DAWN® AC

ANTICOAGULATION SOFTWARE

Proceedings of the 21st DAWN AC User Group Meeting

7th/8th October 2013

"Make life easier and safer in your anticoagulation service through better information presentation"

4S DAWN CLINICAL SOFTWARE

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Chairperson's Summary, Dr Jane Strong, Consultant Haematologist, University Hospitals of Leicester NHS Trust

This year's DAWN AC User Group focused on processes, communication, DAWN functionality and integration.

We heard about group warfarin induction education sessions and how these were effective in reducing the wait times and backlog of patients due to the increased number of referrals following the new AF guidelines. Self-testing was reviewed, as was the management of INRs greater than 8. Staff competencies and protocols were covered including the development of training and record documentation; and identifying and defining scope of practice.

A demonstration of the new DVT diagnosis and assessment module was given along with presentations that discussed the transformation of working processes and communication issues facilitated by DAWN AC. An audit of NOAC patients in one Trust was examined, followed by a demonstration of the NOAC modules for DAWN AC.

Variance Growth Rate was introduced as a more informative measure of warfarin control than time in therapeutic range and we also heard about the development of a dedicated paediatric warfarin clinic from both a clinical and practical perspective.

There was a teleconference link with Wenatchee, Washington, USA that outlined how anticoagulation services are managed in a rural health setting covering 12,000 square miles and how DAWN AC, along with its interfaces, facilitate consistent care across multiple locations.

DAWN AC was consistently used to enhance safety and improve efficiency, process and communication. There were meaningful discussions about how to deliver improvements in patient care and how systems such as DAWN AC and integration can enable this.

Introduction by Syd Stewart, Managing Director, 4S DAWN Clinical Software

Syd opened the 21st DAWN AC User Group by welcoming all of the delegates to the meeting and introducing Dr Jane Strong, Consultant Haematologist from the University Hospitals of Leicester NHS Trust, who has kindly agreed to act as Chairperson.

An excellent and varied programme of talks had been lined up over the two day meeting and a summary of each talk follows:

Anne-Marie Etherington, Lead Nurse Practitioner, Glasgow & Clyde Anticoagulation Service (GCAS), talked about GCAS's new approach to the induction process having introduced group induction education sessions. This was designed to reduce waiting times and the backlog that had built up from the increase in referrals following the release of the new AF guidelines.

Jeff Walker, Chief Biomedical Scientist, The Mid-Yorkshire Hospitals NHS Trust, discussed why the Trust introduced self-testing and reviewed how their current self-testing patients are doing. The review covered the benefits of self-testing, what was achieved, key learning points, data from the self-test study and patient satisfaction results.

Syd Stewart, Managing Director, 4S DAWN Clinical Software, informed delegates of the work being undertaken to incorporate the Variance Growth Rate (VGR) – using the variability of INRs to indicate the risk of an event – into DAWN AC. A study by Poller, L. et al, that evaluated the use of VGR and prompted its potential inclusion into DAWN AC, was discussed and its findings reviewed.

Sean O'Brien, Anticoagulation Specialist BMS, Blackpool and Fylde NHS Trust, gave an overview of their service and discussed greater than 8 in-clinic INRs and their approach to managing them. Working to protocols for signing off and administering Vitamin K, Blackpool's success based on this approach was outlined.

Brenda Nicol, 4S DAWN Clinical Software presented delegates with a DAWN AC product update that included all of the new features that have been introduced in the previous 12 months since the last user group. These included NHS Number Compliance, Post Clinic Checklists and the DAWN AC Reports Webpage.

Wendy Cottee, Lead Biomedical Scientist, Worthing & Southlands NHS Trust, discussed the need for written staff competency and protocols. This included the development of training and record documentation, identifying scope of practice and assessing, through inclusion and exclusion criteria, what exactly staff will and will not be doing as part of their role. Wendy also explained how DAWN AC had helped with this process.

Sue Bacon, Anticoagulation Nurse Specialist, Bristol NHS Trust, gave an overview of an audit that had been carried out on patients that had been

taken off Warfarin therapy and transferred to one of the novel oral anticoagulants (NOACs).

George Kitching, 4S DAWN Clinical Software, followed Sue Bacon's presentation with a demonstration of the Rivaroxaban module which is based on an initiation and follow-up questionnaire. There are DAWN AC NOAC modules currently available for Dabigatran and Rivaroxaban and the benefits of the modules were outlined.

Dr Jane Strong, Clinical Haematologist, and Victoria Frimprong & Jo Eggleston, DVT Specialist Nurses from the University Hospitals of Leicester NHS Trust, along with George Kitching, 4S DAWN Clinical Software, gave an overview of the new DVT Diagnosis Assessment Module developed for Leicester Royal's DVT unit and configured specifically to meet their requirements and fit their workflow. The driving force behind the module's development was presented, a demonstration of the module was given and future development plans were discussed.

Harry Crank, Senior MLA, Calderdale & Huddersfield NHS Foundation Trust, talked about how a number of communication problems within the anticoagulation service were improved using DAWN AC, including patient and GP letters and yellow record books, and what the service's future improvement plans included.

Jenny Brown, Paediatric Pharmacist, Leeds Children's Hospital, discussed the need for a dedicated paediatric Warfarin Clinic at Leeds Children's Hospital from both a practical and clinical perspective. Dosing considerations for paediatric patients along with the benefits and limitations of DAWN AC for paediatric anticoagulation were covered.

Lisa Vaughn, Clinical Manager, Confluence Health Anticoagulation Service, joined the User Group via teleconference from Wenatchee, Washington, USA to give an outline of how anticoagulation services are systematically managed in a rural health setting that covers 12,000 square miles, and how DAWN AC facilitates this to provide consistent care across multiple locations.

