also essential.

Dr David Wright chaired the second Tuesday morning session

Sharon Acton (MLSO) and Amanda Brailsford (BMS Manager of Anticoagulation Service), University Hospital of North Staffordshire discussed how an audit helped them make the case for adding an in-patient element to their anticoagulation service and expanding to a multi-disciplinary team. GPs can now refer their AF patients directly to the service, resulting in a quicker first appointment for this group. They have been able to offer more counselling to patients, and train other service deliverers, making good use of the different skill sets within the team.

Dr David Wright chaired the final Tuesday afternoon session

Eric Watts, Consultant Haematologist, Basildon gave a summary of the studies on the new anticoagulants, Dabigatran, Rivaroxaban and Apixaban, and how the drug companies are presenting their results in the best possible light. This has involved using Warfarin results with very poor control, the quoted TIR being much lower than the average TIR for a UK hospital. He felt there was a need for further studies comparing the new drugs against each other and with properly controlled Warfarin. He also discussed problems in assessing when the extra cost of the new drugs was justified, and whether people deciding this had accurate Warfarin monitoring costs. Finally, he highlighted the startling fact that poorly controlled Warfarin patients were more likely to have a stroke than those not being treated – food for thought!

Using DAWN AC to Better Manage DVT Risk Assessments

Mrs Thelma Bell, Senior Clinical Nurse Specialist, Nottingham University Hospitals NHS Trust and Alistair Stewart, 4S DAWN Clinical Software

How the system operates

Nottingham operates a Nurse-led DVT service. They receive referrals from a wide variety of sources, including from GP admission wards, in-patient wards, outpatient clinics and A & E within Nottingham Hospitals, private hospitals, DVT services from outside the area and Nottingham Urgent Primary Care Assessment Centre (NUPAC). The Nottingham DVT service organises scans and follow-ups. For GP referrals, GPs must contact NUPAC, and then NUPAC contacts the DVT team, there is no direct referral from the GP to the team.

Why change?

They currently have a paper based system, with a master diary. This is their key patient tracker, but it isn't always accurate. All notes are paper based, but notes are not retained once a patient is discharged from a ward. Staff are constantly having to hunt for information, calling GPs and repeating actions etc. This is a waste of staff time and can lead to a poor patient experience. There is inefficient communication between all interested parties. It is a good service but is inefficient because it is paper based, and key performance indicators (KPIs) were difficult to measure, requiring manual data entry.

The new way of working

Thelma already had experience of using DAWN AC and discussions with Alistair and the development team has led to the creation of a DVT module based on the existing pathway booklet and referral sheet. Using this new module, the workflow will largely remain the same, but all information will be recorded in the central DAWN DVT module via PCs connected to the internet. They will mark up the leg assessment document as normal, but will now be able to scan it in and store the scanned document against the relevant patient. They can generate an electronic version of the outpatient DVT referral form, and use electronic questionnaires to record patient assessments. Using this new system, they will be able to:

1. generate clinic lists
2. instantly access patient details when required and have a central location to document any contact with GPs or patients
3. transfer patients to the AC service by moving patients into the DAWN AC module, with no re-entry of data, making transfer safer and more efficient
4. generate automatic reports and easily record KPIs without data re-entry

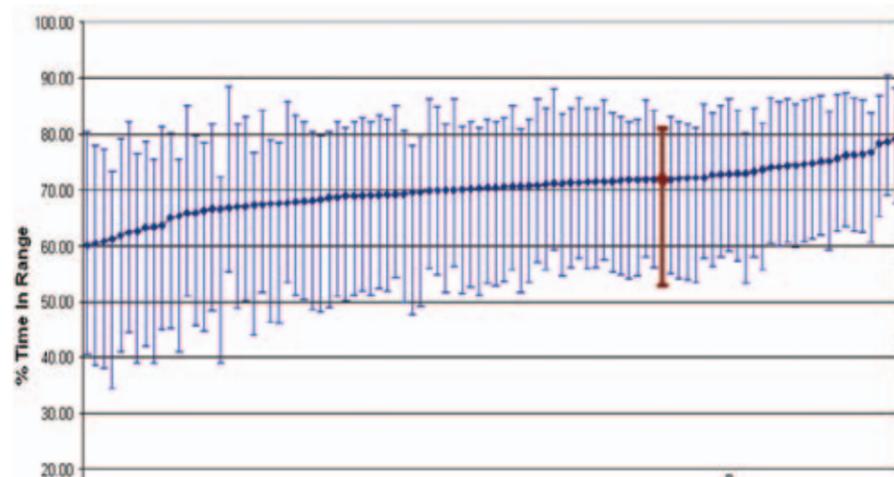
The remaining step is to go live.

