DAWN® AC

ANTICOAGULATION SOFTWARE

Proceedings of the 12th Annual North American DAWN AC User Group Meeting

12th October 2018

"I love the ability to collaborate with other DAWN users and to inspire those who are not yet using DAWN"

Massachusetts General Hospital

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Achieving National Patient Safety Goals in an ambulatory anticoagulation management setting

Peter Collins, Advanced Clinical Practice Pharmacist, Anticoagulation Management Service, Brigham & Women's Hospital

The aim of this talk is to define the National Patient Safety Goals and identify which specific goals apply to an ambulatory anticoagulation management setting. In addition, it will demonstrate how Brigham AMS uses DAWN AC to achieve these goals and increase both patient safety and quality of care.

National Patient Safety Goals (NPSG)

NPSGs were established in 2002 by The Joint Commission to help accredited organizations address specific areas of concern regarding patient safety. The first set of NPSGs were effective starting January 1, 2003 and are updated annually, with the benefits of accreditation including a reduction in liability insurance costs; authorization of Medicare certification and recognition by insurers. However, accreditation is a mandatory regulatory requirement in some states.

Goal 3: Improving the safety of high alert medications

NPSG.03.05.01

Within Goal 3, the sub-goal NPSG.03.05.01, is the goal that specifically deals with anticoagulation therapy

> ***Reduce the likelihood of patient harm associated with the use of anticoagulant therapy***
> *Class of medication most likely to cause harm due to complex dosing, requirement of laboratory monitoring, and inconsistent patient compliance*

For any organisation managing anticoagulation patients, it is important to have protocols & guidelines that allow each patient to be managed in a standardised way to ensure a consistent quality of care for all patients regardless of their diagnosis.

For medication management the AMS has guidelines for:

- Choosing between oral anticoagulation agents
- DOAC clinic management plan
- Warfarin / DOAC drug-drug interaction guideline
- Peri-procedural anticoagulation management protocol
- Reversal of anticoagulation and management of bleeding events
- Anticoagulation reversal guidelines
- Critically high / low INR protocol
- Vitamin K drug administration guidelines

How can DAWN AC help with meeting the requirements of the NPSG.03.05.01? Specifically, the following elements of performance:

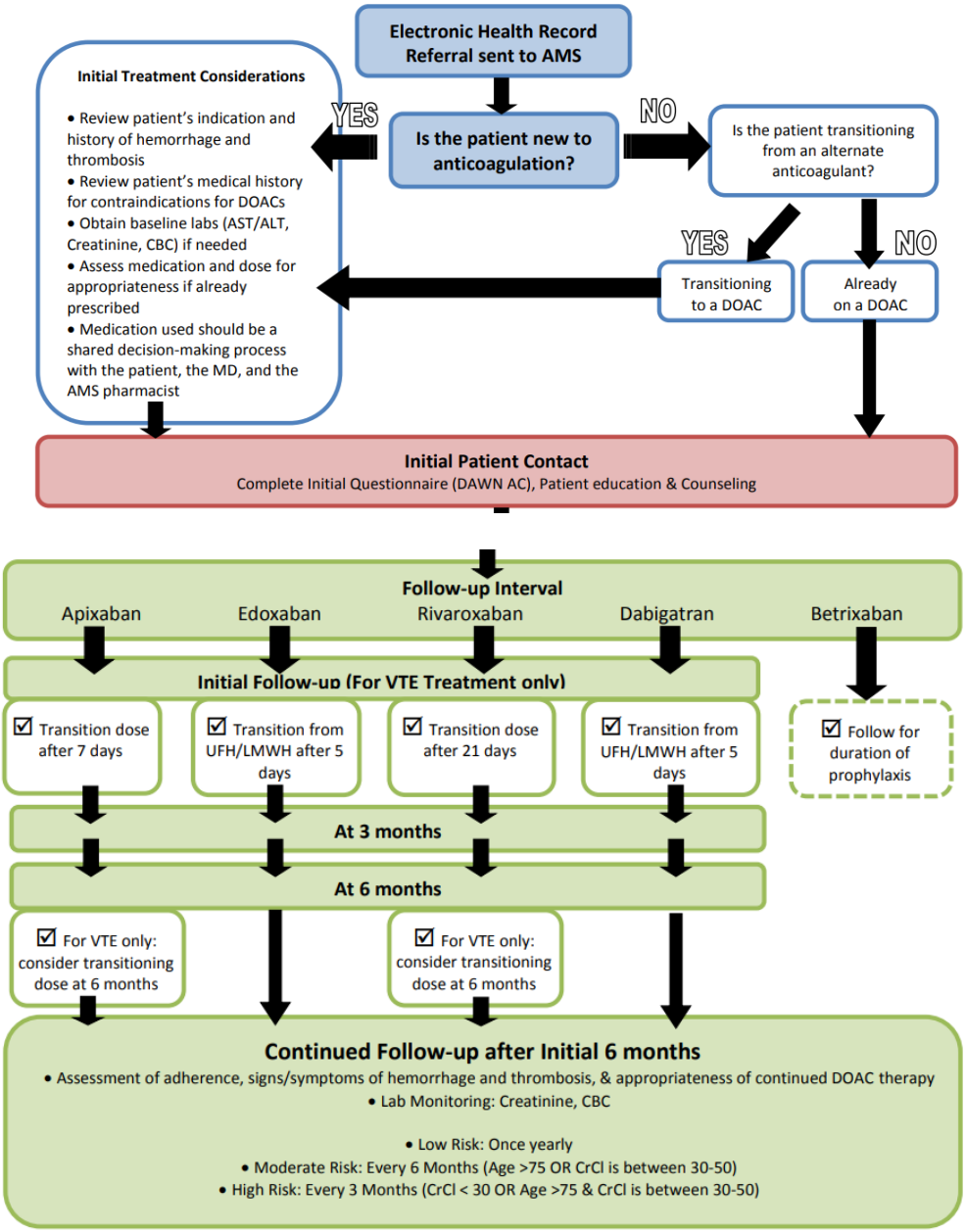
- *Objective 3 & 5: DOAC/Warfarin initiation protocol*
- *Objective 6: Perioperative protocol*
- *Objective 7: Patient education*
- *Objective 8: A written policy addressing anticoagulation safety practices including adverse events*

Objective 3 & 5

Before starting a patient on a direct oral anticoagulant (DOAC) or warfarin, follow evidence-based practice guidelines regarding the need for any baseline and ongoing laboratory tests that may be required to monitor the patient on anticoagulation therapy.

- *All patients require coagulation labs to be documented in DAWN AC*
- *Warfarin and DOAC patients have standardized follow up protocols to ensure quality care is provided*

Brigham AMS's DOAC Management Plan including initiation and follow-up:



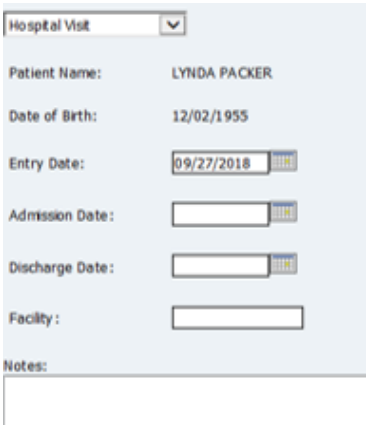
Within DAWN AC, the DOAC Candidate Questionnaires and DOAC Follow Up Questionnaires enable the AMS's DOAC protocol to be followed.

These questionnaires are completed for every patient who is initiated onto a DAOC either as a new patient or an existing patient transferring from warfarin. The follow-up questionnaire is completed at each follow up appointment to ensure that there are no compliance issues, contraindications, adverse events, insurance issues etc.

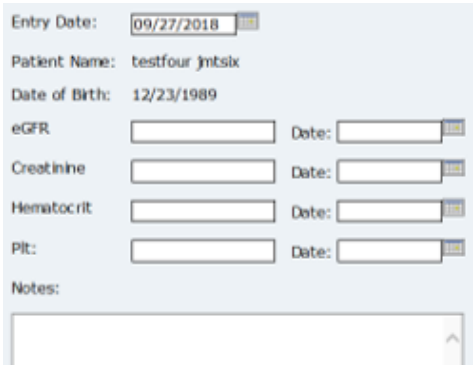
If the AMS needs to follow up with a patient outside of this process or if the patient contacts the AMS and these various points of contact fall outside of the management plan, these can be documented in DAWN AC using Additional Notes questionnaires, which fall into Hospital Visits, Lab Values and General Communication.

These additional notes are stored in chronological order in the bottom right section of the patient record along with the DOAC questionnaires so that it is clear if any communication took place outside of the standard follow-up appointments.

Hospital Visits



Lab Values



Communication

The non-VKA list view in DAWN is checked each day to see which patients are due or overdue a follow-up and the AMS team work through the list using the DOAC questionnaires.

Objective 6

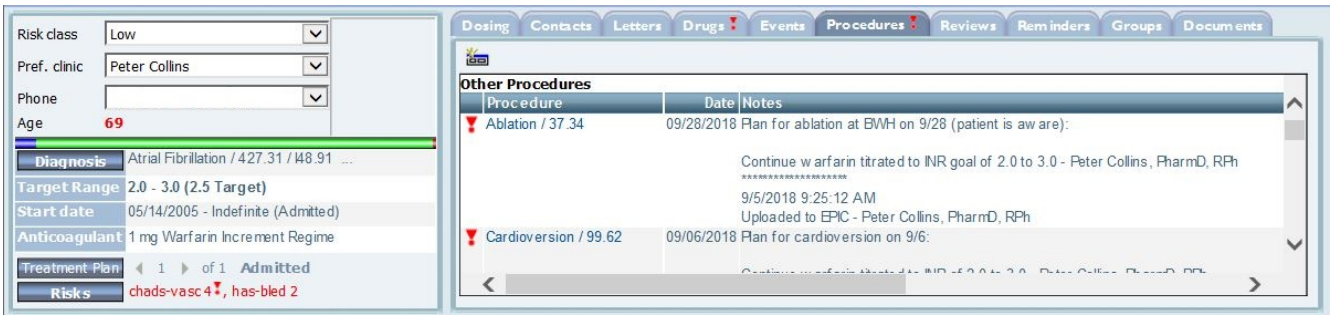
The organization has a process developed using evidence-based practice guidelines for perioperative management of all patients on oral anticoagulants. The process addresses the following:

- *Situations in which the anticoagulant is stopped prior to the procedure*
- *Timing for stopping the anticoagulant and length of time it should be held*
- *Timing and dosing for restarting the anticoagulant*

The AMS document all peri-procedural anticoagulation plans in DAWN AC (via the Procedures tab) and EPIC for both DOAC and warfarin patients and the service prepares more than 120 procedure plans per month.

This approach enables all healthcare professionals, whether part of the AMS or not, to see full details of the patient's peri-procedural anticoagulation plan.

Example peri-procedure plans recorded in DAWN:



Checking the procedures list view is part of the AMS's daily workflow and any patient who has an upcoming procedure in the next 14 days is shown in the list so that the AMS have enough notice to formulate the plan and communicate it to the patient.

Objective 7

Provide education to patients and families specific to the anticoagulant medication prescribed, including the following:

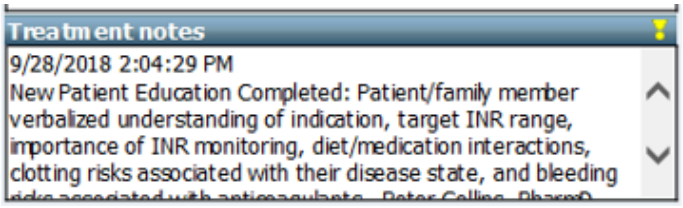
- *Adherence to medication dosing and schedule*
- *Importance of follow-up laboratory testing (if applicable) and physician appointments*
- *Potential drug-drug and drug-food interactions*
- *The potential for adverse drug reactions*

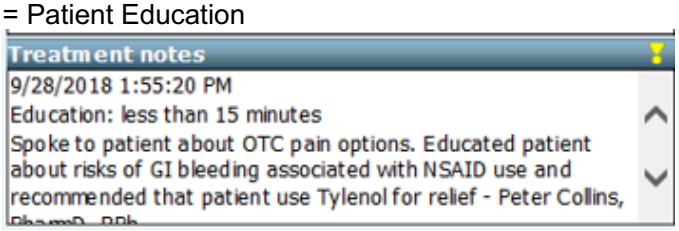
Education is an important component with these medications due to their high risk and the fluctuations in the patient's disease state. Therefore, it is important to ensure the patient is aware of and understands, their dosing, testing requirements, drug and food interactions etc.

