We Need to Talk About Codeine: an Implementation Study to reduce the number of Emergency Department patients discharged on high-strength co-codamol using the Behaviour Change Wheel

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ABSTRACT

Background The crisis of prescription opioid addiction in the USA is well-documented. Though opioid consumption per capita is lower in the UK, prescribing has increased dramatically in recent decades with an associated increase in deaths from prescription opioid overdose. At one Scottish Emergency Department high rates of prescribing of take-home co-codamol (30/500 mg) were observed, including for conditions where opioids are not recommended by national guidelines. An Implementation Science approach was adopted to investigate this.

Methods A Behaviour Change Wheel analysis suggested several factors contributing to high opioid prescribing: poor awareness of codeine addiction risk, poor knowledge of NICE (National Institute for Health and Care Excellence) guidelines on common painful conditions, mistaken assumptions about patient expectations and ready access to a large stock of take-home co-codamol. Based on this analysis a combined Education/Persuasion intervention was implemented over a 1-month period (January 2019) reaching 93% of prescribers. An Environmental Restructuring intervention was introduced at 4 months, and co-codamol prescriptions were monitored over a 12-month follow-up period. Unplanned re-attendances and complaints related to analgesia were monitored as balancing measures.

Results The Education/Persuasion intervention was associated with a 59% reduction in co-codamol prescribing that was maintained over 12 months. The Environmental Restructuring intervention was not associated with any further reduction in prescribing. No increase in unplanned re-attendances occurred during the study period and no complaints were received relating to pain control.

Conclusions The increasing incidence of prescription opioid addiction in the UK suggests the need for all clinicians who write opioid prescriptions to re-evaluate their practice. This study suggests that knowledge of addiction risk and prescribing guidelines is poor among Emergency Department prescribers. We show that a rapid and sustained reduction in prescribing of take-home opioids is feasible in a UK Emergency Department, and that this reduction was not associated with any increase in unplanned re-attendances or complaints related to analgesia.

INTRODUCTION

Pain is one of the the most common reasons for patients to present to Emergency Departments (EDs) and is known to be widely undertreated.[1 2] This has resulted in a proliferation of studies and guidelines designed to address the problem of oligoanalgesia,[3 4] most commonly by recommending early use and escalation of analgesic drugs. Yet all analgesics are potentially harmful, whether because of toxicity, addiction risk or both. An inherent tension therefore exists between the goals of relieving pain and minimising harm from analgesic use. The prescription opioid crisis in the USA is the major contemporary example of this: an almost entirely iatrogenic epidemic caused, in part, by fear of oligoanalgesia and patient dissatisfaction.[2 5]

Opioid consumption per capita is lower in the UK than in the USA, and prescription opioid misuse accounts for a smaller proportion of illicit drug use.[6] However UK consumption of strong opioids increased by 171.9% between 2006 and 2016,[7] an estimated 5% of the UK population currently take prescription opioids[8] and deaths from prescription opioids have increased continuously since 2003.[9] The UK also has a worryingly high rate of diversion of prescribed medications: it is estimated that in 2016 to 2017 over 2 million people aged 16 to 59 took a prescription-only painkiller that had not been prescribed to them.[10]

In the USA, EDs are estimated to account for under 10% of total opioid prescriptions.[11] However, there is evidence that opioid-prescribing behaviour of emergency physicians is associated with risk of long-term opioid use following an index ED visit.[12] A significant proportion of opioid-naïve patients receiving a first opioid prescription from ED may progress to long-term[13] and even problematic[14] use. The contribution of UK EDs to the total opioid supply is currently unknown, but the goal of reducing unnecessary opioid prescriptions is beginning to enter the consciousness of Emergency Medicine as a speciality. For example, in a recent project to develop process quality indicators for the management of musculoskeletal injuries in the ED the expert panel included four quality indicators specifically related to opioid safety.[15]

At one District General Hospital in Scotland (450 beds, *circa* 70 000 annual ED attendances for a population of 280 000) a high rate of prescribing of take-home co-codamol 30/500 mg (30 tablets per box) was observed. It was noted that co-codamol was regularly supplied for conditions such as headache and back pain for which the National Institute for Health and Care Excellence (NICE) specifically recommends against opioids.[16–18] This suggested a significant evidence translation gap which might be reduced using an Implementation