Alistair gave a brief demonstration of how the system works, from patient referral to assessment and selecting the appropriate therapy pathway.

How Dawn AC Sets the Next Dose and Test Date – Now and in the Future

Syd Stewart, Managing Director, 4S DAWN Clinical Software

From the DAWN AC Benchmarking Service results we can see a big variation in the % Time in Therapeutic Range (%TTR) across centres. For example, in the INR Target Range 2 to 3, a variation between 60% and 80% is often observed (See below).



Benchmarking Graph – Target Range 2 – 3 % TTR for each Site

Why does this variation exist?

The sources of this variation come mainly from the following areas:

- Patients (e.g. time on therapy, age, gender, behaviour, adherence and levels of patient understanding about the therapy)
- The INR Measurement System
- Computer Dose Change/Next Test settings
- Healthcare Professional Dose Change/Next Test settings Practise

So what is the best control mechanism for deciding when to change a dose or not?

There are many mechanisms used in industry. We considered the following when designing DAWN AC dose change algorithm (now validated in several clinical trials – see references below)

On/Off Control – stop the dose when the INR goes above the range and start the dose when the INR drops below range. DAWN AC uses this mechanism, for example, when the INR goes above 4.3 – miss or skip one day.

Proportional Control – The dose is adjusted based on how far the INR is from the target or mid point of the range. DAWN AC uses this when a dose change is triggered to set the amount of dose change. The further from the target, the bigger the dose change. DAWN AC does have a limit set for the amount of dose change allowed, usually 20%. This can also be set differently for each individual patient if required.

Derivative Control – In this mechanism, the speed or rate of change which the INR rises or falls is used to adjust the amount of dose change. DAWN AC does not use this but does issue warnings on rising and falling INRs.

Integral control – The time and distance the INR has been above or below range is used again to set the amount of dose change. DAWN AC does not use this type of mechanism. In industrial process control e.g. chemical plants – the mix of Proportional control, Derivative control and Integral control is varied to gain control of each particular process.

Statistical Process Control (SPC) – This mechanism uses probability and statistics theory to detect when a real or significant change has occurred.

Surprisingly, there is only a 50 to 60% chance that next INR will be in range for an average patient. This is quite a low figure and shows how much variation in INR an average patient experiences.

The INR varies for a patient between plus or minus 1.6 from the target INR for 95% of all results – note the target range is usually only plus or minus 0.5! With so much variation, how do you decide whether the patient's coagulation levels have really changed or not? DAWN AC uses SPC and so it does not change the dose when the INR is out of range every time!