A New Patient Induction & Education Process

Anne-Marie Etherington, Lead Nurse Practitioner, Glasgow & Clyde Anticoagulation Service

In 2002 Glasgow Anticoagulation Service (GAS) was established with a nurse-led multidisciplinary team and one-stop local clinics using DAWN.

The service extended to Clyde and became Glasgow & Clyde Anticoagulation Service (GCAS) in 2009 with specialist staff working in local hospitals; local clinics opening and the start of the home visiting service. With patient numbers at this point standing at 12,000, guidelines and policies were developed to ensure standardisation across the entire Glasgow and Clyde territory which included implementing DAWN V7 across all sites.

Currently GCAS patient numbers stand at 15,500 with 150 clinics held per week and numbers are increasing.

New patient referrals to GCAS for AF were around 15-25 per week with waiting times for induction at around 1-3 weeks, however new AF guidelines increased referral numbers substantially. After the new AF guidelines were introduced, the service began to see around 50-65 referrals for AF per week which increased waiting times to up to 9 weeks in some areas and caused a backlog of 100 patients waiting to start on Warfarin.

GCAS's solution to this growing problem was to find a new approach to the induction process, introducing group induction education sessions to the service. Evening clinic sessions began with groups of up to 30 patients and within one week the backlog had been cleared. Group induction sessions are now held weekly for around 12-16 patients per session and waiting times have reduced back to 1-3 weeks.

Group Induction Education Sessions

A new letter was sent to patients informing them that the induction session would be group rather than individual and that they could bring someone along with them. Groups of between 12-16 patients were allocated an hour and a half for the session which started with an educational talk followed by completion of patient forms and the taking of their INR. An appropriate induction protocol was also chosen.

Problems with the group inductions included timekeeping in some areas; patients who weren't fully aware of their referral and attended the induction session without realising that they were there to actually start on Warfarin; and those who willingly shared too much personal information despite being encouraged not to by the nurses.

Despite the small number of problems faced, the group induction sessions have been well received by patients.

The sessions have proved invaluable to the service as patient numbers continue to rise, with 2722 new patients and 1377 AF referrals since January 2013. DVT and Heart Valve patients are also now included in the sessions as they are a generic induction covering Warfarin and so are suitable for these patients.

Using the DAWN AC Induction Module for all new patients enables less experienced staff to dose appropriately. In addition, the audit facilities mean that the service is able to easily demonstrate the increases in new patient numbers which helps their business case.

River Clyde, Glasgow

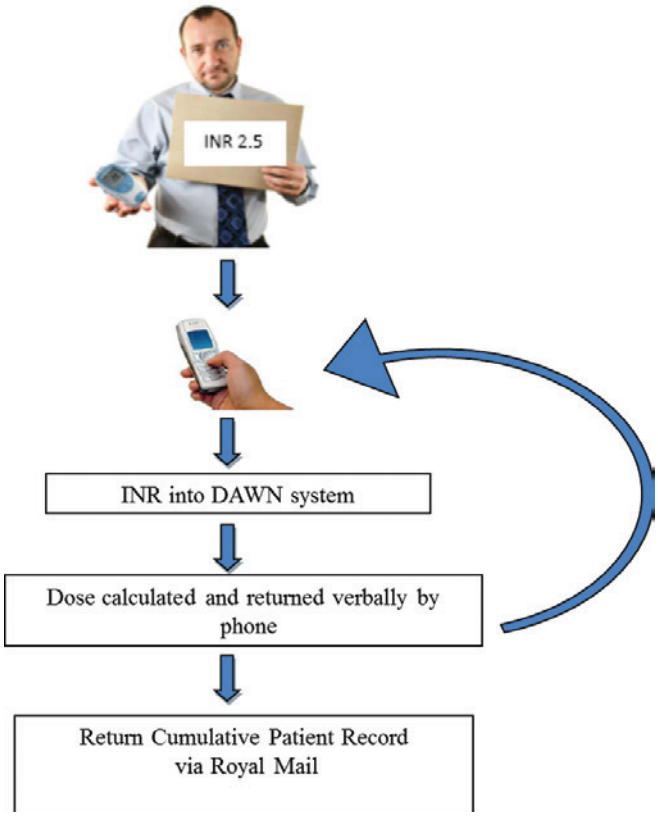
A Review of Self-Testing Patients: How Are They Doing?

Jeff Walker, Chief Biomedical Scientist, Mid-Yorkshire Hospitals NHS Trust

In 2009 Mid Yorkshire Hospitals NHS Trust carried out a management review of self-testing anticoagulation patients. Patients tested at home and either text or phoned in their INR results which would then be entered into DAWN AC and their dose returned to them either by phone or letter.

The Trust did not advertise the fact that it offered self-testing as an option to patients; rather the patient had to approach them and ask to be transferred to the self-testing model and with no funding available, patients had to buy their own Coaguchek machine and strips.

Patient Self-Testing Workflow



A first appointment would be made with the patient to discuss how the system would work and the contract. The contract outlined the responsibilities of the patient, the laboratory and the GP, which included the requirement for the patient to gain agreement from the GP who would sign up that the patient was capable of taking on self-testing. A further 3 training sessions followed the initial appointment to ensure that the patient was fully educated.

The introduction of self-testing to the anticoagulation service was designed to reduce the workload, improve patient compliance and share responsibility of care, whilst promoting the fact that the Trust was committed to providing the best possible service after listening to users.

The achievements and benefits gained from self-testing included improved compliance; better relationships between staff and patients; better INR control and increased patient and staff satisfaction.