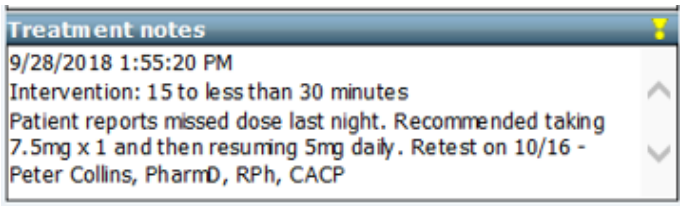
This education not only needs to take place but also needs to be documented so that the AMS can audit the information and see who was educated and when and also know that each patient has been educated in a consistent way that is standardised across the patient population.

In order to document patient education as efficiently as possible, Quick Codes are used in DAWN AC. They also enable the AMS to track pharmacist intervention and the time spent on patient education. When these quick codes are typed into the patient record, they expand as shown below:

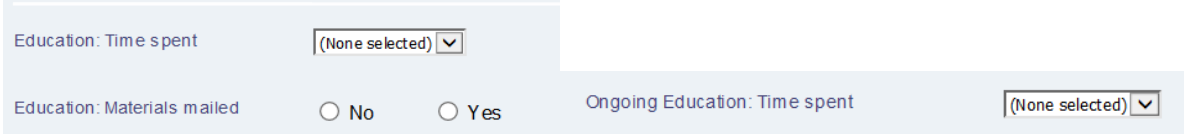
Quick Code	Quick Code Expanded
.nped	= New Patient Education
.ed10	= Patient Education
.in10	=Intervention







The quick notes above are typically used only for warfarin patients as there is functionality to document education of DOAC patients built into both types of DOAC questionnaires, initiation and follow-up:



A clinical note is uploaded to the centralized EMR after each warfarin or DOAC patient is initially enrolled:

Consult Received: The BWH Anticoagulation Management Service will manage the anticoagulation for Patient Bonnie R Neal (09688870) based on the above indication. For daily progress notes and dosing instructions please click on the AMS indicator in the patient header in EPIC and an anticoagulation report will display on the right side of the screen.

Consent: I have discussed with the patient their condition as well as the risks, benefits and alternatives associated with their treatment and with no treatment. I have given the patient and family the opportunity to ask questions and at this time, all of their questions have been answered to their satisfaction. The patient has given consent to have their condition managed within this collaborative practice.

New Patient Education Completed: Patient/family member verbalized understanding of indication, the importance of following up with AMS as per clinician instruction, diet/medication interactions, clotting risks associated with their disease state, and bleeding risks associated with anticoagulants.

Objective 8

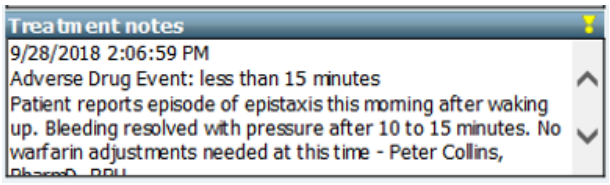
The organization has a written policy that addresses anticoagulation safety practices, including the following:

- *The identification and reporting of adverse drug events, including outcomes and actions taken*
- *Evaluation of the effectiveness of those actions in a time frame determined by the organization*

The Drug-Drug Interactions list view is automatically updated via an interface from the EMR to DAWN on a daily basis and is split between DOAC and warfarin patients. This is checked each day by a member of the AMS team to ensure there are no issues highlighted or adjustments needing to be made to the patient's anticoagulation therapy.

All adverse events are documented in DAWN AC in the Treatment Notes for warfarin patients and in the Events tab for warfarin and DOAC patients.

A Quick Code is used to record this in the treatment notes: **.ad10** = Adverse Drug Event and expands to:



Event reporting in DAWN allows a comprehensive look at the event rates in different populations.

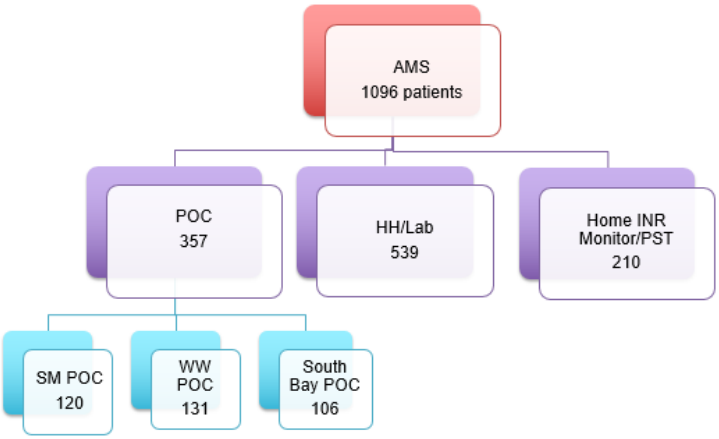
Conclusions

- National Patient Safety Goals assist organizations by identifying areas that require extra attention in order to reduce adverse outcomes
- Anticoagulation Management Services need to have protocols and systems in place to ensure safe and effective management of patients
- DAWN AC has many features that are able to assist providers in fulfilling National Patient Safety Goals and thus increasing the quality of care patients receive.

UCLA AMS time in range by type of INR monitor and challenges with transitions of care

Maija Sanna, MD & Shannon Ruiz, RN, Anticoagulation Management Service (AMS), UCLA Health

The patient population of the UCLA AMS is spread across Point of Care Testing, Home Health Testing, Laboratory Testing and Self Testing:



Procedures: Point of Care (POC) • Patients have scheduled clinic visits • Patients fill out a questionnaire at check in • POC INR test done • DAWN AC generates dosing instructions (MD involvement if out of protocol) • Patients leave with a sheet that has specific dosing instructions and a scheduled date for next POC test	**Procedures: Home Health (HH)** • INR data received via fax and filtered by AMS staff. • AMS staff phone patient to verify dosing and any possible changes affecting warfarin. • DAWN AC generates dosing instructions, and these are verbalized via phone to patient. (Reviewed by MD if out of protocol.) • AMS staff faxes orders for date of next INR check.
Procedures: Lab • Patients go on their own to a designated lab for INR check. • AMS receives INR data either interfaced directly into DAWN AC or by fax. • AMS staff phone patient to verify dosing and any possible changes affecting warfarin. • DAWN AC generates dosing instructions, and these are verbalized via phone to patient. (Reviewed by MD if out of protocol.)	**Procedures: Home INR Machine/Patient Self Testing (PST)** • Patient self-checks INR and notifies home monitor company who then faxes INR result to AMS clinic. • AMS staff phone patient to verify dosing and any possible changes affecting warfarin. • DAWN AC generates dosing instructions, and these are verbalized via phone to patient, (Reviewed by MD if out of protocol) and patient is informed of next date to check INR.

Pros and Cons by INR Monitoring Type

	POC testing	HH Testing	Lab draw	Home machine/PST
Pros	• Face to face visit •Patient receives written instructions •MD available for patient education/questions •Finger stick	• Do not have to leave the home	• INR result inputted to DAWN directly if done at UCLA	• Convenient • Finger stick • Improved quality of life
Cons	• Time consuming • Costly (parking, co-pay time off work) • Only during business hours	• Dependent on agency • Involves phlebotomy • Turnaround on lab results longer •Faxes more unreliable	• Patients may be less reliable about getting INR done on specified date • Involves phlebotomy • If outside lab is used fax is more unreliable	• Patient must make sure they have adequate supplies for testing •Cost associated with supplies may vary

With patients spread over a number of cohorts, the AMS wanted to know:

Do UCLA AMS patients with home monitoring/PST spend more TTR than HH/Lab or POC monitored patients? And does age make a difference?

Firstly, the evidence was checked to see if it had been shown that one particular type of INR testing was better than the other:

- VA Cooperative Study #481: The Home INR Study (THINRS).
  - 6 VA centers across the US
  - 1029 patients with AF or MHV trained and tested ProTime INR meter
  - 787 deemed competent randomized 4 arms (HQACM clinic- testing q 4 weeks, telephone PST q4 weeks, weekly, and twice weekly)
  - Endpoint was TTR at 1 yr
    FINDINGS:
  - TTR increased as testing frequency increased for those in PST
    Q4 weeks 59.9%, Q week 63.3%, Q twice weekly 66.8%
  - TTR for patients in HQACM arm was 60.8%
  - Rates of major events (death, major bleed, stroke) not significantly different across the four groups.

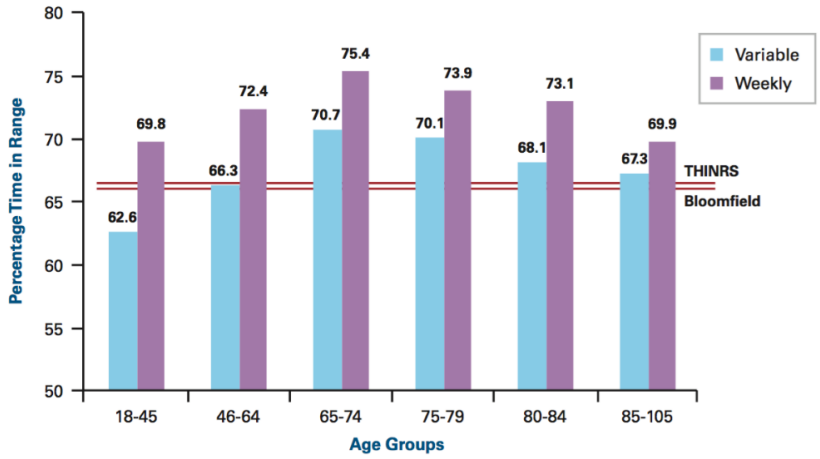
This is consistent with the parent study which did not show a difference in death, major bleed or stroke in patients who performed weekly self-testing compared to monthly HQACM testing[1]. It is important to note that patient self-testing is associated with an improved quality of life (improved quality of life in 87% of patients who performed PST vs. conventional in clinic monitoring)[2]. In addition, it has been shown that weekly PST is a cost-effective alternative to HQACM clinic [3].

There was a meta-analysis of the data from the VA study and also other studies that concluded: PST with or without PSM is associated with fewer deaths and thromboembolic events, without increased risk for a serious bleeding event compared to usual care (in a highly selected group of motivated adult patients).[4]

How does age affect this and what is the evidence?

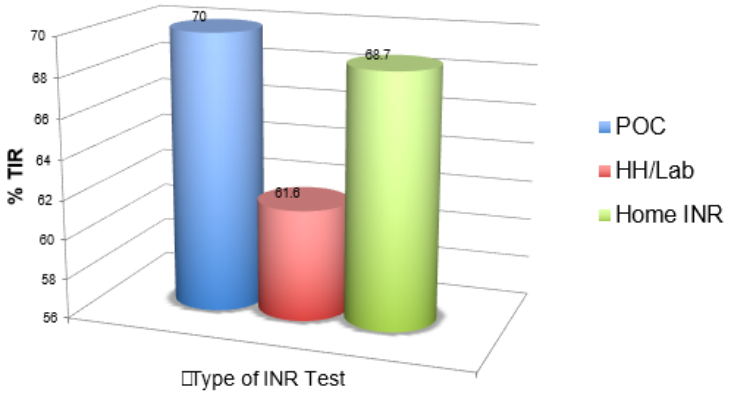
-
- Self-Testing Analysis Based on Long-term Evaluation (STABLE) retrospective cohort analysis of data from PST variable and weekly testing.
  - 29,547 patients (4,550 weekly PST, 24,907 variable PST)
    FINDINGS
  - Weekly PST had higher mean TTR (74% SD 15.1) compared to variable PST (68.9 SD 19.1)
  - Patients 75 years and older performed well with a mean TTR > 73% for weekly testers[5].

Figure 2. Time in Therapeutic Range (%) by Age Group



This following graph shows UCLA Data over a 1-year period for % TTR by type of INR monitoring and covering all ages. POC patients who are having a face to face visit and finger stick for the INR check, and the self-testing patients are performing better than those who use lab or home health testing. This could possibly be to due to home health patients having more comorbidities.

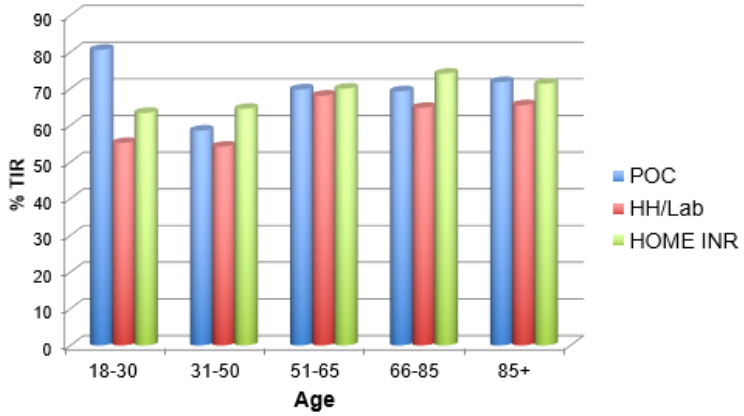
Graph: % TTR by type of INR monitoring



The AMS then looked at the percentage of time that patients had an INR of greater than 5 for all ages. POC patients had the lowest and self-testers actually had the highest. This could possibly be due to POC patients informing the AMS of medication or dietary changes etc due to being face to face for the visit.