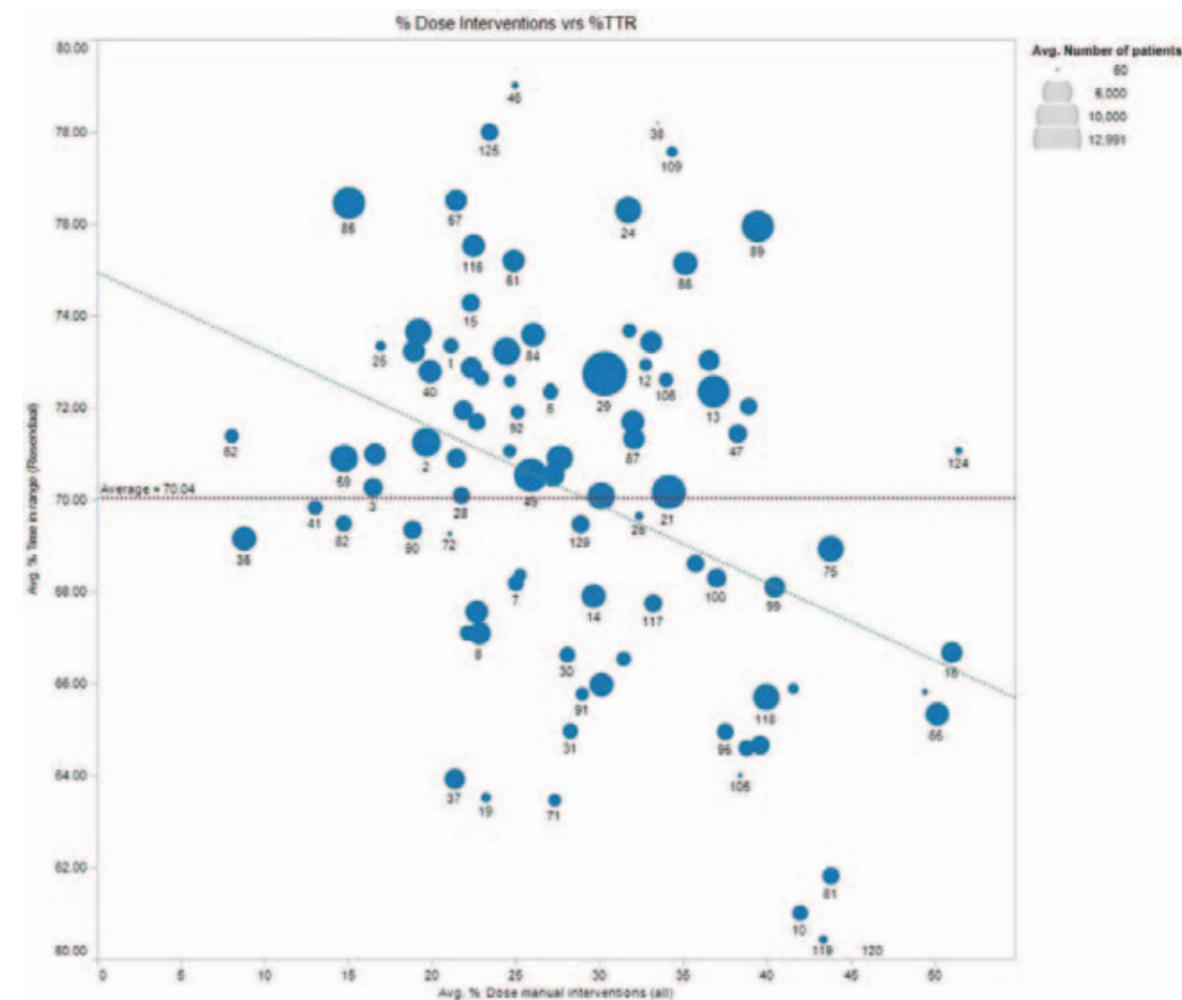
Some examples of DAWN AC dose changes using SPC

When a patient's recent INRs are just out of range, DAWN AC waits between three to five INRs, to be sure the patient's INR levels have truly changed before recommending a dose change. This is where I believe DAWN AC usually gains over the healthcare professional.

On the other hand, for example, DAWN AC will recommend an immediate dose change on a single very high or low INR because the likelihood is that the patient's INR or coagulation level has changed e.g. for the Target Range 2 to 3 where a patient has an INR below 1.7. Note, the DAWN AC trigger settings for dose change are set based on the variation seen in the best patients.

Should the healthcare professional keep changing the dose when there is no real change in the patient's coagulation status this will only provoke INR 'wobble' and continued poor control.

There is evidence to suggest that the more healthcare professional over-riding of the DAWN AC dose change recommendations - the poorer the control (See Below).