The Trust learnt that it was important to keep everyone involved in the patient's care informed at each stage to reduce resistance and gain buy-in, whilst at the same time starting small and increasing patient numbers gradually.
In 2013 a study was undertaken to assess how the self-testing patients were performing and the effectiveness of this model since its introduction in 2009.

The study included the following patients:

- Those who had been on Warfarin for a minimum of six months prior to starting self-testing and had been self-testing for six months
- There were also four patients included who had at least six months prior to self-testing and between three and six months post self-testing

This totalled 35 patients, around 50% of the total self-testers the service had and made up of early adopters who fell into one of three categories: building site workers; travelling retired; and children, for whom the flexibility of self-testing aligned well with their lifestyles and/or personal and work circumstances.

The self-test study data produced some favourable results:

- Every patient apart from one showed an improved Therapeutic Time in Range (TTR)
- The average improvement in TTR was 18% (16.8% including the one non-improver)
- There was a 22% improvement in TTR amongst the poorly controlled (those with a TTR below 65% prior to self-testing)
- There was a 15% improvement in TTR amongst the well-controlled patients (those with a TTR above 65% prior to self-testing)
- 80% of patients who were poorly controlled prior to self-testing (TTR below 65%) moved into the well controlled category after self-testing

The study also highlighted some key patient satisfaction indicators on top of the positive clinical results:

- 82.4% of patients felt that their INR was more stable since starting self-testing
- 94.1% felt more in control of their anticoagulation therapy since starting self-testing
- 100% would recommend self-testing to other anticoagulation patients
- 100% agreed that self-testing had been beneficial to their lifestyle

Using the Variability of INRs to Indicate the Risk of an Event in DAWN AC – Variance Growth Rate (VGR)

Syd Stewart, Managing Director, 4S DAWN Clinical Software

It is widely agreed that neither the INR alone nor the % Time in Therapeutic Range (TTR) are dependable predictors of clinical events in patients receiving oral anticoagulation.
A new study, *'The clinical evaluation of International Normalised Ratio variability and control in conventional oral anticoagulant administration by use of the variance growth rate'* published by Poller, L., Ibrahim, S. and Jespersen, J. in the Journal of Thrombosis and Haemostasis looked at the possible value of an additional calculation (the variance growth rate (VGR)) as an addition to %TTR in predicting clinical events.

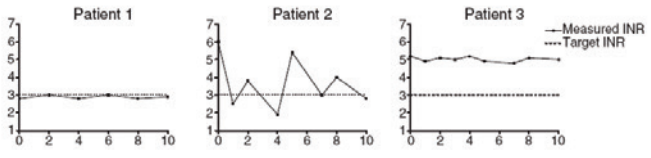
This study took data from a previous prospective multicentre randomised trial comparing DAWN AC computer aided treatment with experienced medical staff *(Poller L, et al. Multicentre randomised study of computerised anticoagulant dosage. Lancet. 1998, 352: 1505-09)*. In total, 661 control patients were matched to 158 event cases (bleeding, thromboembolism or death). The VGR and %TTR were measured over three time periods, overall follow-up; 6 months; and 3 months before an event.

The VGR measurements look at the variability between the patient's INR values to determine how 'stable' they are.

Three methods for calculating the VGR were assessed within the study.

Method A measures the degree to which a patient's INR differs from their target INR over a prolonged period, whilst Method B1 measures the degree to which a patient's current INR differs from the previous one. Method B2 is a similar measure to Method B1 but with some minor differences to the denominator value, however, neither Method B1 nor B2 take into account how close the patient is to their target INR.

The following figures graphically illustrate the three methods.



Key Findings:

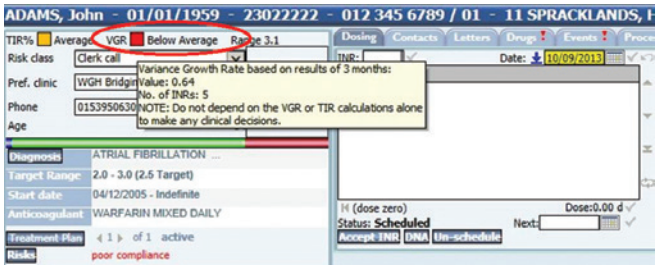
- %TTR is a reasonable predictor of clinical events only when calculated over the last three or six months of treatment
- %TTR showed no correlation with bleeding events when calculated over any period of treatment
- %TTR may be a predictor of thrombotic events when calculated over the last six months of treatment
- The Variance Growth Rate (VGR-A) showed a very strong correlation with clinical events when calculated over the last three or six months of treatment
- The Variance Growth Rate (VGR-A) showed a good correlation with bleeding events when calculated over the last three or six months of treatment
- The Variance Growth Rate (VGR-B1) showed a very strong correlation of bleeding events when calculated over the last three months of treatment
- The Variance Growth Rate (VGR-A) may be a reasonable predictor of thrombotic events when calculated over the last three months of treatment

It should be noted that there were very few thrombotic events, which made the prediction of thrombotic events difficult to measure.

In conclusion, the study determined that INR monitoring with a measure such as the VGR and %TTR, three to six months before the current INR, may offer additional safety by detecting and isolating patients who may be at increased risk of possible adverse episodes.

It should be noted that a large prospective trial is needed to confirm the findings above.

As a result of the findings of the study, the 4S DAWN team have been developing the VGR calculation within DAWN AC as illustrated below:



This will be available to customers in the near future and is offered as an option, with users having the choice as to whether the VGR is displayed on the patient records.

