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Multidisciplinary, patient-centred approach to improving compliance with venous thromboembolism (VTE) prophylaxis in a district general hospital

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ABSTRACT

Hospital-acquired venous thromboembolism (VTE) accounts for an estimated 25 000 preventable deaths per annum in the UK and is associated with significant healthcare costs. The National Institute for Health and Care Excellence guidelines on the prevention of VTE in hospitalised patients highlight the clinical and cost-effectiveness of VTE prevention strategies. A multidisciplinary quality improvement team (MD QIT) based in a district general hospital sought to improve compliance with VTE prophylaxis prescription to greater than 85% of patients within a 3-month time frame. Quality improvement methodology was adopted over three cycles of the project. Interventions included the introduction of a 'VTE sticker' to prompt risk assessment; educational material for medical staff and allied healthcare professionals; and patient information raising the awareness of the importance of VTE prophylaxis. Implementation of these measures resulted in significant and sustained improvements in rates of risk assessment within 24 hours of admission to hospital from 51% compliance to 94% compliance after cycle 2 of the project. Improvements were also observed in medication dose adjustment for the patient weight from 69% to 100% compliance. Dose adjustments for renal function showed similar trends with compliance with guidelines improving from 80% to 100%. These results were then replicated in a different clinical environment. In conclusion, this project exemplifies the benefits of MD QITs in terms of producing sustainable and replicable improvements in clinical practice and in relation to meeting approved standards of care for VTE risk assessment and prescription. It has been demonstrated that the use of educational material in combination with a standardised risk assessment tool, the 'VTE sticker', significantly improved clinical practice in the context of a general medical environment.

PROBLEM

All medical patients admitted to the hospital should be risk assessed for venous thromboembolism (VTE) as soon as possible in order to reduce the risk of hospital-acquired thrombosis (HAT).[1] The National Institute for Health and Care Excellence (NICE) guidelines advocate the use of a VTE risk assessment tool, published by a national UK body, to facilitate this assessment.[2] A three-tiered approach is required and includes an assessment of how mobile the patient will be in the hospital, a review of patient-related risk factors that may predispose them to VTE and finally an assessment of bleeding risk in order to make an informed decision about the risks and benefits of VTE prophylaxis. If the decision is made to prescribe pharmacological prophylaxis, the prescriber must then consider factors such as the weight of the patient and their renal function in order to dose adjust and thus prescribe safely. A comprehensive review by Lau and Haut reinforced the importance of this patient-centred approach as opposed to a 'blanket approach that gives the same medication at the same dose and frequency to all patients' to avoid harm.[3]

The Royal Glamorgan Hospital (RGH) is a district general hospital located in South East Wales and is one of the two hospitals in the Cwm Taf Health Board which caters to the healthcare needs of 10% of the population in Wales.[4 5] Historically, the drug chart (medication prescription chart/medical administration record) in this health board had a prophylaxis prescription prompt integrated into it, an intervention that has evidence for improving compliance with VTE assessment.[6 7] During the introduction of a new all Wales drug chart, this prompt was redesigned in order that the charts could be standardised across Wales. The new version of the chart comprises a designated space for the prescription of VTE prophylaxis where benefits outweigh risks and a section that can be signed where VTE prophylaxis is contraindicated based on individual risk factor assessment. Following implementation, concern was raised that compliance with VTE prophylaxis risk assessment had declined during the transition period and this was confirmed by prepilot data.

It was noted that rotating members of the medical teams and even substantive members of pharmacy and nursing staff were not aware of supplementary prescribing information available via the hospital intranet. This online supplementary material includes an algorithm based on national guidance that facilitates the three-tiered approach described earlier; based on the algorithm, a binary decision is made on whether the benefit of VTE prophylaxis outweighs the risk.