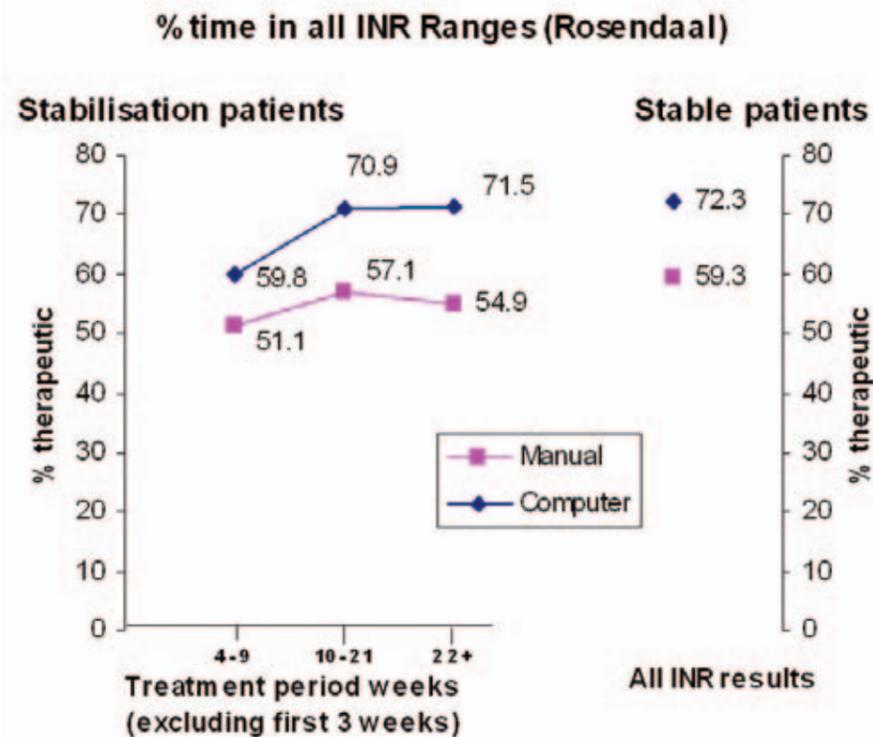
% Manual Dose Intervention versus %TTR

The effect of Test Interval on % Time in Therapeutic Range results

The % Time in Range (using the Rosendaal method) also takes into account the time between INR Tests as well as the INR results above and below range. Consider the case where an unstable patient is given a long interval and they are likely to return an out of range result, their resulting %TTR would be poor. So unstable patients should be kept on short intervals until their stability improves.

It should be noted also that usually a patient’s INR variation lessens with time i.e. their % Time in Range improves to reach a steady state. This can be seen in the 1997 Lancet reported trial ¹ graph below and is also seen in the DAWN AC benchmarking results.

It can take patients from six month to years to reach a good and stable %TTR. This could be an important fact in selecting unstable patients for the new anticoagulants.



Why a patient’s %TTR improves over time is still uncertain. You would expect that with Warfarin’s relatively fast half-life of 36 hours this would not be the case. In a study for the Italian Federation of Anticoagulation Clinics, G. Palareti ² found that with some unstable patients, they did not understand the mechanisms of the therapy sufficiently i.e. patient education needs to be improved.

Case Study of Two Benchmarking Centres – Test Interval Variation

DAWN AC makes test interval changes based on the dose stability of the patient. It only extends the interval when the last dose has not changed.

Here is a comparison of a very good benchmarking centre compared with an average centre in terms of %TTR that illustrates the effect of test interval variation

	Average Centre	Very Good Centre
% TTR	66	78
% INRs in Range	55	62
% Patient < 22 wks	29	41
% Dose Manual Interventions	39.7	38.0
No of patients	1787	844
Average Test Interval (Days)	27	20
INRs per patient pa.	12	15

Both centres use the same DAWN AC dose change and test interval change settings. The very good centre has more patients below six months treatment i.e. more less stable patients, but the average site has twice as many patients.

They are both making the same high level of healthcare professional (HP) dose interventions over the DAWN AC recommended ones (Note, the average for all benchmarking centres is about 30%) but the ‘average’ centre is extending the test interval (see below), most probably to cope with the higher patient numbers. The ‘very good’ centre is shortening the intervals for stable patients in the in- range band 2 to 3.

The best way to improve performance in terms of %TTR would be to keep all maintenance patients on a seven day interval, but this would not be popular with the patients and would add most cost to the service through increased testing and staff costs. The shorter interval minimises the time spent out of range but you get a %TTR penalty for a long interval that goes out of range.

Last INR Band	Average - (66% TTR)		Very Good - (78% TTR)	
	HP	DAWN	HP	DAWN
1.3 - < 2.0	14	7	7	7
2 - 3	28	28	21	28
<3 - 4.3	21	14	7	7
<4.3 - 5.0	14	7	7	7

Median Actual Next Test Intervals (days)

Conclusion

DAWN AC uses Statistical Process Control (SPC) techniques as the basis for making dose changes. SPC detects when a real change is most likely in the patient’s coagulation status and so prevents unnecessary dose changes. When a healthcare professional makes changes and there is not a real change in the patient’s coagulation status, this will probably create further instability and give poorer % TTR performance.