Higher Than 8 In-Clinic INRs and How We Manage Them

Sean O'Brien, Anticoagulation Specialist BMS, Blackpool and Fylde NHS Trust

Blackpool Anticoagulation Dosing Advisory Service (ADAS) is a consultant led point of care anticoagulation service staffed by Specialist Biomedical Scientists who run and validate the DAWN AC dosing software during clinics. KC4 channel analysers are used in clinic with Coaguchek XS machines as a backup and near patient testing is carried out by Medical Laboratory Assistants.

ADAS currently has 6,200 active patients that include 750 domiciliary patients whilst 16 outreach clinics dose up to 550 patients daily.

For patients attending clinic who present with an INR higher than 8 on the KC4, the Vitamin K policy is summarised below:

- Repeat the test on the Coaguchek to confirm the INR is higher than 8
- Check the referral for sign off from the consultant authorising the BMS to administer Vitamin K
- BMS consults the patient as to potential reasons why the INR is high
- If the patient is actively bleeding or bruising they are sent to A&E
- If not, the BMS is authorised to administer 2mg/0.2ml paediatric Vitamin K
- A follow-up appointment with the patient is made for 24 hours later
- The patient is advised accordingly regarding the potential for bleeding /bruising and the necessary actions to take
- An episode report is sent to the Consultant Haematologist

A study into all active patients that had presented at clinic with higher than 8 INRs was carried out to determine whether the current policy was working for the Trust.

The study looked at the period April 2012 to April 2013 and filtered the results into clinic locations, reasons for the high INR and demographics. It also looked at whether Vitamin K had been administered and in those cases where it had, what the patient's INR was on the follow-up appointment 24 hours later. Exclusions to the study included domiciliary patients and those with 'in-patient' added history.

Out of approximately 100,000 tests during the 12 month period selected, there were 74 instances where patients presented at clinic with an INR higher than 8. From this number, 5 patients were excluded due to 'in-patient' added history from the hospital, 21 were domiciliary INRs and 48 were clinic INRs.

The 48 clinic INRs higher than 8 were those that the study focussed on.

Graph shows reasons behind patients >8 INRs

Of the 48 INRs, 45 patients were given Vitamin K in clinic. The remaining three were admitted due to bleeding; sent to A&E with a headache which was found to be an intracranial bleed; and sent to Preston for Vitamin K as they were a patient from outside the territory.

The 45 patients given Vitamin K in clinic were scheduled to return for a next appointment 24 hours later. The mean target INR for these patients was 2.8 and the study showed that the mean INR achieved, 24 hours post Vitamin K was 3.3, with INRs ranging from 1.5 to 6.6.

The results of the study highlighted that the current Vitamin K policy was working and effective. With only 7 in every 10,000 INRs being greater than eight, ADAS's initiation is safe and effective, although more education is needed regarding drug changes and notifying ADAS. However, no complications with all 45 returning patients illustrated that the approach to administering Vitamin K and the Vitamin K dose is right.

The effectiveness of the Vitamin K policy also highlighted potential savings for the Trust:

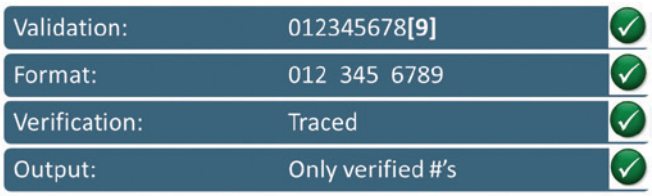
- Cost of 45 potential hospital admissions (either an A&E visit or overnight AMU stay)
- Cost of a major bleed (for multiple patients)
- Cost of red cells and platelets
- Cost to the patient and family!

DAWN AC Product Update: What's New Since Last Year?

Brenda Nicol, 4S DAWN Clinical Software

A number of developments have been made within the DAWN AC product over the last twelve months both from a safety perspective and to improve workflows and the usability of the software for the user, providing a range of tools and functionality.

- The **Quick Notes** section on the main patient screen has had the date and time reformatted to a bold, black font. This is now much easier to read than the previous white text.
- **UK NHS Number Compliance** has been added to the software to conform to the requirements of ISB 0149-02 (formerly DSCN 32/2008) from the UK Department of Health. This new development in the DAWN AC system facilitates the validation, formatting and verification of the patient's NHS number. The NHS number is included at the top of the patient screen.



- **System Generated Passwords** have been made easier for users to remember, consisting now of just 6 characters and containing numbers from 2-9 and lower case letters, other than g, i, j, l, o, p and q, which some users found difficult to read.
- If you cancel out of the diary screen without scheduling the patient's appointment, a **Cancel Diary Screen Warning** box now appears to inform users that messages such as letters, faxes, emails etc. will not be generated automatically until the appointment is scheduled into the diary.
- A new local drug code can now be entered for each drug in DAWN. The **Drug Code Field** is intended to hold the code from your own hospital computer systems and is used by the optional medications interface that can automatically add the details of which drugs a patient is taking.
- A **Post Clinic Checklist** view has been added to list views within DAWN AC to provide a final checklist that can be used at the end of each clinic to identify any unsafe dosing or test interval instructions. This can be sorted by dose or by interval.
- The support team have created many custom reports for customers over the years and these have been added to a **Reports Webpage** so that customers have easy access to the range of reports available to them. These can be found at http://www.4s-dawn.com/dawnac/Reports.htm

Staff Competency & Protocols

Wendy Cottee, Lead Biomedical Scientist, Worthing & Southlands NHS Trust

Worthing has a large elderly retired population and with lots of AF, the anticoagulation service is seeing 20+ patients per week being added on to the anticoagulation database with few being taken off. An increasing number of patients and a limited number of staff who manage dose adjustment highlighted the need to train more staff and the requirement for written competency, complying with UK National Patient Safety Agency (NPSA) 2008.

