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Improving use of proton pump inhibitors with dual antiplatelet therapy in patients admitted with acute coronary syndrome

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ABSTRACT

Acute coronary syndrome (ACS) is one of the leading causes of morbidity and mortality with a major impact on healthcare resources and expenditure. Dual antiplatelet therapy (DAPT) is recommended for the treatment of ACS. DAPT is associated with an increased risk of gastrointestinal (GI) bleeding, which is seen in 1.2%–2.4% of patients on DAPT and associated with fivefold increase in mortality at 30 days and fourfold increase at 1 year. European Society of Cardiology guidelines recommend that patients on DAPT should also be prescribed a proton pump inhibitor (PPI) to reduce the risk of GI bleeding.

We assessed compliance with this recommendation on the cardiology ward of our tertiary cardiac unit. At baseline, only 56% of patients on DAPT were coprescribed a PPI. We subsequently devised and delivered a service improvement project (three completed audit cycles) to improve concomitant prescription of PPI, with the aim of achieving 100% compliance with the guidelines. We introduced low-cost interventions that included educational sessions for junior doctors, cardiac nursing staff and pharmacists, as well as posters which served as visual prompts for discharging doctors. We also initiated a protocol that the pharmacy team clarify with the discharging doctor whether a patient on DAPT should also be on PPI, before the discharge summary is finalised.

Consequently, 100% of patients on DAPT were coprescribed PPI within fourteen weeks of the onset of our intervention. This improvement was sustained across a subsequent cohort of junior doctors. Our interventions should help to reduce the risk of GI bleeding in this population.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Rates of proton pump inhibitor (PPI) prescription in patients on dual antiplatelet therapy (DAPT) are low, despite their known benefit in reducing gastrointestinal bleeding.

WHAT THIS STUDY ADDS

⇒ A 14-week multidisciplinary team intervention can significantly increase rates of PPI prescription for patients on DAPT.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study emphasises the importance of ensuring that cardiac centres have appropriate policies in place to ensure PPI prescription in patients on DAPT.

PROBLEM

Dual antiplatelet therapy (DAPT) is the mainstay of treatment for patients with acute coronary syndrome (ACS). European Society of Cardiology (ESC) guidelines recommend the prescription of proton pump inhibitors (PPIs) in patients treated with DAPT, to mitigate their risk of bleeding complications.[1] However, while working at a tertiary care cardiac centre in the UK, we noted a high incidence of patients who were being treated for ACS with DAPT, but who did not have PPI prescribed on discharge. This inconsistent pattern of PPI coprescription may put this group of patients at increased risk of bleeding complications. There was, therefore, a need to objectively assess our compliance with the recommended guidelines and to carry out effective interventions to improve this.

BACKGROUND

Our hospital is a tertiary care cardiac centre, serving an immediate population of over 260 000 residents, as well as acting as a referral centre for emergency percutaneous coronary intervention (PCI) from several hospitals in the West Midlands of England.

ACS continues to be a serious public health problem in industrialised countries and is becoming an increasingly significant burden in the developing world.[2 3] Coronary artery disease (CAD) affects around 126 million individuals (1655 per 100 000), which is approximately 1.72% of the world's population. Nine million deaths are caused by CAD globally and the global prevalence of CAD is rising.[2]

DAPT is recommended for patients presenting with ACS, to reduce the recurrence of ischaemic events.[4] The advocated duration of DAPT is 1 year after the initial event. Standard DAPT includes a P2Y12 inhibitor (clopidogrel, prasugrel or ticagrelor) in addition to aspirin. Although

DAPT offers protection against ischaemic events such as stent thrombosis, it is associated with an increased risk of bleeding complications.[5] Since bleeding on DAPT is as an independent predictor of adverse long-term outcome, it is important to identify patients who are at risk of bleeding.[6] Recognised factors contributing to increased bleeding risk include advanced age >75 years, prior history of bleeding, heart failure, peripheral artery disease, hypertension, abnormal renal or liver function and prior stroke.[6] Other contributory factors include chronic steroid use, smoking, alcohol abuse, anaemia and malignancy.[7] The incidence of bleeding reported in the ADAPT-DES registry was 6.2% at median time of 300 days following discharge.[8] It is also known that almost two-thirds of these bleeding episodes occur from the gastrointestinal (GI) tract. Overall GI bleeding (GIB) is estimated to occur in 1.2%–2.4% patients undergoing PCI.[9]

In patients with ACS, GIB is strongly associated with 30-day all-cause mortality (HR 4.87 [IQR 2.61–9.08], p<0.0001), cardiac mortality (HR: 5.35 (IQR 2.71–10.59), p<0.0001) and composite ischaemia (HR: 1.94 (IQR 1.14–3.30), p=0.014).[9 10] The mechanisms behind the high rates of mortality and nonfatal myocardial infarction in patients with ACS experiencing GIB are multifactorial. These patients have a more unfavourable baseline clinical profile that include older age, higher prevalence of diabetes, anaemia and chronic renal insufficiency, all factors known to worsen the prognosis of patients with ACS.[8 11 12]