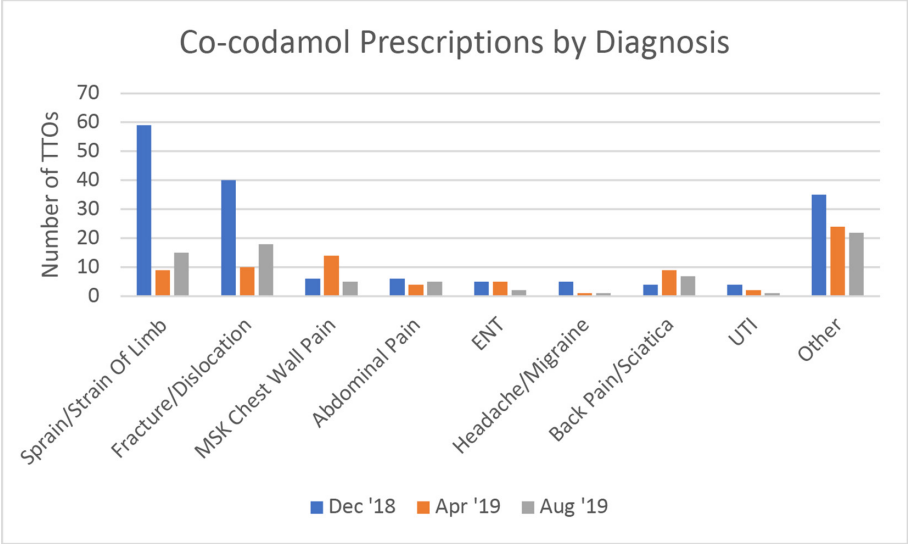


Figure 1 Numbers of boxes of take-home co-codamol by discharge diagnosis before the start of the project (December 2018), at 4 months (April 2019) and at 8 months (August 2019) for the eight most frequent diagnoses. 'Other' includes all diagnoses for which three or less boxes of take-home co-codamol were given. TTO, To-Take-Out; MSK, Musculoskeletal; ENT, Ear-Nose-Throat; UTI, Urinary Tract Infection.

Science approach.[19] Here, we report the results of a 12-month study aiming to reduce the rate of take-home co-codamol prescribing, with a dual focus[20] on the implementation strategy (the Behaviour Change Wheel)[21] and the healthcare intervention implemented (reduction in opioid prescribing rates).

METHODS

Pre-implementation Planning

An initial audit was conducted of all patients discharged home from the ED over a 1-month period (2988 patients); 10.3% were given take-home co-codamol, compared with 1.2%, 1.6% and 4.5% for paracetamol, ibuprofen and naproxen, respectively. The majority of co-codamol prescriptions were for limb injuries (figure 1) and prescribing rates were similar across all grades of clinicians. Informal discussions with prescribers suggested that co-codamol was favoured for two main reasons: the perception that weak opioids provide better analgesia than paracetamol or Non-Steroidal Anti-Inflammatory Drugs (NSAIDs), and the perception that patients expect to be discharged with medications that they cannot buy over the counter. These findings were discussed with all 11 ED consultants, pharmacy staff (Lead Pharmacist, Senior Pharmacist with responsibility for 'desirable stock' and Chief Pharmacy Technician), two representatives of the Emergency Nurse Practitioner group, the senior ED nursing group and the lead consultant for the hospital's Acute Pain Team (hereafter 'stakeholders'). All stakeholders expressed surprise at the extent of co-codamol prescribing from ED and agreed that there appeared to be a 'co-codamol culture' which required further investigation. There was broad agreement that reducing opioid prescriptions was a sensible goal so long as this did not result in an increase in uncontrolled pain and patient dissatisfaction.

The COM-B Model[21] was used to understand the target behaviour (prescribing take-home co-codamol) in terms of Capability, Motivation and Opportunity. Potential sources of the target behaviour identified under each of these domains are shown in figure 2, and each was considered in turn as a possible area for study and intervention.