Next, %TTR by age and location was investigated. This showed that home health and lab testing performed worst across all cohorts of patients whilst patients in the 18-30 age bracket who were POC tested had the highest %TTR. In addition, as patients got older, there was little difference between the testing methods in terms of %TTR.

Graph: %TTR by age and location



Conclusions

- UCLA POC patients and Home INR monitoring patients spend about the same amount of time in therapeutic range (70 and 68.7% respectively).
- HH/Lab INR monitored patients spent less TTR than patients who used a home INR monitor or came into the clinic for POC testing.
- Home INR monitored patients spent more time with INR > 5, whereas POC patients spent the least amount of time with an INR >5.
- Younger patients actually had more TTR with POC testing.

Transitions of Care

Hospital to home, hospital to skilled nursing facility (SNF), and SNF to home transitions are vulnerable periods of time for patients on warfarin due to medication errors, med-med interactions, and diet-med interactions. Thirty-day readmission rates for Medicare patients after discharge from inpatient rehabilitation facilities has been shown to be 13.1%[6] and a review of drug related hospital readmissions showed median prevalence 21% [7]. Vitamin K antagonist were among the highest prevalence for drug group readmissions[7].

Transitions of Care: Interaction with AMS Clinic

The AMS team use DAWN AC to manage transitions of care. For patients who are hospitalized, their status moves from “Active” to “Admitted” and the patient appears on the appropriate list view, which happens automatically via direct Care Connect-DAWN integration.

Inpatient warfarin dosing and management falls on the inpatient team (physicians or pharmacy) and when patients are discharged from the inpatient setting, they automatically move to the “Discharged” list in DAWN AC. The AMS staff reviews the discharge, coordinates the INR check and moves the patient to the “Active” list. If the patient was discharged to a SNF, they change the clinic site to indicate that they are at a SNF.

If patients are discharged to SNFs, most of the time SNF physicians manage the patient’s INR. While at the SNF, patients are placed on a “Reminder” list in DAWN and the AMS does two week checks with family or SNF re discharge. On average there are 10-20 AMS patients at SNFs for short term rehabilitation.

Transitions of Care: Pitfalls

- Hospital to home:
  - Discharge summary not always accurate.
  - AMS staff do not have access to the after-visit summary (AVS) which lists doses of medications to take on discharge.
  - Medication changes and dietary changes from discharge place patients at high risk of medication error and med-med or med-diet interactions which impact their INR
- SNF to home:
  - The AMS is not always notified regarding the patient’s discharge.
  - Current policy is to check every 2 weeks with patients on the “reminder” list in DAWN AC but the patient may be discharged and already miss the critical time frame for INR recheck.
  - Medication changes and dietary changes from discharge place patients at high risk of medication error and med-med or med-diet interactions which impact their INR

Case Study: Mr. R.T.

Transitions of Care

- Mr. R.T. 95-year-old male with a-fib (on warfarin), TIAs, aortic stenosis, BPH s/p TURP c/b urinary retention requiring chronic suprapubic catheter, T2DM, HTN, HLD, glaucoma, macular degeneration, and hearing loss.
- GLF on 7/13 s/p R hip hemiarthroplasty on 7/14 with hospital course c/b delirium. Discharged to SNF for deconditioning/PT on 7/18
- Discharged from SNF back to assisted living facility (ALF) on 8/31 (INR 8/30 was 2.45) plan to repeat INR on 9/4 via HH.
- HH did not repeat INR
- Pt was readmitted for frank hematuria on 9/9. INR was 4.1 which resolved w/ suprapubic cath exchange and holding warfarin.

What went wrong?

- INR was ordered by SNF team on discharge but HH reported they never received orders for INR check.
- By the time the patient showed up on the DNA list in DAWN, they had already been readmitted.
- Patient's post discharge appointment with primary care provider was scheduled after his INR was due.

Room for Improvement

- Hospital to home:
  - Improved access to AVS from hospital discharge to AMS clinic so AMS staff can see clearly what the patient has been told
  - Program "hard stop" into discharge workflow for patients flagged as enrolled in AMS clinic to ensure clinicians send AVS to AMS clinic.
- SNF to home:
  - Increase rate of "Reminder" list phone calls from every 2 weeks to once a week.
  - Enlist eligible providers to send message in Care Connect directly to AMS clinic on patient discharge.
  - AMS workflow to incorporate double-check system for HH orders for initial INR draw on discharge.

Ref:
1.Matchar et al N Engl J med. 2010.; ***2. Barcellona et al. Patient Prefer Adherance. 2018;*** *3. Phibbs et al. J Gen Intern Med. 2016;* ***4. Bloomfield et al. Ann Intern Med. 2011;*** *5. DeSantis et al. Am J Manag Care 2014;* ***6. Coots Daras et al. Arch Phys Med Rehabil. 2018;*** *7. El Morabet et al. J Am Geriatr Soc. 2018*

How we interface DAWN with other software systems

Cassandra Means, Clinical Pharmacy Technician, Desert Oasis Healthcare

In 1980 Dr. Merkin began building a physician group practice. By 2010, it had grown exponentially and encompassed 9 medical groups. Today, the network comprises 3700 primary care physicians, 10,000 specialists and almost 1700 affiliated facilities and is now one of the largest provider networks in California.

Originally a Coumadin Clinic with 6 staff members, the anticoagulation service has grown to become Population Health and Prescription Management (PHARXM) and as of 2018, comprised 25 Pharmacists, 5 PGY1 Pharmacy Residents, 17 Pharmacy Technicians, and 8 Clinical Support Staff.

PHARXM manages Anticoagulation, Diabetes, COPD, Hep. C, Anemia/Transfusion, Injectable Medications, Refill Clinic, Cardiology and Cardiology Case Management.

The Anticoagulation Clinic within PHARXM manages around 3000 patients on Warfarin/Lovenox, Xarelto, Eliquis, Pradaxa, and Savaysa. These medications are monitored by either INRs or CBC/CMP panels and the medical group determines which lab patients are asked to use. A little over half of patients use LabCorp and the rest use Quest Diagnostics. With everything being done through the lab systems, there is room for error in terms of mis-communication between the labs and the Anticoagulation clinic.

PHARXM uses 2 main software systems, Nextgen and DAWN AC.

- Nextgen is the electronic health record system used for all of Desert Oasis members that tracks encounters/records office visits, hospital admissions, skilled nursing and UC visits. It also generates all lab orders and lab results and handles appointments and calendars.

- DAWN AC is used solely for the anticoagulation clinic and tracks lab results, warfarin dosing, documentation of calls, prescriptions, results letters, and general patient demographics and history.

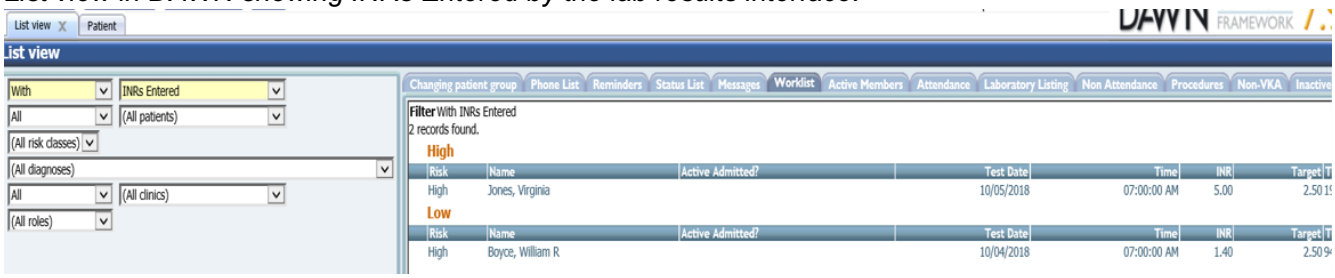
It is important for the anticoagulation clinic that interfacing between these two systems is in place and works well to increase safety and efficiency.

The Nextgen system uses SQL Server Integration Services version 2008R2 (SSIS) which is a platform used for data integration and workflow applications.

Interface workflow:

- SSIS runs a report every 30 mins, 24/7 between LabCorp and Nextgen to pull patient INR results from the lab system
- Nextgen uses a program called Rosetta Interface HL7 to ensure accuracy as labs load into the Nextgen Provider Approval Queue (PAQ)
- Once the lab results hit the PAQ they are then interfaced over to DAWN AC using an in-house program called Matching Utility
- Matching Utility works in DAWN AC to match the lab results to the correct patient and add them to the DAWN AC patient record
- This then adds the patient into the "worklist" list view under the 'INRs Entered' filter
- The anticoagulation pharmacists then use this worklist on a daily basis to go in and dose the patient accordingly

List view in DAWN showing INRs Entered by the lab results interface:

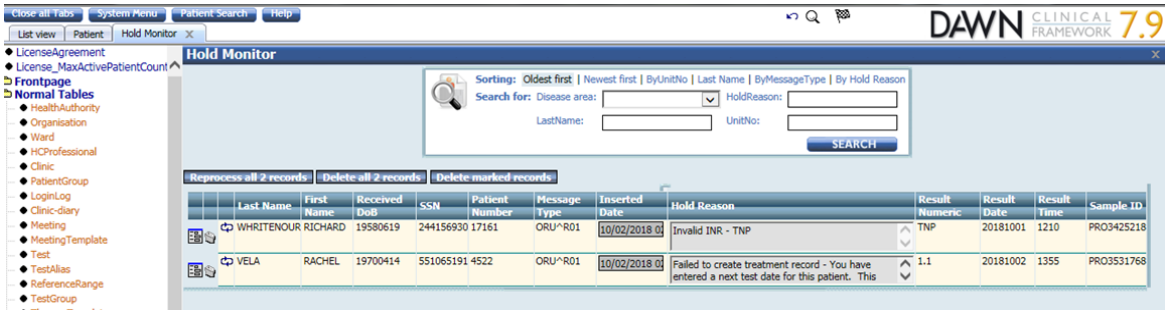


The matching rules of the interface mean that the patient details in Nextgen and DAWN AC must be exactly the same in order for it to interface successfully in to the DAWN patient record.

If there is a discrepancy or mismatch and the lab result cannot be matched to a patient in DAWN AC, the INR gets sent to the DAWN HOLD Monitor. New patients are entered manually into the DAWN system so this means there is room for error such as a spelling error or the middle name initial is wrong etc.