In the ACUITY trial, GIB was the second most frequent source of non–coronary artery bypass grafting-related bleeding (after access site bleeding) in the entire study population (1.3%) and was the most common source of bleeding among patients triaged to medical management.[9] As patients with haemorrhagic diatheses and recent bleeding were excluded from the ACUITY trial, the true incidence of GIB in a non-selected ACS population is likely to be higher given the increasing incidence of GIB as the population ages. In one retrospective analysis of consecutive patients with ACS treated with a combination of aspirin, clopidogrel and enoxaparin, the rate of GIB was 2.7%.[13]

GIB is a well-known cause of premature cessation of antiplatelet therapy and disruption of DAPT due to non-compliance or bleeding is known to significantly increase the risk of adverse outcomes after PCI.[14] Nikolsky *et al* found that one-fifth (20.8%) of the ACS patients with GIB were not taking either aspirin or thienopyridines at discharge. The percentage of patients not on aspirin or thienopyridines was highest among patients triaged to medical management (40.0%), followed by patients triaged to CABG (27.3%) and to PCI (13.3%).[9] Of note, in the ACUITY trial, aspirin was recommended at a relatively high daily dosage (300–325 mg orally or 250–500 mg intravenously) during index hospitalisation.[9] Aspirin at any dosage nevertheless is known to be ulcerogenic.[15]

Multiple studies have demonstrated that concurrent administration of PPI reduces the risk of GIB in patients on antiplatelet therapy.[16–18] As a result, coprescription of PPI with DAPT is given a class I indication by the ESC.[1] This differs from American guidelines that only recommend the use of PPI in patients on DAPT who have a history of prior GIB or those at increased risk of GIB.[19] However, ESC guidelines are the reference standard in the UK, where our institution is based.

Due to our desire to ensure overall reduction in the morbidity and mortality rates associated with ACS, we conducted a quality improvement project with the aim of highlighting the present compliance rates and institution of effective interventions to ensure 100% compliance with recommended guidelines on the use of PPI in patients with ACS treated with antithrombotic therapy.

METHODS

The model used in this study is the Plan–Do–Study–Act (PDSA) model. This model for improvement provides a framework for developing, testing and implementing changes leading to improvement. It is based on scientific method and moderates the impulse to take immediate action with the wisdom of careful study. Using PDSA cycle enables testing out changes on a small scale, building on the learning from these test cycles in a structured way before wholesale implementation. This gives stakeholders the opportunity to see if the proposed change will succeed and is a powerful tool for learning from ideas that do and do not work. This ensures that the process of change is safer and less disruptive for patients and staff. The timeline of our study is shown in figure 1.

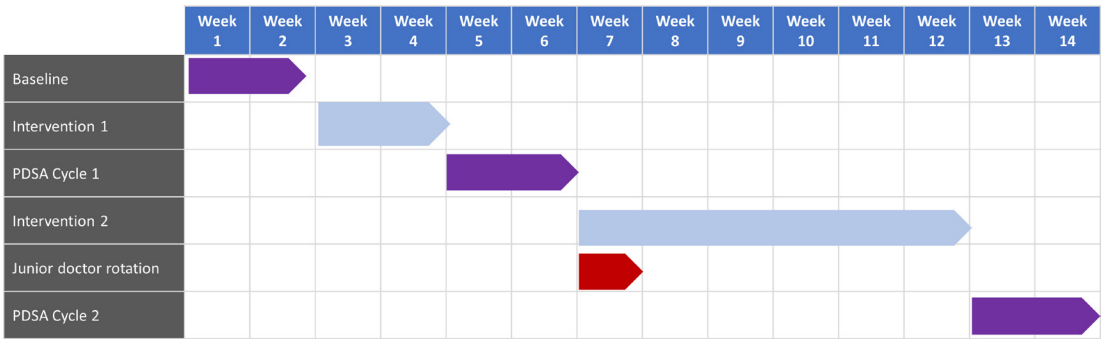


Figure 1 Gannt chart showing timeline of study. PDSA, Plan–Do–Study–Act.

ESC guidelines recommend the use of PPI in all patients on DAPT admitted with acute coronary syndrome.

Figure 2 Poster reminding team to prescribe PPI in ACS patients with DAPT. ACS, acute coronary syndrome; DAPT, dual anti-platelet therapy; ESC, European Society of Cardiology; PPI, proton pump inhibitor.