Despite an ethos of patient-centred care in the hospital, it was also established that patients were often unaware of the risks of HAT and the importance of VTE prophylaxis. It is recognised in the literature that inadequate patient education impacts negatively their involvement in VTE prophylaxis and that optimisation of education should play a pertinent role in reducing HAT.[8] In a qualitative study exploring patients' perceptions and experiences of the prevention of HAT, it was in fact noted that patients reported contradicting information provided by varying members of the multidisciplinary team (MDT) consolidating the need for sound and consistent healthcare professional understanding of the condition.[8 9]

During the advent of new multidisciplinary quality improvement teams (MD QIT) and the formation of a new acute medical model in our hospital, we believed that this was an opportune time to try to improve compliance with VTE prophylaxis prescription and heighten awareness of the importance of VTE prevention both with medical staff, allied healthcare professionals and patients. By using a multidisciplinary approach and ensuring patient involvement, it was hoped that any interventions would be more sustainable and would promote a patient-centred approach to care.

At baseline, compliance with VTE assessment being completed within 24 hours of admission to a medical ward was 51%. These rates are similar to previous studies assessing adherence to local guidance in previous published literature.[10] The 'Specific, Measureable, Achievable, Realistic and Timely (SMART) aim was to increase this percentage to 85% within a 3-month time frame. In addition, it was hoped this project would promote interdisciplinary communication and improve patient education about the risks of HAT and the importance of early risk assessment and prophylaxis where appropriate.

Background

Hospital-acquired VTE comprises all occurrences of VTE that develop while an in-patient or in the 90 days following discharge from hospital.[2 8] Hospital-acquired VTE is associated with significant morbidity and mortality, currently estimated to account for 5%–10% of all deaths among hospitalised patients.[3] As a potentially preventable problem, strategies to improve rates of VTE prophylaxis prescription in patients admitted to secondary care have been demonstrated to reduce morbidity, mortality and healthcare costs.[3 11]

In 2005, a report issued by the House of Commons Health Committee highlighted that an estimated 25 000 people die from preventable HAT each year in the UK. In addition, the cost to the National Health Service (NHS) of treating non-fatal symptomatic VTE and the long-term complications is calculated at £640 million per year, demonstrating that this is an expensive, nationwide problem.[12]

NICE published guidelines on the prevention of VTE in hospitalised patients in 2010, which was subsequently updated in 2018. This highlights clinical and cost-effective measures for VTE prophylaxis and in addition taking patients' preferences and risks of treatment into consideration. The Commissioning for Quality and Innovation framework endorsed these guidelines and suggested there ought to be a 95% compliance rate with VTE risk assessment using a national tool.[12] VTE prophylaxis via mechanical and pharmacological measures has been shown to reduce the incidence of deep vein thrombosis (DVT) and subsequent VTE.[11 12]

The NICE guidelines focus on all patients over the age of 16 years admitted to hospital presenting to a variety of different specialties. In the context of patients admitted under general medicine, the guidelines stipulate that all medical patients should be risk assessed for VTE as soon as possible after admission using a tool published by a national UK body, most commonly the Department of Health VTE risk assessment tool will be used.[2]

The benefits of MDT working are well established. For healthcare professionals, MDTs assist in increased rates of care provision in accordance with clinical guidelines, the development of streamlined treatment pathways, improved interdisciplinary coordination, communication and improved education of staff.[13] For the patient, the benefits of MDT collaboration also include the increased access to treatment in accordance with evidence-based medicine, which will be of benefit to the patient, as well as improved access to information and consequently greater levels of patient satisfaction.[14] Multidisciplinary quality improvement initiatives have previously been shown to be effective in different clinical environments.[13 15 16]

Measurement

The project adopted standard quality improvement methodology with the use of Plan-Do-Study-Act (PDSA) cycles to develop and measure the effect of interventions. Information was obtained via the review of patients' medical notes (in the form of paper records that are available on the ward) and the drug charts, with anonymised patient information by two members of the team (one doctor and one pharmacist).

Initial data were collected using a standardised data collection tool designed by the MDT; this was used to document rates of VTE risk assessment within 24 hours of admission, VTE prophylaxis dose adjustment for patient's weight and VTE prophylaxis dose adjustment for renal function. In the context of this study, local guidelines recommended the use of low-molecular-weight heparin (enoxaparin) for VTE prophylaxis adjusted for a total

body weight of less than 50 kg or more than 110 kg and an estimated glomerular filtration rate of 15–30 mL/min.