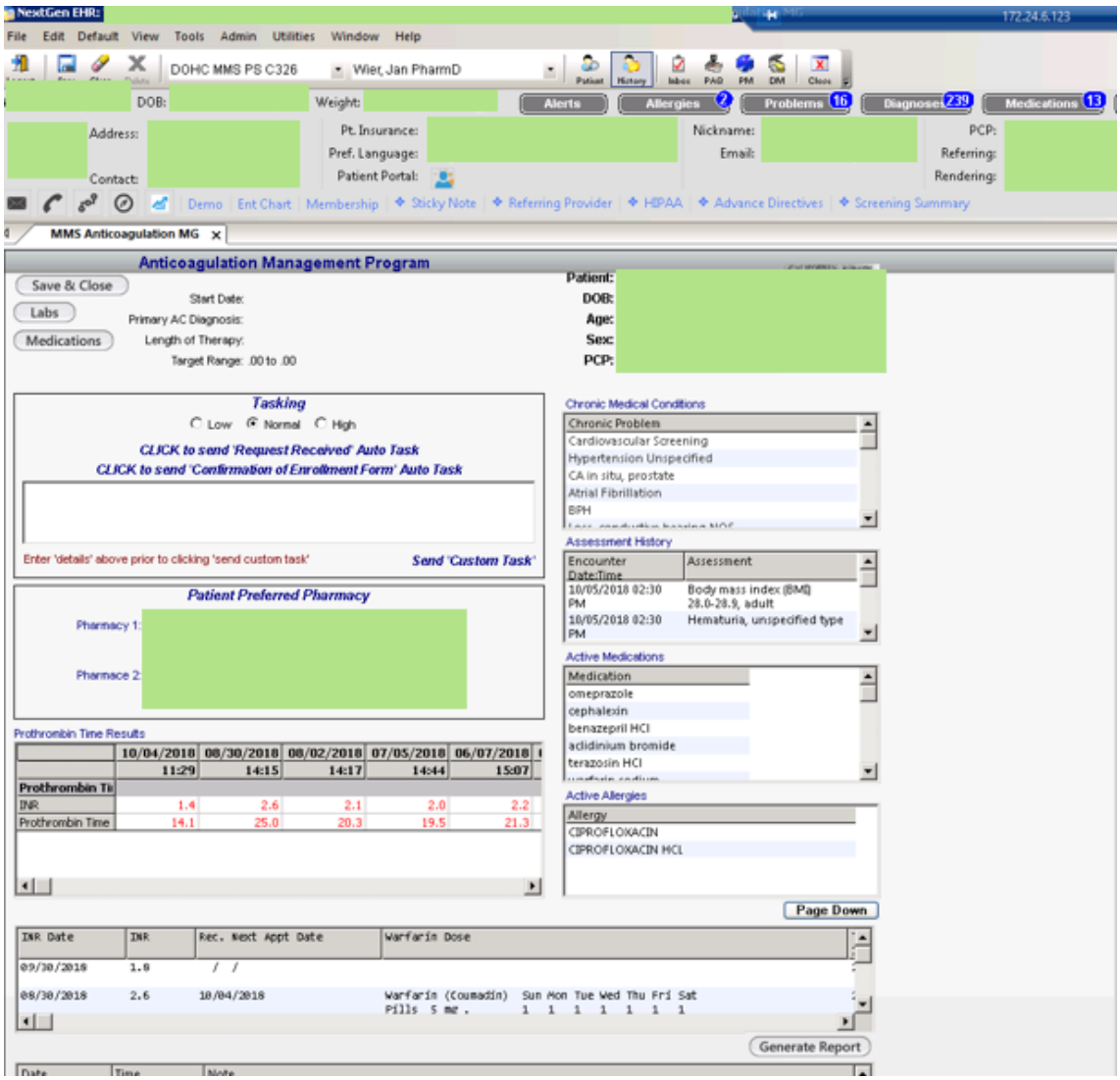
The anticoagulation team checks the DAWN Hold Monitor on a daily basis to resolve any discrepancies and reprocess the interface messages to ensure that the INR goes in to the correct patient record in DAWN.

DAWN AC Hold Monitor



Recently, the anticoagulation clinic has enabled patient treatment notes and dosing information to be interfaced back into Nextgen from DAWN AC. This goes into a "medication module" in the Nextgen system so that the information is available to share with all DOHC providers. This interfacing occurs each night.

The medication module in Nextgen



As a back up in case of system failure, the anticoagulation clinic can get lab results via fax and also have access to the lab websites which will enable access to patient results until any system issues are resolved.

What does the future of interfacing hold?

Interfacing is currently only in place for LabCorp results, but it is hoped that a direct interface between DAWN AC and Quest Diagnostics can be built. Currently the anticoagulation service has to call for the results or get them faxed over which then requires manual input into DAWN and increases the chance of transcription errors.

Additional interfacing requirements of the anticoagulation service include full panels of lab results for DOAC patients and full medication lists including medication changes, into DAWN from the lab systems and the EHR.

Finally, PHARXM is working to get the Anemia clinic added to the DAWN system to enable the efficient monitoring of this patient cohort.

Benchmarking breakdown

Andrea Lewin, Advanced Practice Clinical Specialist, Anticoagulation Management Service (AMS), Brigham & Women's Hospital (BWH)

Time in Therapeutic Range (TTR) is the assessment of the quality of anticoagulation. Vitamin K antagonists are effective oral anticoagulants titrated to a narrow therapeutic international normalized ratio (INR) range & it is important that TTR data be monitored on a regular basis to ensure effective anticoagulation.

A proper TTR measurement does not look at the percentage of in-range INRs, but rather it is an area under the curve measurement of the time spent within the therapeutic range of, for example, 2.0 to 3.0. If a patient has a low TTR, whether they are taking the drug or not, be assured the quality of their anticoagulation is low. The higher the TTR, the higher the quality of anticoagulation, and less likely the patient will experience adverse events.

But when TTR is spoken of as a way to assess the quality of anticoagulation control it is important to understand the variables of calculating a TTR.

- Rosendaal method or a modified Rosendaal method appears to be standard for calculation of the TTR
- A benchmark of 66% is generally set for TTR in warfarin patients.

It is important to know there are other areas of benchmarking within anticoagulation that should be regularly looked at.

- Warfarin
    - Variance Growth Rate (VGR)
    - VGR uses INR variability to predict events as a measure of anticoagulation quality.
- Critical INRs
    - INR ≤ 1.5
    - INR ≥ 4
    - Critical INRs should also be looked at and at Brigham these are defined as 1.5 or less or 4.0 or greater.
- Clinical Outcomes
    - Thrombotic Events
    - Haemorrhagic Events
    - Clinical outcomes like thrombotic and bleeding events can be captured and analyzed. When monitored consistently over time, it is easy to notice trends which provide lots of helpful information. Events can further be looked at within patient populations. For example, ischemic stroke specifically within Atrial Fibrillation.
- Direct Acting Oral Anticoagulants (DOACs)
    - With regards to DOACs, monitoring them within an AMS is starting to become standard, and we should also look at quality measures in these patients. Clinical outcomes like thrombotic and hemorrhagic events are good measures to look at.

Time in therapeutic range can be analyzed in several different ways and when benchmarking TTR one should consider the patient population.

- Patient Populations
    - Overall Population
    - Atrial Fibrillation (AF)
    - Venous Thromboembolism (VTE)
    - Ventricular Assist Device (VAD)

Overall population benchmarking in a setting or clinic is useful information but can provide even more information when broken down further. At Brigham there are a great deal of AF, VTE and VAD patients.

Overall Population – Benchmark = 66%

Walraven et al Meta-analysis

- 67 studies; 50,208 patients with 57,155 patient-years of follow-up
- Vitamin K antagonists included (warfarin, acenocoumarol, dicumarol, ethyl biscoumacetate, and phenprocoumon)
- Indications included AF, VTE, cardiovascular disease other than AF, peripheral vascular disease, valvular heart disease, and other indications
- Overall TTR 63.6% of the time (95% CI = 61.6%-65.6%)
- Study setting significant predictor of TTR
- **~ 66%** of the TTR in both randomized controlled trials and anticoagulation clinics as compared with 57% for community-based care provided by physician

Metaregression showed that setting had a significant effect on anticoagulation control, with studies in community practices having significantly lower control than either anticoagulation clinics or clinical trials (–12.2%; 95% CI = –19.5 to –4.8; *P* < 0.001).

The findings reported by van Walraven et al. are informative but not specific to AF patients and perhaps not generalizable to the United States for warfarin therapy. Health system infrastructures and practice patterns vary greatly between nations which can lead to differences in degrees of management.

Atrial Fibrillation – Benchmark = 66%

There is a demonstrated relationship between higher TTR and a lower risk of morbidity and mortality [1-3]
Median TTR ~ 66%

- Connolly et al. 2008 [4]
- Camm et al. 2012 [5]

S.D. Pokorney et al 2018[6]

- 5,210 AF patients with 119,842 INRs over a median of 18 months of follow-up
- 59% of all measured INR values were in the therapeutic range
- The mean and median patient-level TTRs were **65%** ± 20% and **68%** (IQR 53%-79%)
- Patients followed at anticoagulation clinics had higher median TTR (**69%**, IQR 55%-80%) than those patients not followed at anticoagulation clinics (**66%**, IQR 51%-78%) (P < 0.0001)
- Patients within the lowest quartile TTR (i.e., TTR ≤53) were more often female, nonwhite, and had less college education than those with higher TTRs
- Patients with comorbidities, including diabetes, CKD, and heart failure, were also less likely to have high TTR

Atrial Fibrillation – Aiming for a Higher TTR

Well controlled patients often see TTRs of greater than 70% and AF patients are often on warfarin therapy indefinitely unless a normal rhythm is restored. This means TTRs can be calculated over longer durations of time and after the initiation phase of anticoagulation, this patient cohort can generally achieve a fairly stable state.

This is what a lot of US based anticoagulation management services are hitting, and others should definitely continue to aim higher in this population as it may be noticed that, on average, more sick patients are on warfarin therapy versus DOACS.

Comorbidities often mean a higher CHADS-VASC and also a higher HASBLED which is why it is so important to continue to set high standards in this patient group.

Atrial Fibrillation – DOAC Trials

Since the introduction of the DOACs there have also been several large-scale clinical trials with real world data that can be used (Artistotle, Rocket AF, Engage AF TIMI 48, Rely). It is important to consider the limitations of these studies when it comes to reporting TTRs, for example in the rivaroxaban trial, INR was calculated with the INRatio which has since been recalled however, these trials still provide large AF patient population data to look at. The TTR data in these DOAC trials range from 55% to 68% with the exception of Rocket AF where all TTRs were in the 60% range.

Venous Thromboembolism

Venous thromboembolism benchmarking depends on the time period since the start of treatment and guidelines indicate 3 months as standard treatment for VTE. After the initiation phase, warfarin patients are not on anticoagulation for that long a period unless their treatment is extended.

A meta analysis by Erkin et al[7] in 2012 looked at 40 studies of patients with VTE and different randomized controlled trials studied TTR based on different time periods.

- 40 studies reporting TTR in 26064 patients treated with a Vitamin K antagonist for VTE
- Mean TTR = **54.0%** in the first month since the start of treatment
- **55.6%** in months 1 to 3
- **60.0%** in months 2 to 3
- **60.0%** in the months 1 to 6+
- **75.2%** in months 4 to 12+

In all, a mean TTR of 54% in the first month since start of therapy was average. Although this number is low, it should be considered that generally when calculating a TTR the first 6 weeks is excluded as the induction phase. These numbers show that over time, this warfarin patient population should also yield high TTR results.

Venous Thromboembolism – DOAC Trials

For VTE patient populations, there are several large-scale trials to compare TTR data from e.g. Amplify, Einstein PE, Einstein DVT, Hokusai – VTE, Recover I and Recover II. A range of 51% to 63% is seen among all these trials.

These TTRs are definitely lower than in the AF population, but also these patients have been on warfarin for a much shorter duration on average.

Ventricular Assist Device – Benchmark = 50%

There have been several studies looking at the VAD population. These patients are very sick, have several comorbidities and their constant fluid status battles, medication changes, and inpatient stays take a toll on a patient's TTR.

- In Halder et al[8], an overall TTR of 52%, showed an interesting revelation that in a single institutional study of 51 patients, only half the time was spent in therapeutic range, with 48% of values being outside of the target INR range. This study also showed the correlation with the time spent in supratherapeutic range 30 days prior to a bleeding event correlating with such events.
- Also, Jennings et al[9] in 2011 looked at cohorts of patients with a continuous flow LVAD. Patients with a heartMate2 had an average TTR of 51%.

Reporting of Time in Therapeutic Range

Consider patient populations and different INR Ranges. TTRs should be calculated over a maintenance period of 6 months, excluding the first 6 weeks following initiation. DAWN AC can be used to assist in TTR reporting & benchmarking. Reporting in DAWN AC can be done for TTR as well as other anticoagulation quality and outcomes data.

At Brigham AMS there is a specific report in DAWN AC called 'Performance Measure – Overall TTR', which calculates overall TTR for any patient population.

TTR is calculated for all patients regardless of indication, INR range, or time since the start of therapy. Specific dates can then be entered so TTR is given for each month. TTR is calculated by the Rosendaal method in DAWN AC and in addition the AMS also calculate TTR +/ 0.2, percentage out of range, and also the number of INRs that counted toward that analysis.

There are two clinics within the BWH header, the BWH AMS and the DFCI AMS, so when this report is run in DAWN it can be done so specifically to look only at the numbers for individual clinics. However, the TTR can also be calculated for both clinics by month.

Reporting can be limited to "maintenance only" patients, excluding results calculated during the initiation phase of warfarin. The reporting function also allows the AMS to break down patient populations by indication, again opting whether to include induction patients.

BWH AMS run reports both on overall patient population and on specific elements of the patient population in order to compare TTR data to wider benchmarks.

Overall TTR Calculation Summary for BWH AMS

Overall Population	70.18%
Overall Population (Maintenance)	71.81%
Atrial Fibrillation Population	72.85%
Atrial Fibrillation Population (Maintenance)	74.28%
Atrial Fibrillation Population (INR Range 2.0 – 3.0)	74.49%
Atrial Fibrillation Population (INR Range 2.0 – 3.0 & Maintenance)	76.30%

TTR performance by clinic is also reported from DAWN to see if individual clinicians are meeting benchmarks, showing TTR, TTR plus or minus 0.2, out of range and number of INRs in each calculation.