The test interval influences the %TTR performance too. The DAWN AC test change algorithm based on the patient’s recent dose stability helps create an optimum of patient safety, patient convenience and centre operational cost.

References

Poller L, et al. Multicentre randomised study of computerised anticoagulant dosage. *Lancet* 1998; 352: 1505-09

Br J Haematol. 2005 Apr;129(1):72-8. **Risks factors for highly unstable response to oral anticoagulation: a case-control study.** Palareti G², et al.

INR Fluctuation: a Reflection of Treatment Inadequacy or of Prothrombin Time Inadequacy?

Dr Pall Torfi Onundarson M.D., Department of Laboratory Haematology and Haemostasis Centre, Landspítali University Hospital and University of Iceland School of Medicine 101 Reykjavik, Iceland. pallt@landspitali.is

Coumarin anticoagulation or vitamin K antagonist treatment (VKA), mainly Warfarin, is used extensively in modern medicine based on evidence in order to prevent life-threatening and debilitating thromboembolic events. Warfarin is well studied and efficacious, its dose effect is controllable through monitoring (usually with the prothrombin time/PT), it has a well delineated therapeutic window which can be adjusted to individual needs and its effect can be immediately reversed using prothrombin complex concentrates and vitamin K. On the other hand, Warfarin has a slow onset of anticoagulant activity and the dose size of separate patients varies markedly which complicates initiation of therapy. The anticoagulant effect, usually indicated as international normalized ratio (INR) based on the PT ratio, fluctuates in many patients which necessitates frequent monitoring and dose adjustments. The fluctuation is generally considered to be caused by drug and food interactions and it is well known that patients with poor control do have more frequent serious bleeding complications. INR fluctuation caused by these interactions is a reflection of unstable anticoagulant effect.

Is it possible, however, that the INR fluctuation is not always reflective of the anticoagulant effect and that fluctuation may be an indication of a confounding effect that is inbuilt in the prothrombin time itself? If true, and if such an artefactual cause of fluctuation could be removed, possibly more stable Coumarin anticoagulation could be attained.

During initiation of treatment with VKA and dose changes, the coagulant activity (activity) of each Vitamin K dependent (VKD) coagulation factor declines at different rates reflecting their half-lives which vary from 3.5 hours for FVII to 72 hours for FII. The PT assays use undiluted thromboplastin and recalcification to activate coagulation in citrated platelet poor plasma (PPP). The PT has been presumed to accurately reflect the antithrombotic effect of VKA. However, prior studies using thrombin generation or animal models have indicated that the antithrombotic effect of FVII may actually be of minor importance compared to the activity of FX and, in particular prothrombin. Also, factor VII has little influence on thrombin generation until levels are well below 5%. Since FVII has the shortest half-life, fluctuations in the PT may simply reflect FVII activity changes rather than a true change in antithrombotic effect which depends on factor II and X activity. This may have therapeutic implications and, indeed, studies have suggested that measuring prothrombin alone as native prothrombin antigen by ELISA more accurately reflects the antithrombotic effect and hemorrhagic risk of VKA than does the PT.

We evaluated the roles of each VKD coagulation factor on clotting *in vitro* using both the Quick and Owren PT assays and also rotational thromboelastography (ROTEM). The ROTEM is a method that perhaps more accurately reflects the complex *in vitro* clotting process than the usual clotting times since it measures not only the clotting time but also the rate of the following bulk clot formation and the final clot strength. In the ROTEM experiments coagulation was activated with highly dilute thromboplastin (1:17,000). The findings support the previous findings suggesting that FII and FX play a dominant role in clotting over factor VII.

We hypothesized that the combined measurement of factors II and X alone on fibrin formation would reflect clotting better in anticoagulated patients on Coumarins than the current PT based methods which include factors II, VII and X and are therefore subject to a confounding variation caused by FVII. Therefore, we developed a new PT variant, "Fiix-PT", which measures the combined effect of both and only FII and FX on fibrin formation but is insensitive to deficiency in all other coagulation factors. The Fiix-PT (Fiix-INR) correlates well with the PT (INR). However, the Fiix-INR fluctuates less than the INR in anticoagulated patients reflecting its insensitivity to FVII. Since there is less fluctuation with the Fiix-INR, this could potentially improve the therapeutic outcome of patients treated with VKA. In order to test this hypothesis further, a randomized double blinded

single centre clinical study involving 1200 patients powered to compare the efficacy (thromboembolic events) and safety (bleeding) of dosing VKA based on Fiix-PT (Fiix-INR) in comparison to the PT (INR) will be embarked upon early in year 2012.