With a range of healthcare professionals working within the anticoagulation service the initial task was to identify the scope of training for each group.

Understanding what fitted into the scope of practice was the first step in the process. This included breaking down what happens in clinic into sections, considering who will be allowed to do which components and ensuring that trainee staff know and adhere to their current scope of practice.
Five levels of practice were determined for the training to ensure that it was appropriate to each of the groups. These five levels were dependant on staff grade, training, experience and confidence and each level included specific inclusion and exclusion criteria.

- Level 0 – Administration of clinic **(All staff)**
- Level 1 – Basic dosing **(Practitioner & Specialist BMSs or AC nurses in training)**
- Level 2 – Dose changes **(Specialist BMSs and AC nurses)**
- Level 3 – Authorising complex dosing/manual changes **(Experienced and Senior BMSs and AC nurses)**
- Level 4 – Complex dosing, induction & risk assessment, problem patients and bleeds **(Consultants, Specialist registrars, AC nurse prescribers)**

Once the service understood what they wanted the staff to do and what the limits of each level were, they

were then able to start developing a training manual for each level of practice that had been defined:

Step One: Take the tasks that are required to be performed at that level and list them:

	Level ZERO Non – dosing tasks (administration)
	ITEM
1	Addition of new patient onto system
2	Addition of drugs to patient record
3	Addition of patient notes
4	Telephoning results to Patients and dealing with telephone queries
5	Dealing with DNAs
6	Dealing with Anticoagulant Clinic Paperwork

Step Two: Take each task and break it down:

1. Addition of new patient to system

Item to Check	Training notes
Checking referral information	Checking for complete referral information. Pink forms and "cold" referrals via clinic clerks and secretaries. Use of LF-HAE-ACRejectForm
Use of Sema Helix (Electronic Medical Record System)	To be able to log in and look up patient details on Sema- to look up and check GP and patient contact telephone numbers including Next of Kin Also to be able to look up inpatient stays and discharge entries.

Step Three: Tailor to the grade and level.

Training records were produced that mirrored the training manual and required signatures from both the trainer and trainee, whilst competency levels were also developed for each task ranging from Competence Level 1: Unsure, has been shown but not confident; to Competence Level 4: Independent, can teach others when comfortable.

The DAWN AC system was used to facilitate the training through the use of list views. These were customised to split patients into three groups, High (above range), Low (below range), and In-Range, enabling the selection of relevant groups of patients to work with. For Level 1 trainees, the In-Range patients were worked on as they fitted with what had been defined as the scope for Level 1 staff.

On-going assessment of staff also takes place through the use of self-audit forms, where staff are encouraged to reflect on outcomes and what they would do differently if the desired outcome was not achieved, and Level 3 dosers randomly auditing each other and the levels below them.

Audit of NOAC Patients Previously on Warfarin

Sue Bacon, Anticoagulation Nurse Specialist, North Bristol Trust

The anticoagulation service at North Bristol Trust covers North Bristol and South Gloucestershire and operates shared care with GPs serving 5,200 patients through a postal service.

The Trust has introduced Dabigatran, Rivaroxaban and Apixaban to the anticoagulation service, with Edoxaban coming soon.

After concerns about how GPs were transferring patients from warfarin to a NOAC, an audit was carried out to understand how many patients had been transferred to NOACs; to look at the transfer process and ensure that best practice was followed; and to feedback the results to GP surgeries in order to improve patient care. The list views in DAWN enabled all of the relevant data to be extracted from the DAWN AC system quickly and easily for the audit to take place.

Patient data was extracted from the DAWN AC system for the previous two years and showed that 3438 patients had stopped Warfarin therapy in that time for a variety of reasons. A closer look at the patients being stopped on anticoagulation therapy highlighted a number of reasons such as dementia, falls, and high INRs, that the service felt were not appropriate reasons for stopping anticoagulation in patients with AF and that these should be investigated. Letters were sent out to GPs to increase their understanding of anticoagulation therapy.

Of those patients that had stopped Warfarin, 461 had been transferred onto NOACs: 1 on Apixaban; 164 on Dabigatran; and 296 on Rivaroxaban. Further

investigation highlighted inappropriate management of the transfer of patients to NOACs with GPs stopping anticoagulation therapy completely in order to transfer patients. Information is now available for all GPs on the Bristol, North Somerset and South Gloucester website outlining the process for transferring patients onto NOACs.

Further problems picked up during the audit identified that patients had been transferred onto Dabigatran and Rivaroxaban for things that the therapies were not licensed for.

It was concluded that GPs were struggling to fully understand anticoagulation therapy and the impact and specifics of NOACs meaning that there was potential for patients to come to harm.

Actions arising from these findings included consultants writing to GPs regarding heart valves; the Clinical Nurse Specialist checking all future letters from GPs; and a further formal audit including junior doctors to get a wider perspective of the understanding and use of NOACs within the Trust.

Reference to a good paper for a practical guide on the use of NOACs was made which is free to download and contains a patient alert card. www.NOACforAF.eu

New DAWN AC NOAC Modules

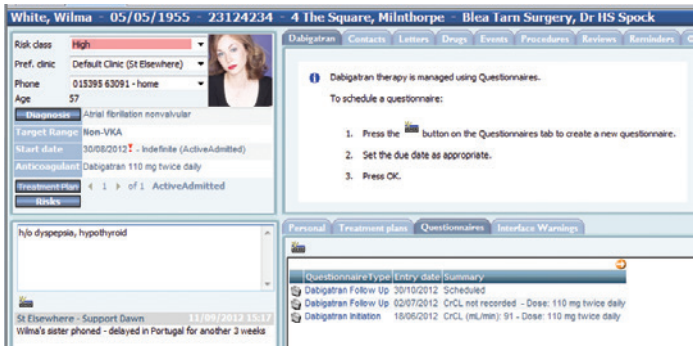
George Kitching, 4S DAWN Clinical Software

4S DAWN has worked with Boehringer Ingelheim and Bayer Healthcare to develop new modules for the safe and efficient management of Dabigatran and Rivaroxaban.