A BWH AMS TTR Benchmarking Report is submitted to the AMS leadership team monthly & P&T yearly and includes: TTR – Overall Population (Maintenance), TTR – AF Population (INR Range 2.0 – 3.0 & Maintenance), TTR – VAD (Maintenance) and TTR by Clinician – Overall Population (Maintenance).

This TTR Benchmarking Data enables a look at the AMS as a whole and by individual clinicians to enable the service to better manage patients.

Conclusions

- TTR Benchmark
  - Overall – 66%
  - AF – 66%, well controlled patients >70%
  - VTE - >60% after first month
  - VAD – 50%
- DAWN AC reporting
  - By Population/ Indication
  - By INR Range
  - Maintenance mode calculation
  - By individual clinicians
- Use this data to improve the quality of anticoagulation therapy patients receive

Ref:
1.Gallagher AM, Setakis E, Plumb JM, Clemens A, van Staa TP: Risks of stroke and mortality associated with suboptimal anticoagulation in atrial fibrillation patients. Thromb Haemost 106:968–977, 2011. ***2. Morgan CL, McEwan P, Tukiendorf A, Robinson PA, Clemens A, Plumb JM: Warfarin treatment in patients with atrial fibrillation: observing outcomes associated with varying levels of INR control. Thromb Res 124:37–41, 2009.*** *3. Wan Y, Heneghan C, Perera R, et al: Anticoagulation control and prediction of adverse events in patients with atrial fibrillation: a systematic review. Circ Cardiovasc Qual Outcomes 1:84–91, 2008.* ***4. Connolly SJ, Pogue J, Eikelboom J, et al; ACTIVE W Investigators: Benefit of oral anticoagulant over antiplatelet therapy in atrial fibrillation depends on the quality of international normalized ratio control achieved by centers and countries as measured by time in therapeutic range. Circulation 118:2029–2037, 2008****. 5. Camm AJ, Lip GY, De Caterina R, et al; ESC Committee for Practice Guidelines (CPG): 2012 focused update of the ESC Guidelines for the management of atrial fibrillation: an update of the 2010 ESC Guidelines for the management of atrial fibrillation. Developed with the special contribution of the European Heart Rhythm Association. Eur Heart J 33:2719–2747, 2012.* ***6. S.D. Pokorney, D.N. Simon, L. Thomas, et al. Patients' time in therapeutic range on warfarin among US patients with atrial fibrillation: Results from ORBIT-AF registry. Am Heart J, 170 (2015), pp. 141-148:48.e1*** *7. Erkens PM, Ten Cate H, Buller HR et al (2012) Benchmark for time in therapeutic range in venous thromboembolism: a systematic review and meta-analysis. PLoS One 7:e42269* ***8. Halder LC, Richardson LB, Garbeich RF, Zimbwa P, Bennett MK. Time in therapeutic range of left ventricular assist device patients anticoagulated with warfarin: a correlation of clinical outcomes. ASAIO J 2017;63: 37–40.*** *9. Jennings D, McDonnell J, Schillig J: Assessment of long-term anticoagulation in patients with a continuous-flow left-ventricular assist device: a pilot study. J Thorac Cardiovasc Surg 142: e1–e2, 2011.*

Direct Oral Anticoagulant (DOAC) monitoring with DAWN AC

Chelsea Dao, Anticoagulation Services, Scripps Clinic & Scripps Green Hospital

The role of pharmacists at Scripps Anticoagulation Services (SAS) as anticoagulation specialists includes the management of patients on both warfarin and DOACs and the service uses the DAWN AC modules for DOAC management.

Patients are referred to SAS by outpatient physicians, inpatient physicians and Urgent Care. The service provides education, prescription verification and insurance coverage, adherence encouragement, dose adjustments, and follow-up of renal function and adverse drug reactions.

Pharmacists also deal with pre- and post- operation therapy instructions, the follow-up of bleeding complications and the tracking of drug discontinuation and transitions back to warfarin.

Advantages of DOACs

- No routine monitoring
- Rapid onset
- Short half-life (advantageous for invasive procedures or in the setting of active bleed)
- Fixed dosing
- Greater convenience, patient satisfaction and quality of life
- Fewer drug, disease and diet interactions

Due to ease of dosing and a lack of frequent monitoring, there are less concerns among practitioners for following up patients on DOACs vs VKA, and Urgent Care physicians at Scripps started ordering DOACs without an anticoagulation clinic referral which meant that many new patients lacked appropriate follow-ups.

When this occurs, the SAS is not notified that the patient has been prescribed anticoagulants, and therefore is not able to follow up with them to start them on therapy, if needed. Due to this, there have been a number of cases which have occurred where patients have been readmitted to hospital. It was clear that a new process was required to inform the SAS that patients were being prescribed an anticoagulant.

Case 1 – Prior to new process implementation

- 70yo male was seen in the urgent care for acute proximal and distal DVT in RLE.
- Patient was prescribed Xarelto 15mg bid with meals.
- Patient was discharged home with no anticoagulation clinic referral
- Both Xarelto and Eliquis were not covered on insurance, so patient was started on Coumadin 5mg od
- One week later, patient was admitted to the hospital with an acute PE
- Patient was only prescribed loading dose of Xarelto
- No lovenox bridge when Coumadin was started
- No anticoagulation clinic referral

Solution? – New communication process with SAS

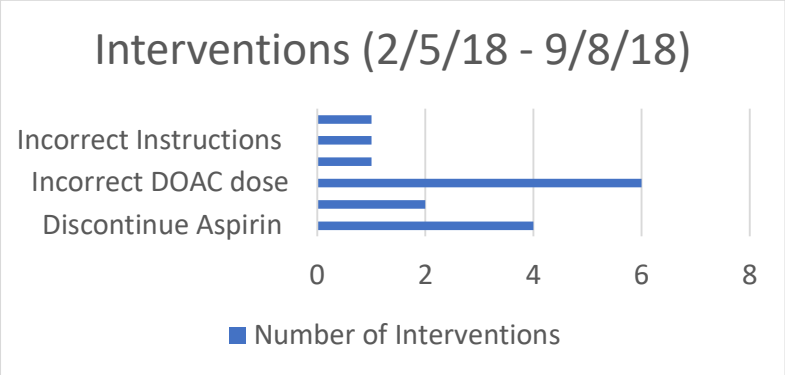
Use a silent Best Practice Advisory (BPA) in the electronic heath record, Epic, to send a message to the anticoagulation clinic's inbox every time a provider in one of the Urgent Care departments orders an anticoagulant. This will alert the anticoagulation clinic that an anticoagulant was prescribed, and the patient needs follow-up.

BPA Data (2/5/18 - 9/8/18)

- Number of BPA: 78

Types of Medication		Indications	
Warfarin	2	Afib	18
DOACs	76	VTE	60

- Number of referrals coinciding with BPAs: 20
- Number enrolled into Anticoag Clinic: 67
- Number of interventions made: 15 of 67 (22%)



Case 2 – Post new communication process implementation (BPA)

- 73 yo male presents to the urgent care for evaluation of irregular heart rhythm.
- Pt has a h/o afib and currently takes ASA 81mg qd.
- There were concerns about cardioverting the patient so rate control and anticoagulation were recommended.
- Pt was started on Toprol XL 25mg qd and Xarelto starter pack (15mg bid x21days, then 20mg qd thereafter).
- PMH: paroxysmal afib, HPL
- Labs: CMP unremarkable, CBC normal, SCr=1.1
- Meds: ASA 81mg qd

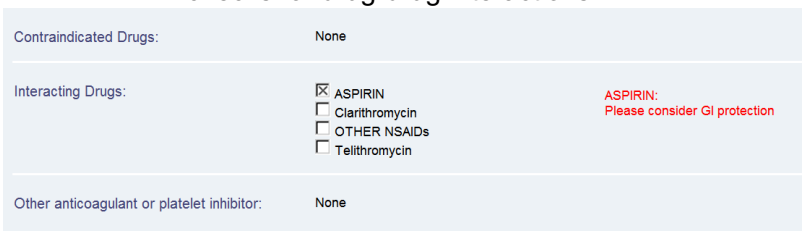
- Intervention:
  - No referral was placed to the anticoagulation clinic but a silent BPA was triggered and a message was sent to the pharmacists within the SAS
  - Patient was prescribed Xarelto starter pack for acute VTE when he has afib
  - Pharmacist contacted urgent care MD and asked to change Xarelto dose to 20mg qd
  - Pharmacist contacted patient to educate him on Xarelto and to make sure he's on correct dose
  - Pharmacist contacted patient's cardiologist about ASA use with Xarelto and cardiologist discontinued ASA

Dawn AC enables SAS to make interventions and ensure patients are on appropriate drug and dose by providing a full anticoagulant history for the patient, scheduling follow-ups, managing missed appointments, reporting and auditing

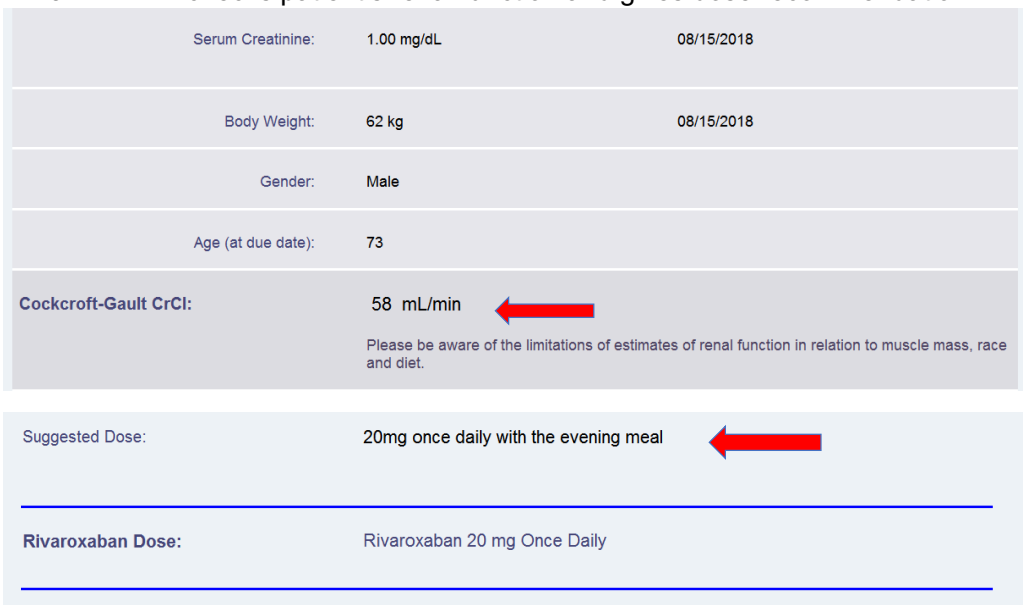
The following section demonstrates how DAWN can be used to manage DOAC patients.

1. DAWN guides you on how to switch from VKA to a DOAC

2. DAWN checks for drug-drug interactions



3. DAWN checks patient's renal function and gives dose recommendation



Conclusions

- With their ease of dosing and lack of blood monitoring, DOACs are preferred by many practitioners and patients
- Many medication errors can still occur with DOACs
- The use of silent BPAs and the DAWN AC program helps the SAS make many interventions and prevent serious outcomes
- Future plan: create a BPA program for hospital discharges with anticoagulants

Evaluating risk & workload with DOAC patients; one year later

Walter Moulaison, Co-Director, Anticoagulation Management Service (AMS), Massachusetts General Hospital (MGH)

Evaluating risk and workload for warfarin patients is something that the MGH AMS has been doing for around 10 years and last year incorporated the DOAC patients using the same measures so that the results were consistent across both cohorts of patients.

Measuring work is important, particularly with DOAC patients due to the cost implications from the patient perspective and also with AMS's being able to justify the additional work.

Barriers

- Greatest challenge is financing – for patient and AMS service
- Studies of the cost-effectiveness of DOACs do not include the costs of clinic support
- Change in culture – many providers are under the impression that it is easy, write a prescription, no follow-up

Drivers

- Changing payment landscape
- Focus on holistic strategies to improve care and reduce expenses – do more with less
- Responsibility for costs of care, not just fee-for-service costs
- Strategies to reduce adverse drug events financially beneficial

Robust data is lacking in terms of patient outcomes, assessment of clinic function and costs, and assessment of cost avoidance in order to provide cost comparisons of a patient being admitted to hospital versus the AMS clinic existing to managing them and prevent admission.