Comment: The full study on the Fiix-method and Fiix-prothrombin time is currently in press in the Thrombosis Research journal. Pall T. Onundarson and Brynja R. Gudmundsdottir have filed a patent application IS 050010 for the Fiix method.

Stroke Prevention and Atrial Fibrillation

Dr Matt Fay, GP at Westcliffe Medical centre and National Clinical Lead, AF/Stroke Prevention Programme with Dr Duncan Petty (Prescribing Support Services) and Mr Greg Fell (Public Health Consultant)

Atrial fibrillation (AF) is associated with a five-fold increase in stroke risk and a one in three life time risk of stroke. The cardio-embolic strokes caused by AF are associated with more fatalities than other ischaemic strokes, and are generally more disabling at presentation leading to increased hospital stay, poorer ongoing quality of life and increased discharge to long term care.

Oral anticoagulation is known to be the only effective intervention to reduce the risk of AF related stroke and has also been shown to reduce the damage caused if a stroke occurs. The only role for anti-platelet medication is in those at low risk.

In patients at higher risk of stroke in AF, aspirin is not effective in stroke prevention but carries the same risks as oral anticoagulants.

Stroke Risk Stratification with an improved CHADS₂

The CHADVASC schema is the approved risk schema from the European Society of Cardiology. It is excellent at showing people at low risk (score of zero indicates an annual adjusted risk of 0%), however is harder to remember and has a mild anomaly around its point score for gender. We present another way to see the score.

- C**₁ or **C**₂ Cardiac Disease (1 point LVSD and/or 1 point Vascular disease (IHD and/or PVD))
- H** Hypertension
- A**₁ or **A**₂ Age (1 point 65 to 74; 2 points if 75 or over)
- D** Diabetes
- S**₂ Stroke or TIA (2 points)

In a woman over the age of 65 years, an additional 1 point should be scored to reflect their increased risk.

Interpretation

- Score of 0, nothing or aspirin
- Score of 1, aspirin or oral anticoagulant
- Score of 2 or more, oral anticoagulant

Bleeding Risk Stratification with the ATRIA Bleeding Risk Score

Clearly oral anticoagulants are not without risk as they slow blood clotting. In general it is thought that clinicians tend to over estimate the risks associated with anti-coagulation. Population study data from Finland has shown a decrease in intracerebral haemorrhage (ICH) in the population although there has been a doubling of the level of anticoagulation. This has been further developed to show that Warfarin increased the absolute risk rate of ICH by 0.19% giving a numbers needed to harm (NNH) of 526.

A simple validated scoring system for bleeding is the ATRIA schema.

- | | | |
|----------------------|----------|---|
| Anaemia | 3 points | (haemoglobin <13 g/dl in men and <12 g/dl in women) |
| Severe Renal Failure | 3 points | (eGFR <30 ml/min or dialysis-dependent) |
| Over 75 Years | 2 points | |
| Previous Bleeding | 1 point | (Any previous significant bleeding) |
| Known Hypertension | 1 point | (Previously established hypertension, a persistent point) |

Balancing Risk and Benefit

Bleed risk score	Annualised haemorrhage rate	C₂HA₂DS₂	Annual Stroke Risk
Low (0-3)	0.76%	0	0%
Intermediate (4)	2.62%	1	1.3%
		2	2.2%
		3	3.2%
		4	4.0%
High (5-10)	5.76%	5 to 6	6.7-15.2%

We do not see the strokes and suffering we prevent, only the inconvenience of treatment we prescribe

How a Busy Anticoagulation Service Monitors the NPSA Safety Indicators

Jane Pitfield, FIBMS, Clinic Manager, Royal Berkshire Hospital

In March 2007 the National Patient Safety Agency (NPSA) issued Safety Alert 18, having identified anticoagulants as a class of drug commonly causing preventable harm and admission to hospital. The alert provided a list of actions to make anticoagulant therapy safer.