Regarding the analgesic benefit of weak opioids (C1), multiple studies have failed to show superiority over non-opioid analgesics

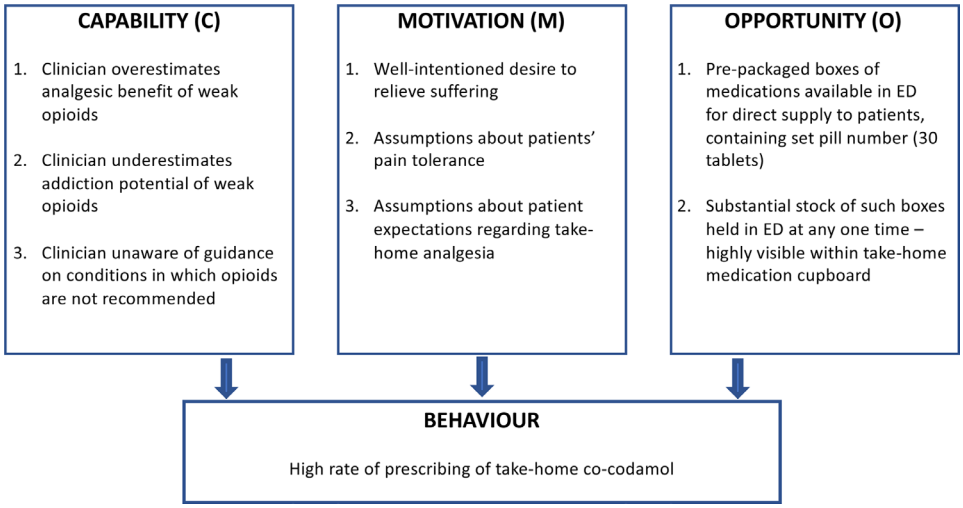


Figure 2 COM-B analysis showing potential factors contributing to high take-home co-codamol prescribing. ED, emergency department.

for acute musculoskeletal injuries.[22–24] However many guidelines (including the Royal College of Emergency Medicine's guideline on pain management in adults[4]) continue to recommend oral codeine for moderate pain, making this a controversial area for intervention. By contrast, the addiction potential of weak opioids (C2) is well-established,[25] as are evidence-based guidelines on conditions in which opioids should be avoided[16–18] (C3) therefore these areas were selected for further study.

The desire to relieve suffering (M1) was assumed to be a goal of all clinicians and was not explored further. However, it is known that clinicians often make assumptions about what their patients expect (M2 and M3) and that these assumptions can affect prescribing behaviour,[26] therefore these areas were also selected for further study.

Regarding opportunity to supply opioids (O1 and O2) there is evidence from systems with electronic prescribing that pre-populated default pill numbers affect the opioid prescribing behaviour of emergency physicians.[27] To our knowledge no similar studies have been conducted in EDs with direct supply of take-home opioids to patients, therefore extensive consultation with Pharmacy stakeholders was undertaken to explore potential interventions.

Implementation strategy

The Behaviour Change Wheel describes nine different Intervention Functions that may follow from a COM-B behaviour analysis: Education, Persuasion, Incentivisation, Coercion, Training, Enablement, Modelling, Environmental Restructuring and Restrictions.[21] Several of these have an established evidence base with regard to ED opioid prescribing, and in order to identify the most appropriate Intervention Functions for this project the six selected COM-B factors (C2, C3, M2, M3, O1 and O2) were evaluated in more detail.

All survey work with patients and prescribers was fully anonymised and received ethical approval from the hospital's Clinical Effectiveness Team.

Capability

To investigate factor C2, 20 prescribers across all grades completed a paper survey in which they were asked how many days of continuous codeine use they thought could lead to codeine addiction (3 days / 7 days / 30 days / 90 days). The sample was based on the number of prescribers who could be surveyed during a single shift, to avoid introducing bias from prescribers discussing the study with each other. None of the 20 prescribers gave the correct answer of 3 days.[25]

To investigate factor C3, 16 junior doctors completed a paper survey (online supplemental appendix 1) in which they were asked to indicate what painkillers are recommended by NICE for the management of migraine, tension headache and back pain with or without sciatica—conditions for which NICE either 'does not recommend' or 'recommends against' weak opioids.[16–18] The sample was based on the number of doctors who could be surveyed during a 24-hour period, ensuring that incoming doctors completed the survey before they met with their colleagues at handover. None of these doctors believed that weak opioids are recommended for migraine, and only 6% believed they are recommended for tension headache. However, 56% believed that weak opioids are recommended for back pain without sciatica, and 44% for back pain with sciatica.