Budgeting is a key element of this but is not a plan for doing what has always been done. It is a tool to constantly get better at what we do, to benchmark against ourselves and find best practice, to measure productivity by cutting the fat rather than the lean, and finally, to enable a cost benefit/cost effectiveness analysis and change processes to work smarter not harder.

The goals of measuring risk and workload:

- To measure the relative amounts of resources consumed in providing specific services for patients
- To consider RN time and care intensity in the measurement
- To provide an analytical method for measuring productivity
- To use historical data for deriving meaningful benchmarks
- To remove subjectivity
- To bring credibility to requests for equipment and staffing

Leveraging the Warfarin Relative Value Unit (RVU) Model
The Relative Value Unit Model was used as this is what is also used for Medicare and employs time studies to determine the amount of time required to manage patients on particular therapies whilst providing an analytical method for measuring productivity.

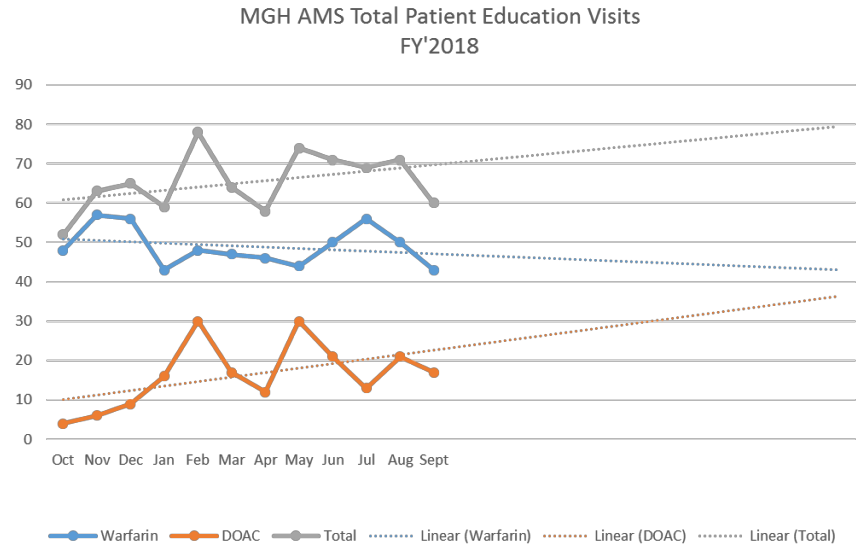
Application to the DOACs

1. Weighted Risk Class Assessment
   - Grouping patients on the basis of common clinical characteristics and level of resource use
     - Requirement for nursing care (Critical indicators predict intensity of care needs)
     - Quantification of nursing care resources (Direct observation and time studies)
     - Method for calculating staffing for required nursing hours (RVU model)

2. Relative Value Units
   - Analytical method for measuring productivity
     - Removes subjectivity
     - Adjusts for variations among patients
     - Captures major work drivers
     - Informs understanding of patient needs and changes in the population

By using the data and comparing it over previous years, it provides evidence for those who control the budgets of the requirement for additional resources based on the additional hours and associated costs spent managing the AMS patients. Importantly, it provides the evidence in a format and language that those responsible for budgets and finances understand.

Growing Volume *- engage with a new crowd, expand services to counteract the downturn in warfarin patient numbers*

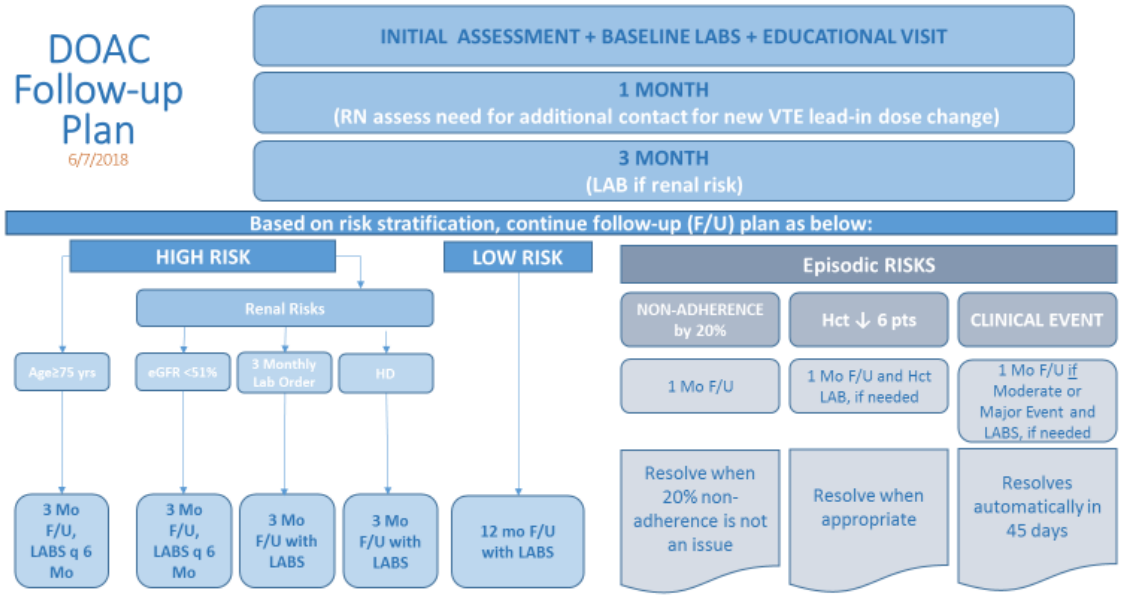


Incorporating DOAC Services into the AMS was done slowly due to the numbers (potentially around 7,000) of DOAC patients and the need to not overwhelm the AMS with large increases in patient numbers in a short period that the service would struggle to manage.

The reasons for incorporating DOAC patients into the AMS also included the requirement for routine monitoring for:

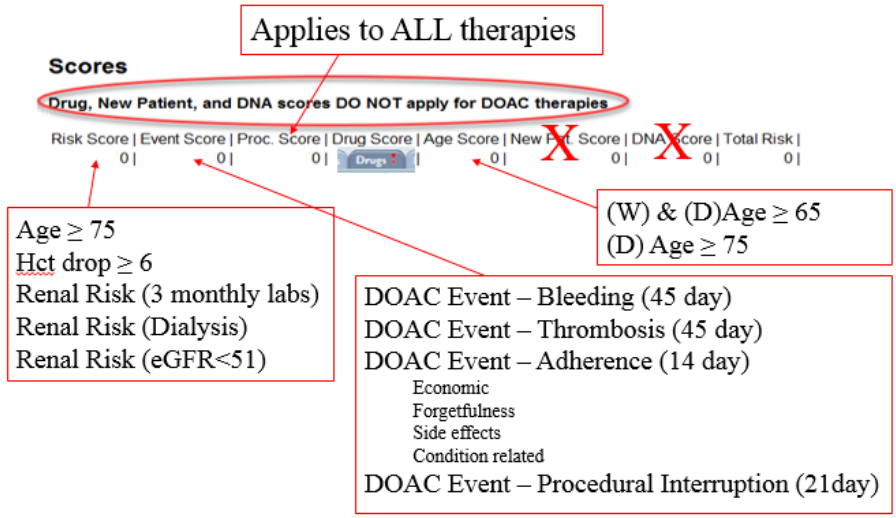
- Improved safety and quality of care - Increased adherence, Increased safety monitoring, Increased patient education
- Reduced cost and utilization of acute care services - Anticoagulants most common, Drug-related hospitalizations, Emergency department visits

BWH AMS DOAC Follow-up Plan



BWH AMS determines the risk class for each patient and identifies critical indicators of their risk in DAWN. With the help of the team at 4S DAWN, a template for calculating a risk score for patients and selecting the risk class was built in the software.

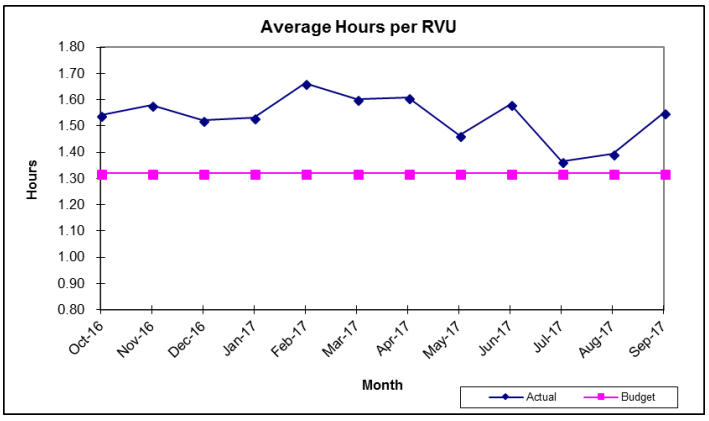
In order to use the same measurement method for DOAC patients that had been used for warfarin patients, the AMS had to document things in the same way such as events score, procedures score, age score etc, which all contribute to the risk score given to the patient in order to determine the monitoring workflow for them. The DOAC list view in DAWN prioritizes patients by risk.



Workload – Productivity Report Financial Year 2017

Anticoagulation Services Nursing
FY'17 Workload - Productivity Report

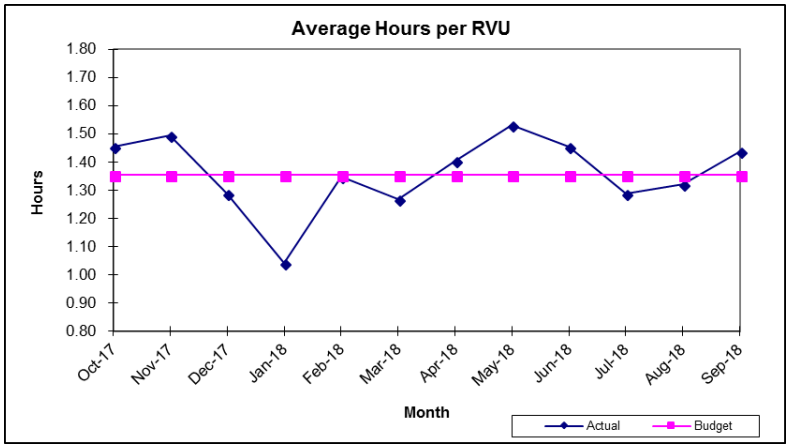
YTD Performance															
YTD: September 2017	Total FTE					Direct Care FTE				Productivity					
			Direct Care			Direct Care						Other		Avg. Hours
Category	Mgmt.	Support	RN	Non-RN	Total	Paid FTE	Bnft FTE	%Bnft	worked FTE	RVU	Direct FTE	worked FTE	%Direct	Per RVU
Actual	2.8	3.9	10.8	-	17.6	10.8	1.5	15.7%	9.4	12,735	6.1	3.3	65.3%	1.53
Budget	2.8	4.0	10.6	-	17.4	10.6	1.2	13.3%	9.4	14,724	7.1	2.3	75.7%	1.32
Variance	-	0.1	(0.2)	0.0	(0.2)	(0.2)	(0.2)	2.4%	(0.0)	(1,989)	1.0	(1.0)	10.4%	(0.21)



Workload – Productivity Report Financial Year 2018

YTD Performance															
eptember 2018	Total FTE					Direct Care FTE				Productivity					
			Direct Care			Direct Care						Other		Avg. Hours
Category	Mgmt.	Support	RN	Non-RN	Total	Paid FTE	Bnft FTE	%Bnft	worked FTE	RVU	Direct FTE	worked FTE	%Direct	Per RVU
Actual	2.8	3.9	9.9	-	16.6	9.9	1.4	16.7%	8.5	13,003	6.5	2.0	76.6%	1.31
Budget	2.8	4.0	10.3	-	17.1	10.3	1.5	17.0%	8.8	13,500	6.5	2.3	73.9%	1.35
Variance	-	0.1	0.4	0.0	0.5	0.4	0.1	-0.3%	0.3	(497)	(0.0)	0.3	-2.7%	0.05

Compared to the previous fiscal year of 2017, the productivity of the AMS has increased from an average hour per RVU of 152 to 131 which is now under the budget of 1.35.



The table below shows the Workload comparison between DOAC and warfarin patients but there is no event follow-up data available for DOAC patients.