The key action points/recommendations were:

- Ensure all staff caring for patients on anticoagulants have the necessary work competences
- Review and update written procedures and clinical protocols for anticoagulant services to ensure they reflect safe practice and that all staff are trained in these procedures
- All patients prescribed anticoagulants should receive verbal and non verbal information at initiation of therapy, at the first Anticoagulant Clinic visit, at discharge and when necessary throughout the course of treatment
- Promote safe practice with prescribers to ensure INR monitoring takes place regularly and that the INR is within safe limits before issuing repeat prescriptions
- Promote safe practice when co-prescribing interacting medicines
- Ensure that dental practitioners manage patients according to evidence based therapeutic guidelines
- Promote written practices for safe administration of anticoagulants in a social care setting
- Undertake regular audits using the NPSA safety indicators as listed in the appendix of Alert 18
Monitoring such indicators will help identify risks and promote appropriate actions to minimise those risks

As a busy DGH with over 5000 patients in our service, we sought the help of the team at DAWN 4S to develop a series of custom built reports to enable the audit of these safety indicators.

The safety indicators include :

- Proportion of patient time in range
- Percentage INRs over 5, over 8 and below the target INR by 1
- Percentage of patients suffering adverse outcomes, categorised by type, such as major bleed etc. This relies on gathering as much audit data on bleeding/thrombotic events as possible. We obtain this information via the electronic discharge letter and follow up of all A&E visits by our anticoagulant patients. Every out-patient INR is submitted with a questionnaire in which the patient is asked if any symptoms of bleeding or bruising have arisen or if the patient has been hospitalised. Reversal of anticoagulation with vitamin K and/or Beriplex is also recorded
- Percentage of patients lost to follow up
- Percentage of patients with unknown/inappropriate Target INR, unknown diagnosis or stop date
- Percentage of patients in therapeutic range at discharge
- ...and many more!

To address the issue of promoting safe practice with prescribers we developed the following:

- On authorisation of the dose within DAWN AC, every INR, dose and next test date is uploaded to GP Web Links.

- DNA process automated. On the third DNA, the patient's GP receives a copy of the DNA letter and is advised to stop prescribing
- DAWN AC contains a list view that selects patients for review on the anniversary of their start date. Bulk letters are printed by GP (approx 300 per month), advising the GP to undertake an annual review of a patient's ongoing risk versus the benefit ratio of being on anticoagulants

We monitor the other safety indicators predominantly by recording them on individual patient records via the Events tab. These include events such as incomplete referral, no referral, not loading protocol etc. These can then be reported by using an "events by date range" report available from DAWN 4S.

We have also created a List view for Missed ID card, which will pick up any patient not given educational leaflets and alert card.

In Summary

- The NPSA safety alert gives us a framework to improve patient anticoagulant care and raise standards in the Anticoagulant Clinic
- Reports are available from DAWN AC to monitor key indicators from the alert, as are ways of recording these indicators
- Annual review of each patient is easily prompted by the use of a list view and bulk letter template

Please contact the team at DAWN 4S to obtain these reports for your system as they will enable you to undertake audit far more efficiently and accurately.

Development of the Anticoagulation Service to Include In-Patient Dosing at the University Hospital of North Staffordshire

Sharon Acton (MLSO) & Amanda Brailsford (BMS Manager of Anticoagulation Service), University Hospital of North Staffordshire

The University Hospital of North Staffordshire (UHNS) set up the Anticoagulant Management service in 1998. Initially the service was run by Biomedical Scientists (BMS) to provide a service to manage GP patients' Warfarin treatment. The demand for the service continues to grow and we have taken over Pharmacy and Cardiology clinics. Current patient numbers on the DAWN AC system are 5700.

We upgraded to DAWN AC version 7 in July 2009; the upgrade went very smoothly.

There were many drivers behind us moving the Anticoagulant Management service forward:

- The service was limited to outpatients only
- Limited induction clinics, which meant if a patient had a DVT on a Wednesday the patient would have to wait until the following Monday to be started on Warfarin
- BMS are unable to work under Patient Group Directions (PGDs) so a multi-disciplinary team was considered advantageous
- No weekend service
- Ward doctors were not adhering to the loading algorithms in the medical guidelines; Fennerty fast load for acute thrombosis, and Tait slow load for AF
- No direct access to GPs for referring a patient with AF, they would have to first refer to cardiology

An audit was carried out that showed 230 bed days were lost per month due to inefficient anticoagulation, and the bed day costs were estimated at £229/day. On the back of these findings a business case was presented on the basis of spend to save and funding for 2 whole time equivalent (WTE) Anticoagulant Nurse Specialists (ANS) at band 6 was secured.