The modules are made up of easy-to-use questionnaires and checklists that are incorporated into the patient's overall treatment plan to ensure a consistent approach throughout each stage of the patient journey from initiation to follow-up, enabling protocol-driven care and improving the consistency of dosing practices. Further benefits include allowing healthcare professionals to track adherence, patient feedback and monitor side effects to increase patient safety and reduce clinical risk.

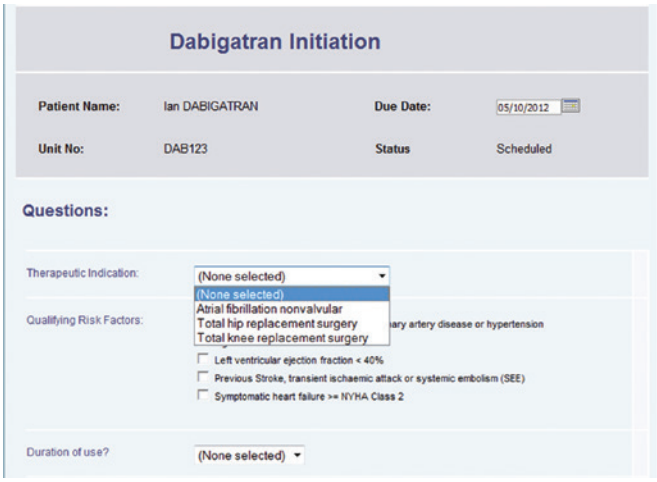
A demonstration was given of the NOAC modules to highlight the integration with DAWN AC that ensures a seamless transfer of patients from Warfarin therapy to either Dabigatran or Rivaroxaban.

DAWN AC patient screen showing Dabigatran Module



The questionnaires that make up the modules ensure that pertinent information such as comorbidities, interacting concomitant medication, possible side-effects and adherence are recorded easily and are highly visible within the patient's treatment plan. This provides the healthcare professional with a safe and easy approach for prescribing NOACs.

DAWN AC Dabigatran Module – Start of Initiation Questionnaire



Benefits include:

- Enable protocol-driven care
- Record risks to the patient (thrombotic/bleeding)
- Lists of current patients treated
- Record patient education
- Shared database with existing anticoagulation records to enhance risk analysis and audit
- Track adherence and patient feedback
- Non-VKA list view for easy management of patient reviews
- Powerful reporting on patient outcomes and population data
- Follow protocols for initiation, routine follow-up, perioperative actions, and compliance checks
- Track dosing history along with side effects

- Support medical research
- Improve consistency of dosing practices
- Ensure all information is in one place
- Help to follow the recommended prescribing guidelines

Contact the 4S DAWN team at sales@4s-dawn.com or 015395 63091 for a video link to the Rivaroxaban and/or Dabigatran module demonstrations and information about possible funding for the modules.

New DAWN DVT Module

Dr Jane Strong, Consultant Haematologist, Victoria Frimpong & Jo Eggleston, DVT Specialist Nurses, University Hospitals of Leicester NHS Trust

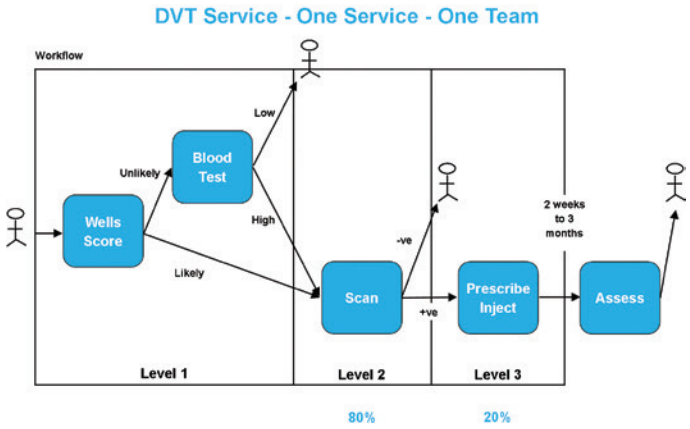
The DVT service at the University Hospital of Leicester is separate from the anticoagulation service. The patient is diagnosed, prescribed and treated by the DVT clinic before being passed to the anticoagulation team. Referrals for the DVT service come from GPs, wards, A&E and outpatients.

Prior to the development of the DAWN DVT Diagnosis & Assessment module, the service was paper based with very little space and no clerical support which resulted in a huge workload for the DVT nurses and low staff morale. Furthermore, a serious patient incident with key documentation unable to be found, highlighted the need to assess how the service could be improved.

In 2011 Dr Strong attended the DAWN AC User Group Meeting and saw a presentation from Nottingham University Hospitals NHS Trust in which they outlined how they had been working with 4S DAWN to develop a DVT module that was specific to their DVT service and its requirements. This prompted the Leicester team to review their DVT service with a view to achieving a seamless referral and GP communication process; an improved clinical governance and audit trail; and more importantly a paperless system. Team meetings were held with Consultants, Senior Managers and DVT Nurses to discuss how best to improve the service.