The results of these surveys suggested a significant knowledge gap among prescribers regarding the addiction risk of codeine (C2) and evidence-based prescribing guidelines (C3), both of which should be amenable to intervention using the Education function of the Behaviour Change Wheel.

Motivation

To investigate patient expectations of analgesia (M2 and M3) an anonymised paper survey was distributed to consenting, non-intoxicated patients in ED presenting with painful musculoskeletal conditions, who had not received parenteral analgesia, and whom the treating clinician expected to discharge home from ED. This population was chosen because the majority of co-codamol prescriptions were being given out for musculoskeletal conditions (figure 1). To ensure consecutive recruitment a 3-day study period was chosen during which at least one of the authors was continuously present in the ED. Patients were asked to select responses to two statements:

1. "When I leave the ED today I expect…" (Advice on how to manage my injury / A prescription for painkillers / Neither of the above).
2. "Over the next 24 hours I expect my pain to be…" (Completely gone / Almost completely gone / Still there but bearable / Still there and severe / Very severe).

Forty-one patients completed the survey during the study period. At the same time, 25 ED prescribers of all grades were shown these statements and asked to indicate how they thought 'most patients' would respond.

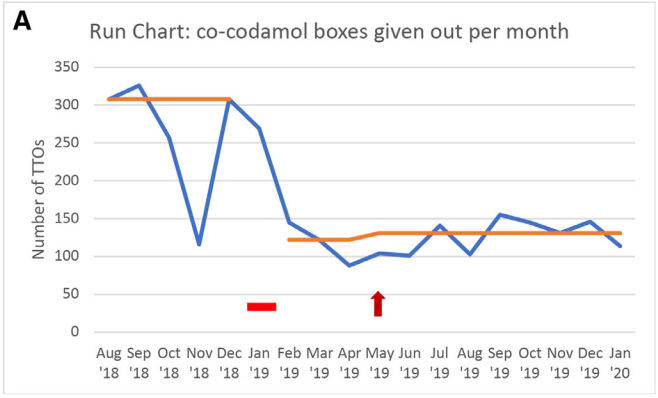
Twenty-seven per cent of patients surveyed expected a prescription for painkillers. By contrast, 48% of prescribers believed that most patients expect a prescription for painkillers. Seventy-eight per cent of patients expected their pain to be 'Still there but bearable' in the 24 hours following ED discharge, while 7% expected their pain to be 'Almost completely gone' and 0% 'Completely gone'. By contrast, 52% of prescribers believed most patients would expect their pain to be 'Still there but bearable', while 51% believed most patients would expect their pain to be 'Almost completely gone' or 'Completely gone'.

The incorrect assumptions being made by prescribers regarding patient expectations (M2 and M3) might thus be amenable to both the Education and Persuasion functions of the Behaviour Change Wheel.

Opportunity

It was noted that the ED stocked pre-packaged boxes of 30×30/500 mg co-codamol for direct supply to patients on discharge (O1). Thirty tablets represent a 3.75-day supply at maximum dosing, which is significant in light of the Medicines and Healthcare products Regulatory Agency (MHRA) warning that codeine addiction can develop after only 3 days' use.[25] Furthermore, there is evidence that ED patients discharged with opioid prescriptions consume substantially fewer tablets than they are supplied with,[28] potentially contributing to a pool of unused opioid pills in the community which could fuel non-prescription use and diversion. The supply of take-home co-codamol boxes in the ED was continuously maintained at 100 boxes (re-stocked two times per week by Pharmacy). Co-codamol occupied a quarter of the space in the discharge medication cupboard and was therefore highly visible to prescribers (O2).