The GP Commissioning Consortia (GPCC) secured funding for a further WTE ANS, to allow direct access for AF patients to be started on Warfarin. The GRASP tool is being rolled out to the GPs and any patient with a CHA₂DS₂-VASc score of >2.0 will be seen at an AF induction clinic within 2 weeks of us receiving the referral form.

An Operational Policy was written for the In-Patient service, along with PGDs for the administration and monitoring of Warfarin, and the administration of oral Vitamin K.

In January 2011 we recruited 4 ANS, 1 WTE and 3 part time nurses. Intensive training took place involving the Lead Clinician, VTE Nurse, Pharmacy Team and Anticoagulant Management team.

We went live with the new service to include In-Patient dosing on February 14th 2011.

Initially there was a slow uptake for In-Patient dosing; we now do approximately 20 in-patient doses a day. There is a smooth transition for patients going into hospital or being discharged, all the dose history is known to us. New patients are given comprehensive counselling before commencing on Warfarin and they are loaded onto the correct algorithm according to the patient's diagnosis. The INR is generated at the patient's bed side. We offer the same day service if we receive the referral before 3:30 pm on a weekday or 10:00 on a weekend or Bank Holiday.

Initially the ANS were unable to write directly onto the prescription charts, so a lot of the doses were being over ridden by the Medical staff. The trust agreed an amendment to the PGD to allow the ANS to write onto the prescription charts, as long as ANS obtain Non-Medical Prescriber qualification within 2 years.

Funding has now been secured for a further 2 years, funding agreed for a finite time due to the potential new anticoagulants. The service is meeting all the targets set and there are no delays in discharge attributed to anticoagulation.

Future developments are to include expansion of the ANS role to include administration of Low Molecular Weight Heparin.

To conclude the multidisciplinary approach to Anticoagulation Management at UHNS has been a positive experience.

An Update on the New Anticoagulants Dr Eric Watts, Consultant Haematologist, Basildon Hospital

The most significant development in the last year is that NICE have approved Dabigatran for patients with AF and at least one other significant risk factor, however the debate about its cost effectiveness is only just beginning.

The initial publication that showed slight improvement in clinical outcomes compared to Warfarin (RE- LY, NEJM, 2009, 361,2671-5) did so with an average time in range (TIR) of all the 18,113 patients of 67%.

This was a multi centre trial and a subset analysis ,published in the Lancet (Wallentin, 2010, 376, 975-83) demonstrated in the UK the TIR was better at 72%.

In August NICE published their 'Atrial fibrillation - Dabigatran Etxilate: appraisal consultation document' where they revised their costs of anticoagulant control, stating it could be carried out for £115 pa – which is still more expensive than the costs at many hospitals.

The economic modelling showed that Dabigatran was cost effective i.e. was less than £30,000 per Quality Adjusted Life Year (QALY) when compared to placebo or to Aspirin, but not when compared to Warfarin. The Incremental Cost Effectiveness Ratio/ QALY in this case was a prohibitive £60,897.

Incremental Cost Effectiveness Ratio – ICER/QALY

Dabigatran versus	Warfarin	UK Population	£10,582
Dabigatran versus	Warfarin	INR 2~3	£60,897
Dabigatran versus	Aspirin	INR < 2	£746
Dabigatran versus	Aspirin	INR > 3	£4,441

Therefore there is no economic case for changing patients en masse to Dabigatran, but I have always advocated changing selected patients for specific indications, particularly those with a history of intracerebral haemorrhage; however this is less than 1% of our population.

If we add poorly controlled patients then, where do we set the benchmark for 'poor control'? We checked our records and found 7.1 % were in control less than 50% TIR and looking at patients with high INRs if we were to say that two results over 6 equals poor control, then we would add another 1.47%.

Warfarin Wobblers

- 50% INRs in range – 7.1%

INRs > 6 between 01/02/2010 ~ 01/02/2011

Number of INRs > 6	Number of patients	Percentage
1	238	5.56%
2	63	1.47%
3	18	0.42%
4	4	0.09%

Therefore at the current price, Dabigatran is unlikely to displace significant numbers of Warfarin controlled patients.

In the next year there will be published studies and NICE reviews of Rivoroxaban and Apixaban which could lead to a price war.



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