The DVT processes and pathway were defined and the Leicester team worked with 4S DAWN to structure a DVT Diagnosis & Assessment module that specifically suited the needs and workflow of the DVT clinic.

The Pathway – Primary Care & Secondary Care / Specialist-Generalist – not site specific



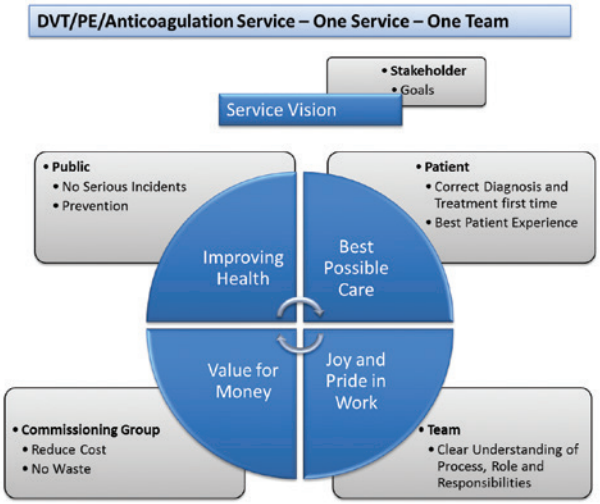
As only 20% of patients scanned actually have a DVT, the DAWN DVT module enabled the clinic to reduce their workload by 80% as they were clearly able to determine at each stage, whether the patient needed to be progressed through the defined DVT workflow or discharged from the clinic.

Leicester DVT clinic also outlined further benefits from the introduction of the DVT module:

- Information is electronically stored therefore easy to access for future episodes
- Provides an audit trail
- Saves time and resources as only collecting relevant information
- Fluent, methodical way of working
- Simplified algorithms easy to use
- Message box to highlight information for other users
- Ability to add messages for letters to GPs, e.g. abnormal blood results
- No more writing endless discharge and blood results letters
- Easy referral to the anticoagulation clinic
- As 80% of patients scanned are negative and now discharged, this allows the DVT clinic team to spend more time with those patients who require treatment

Both Dr Strong and the DVT nurses believe that the introduction of the DAWN DVT Diagnosis & Assessment module has revolutionised the way Leicester's DVT clinic operates. A demonstration of the module was then given by George Kitching who took delegates through the DVT pathway and outlined how it was configured specifically to fit Leicester's workflow.

Leicester DVT team and the 4S DAWN team continue to work together to develop the DVT module further and realise Leicester's vision for the future:



Overcoming Communication Problems in the Anticoagulation Service at Calderdale & Huddersfield (CHFT)

Harry Crank, Senior MLA, Calderdale & Huddersfield NHS Foundation Trust

The anticoagulation service at CHFT has over 4,600 active patients and holds 30+ phlebotomy-led community clinics with referrals from wards, GPs and other hospitals. Operating a shared care service, there are 110 GPs within CHFT's territory that are also involved in their patients' anticoagulation care.

The integration of Calderdale's patients into the Huddersfield DAWN system and the subsequent upgrade to DAWN AC Version 7 enabled a number of areas to be improved, specifically with regards to communication.

The process for producing patient dosing letters has seen the requirement to produce a yellow questionnaire/blood test request form; a separate dosing letter; 2 sticky labels for postage; and the hand-folding and enveloping of letters replaced by a single letter produced on the Economailer that incorporates dosage, sticker, blood test request form and questionnaire all in one. As part of the process, the letter is also machine folded and no longer requires an enveloped which has saved greatly on paper and time.

Likewise, dosage letters for GPs that would require printing, folding, sorting and delivery to the GPs via the internal mail room which could take around 3-4 days, are now sent to GPs via email through the GP portal. These are sent each night so that the GPs receive them in the morning and currently there are 8 different types of letter that are sent out.

Letters are sent from DAWN AC via email to a dedicated email server (the Trust Integration Engine) which determines GPs by an allocated code within DAWN AC to ensure the correct letters are sent to the correct GP.

The table below shows the number of GP dosage letters that have been sent since October 2012 when they started being distributed electronically and highlights the amount of paper and time saved by updating the process through DAWN AC.

October 2012	3234
November 2012	4192
December 2012	3482
January 2013	4524
February 2013	4212
March 2013	4345
April 2013	4670
May 2013	4858
June 2013	4542
July 2013	4794
August 2013	4436
TOTAL	47289

District Nurse and pharmacy letters were also addressed as part of the improvement in letter processes. Where previously the name and address was added to the Next of Kin contact details, allowing only one other person to be informed of the patients dose and next test date, these are now added as an HCProfessional and added to patients as a contact. This means that each time a patient is dosed, a Next of Kin style contact letter is printed for each of the associated contacts.

Another time-consuming exercise in the form of hand written details into patients' yellow books was addressed through the setting up of labels within DAWN AC that were automatically printed and stuck into the yellow books, ensuring the instructions were legible and avoiding transcription errors.

Finally, having a single fax machine and telephone and with 40-50 calls a day meant that just one person at a time being able to deal with calls was extremely resource intensive. A review of the communications system prompted an extra two telephones to be added and a scanner to enable letters, referrals and other

communications to be attached to the patient record in DAWN AC.

Each of these individual improvements within DAWN AC has not only improved communications between the anticoagulation service, the patient and all health care professionals involved with the patients' care, ensuring they are fully informed, it has also made the service more efficient by saving paper costs and staff time.

Using DAWN AC for Paediatric Patients Managed on Warfarin

Jenny Brown, Paediatric Pharmacist, Leeds Children's Hospital

The UK National Patient Safety Agency (NPSA) Alert 18 prompted a review of the paediatric warfarin management service offered at Leeds Children's Hospital. Growing numbers of paediatric patients on warfarin (44 in Aug 2012, 78 in Aug 2013) meant it wasn't appropriate for paediatricians based on an acute ward nor the adult anticoagulation service to take on the management of these patients.