The possibility of reducing both pill number per box and the number of boxes stocked was discussed at length with Pharmacy stakeholders. The manufacturer of co-codamol 30/500 mg does not produce boxes of less than 30 tablets, and Pharmacy advised that repackaging co-codamol into smaller quantities (eg, 10 tablets) was financially untenable because of the staffing costs involved. Furthermore, ED staff were advised that removing



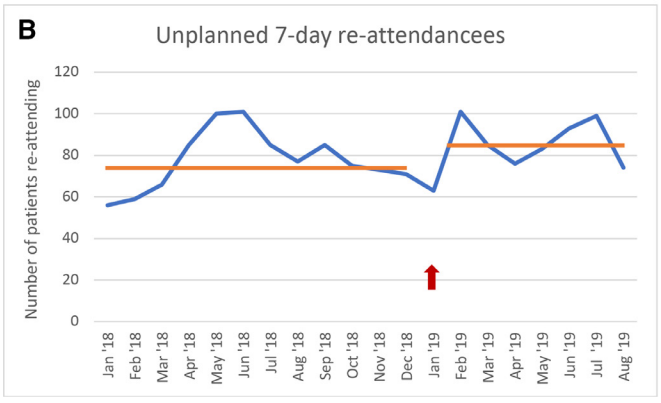


Figure 3 (A) Run chart showing boxes of take-home co-codamol given out per month (blue line). The red bar represents the period of the Education/Persuasion intervention (January 2019), and the red arrow shows the Environmental Restructuring intervention (1 May 2019). Yellow lines show medians for the time periods before intervention, after the one-month Education/Persuasion intervention, and after the overnight Environmental Restructuring intervention. (B) Numbers of patients re-attending within 7 days of their index presentation (blue lines) with median number of re-attendances (yellow lines) before and after the start of the project (red arrow). TTO, To-Take-Out.

strips of pills from pre-packaged boxes at the point of supply to patients is not legal in the UK. By contrast, reducing the stock of co-codamol boxes held in the ED would be entirely straightforward—an example of the Environmental Restructuring function of the Behaviour Change Wheel.

Interventions

Educational interventions have previously been shown to achieve short-term reductions in opioid prescribing, but with concerns expressed about their longer-term efficacy.[29] More recently the role of one-to-one education by ED 'clinical champions' has been examined and found to be associated with substantial reductions in opioid prescribing.[30] A multifaceted educational programme was therefore designed and implemented over a 1-month period (January 2019). An initial 5-minute one-to-one education session was delivered in person to each of the Department's 45 prescribers by one of the authors. The focus of this session was to illustrate the extent of co-codamol prescribing in the Department, to educate prescribers on the addiction risk of codeine and to inform/remind them of NICE recommendations. Prescribers were also informally asked what they thought patients expect on ED discharge, then shown the results of the patient expectations survey. Following the one-to-one session all prescribers were emailed a document summarising the evidence for the analgesic efficacy and addiction risk of codeine, and signposting NICE guidelines. These targeted interventions were followed by four separate group education sessions delivered at the department's Morbidity and Mortality meetings and at scheduled junior doctor teaching sessions.

Three months after the Education/Persuasion intervention, the Environmental Restructuring intervention was enacted by reducing the ED's stock of take-home co-codamol from 100 to 50 boxes.

Evaluation of interventions

Process Measures included the proportion of ED prescribers receiving the individual face-to-face Education/Persuasion intervention, the proportion of prescribers attending follow-up group education sessions, and the number of take-home co-codamol boxes stocked in the department.

The primary Outcome Measure was the number of boxes of co-codamol given out by the department per month, which was monitored continuously after the start of the project and compared with the 5-month period before the first intervention. Repeat audits were conducted at 4 months and 8 months to examine the diagnoses for which co-codamol was being given.

The stakeholder group had been keen to ensure that any reduction in opioid prescribing was not accompanied by an increase in uncontrolled pain after ED discharge. The primary Balancing Measure was therefore selected as the number of unplanned re-attendances within 7 days of the index visit per month. All formal complaints received by the department after the start of the project were also examined for any that related to pain control.

Given the small sample sizes and non-parametric data set, statistical analyses were performed for the primary Outcome and Balancing Measures using the Mann-Whitney U test in Microsoft Excel.

RESULTS

Process measures

Ninety-three per cent of prescribers working in the ED at the time of the Education/Persuasion intervention received the one-to-one education session, 100% received the summary document by email and 62% attended at least one of the four follow-up group education sessions. The Department's take-home co-codamol supply was maintained at 100 boxes until April 2019 and reduced to 50 boxes on 1 May 2019.