8/26-9/27/18 - Weeks 49-52
Excluding Education Visits - 60 minutes for either therapy

DOAC vs Warfarin Workload Comparison (8/26-9/27/18)

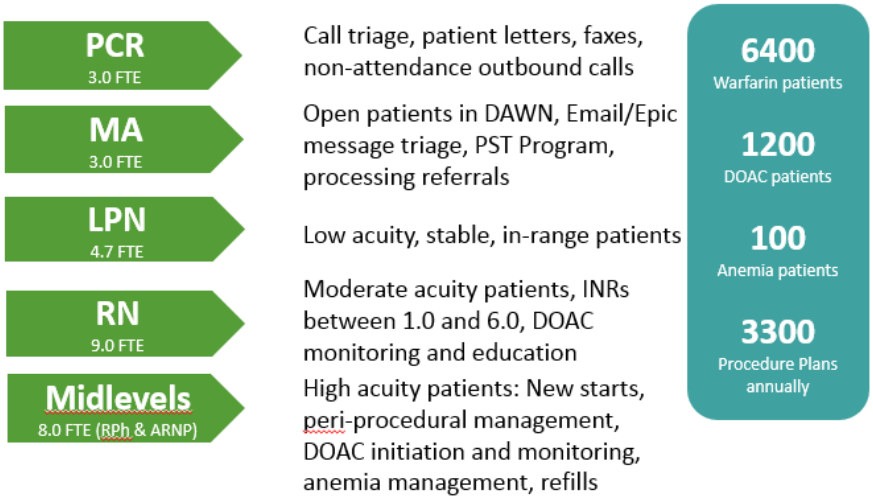
DOAC	Volume	Time in Minutes	Total Time in Minutes	Warfarin	Volume	Time in Minutes	Total Time in Minutes
Candidate QNR	20	30	600	Authorized INRs			
Followup QNR				Induction			
Low Risk	24	10	240	Low	68	20	1360
High Risk	21	15	315	High	39	25	975
Event Followup				Complex	60	30	1800
Bleeding/Thrombosis				Manual/Bridging			
Adherence				Controlled	142	10	1420
Therapy Interruption				Low	192	15	2880
Therapy Change to Warfarin				High	112	20	2240
Reactivation				Complex	51	25	1275
Discharge from Hospital				Maintenance			
Return from Suspension				Controlled	4733	5	23665
				Low	1562	8	12496
				High	180	12	2160
				Complex	50	15	750
Total Minutes/month			1155	Total Minutes/month			51021
Total DOAC Patients			194	Total Warfarin Patients			3495
Minutes Per Patient/month			6.0	Minutes Per Patient/month			14.6

2.45 warfarin patients : 1 DOAC patient

Implementing the 'Moulaison' model for evaluating workload and productivity

Paul Kuo and Gail Elliott, Anticoagulation and Anemia Management Service (AAMS), Kaiser Permanente of Washington

AAMS optimizes drug therapy through centralized telephonic management of warfarin, LMWH, DOACs, Epoetin, Iron.



It was decided that the AAMS needed workload and productivity measures because whilst there were tools and processes that could be measured such as **Quality Performance** (*TTR and Benchmarking Report, Kaiser Permanente Interregional Performance and Quality Data*) and **Affordability Performance** (*Claims, Acquisition Cost, and Utilization Data, and Budget and Labor Reporting*), there were no tools or processes to measure **Resource Utilization** (*Are we staffed appropriately?, What's our capacity to take on new work?, How do we adjust work where needed to meet goals?)* or **Variation in Performance** (*in order to Streamline Processes, Redefine work or Retrain content*).

There were a number of models considered for measuring workload and productivity and these included:

- **Queue/Panel Size**
  - Does not take into consideration complexity of patient population
  - Varying regional practices
- **Encounters/Visits**
  - Does not take into consideration complexity of patient population
  - Does not account for work done that is not part of a visit
- **Relative Value Units (RVU)** (Walter Moulaison @ Massachusetts General Hospital)
  - Better measurement of all tasks
  - Takes into account complexity of tasks and visits

The Kaiser RVU model was developed (based on the work that was being done at Massachusetts General Hospital) and involved Cycle Time Studies and a report created in DAWN AC for volume measures that included INR/Dose Authorized, Anemia Visits Closed, Reminders Completed by type, Procedures and Quick Note Texts.

Risk Class	Activity	Cycle Time (minutes)	Volume	Relative Value Units (min)
High	INR Dose Authorized	5	2187	10935
	New Referral	15	284	4260
	Procedure Plan (Part 1)	20	358	7160
	Procedure Plan (Part 2)	20	358	7160
	DOAC	15	271	4065
	Anemia	12.5	219	2737.5
	Prescription initiation/renewal	5	410	2050
	Misc. Chart Documentation	3	2493	7479
Total Work Units (hours)				764 Hours

Relative Value Units (hours) = Cycle Time (min) x Volume / 60 min

Total Work Units	Clocked Time	% Time Accounted
764 hours	1172 hours	65%

The model included individual productivity measures that looked at the numbers of RVU's produced for each hour worked, by clinician, and this showed if everyone was 'pulling their weight' or whether certain individuals were focusing on specific activities.

How were the figures worked out?

- Daily Expectation = Total work units (min)/Expected work hrs
    - Expected Work Hours:
    - 8 FTE x 80 hrs/FTE = 640 hrs per pay period x 26 pp/yr = 16,640 hrs
    - Accounting for PTO: 25 days x 8 hrs x 10 Clinicians annually = 2,000 hrs/yr
    - Total expected yearly worked hours = 14,640 = 40.1 hours per day for 365 days/yr
    - For the month: 40.1 hours/day x days in the month = Expected hours for the month

Setting Performance Expectations

The AAMS validated the data over a 5-month period and found that the average productivity per clinician to complete incoming work = 26 RVU/hr. The initial target was to increase productivity by 30% or to goal of 26 RVU/hr over 6 months to decrease provider variability. To help clinicians achieve this goal, AMS updated documentation standards and share tracking methodology with staff.

With the implementation of productivity expectations, the concern was whether quality would be sacrificed for productivity. AAMS monitored the productivity while aiming to achieve quality goals.

The 2018 Quality Goals were:

- TTR-Afib: 75%
- TTR-VTE: 73%
- DOAC adherence*: 85% of population at Proportion of Days Covered (PDC) > 80%

**Data includes discontinued prescriptions*

The next steps for the AAMS is to establish performance goals of where we should be and enhance the model to capture more of the work that is unaccounted for. Workload will also be restructured to track strength/weaknesses to better leverage subject matter experts (SME) and to improve overall team performance. In addition, customer service metrics will be measured and tracked by introducing peer and manager evaluations on recorded calls and potentially carrying out customer service surveys.

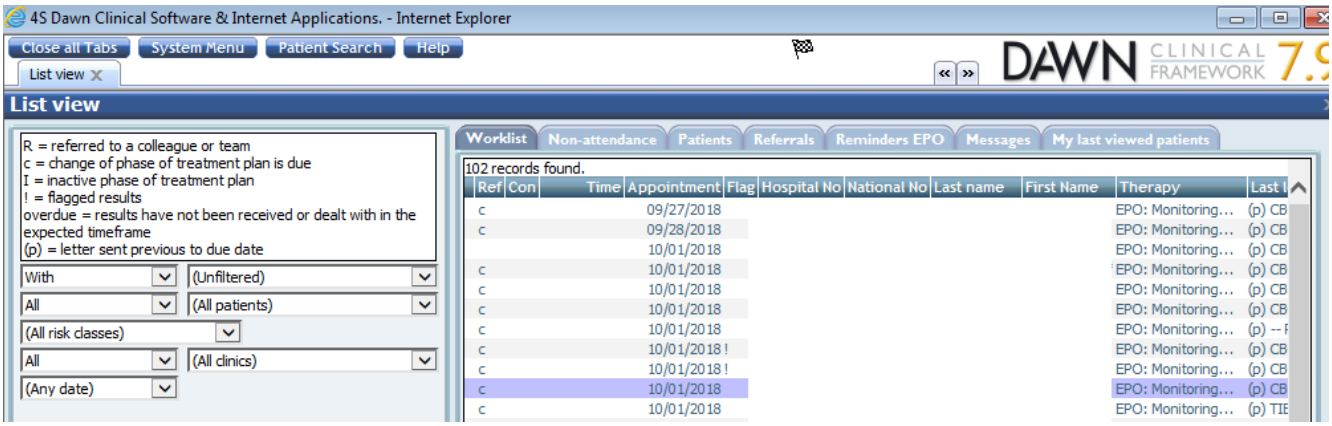
Using DAWN Growth Factors (GF) module to support anemia management

Elizabeth de Leeuw, Anticoagulation and Anemia Management Service (AAMS), Kaiser Permanente

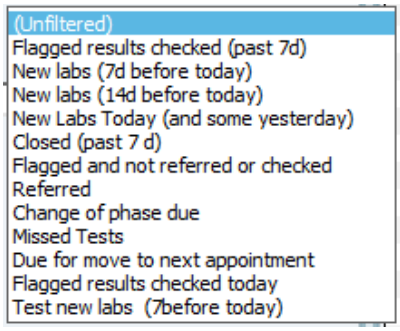
DAWN enables the service to keep track of all patients on EPO, including when labs are due (or overdue) and when labs are available. The system also allows for distribution of work to providers. With key patient information available on one screen in the DAWN patient record, healthcare professionals can quickly see the patients preferred method of communication and who to contact (patient or delegate). It is also easy to view historical data.

The AAMS works primarily from the list view in DAWN where all cohorts of patients can be seen based on the relevant filters selected.

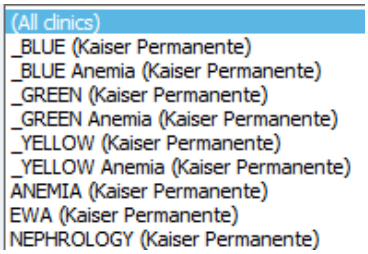
DAWN List View



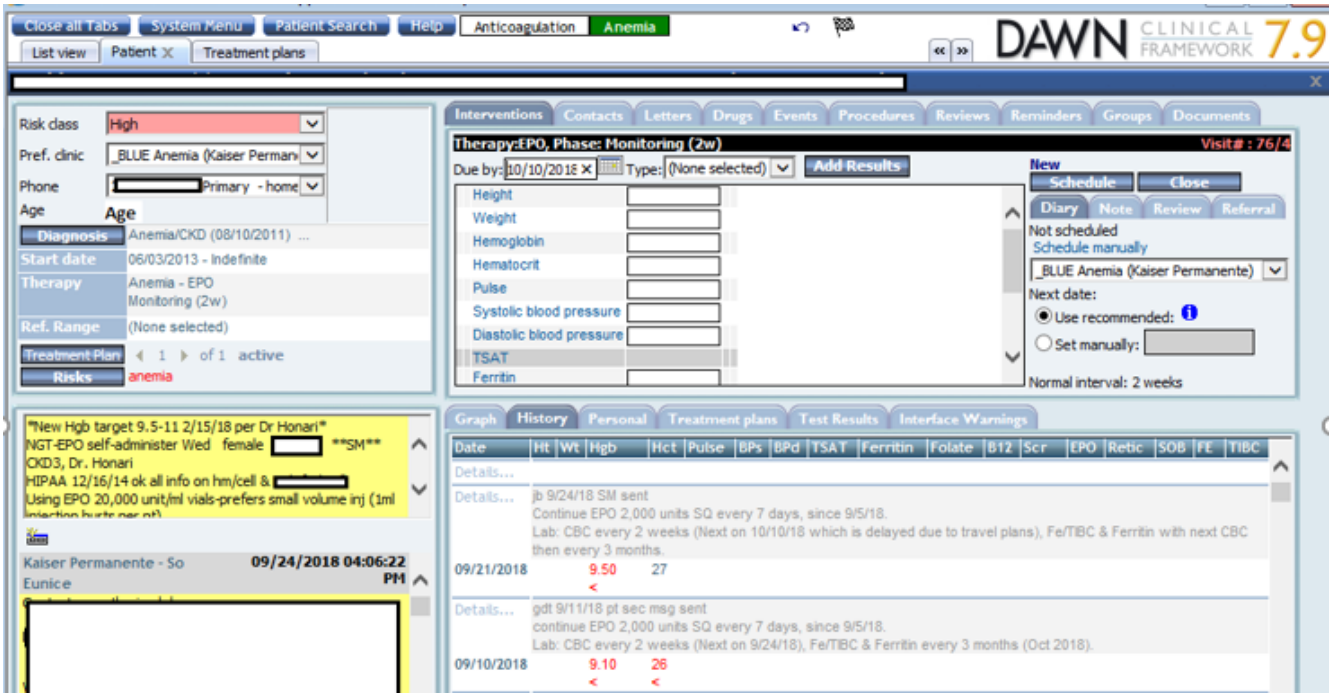
Results Filter



Clinic Filter



A typical EPO day will focus on the worklist, filtered on ‘New labs (14d before today)



Special Care Notes (permanent notes) vs Quick Notes

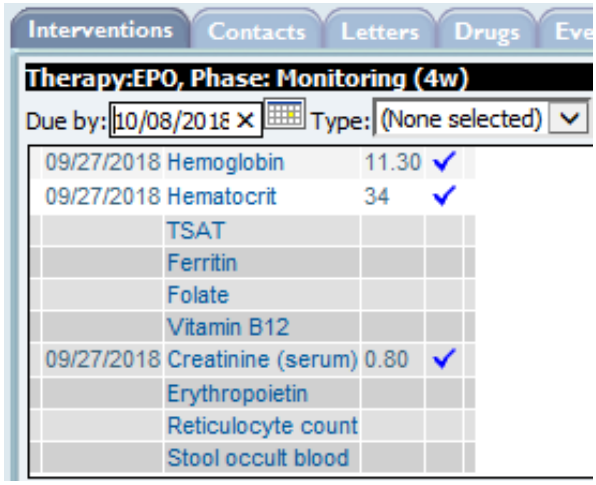
What do I need to know every time?