The previously mentioned measures were selected as they would allow the team to establish whether VTE prescription was in line with national and local guidance and whether safe prescription accounting for patients' weight and renal function was being carried out. Quantitative data would allow direct comparison following each intervention. Data would be collected on all patients on the selected wards (wards 12 and 14, two medical wards in our hospital) at 3-month intervals (after each PDSA cycle). The wards selected manage patients with a range of general medical problems and as such a variety of risk factors for VTE. The data would be collected by the same two members of the team to avoid interpersonal variation. A short survey would be carried out at the end of the final cycle to identify any benefits of the multidisciplinary approach to this work.

In order to ensure that any improved outcomes were attributed to the interventions made, we would ensure that only one project with defined interventions was being carried out at one time. Data were collected on the ward by the study team on a random day to avoid the Hawthorne effect. The random days were selected at the beginning of the study period using a random calendar date generator.[17]

Baseline data were collected on 39 patients revealing that only 20 of 39 (51%) patients had a documented VTE risk assessment carried out within the first 24 hours. Appropriate dose adjustment of low-molecular-weight heparin for weight and renal function was achieved in 27 of 39 (69%) and 30 of 39 (80%), respectively (table 1).

Design

A MDT consisting of three doctors, a pharmacist, a charge nurse, a member of the patient experience team, a clinical nurse practitioner and a physiotherapist was formed under the supervision of a 'core team' including the Associate Medical Director who was clinical lead for the MD QIT work, the Head of Nursing for medicine, a quality improvement facilitator and a Senior Pharmacist. Engagement of the entire team at the planning stage ensured stakeholder contribution and reduced parallel working streams. The delivery of sound patient care relies on good interdisciplinary working and thus by using an MDT approach, the team aimed to ensure that all members would feel valued and would work positively to achieve the end goal. Doctors, pharmacists and student nurses frequently rotate through different wards and hospital, therefore, by ensuring that permanent ward staff were involved in the project would help to facilitate sustainable changes being achieved by the project.

Initial interventions included the introduction of a 'VTE sticker' that would prompt prescribers to carry out the risk assessment: this would be accompanied by education for all members of the MDT. It has been well documented in previous studies that patients, given the option, would choose to be educated about VTE via direct discussion with the healthcare professional, and thus ensuring that clinicians were provided with the opportunity to consolidate their knowledge was considered a priority.[18] The education comprised sessions run in the medical department weekly teaching, in which staff from all areas of the MDT were invited. The sessions included a Powerpoint presentation with didactic teaching followed by some simple case scenarios that covered more complex VTE prophylaxis decisions and allowed the opportunity for discussion. There was a reminder on how to access the hospital guidelines and the opportunity for questions. Shorter sessions were also run for three consecutive weeks on the ward during the nursing and doctor handover that included the indications, risks and two case scenarios surrounding VTE prophylaxis. The rationale behind the shorter sessions in handover was that as large a percentage of the ward staff could benefit from the teaching despite the constraints on time that can pose a challenge to staff leaving the ward for longer sessions.

The intended use of the sticker was such that if it was noted by any member of the MDT that risk assessment had not occurred, a sticker would be placed in a designated place in the medical notes, where it would come to the attention of the doctors even under time-pressured circumstances. Preprinted stickers would be in an accessible location to pharmacists and nurses to promote their uptake. During the implementation, the team would meet on a 2 weekly basis to discuss progress and provide informal feedback. By promoting MDT involvement, we

Table 1 Percentage improvements in all measures at baseline and through three PDSA cycles

Measure	Baseline (wards 12/14)	Cycle 1 (wards 12/14)	Cycle 2 (wards 12/14)	Baseline (wards 4/6)	Cycle 3 (roll out on wards 4/6)
VTE assessment completed within 24 hours of admission, n/N (%)	20/39 (51%)	31/36 (86%)	34/36 (94%)*	23/38 (61%)	35/37 (95%)*
Enoxaparin corrected for weight, no. of patients (%)	27/39 (69%)	29/36 (80%)	36/36 (100%)*	30/38 (79%)	37/37 (100%)*
Enoxaparin corrected for renal function, no. of patients (%)	30/39 (80%)	35/36 (97%)	36/36 (100%)*	30/38 (79%)	37/37 (100%)*

*Statistically significant improvement ($p<0.05$).
PDSA, Plan-Do-Study-Act; VTE, venous thromboembolism.

hoped this would allow for positive changes to the interventions as part of the PDSA cycles and also to encourage compliance.