There are also a number of clinical considerations that make the management of children on warfarin more complex and thus strengthen the argument for a dedicated paediatric warfarin service:

- Different pharmacokinetics
- Variations in weight-dose and age-dose responses
- Frequent intercurrent illnesses
- Variable dietary intake
- Concurrent medication

The review highlighted that certain elements of the current system weren't compliant with the standards set in NPSA 18; these were addressed by developing the new formal paediatric warfarin clinic. The first clinic was held in September 2012.

Comparison of service before and after changes

Old Service	New Service
Based on acute paediatric ward	Formal, dedicated outpatient clinic based in a clinic room
Parents phoned on an ad hoc basis; no follow up if they failed to ring	Formal appointment times and follow up if appointment missed
Paper records kept. No written communication with GP/parents. No formal follow up arrangements.	Computerised recording system (DAWN AC!) which does it all!

For paediatric patients, seemingly insignificant changes, such as growth spurts, altered dietary intake, term time vs. school holidays, can affect their INR. They also appear to be more sensitive to changes in dose, thus requiring more subtle dose changes and more frequent monitoring.

Benefits of using DAWN AC: up to date record of anticoagulation history, current medications and medical history; documentation of all INRs and dosing recommendations; written communication to GPs and parents/carers; formal follow-up arrangements; and an audit trail.

Limitations of using DAWN AC: being able to distinguish between adults and children would be a further benefit of the DAWN AC system. A dosing algorithm that takes into account the sensitivity of children to dose changes and environmental changes that can affect their INR would be extremely beneficial. This would mean our letters don't have to be altered by hand before they can be sent out.

The DAWN AC system has transformed the way the paediatric warfarin clinic works at Leeds, improving the service to patients, enabling it to comply with NPSA 18 and providing a fully auditable system.

The paediatric warfarin team are getting ready to publish a paper on their use of DAWN AC and to promote the use of computer aided dosing software in anticoagulation therapy management for paediatrics.

Systematic Anticoagulation Management in the Rural Health Setting

Lisa Vaughn, Clinical Manager, Confluence Health Anticoagulation Service, Washington, USA (via teleconference)

Confluence Health is one of the largest, most comprehensive medical centres in the Pacific North-western United States covering an area of over 12,000 square miles. The organisation consists of 7 clinic locations caring for 2200 anticoagulation patients that are split into three groups; home visits; self-testing and APS.

With such a large area covered, and multiple locations serving the Confluence Health patients, it was important to ensure as much standardisation as possible across the service for consistency of care and continuum of care between the multiple locations.

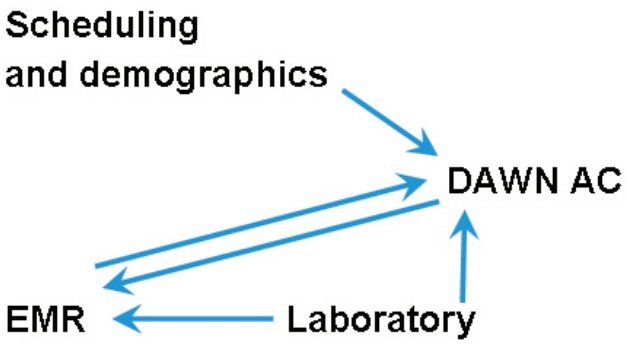
It was determined that there was a common scope of service across all locations and this included, face-to-face visits; patient self-testing; televideo appointments; home visits; extended care facility visits; POC INR testing; EMR patient access for lab results, RX renewal, scheduling and healthcare questions; and patient education for all anticoagulants.

A number of support services were also shared across locations including administration, staff coverage, pharmacy support, AC steering committee and clinical resources.

By standardising personnel requirements, training and certification and the anticoagulation workflow, a systematic approach was taken towards therapy management to ensure that regardless of location or staff, patients received the same consistently high level of care.

DAWN AC supported this systematic approach through its documentation and coded comments; the patient list views; and the reporting facility which enabled quality measures to be reviewed between clinic locations. Participation in the DAWN AC benchmarking scheme also enables Confluence Health to compare their anticoagulation service and its performance against other providers.

A systematic approach to anticoagulation therapy management across such a large territory also requires enhanced communication ensuring all health care professionals have access to up-to-date patient information as and when they need it. This was facilitated by a number of interfaces to other systems.



Electronic Medical Record (EMR) Interface
This interface enabled all providers, both those in the local hospitals and those from rural clinics further afield, to access their anticoagulation patient information. All providers are able to see the most recent INR, anticoagulant dose, progress note and expected return appointment for anticoagulation visits.

Scheduling & Demographics Interface
An admissions/discharge and demographic interface allowed the organisation to maintain current demographic and contact information in DAWN AC without having to update two systems. Also, appointments made in the EMR are sent to DAWN AC.

Laboratory Interface
The laboratory interface from 4S DAWN enables the laboratory system used by Confluence Health to automatically send INR results to DAWN AC allowing immediate access to INRs. This increases patient safety by eliminating the potential for error in manual entry. It also alerts the organisation when INRs are performed by other providers so that the patient can be followed-up as needed.

Conclusion
The DAWN AC system contributes to Confluence Health Anticoagulation Service achieving our stated mission:

- To provide our patients with the highest quality health care and service in a friendly and caring atmosphere
- Committed to assisting in the development of one of the nation's best rural health care delivery systems

For more information on DAWN AC Products and Services:
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