- Who is the Referring provider
- For CKD, what is the stage (3 to 5)
- Special considerations for patient communication
- Office vs home injection
- Does the patient have a set day of the week for their injection

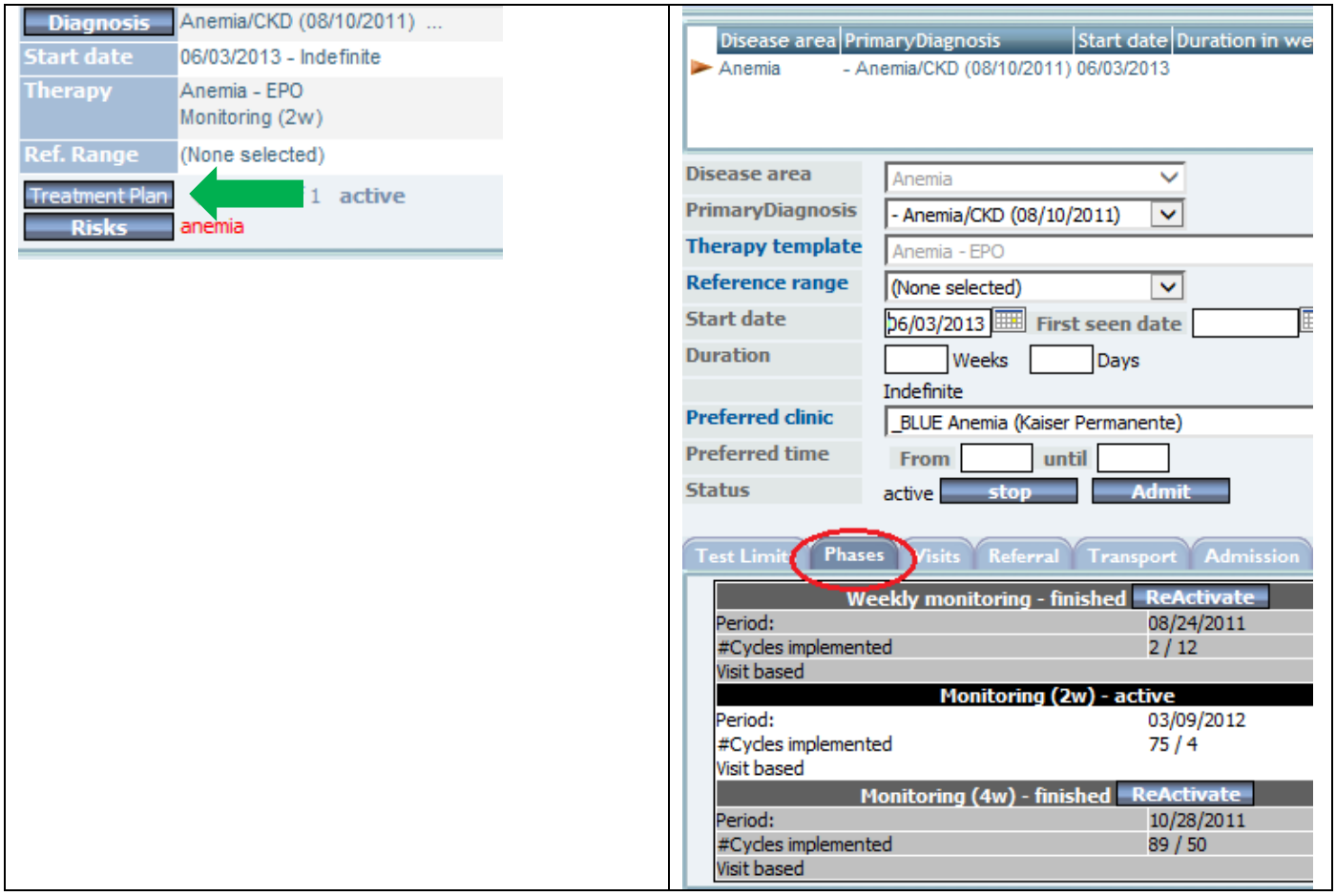
OLY-EPO office administered
CKD4, Dr Mondress
HIPAA 08/23/18 ok all info on cell only

***SM -call only if a change is needed, otherwise send SM
per equest***
NGT-EPO in clinic Mon/Tue
Hx MDS, Dr. Ancheta
HIPAA 11/08/16 No vm on hm & all info ok to

Labs Drop in directly from Lab Information System (LIS)



How to set the right 'Phase'



Evaluation

No internal Dose Calculator in DAWN AC EPO module.
There is no place to enter the EPO dose into DAWN.

Details...	hh 9/21/18 Continue EPO 2,000 units SQ every 2 weeks, since 9/4/18. Lab: CBC every 2 weeks (on around 10/4/18), Fe/TIBC & Ferritin every 3 months (11/2018). Current iron supplementation: FES 325mg four times daily. Transfusion History: none Notes: Spoke with patient. Pt still gets tired easily from time to time			
09/20/2018	11.00 +13%	32		3.40
Details...	gdt 9/17/18 Continue EPO 2,000 units SQ every 2 weeks, since 9/4/18. Lab: CBC every 2 weeks (on around 9/28/18), Fe/TIBC & Ferritin every 3 months (11/2018). Current iron supplementation: FES 325mg four times daily. Transfusion History: none Notes: spoke with patient			
09/14/2018	9.70 <	29		3.30
Details...	gdt 9/7/18 pt not contacted with lab ordered by provider; next CBC for EPO is on around 9/13			
09/06/2018	10.10	30		3.20
Details...	ja 8/31/18 Increase EPO to 2,000 units every TWO weeks starting 9/4/18. Lab: CBC every 2 weeks (Next on 9/13/18), Fe/TIBC & Ferritin every 3 months (Nov 2018).			

Review EPIC notes to complete clinical evaluation

Clinical considerations:

- Has patient been seen by other providers.
- What condition is being treated.
- Changes in Health status that influence Anemia / EPO sensitivity.
- How quickly is Hemoglobin elevating (or not).
- How long ago was last EPO dose change.
- Recent transfusions.
- Patient compliance with getting EPO injections.
- Does patient have enough iron on board?
- Is patient energy level improving?

Contact the patient

Ways to reach the patient:

- Call the patient
  - If patient prefers a call
  - If a dose change is suggested
- Send a Secure Message
  - If the patient uses Secure Messaging and a dose change does not need to be discussed
- Send a Letter

How often to follow up with the patient?

- If we need to call the patient to discuss a possible EPO dose change and they are not immediately available, then leave a message.
- If the patient has not called back by the second business day, then attempt to call again. Try all listed numbers.
- If the patient has not called back by the fourth business day, then attempt to call again.
- If the patient has not called back within a week of getting the Complete Blood Count, then notify PCP and send an unable to reach letter.

Documentation

Recent lab tests:

HEMOGLOBIN

Date	Value	Ref Range	Status
09/20/2018	11.0 (L)	11.4 - 17.0 GM/DL	Final
09/14/2018	9.7 (L)	11.4 - 17.0 GM/DL	Final
09/06/2018	10.1 (L)	11.4 - 17.0 GM/DL	Final

HEMATOCRIT

Date	Value	Ref Range	Status
09/20/2018	32 (L)	38 - 50 %	Final
09/14/2018	29 (L)	38 - 50 %	Final
09/06/2018	30 (L)	38 - 50 %	Final

% SATURATION

Date	Value	Ref Range	Status
08/14/2018	26	15 - 50 %	Final

FERRITIN

Date	Value	Ref Range	Status
08/14/2018	128	30 - 400 ng/mL	Final
05/15/2018	112	30 - 400 ng/mL	Final
04/03/2018	46	30 - 400 ng/mL	Final

Hgb 11.0 on 9/20/18

Current EPO dose: 2,000 units every TWO weeks since 9/4/18

Target Hgb: 10.5-11.5

Comments:
Anemia symptoms: Pt still gets tired easily from time to time
Acute medical conditions which may affect anemia: none
Compliance with EPO regimen: excellent

Plan:
Continue EPO 2,000 units SQ every 2 weeks, since 9/4/18.
Lab: CBC every 2 weeks (on around 10/4/18), Fe/TIBC & Ferritin every 3 months (11/2018).
Current iron supplementation: FES 325mg four times daily.
Transfusion History: none
Notes: Spoke with patient..

Per KP Anemia protocol/Hoi H Ho, RPh

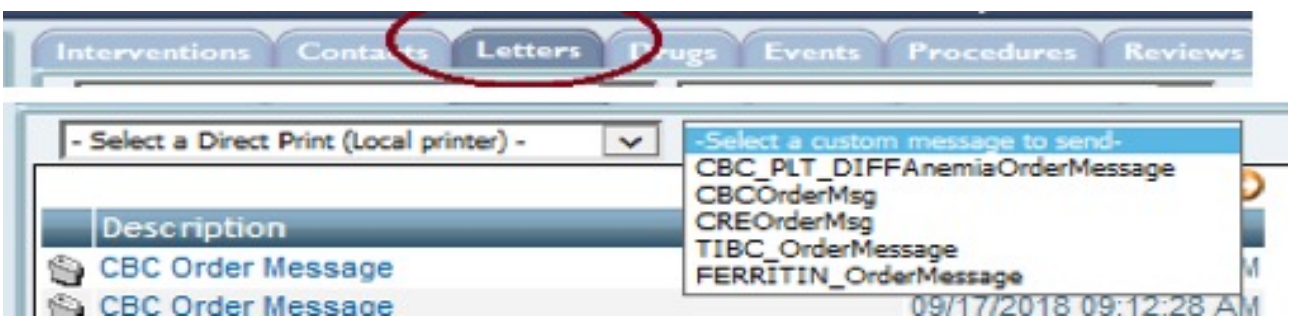
Providers cannot see DAWN notes

EPIC documentation should include:

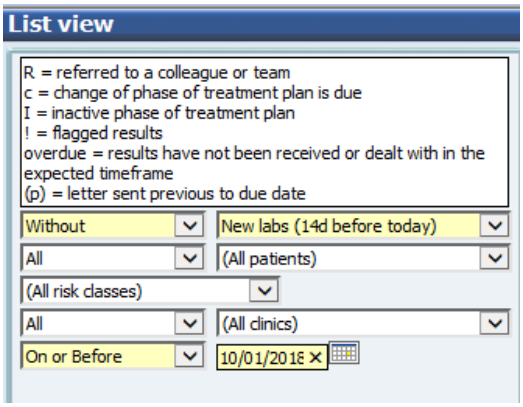
- Current lab results
- Current EPO dose
- Any relevant clinical considerations
- Updated plan of care
    - If EPO dose needs to be adjusted then AAMS provider will enter the new dose in EPIC and cancel the previous order (either CAM or Rx).
    - Next labs can be ordered via either DAWN or EPIC.

One Button Lab ordering in DAWN

DAWN is set to send a lab order to EPIC via LIS (signed by AAMS medical director)



Follow up for patients overdue for CBC



Patient Care Representative (PCR) contacts patient

- If patient is 2 days late for CBC, Pt will get a courtesy reminder call that CBC was due.
- Pt will get 2 calls within the week. If no CBC by the next week, then the patient will get an overdue letter, and the PCP will be notified that the CBC is overdue.

Things I wish DAWN did better

- Double documentation between DAWN and EPIC can create a gap, and lead to errors.
- With no Dosing Recommendations there is more room for intra-provider variability. This can lead to a lack of consistency.
- For 'Other' tests, if the initial flags are not set correctly, DAWN will suggest 'Other labs' are overdue after 50 weeks, this means having to bypass things like "Ht", "Wt", "Pulse", "BPs", etc. This override is time consuming.
- Possible gap in communication if patient needs follow up between lab work (i.e. possible iron dose change or IV iron order).

For more information on DAWN AC Products and Services:
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Or Internationally 44 15395 63091. Fax 44 15395 62475

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