After the initial cycle was complete, data would be recollected and presented to the 'core team' allowing advice and leadership to be provided by senior colleagues with a good understanding of quality improvement methodology.

At this early stage, it became apparent that it was difficult to hold frequent meetings with all members off the ward due to the demand for clinical commitments. Therefore, it was decided that all meetings would be held in the ward manager's office within the clinical environment to allow maximum attendance and the agenda was strictly abided to ensuring that the meetings met their objectives in a timely manner. Larger meetings at monthly intervals with the 'core team' were held in a more protected environment allowing the longer discussion to take place.

Further interventions were determined using feedback at each stage and included educational posters, bilingual patient information leaflets and electronic public displays. The educational posters that were displayed were those developed as part of the 1000 Lives (now Improvement Cymru) 'Ask about Clots' campaign, with permission. These resources were used to ensure that validated information was being disseminated. The bilingual patient leaflets were developed in conjunction with the patient experience team and their expertise was valued with respect to ensuring that the messages within the content were clear and available in both the Welsh and English language. They combined some of the figures from the 1000 Lives campaign combined with text developed by the team.

The work would initially be held on two wards in the hospital and if improvement was demonstrated, then the project would be extrapolated to other wards.

Strategy

Our aim was to increase the percentage of risk assessments for VTE prophylaxis in patients being admitted to a medical ward within the first 24 hours of their admission, evidenced by an 85% compliance within a 3-month time frame.

Cycle 1 (carried out between October and January) had two main focuses: first, the education of staff regarding VTE and VTE prophylaxis and second, 'VTE stickers' for the use in the medical notes to act as a visual cue and prompt to VTE risk assessment in the clinical setting.

With respect to healthcare professional education, our first intervention was the development of a VTE teaching session that was delivered to doctors, pharmacists and nursing staff highlighting best practice as outlined within local and national guidelines. This education also provided staff practical advice on how to access local VTE prophylaxis guidelines via the hospital intranet.

With respect to the 'VTE sticker', the MDT designed a sticker that could be placed in the medical notes following admission to act as a prompt to prescribers to carry out a risk assessment for VTE prophylaxis if this had not yet been performed. This action was largely led by pharmacy and nursing colleagues and was designed to prompt timely risk assessment.

This cycle focused on improving care in a defined clinical area covering two general medical wards (wards 12 and 14) at the RGH. Data using the standardised data collection tool described were recollected at this stage using the same approach as described earlier.

A further cycle of improvement (cycle 2, February–April) was carried out after modification of the sticker design in response to feedback gained from users and the 'core team' that was aimed at simplifying the VTE sticker for ease of use. In addition, cycle 2 also focused on patient-centred education. Education materials and literature developed by 1000 Lives during their 'Ask about Clots' campaign were displayed in clinical areas.[19] We also worked with the patient experience team to use a modified poster to display on electronic public information screens. In addition, a bilingual patient information leaflet, in both English and Welsh, was designed for patients to raise awareness of HAT, encouraging patients to remain as mobile as possible and facilitating informed shared decision making. The expertise of the patient experience team was valued in ensuring that the messages the team were trying to covey were clear. Data were recollected following cycle 2 using the standardised collection tool.

Following an observed and sustained improvement in this defined clinical area (wards 12 and 14), the third cycle of the Quality Improvement Project (QIP) was to extend our project to another clinical area to try to improve practice across a wider area. Cycle 3 (May–July) focused on two acute general medical wards (wards 4 and 6). Prior to implementation, baseline data were collected in the same manner as on the previous wards by the study team.

At the end of the final cycle, appropriate statistical tests have been used to establish whether improvements are statistically significant. In addition, a short survey would be distributed to the members of the QIT to establish the benefits of the multidisciplinary approach to this work. This would be an anonymous questionnaire that would be distributed at the QI meeting and then inserted into an envelope by the participant. The results were then revealed and analysed by one of the study teams.