Baseline measurement

Baseline data were retrospectively collected, from patient electronic records, over a 2-week period for all hospitalised adult (over 18 years old) patients with a confirmed diagnosis of ACS admitted on cardiology ward. A total of 49 patients were included. Documented evidence of a diagnosis of ACS and prescription of DAPT±PPI, was then confirmed by reviewing medication charts on the discharge summary. Those who met the criteria for ACS and who were admitted, treated and discharged from our facility were included in the data collection. Patients who were 'treat and return' from satellite hospitals were excluded. Clinical information was transcribed onto a predesigned data collection proforma and analysed on a secure electronic spreadsheet programme. At baseline measurement collection, 49 sets of notes were identified and 4 patients were excluded as they died prior to discharge. A total of 45 patients (35 males, 10 females) were included in the baseline measurement. 20 out of 45 patients (44%) did not have a PPI coprescribed with DAPT. 25 out of 45 patients (56%) satisfied ESC guidelines by having a coprescription of PPI and DAPT.

Design and strategy

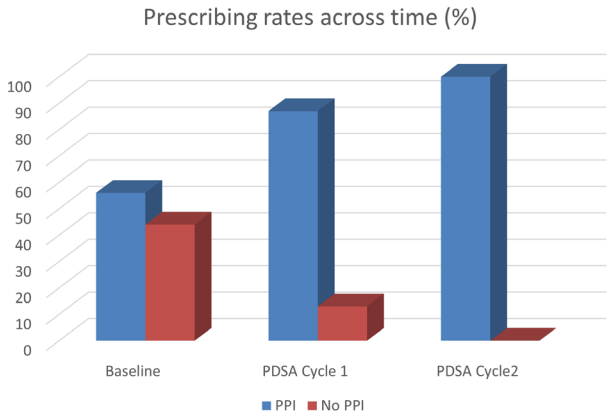
The core quality improvement team responsible for the design and implementation of this project was made up of one cardiology clinical fellow, one ST5 cardiology registrar and a supervising consultant. Our SMART aim for this project was to improve the percentage of ACS patients receiving PPI co-prescription with DAPT, from 56% to 100% within a 1-week period. This clinical target was devised after consideration and adoption of the ESC recommendation that all ACS patients with DAPT should receive a PPI.

When considering the underlying causes of the problem, it became apparent that a multifaceted set of interventions were necessary to improve the compliance rate in our hospital. First, we identified a general lack of awareness of the ESC guideline among the multidisciplinary team (MDT) working on the cardiology ward. We, therefore, sought to educate members of the MDT about the importance of PPI cover for patients on DAPT. This was achieved through one-on-one and group discussions with medical and nursing staff as well as pharmacists over a 3-week period. Data from our baseline measurement was used as a rationale for adopting modifications to prescription practice.

In addition, we created posters (figure 2) with pictorial illustrations and posted these at strategic points on the ward such as next to computers where junior doctors sat to complete discharge letters, as well as at nursing stations. These were intended to serve as reminders and prompts to the team. The poster received positive feedback with many commenting that it was easy to understand and served as a cue to prescribe a PPI. We also encouraged nursing staff to actively question whether patients in their care should be prescribed a PPI if they were on DAPT.

In addition, we realised that the success of this project would be greatly enhanced if the pharmacy staff were involved. We held a series of informal meetings with them, educating them on the ESC guideline and sharing the results of the baseline audit with them. In our institution, prior to the discharge summary being finalised and medication issued to the patient, the ward pharmacist must verify that the drug regime is accurate. It was agreed with the pharmacy team that they would clarify with the responsible clinician whether the omission of PPI on the discharge summary of a patient on DAPT was deliberate or an oversight. Thus, through multiple layers of checks from junior doctors, nurses and pharmacists, we envisaged that our compliance with the guideline would improve.

Finally, we have noted from previous quality improvement project experiences that sustainability of clinical interventions is challenging. This is often due to the high turn-over of staff, especially junior doctors, who frequently rotate through different jobs in different hospitals. We were keen to ensure the longevity of improvements made in our hospital. As a result, we identified that the clinical fellows, nurses and nurse practitioners, who do not rotate to other departments, would provide the continuity needed for our interventions to be successful. By involving them as major stakeholders in our intervention, they could provide the leadership and support



	Baseline	PDSA Cycle1	PDSA Cycle2
PPI	25 (56%)	34 (87%)	28 (100%)
No PPI	20 (44%)	5 (13%)	0 (0%)

Figure 3 Impact of QIP on PPI prescription. PDSA, Plan–Do–Study–Act; PPI, proton pump inhibitor.

for rotating doctors, thereby ensuring adherence to the guideline over time and across rotations of doctors.

Further cycles

After carrying out the above outlined intervention over a period of 2 weeks, we then went on to collect more data to assess if our intervention resulted in an improvement in outcome.

To ensure sustainability and continuity, we performed a further cycle 7 weeks after completion of the second cycle as the junior doctors previously on the ward had rotated to other units and we had a new cohort of junior doctors.

RESULTS

PDSA cycle 1

A total 41 patients were admitted with ACS over a 14-day period. Two patients died prior to discharge. Of 39, 34 (87%) were prescribed PPI on discharge. This was an improvement from the 56% compliance rate we had seen in the baseline audit. Even though this was a significant improvement, it had still not met our audit standard of 100% compliance, so we carried on with continued education of all stake holders involved. This included an additional cohort of pharmacists who had rotated to the ward.

PDSA cycle 2

Data were analysed using 32 patients admitted on the cardiology ward over a 2-week period (11 weeks postbaseline audit). Three patients died prior to discharge and one patient was a palliative discharge. Of the remaining 28 eligible patients, 28/28 (100%) were prescribed a PPI on discharge.

Summary and interpretation

At baseline, only 56% of our cohort of patients treated for ACS with DAPT were also prescribed a PPI. This figure is surprisingly low, given that our institution is a tertiary cardiac centre. Although we do not have any data for comparable UK institutions, Shen *et al* reported that only 62% of their cohort of patients receiving DAPT at a tertiary cardiac unit in Montreal, Canada, were also prescribed a PPI.[20] It is unlikely that general practitioners would alter the prescriptions issued from specialist cardiac units for patients treated for ACS. Thus, there may be a large cohort of patients who are at increased risk of GIB without appropriate PPI usage, highlighting the importance of this study and our interventions.

Overall, we saw a sustained improvement in compliance with PPI prescriptions in line with recommended guidelines (figure 3). By the end of PDSA cycle 2, 100% of patients on DAPT were prescribed a PPI on discharge. This was achieved through a co-ordinated effort from the entire MDT. In particular, the pharmacists and nursing staff felt empowered by our project to clarify why patients on DAPT were not prescribed a PPI, which is likely to have contributed to the success of the interventions.

Limitations

There are a few limitations to this project. One limitation of this study is the relatively small population size studied. It is hoped that further quality improvement projects on this topic will be conducted over a longer period to analyse a larger patient cohort and improve the validity of the study.

Moreover, we did try to minimise the Hawthorne effect by carrying out the second cycle eleven weeks after the end of the baseline measurement period. The Hawthorne effect is a phenomenon whereby staff may artificially change their behaviour during a study due to the awareness that it is under review.[21] This is hard to assess and may still have occurred during our data collection periods. However, data collection periods were not disclosed to ward members, to avoid influencing their behaviour. It is possible that if we had conducted more frequent data collection that the Hawthorne effect may have been exaggerated, affecting our results.

This study was only conducted over a 14-week period, and as such its long-term sustainability is yet untested. Therefore, the key challenge is to ensure future sustainability. We accept that use of a multidisciplinary quality improvement team structure (doctors, nurses and pharmacists) has strengthened the project through idea collaboration. However, we believe that involvement of more members of the MDT may bring new ideas to the group that have not previously been considered. In addition, greater quality improvement group inclusion may help to fuel positive work-based culture changes and promote the longevity of good practice within our hospital.

Recommendations

Going forward, we plan to provide continued education of each cohort of junior doctors at their induction to cardiology. We intend to carry this out by including an educational piece in the official induction packs of the new doctors.

Similarly, there needs to be education of junior doctors on medical wards as some of the patients being managed for ACS are not admitted under cardiology and some may be medically managed and discharged from other wards.

In addition, we recommend adapting the cardiology clerking sheet to include a box for PPI next to DAPT so that this becomes standardised practice. We plan to also include stickers in patient notes as reinforcement of visual cues/prompts.

Finally, as our hospital uses an electronic prescribing system, we will liaise with the information technology department to assess the feasibility of adding an electronic alert to remind doctors of the importance of prescribing a PPI when DAPT is prescribed. Until that is achieved, the ward pharmacists will continue to provide a valuable service in clarifying with doctors why PPI is not prescribed in patients on DAPT.

Most importantly, reaudit in the future is highly recommended to ensure effectiveness of interventions and continued service improvement. This is planned for September 2022. This is 1 month after the changeover data, which will allow time for the new doctors to be settled into the department and be familiar with ward protocols.

CONCLUSION

PPIs are recommended by ESC guidelines to reduce the risk of GIB in ACS patients treated with DAPT. However, implementing these guidelines into clinical practice can be challenging and requires close collaboration with all the parties involved in the patient's care. We have introduced several simple but effective interventions that have improved the compliance with these guidelines in our tertiary cardiac centre. An ongoing challenge remains the need to ensure the sustainability of this clinical improvement in the long term. To address this, we propose expanding our data set by studying a larger cohort of patients over a longer period, promoting regular education of key staff and presenting the project to a wider audience of stakeholders.

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