RESULTS

The percentage of patients being admitted to medical wards having a risk assessment for VTE prophylaxis within the first 24 hours of their admission increased from 51% to 86% over a 12-week period following cycle 1. Improvements were also seen with respect to low-molecular-weight heparin dose adjustment for weight, with accurate prescription rate improving from 69% to 80% following cycle 1 of intervention. Dose correction for renal function

also improved from 80% to 97% over the 12-week time frame (table 1).

The results from cycle 2 demonstrated a further improvement in VTE risk assessment within 24 hours of admission from 86% compliance after cycle 1 of the project to 94% after cycle 2. Similarly, improvements were also observed in dose adjustment for weight and renal function with 100% compliance with guidelines in both areas by the end of the second QIP cycle (table 1). The improvement observed for each measure from baseline to post cycle 2 was statistically significant (Fisher exact $p<0.05$).

Cycle 3 involved extending the project to another clinical area, two acute general medical wards (wards 4 and 6). Prior to implementation, baseline data were collected on this ward, and these data were comparable with the baseline data on the original wards. Following the implementation of the educational material and VTE sticker, we observed an increased compliance rate from 61% to 95% with VTE risk assessment at 24 hours and 79% to 100% compliance with dose adjustments for both renal function and weight (table 1). Again, the improvements observed were statistically significant on wards 4 and 6 between baseline and end of cycle 3 (Fisher exact $p<0.05$).

The greatest improvement in percentage compliance with completion of VTE assessment in the first 24 hours and in correct dose adjustment for weight and renal function was demonstrated over cycle 1. It is difficult to ascertain whether the provision of educational material to healthcare professionals or the introduction of the 'VTE sticker' had the biggest impact on clinical practice; however, the combination of methods resulted in significant sustained improvements.

The unexpected consequences of the project included a vast improvement in interdisciplinary morale and communication between different disciplines. We collected a short survey from eight members of the QIT which demonstrated that six of eight (75%) members felt that there had been improved understanding of the roles of each discipline within the MDT, six of eight (75%) felt there was a reduction in the interdisciplinary barriers, seven of eight (88%) felt there was improved communication between the disciplines and six of eight (75%) felt that there was improved morale on the ward as a consequence of the formation of the MDT QIT. In addition, team members were able to achieve the silver Improving Quality Together award (the national quality improvement training programme for NHS staff in Wales) and were empowered to change their working environment.

The focus groups also provided qualitative feedback that patients had started to ask about VTE prophylaxis implying an improved awareness of prophylaxis among the patients. However, qualitative data relating to the patient experience were beyond the scope of this project.

Lessons and limitations

There are a number of strengths to this project. It was conducted over multiple cycles allowing for positive adaptions to be made at each stage that resulted in improvement in practice over time. The multidisciplinary approach resulted in sustained improvements over the course of the project. The project was conducted on general medical wards, rather than specialty-specific environments, which highlights the generalisability of these data across medical specialties. We were also able to show improvements in different clinical areas between cycle 2 and cycle 3, highlighting the project's strength of reproducibility. Future cycles of the QIP will focus on introducing the project within the surgical directorate thus increasing the project's generalisability further. The use of simple interventions facilitated ease of use and the incorporation of patient educational information promoted shared decision making.

As aforementioned, challenges were faced in ensuring regular MDT meetings to ensure a cohesive approach to project development, which was overcome by finding a mutually convenient time and environment to meet and the use of a specific agenda to allow for rapid data assimilation and project development.

In terms of the limitations of this study, the total numbers of patients included in each cycle of the QIP was relatively small and it is therefore difficult for us to comment on whether these results would have been reproducible with larger patient size. The MDT was mindful of this when producing the patient/staff educational tools and the sticker and ensured that materials were easy to use and standardised such that if extrapolated to larger patient groups, complications would be minimised. This was demonstrated to work successfully when extrapolating the work on wards 4 and 6.

We aimed to minimise data collection bias by assigning specific roles, with only two individuals being responsible for data collection to reduce interpretation bias as well as the use of a standardised data collection tool. We also chose data collection days at random to avoid bias caused by alterations in clinical practice. It should be noted that this random day approach may also represent a limitation in that staffing levels and patient population may differ on different days of the week. For example, the numbers of healthcare professionals are often reduced over a weekend so if the data collection were performed on a Monday, less time may have been available to ensure that appropriate procedure concerning VTE prophylaxis was carried out. In addition, the number of new admissions may also be increased on certain days that will impact healthcare professional workload which may reduce vigilance with regards to VTE prophylaxis.

Further cycles of improvement are planned each followed by further data collection; in addition, we hope to obtain qualitative feedback regarding patient awareness and understanding of the importance of VTE prophylaxis by the use of patient questionnaires to help adapt educational material in accordance with patient need. We believe that patient involvement in the further development of further resources will strengthen the material.

We also hope to introduce the project to other medical wards and within the hospital's surgical directorate.

The expansion of the project would require us to increase the size of the MDT carrying out this work. Our hospital has a strong multidisciplinary quality improvement team that is supported by facilitators with appropriate expertise and so it is predicted that this would be feasible. Sustainability would be supported by the fact that the involvement of permanent staff (as opposed to only training doctors/pharmacists who tend to rotate) are involved and so can provide some continuity.

CONCLUSIONS

The results of this quality improvement project showed that the development of an MD QIT, use of an educational intervention and a prescription prompt, resulted in an improvement in adherence to the NICE quality standards which mandate that all patients admitted under medicine should have a VTE risk assessment completed on admission to secondary care. We were able to achieve our SMART aim of increasing rates of VTE prophylaxis assessment in patients admitted to a medical ward to 85% compliance in the first 24 hours of admission within a 3-month time frame. No adjustments were made to our defined endpoint and the measures were based on clinically important outcomes. We achieved sustainable results over multiple cycles of the project.

This is of significance given as VTE is considered among the most common, preventable causes of hospital-related mortality and constitutes a significant burden in terms of morbidity and economic cost to healthcare systems both during the acute phase of VTE identification and management but also as a consequence of long-term complications such as the post-thrombotic syndrome and recurrent VTE events.[20 21] This highlights the clinical utility of the project given the importance of VTE risk assessment and the frequency of which these types of clinical decisions will be encountered in the general medical environment.

The use of the 'VTE sticker' helped to highlight potential prescription omissions but also resulted in improved rates of appropriate dose adjustment for the patients' weight and renal function. This is of particular relevance as it is recognised that harm may result, particularly an increased risk of bleeding events, where dose adjustments have not been made. The 'VTE sticker' assisted the clinical decision maker to balance the probable treatment benefit from VTE prophylaxis against the possible risk of increased harm and prompted dose reductions of enoxaparin where clinically indicated.

Other quality improvement projects aimed at reducing the variance between evidence-based medicine and clinical practice with respect to VTE have adopted similar strategies. A review article published by Michota suggested that rates of VTE prophylaxis were more likely to be improved by the implementation of active rather than passive QI strategies.[20] Tooher *et al* concluded that multifaceted intervention, utilising multiple active strategies, were more successful than single-component interventions.[22] In most VTE prophylaxis QIPs identified in this review article, multicomponent intervention incorporated educational material in combination with prescription reminders and decision support tools, which mirrors the strategies that we adopted in our project.

This project has also highlighted the benefits of an MD QIT in terms of quantitative improvements in VTE prescription, as aforementioned, but also qualitative improvements such as improved staff engagement in quality improvement initiatives, with an increase in the number of participants in allied projects across the health board, and improved communication between the MDTs. By engaging multiple disciplines, we were able to make a sustainable impact. In the UK, the frequent change over of junior doctors can be a barrier to sustained changes in clinical practice and poses challenges for ensuring the regular delivery of educational material despite VTE prophylaxis being an important focus of the medical induction process.[12]

Our project demonstrates the benefits of using multiple active strategies to improve compliance with both national and local guidance. Our study also reiterated the importance of using a multidisciplinary approach in order to facilitate sustainable and meaningful changes to patient care.

We, therefore, reiterate the importance of an MDT approach, involving all stakeholders when making improvements.

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