Outcome measures

The median number of boxes of co-codamol supplied by the department was 308 per month in the 5 months prior to the start of the project, 122 per month in the 3 months after the Education/Persuasion intervention and 131 per month in the 9 months after the Environmental Restructuring intervention (figure 3A). Overall, this represented a reduction in prescriptions of 59% (Mann-Whitney U test, p=0.018) after the Education/Persuasion intervention with no statistically significant change after the Environmental Restructuring intervention. The major reduction in co-codamol prescriptions was for limb injuries; prescriptions for headache dropped to near zero, while prescriptions for back pain continued at a low level (figure 2).

Balancing measures

There was no statistically significant difference in the median number of unplanned re-attendances within 7 days of index presentation before and after the start of the project (76 vs 85, Mann-Whitney U test p=0.19) (figure 3B). The department received no complaints related to analgesia during the period of the study.

DISCUSSION

In this Implementation Study, interventions targeting opioid prescribing behaviour were associated with a 59% reduction in the

number of boxes of high-strength co-codamol given out by a UK ED. The magnitude of this change compares favourably with other studies targeting opioid prescribing which have reported reductions in the range of 3.5% to 40%.[27 31–39] Other studies have used a variety of Intervention Functions to reduce opioid prescribing including Training,[31] Restriction,[32–36] Environmental Restructuring[27 37] and Coercion.[38 39] This study demonstrates that a single, multifaceted Education/Persuasion intervention targeting all ED prescribers over a 1-month period was associated with a rapid reduction in opioid prescribing. An Environmental Restructuring intervention at 4 months did not result in any further reduction. This may be because the prominence of co-codamol boxes in the take-home drug cupboard did not in fact influence prescriber behaviour, or because a floor effect had already been reached following the Education/Persuasion intervention. It is also possible that the Environmental Restructuring intervention did actually help in maintaining the initial reduction achieved by the Education/Persuasion intervention; the present study design does not allow us to distinguish these possibilities.

One limitation of our study design is that the factors considered in the COM-B analysis were identified through informal discussions with prescribers in the pre-implementation planning phase. A more rigorous qualitative methodology (eg, focus groups) might have revealed other causes of high co-codamol prescribing, which could have suggested additional interventions. Nonetheless, the magnitude of the reduction in prescribing following our interventions does suggest that the factors identified were important, if not exhaustive.

Since this was an implementation study and not a trial it is possible that the association between the intervention and the outcome was not causal. Awareness of opioid risk has increased in the medical community in recent years and total opioid prescribing has begun to fall very slightly in England since 2016.[40] Nonetheless, the dramatic reduction in opioid prescribing that immediately followed our first intervention then persisted for 12 months increases the plausibility of a causal relationship.

Importantly, given the recognised problem of oligoanalgesia in EDs, the reduction in co-codamol prescriptions was achieved without any significant increase in unplanned re-attendances or complaints related to analgesia. An important limitation is that neither of these balancing measures can be taken as direct evidence that patients' pain was sufficiently controlled after ED discharge. It is possible that patients whose pain was not controlled presented to primary care rather than returning to the ED. Ideally all patients would have been followed up electronically to monitor primary care prescriptions, but this was outside the scope of the project. However, given the recognised addiction risk of weak opioids, if these are really needed after failure of non-opioid analgesia it may in fact be safer for them to prescribed and monitored by the patient's primary care provider.

A further limitation is that this study was conducted at a single centre with only one pre-packaged opioid formulation available for direct supply to patients. The number of patients discharged with advice to take over-the-counter analgesia could not be measured, which may mean that the frequency of co-codamol prescriptions in relation to other analgesics was over-estimated in the initial audit. However, if many of these co-codamol prescriptions were potentially avoidable, the reduction remains important.

A difficult question arises as to whether further reductions in opioid prescribing should be attempted in the wake of this project. There are some patients in whom non-opioid analgesics are insufficient or not tolerated, and these patients should not be left in pain. It is therefore recognised that some level of take-home opioid prescribing is probably appropriate, though defining this level is unlikely to be straightforward.[38] In those patients who are given opioids, however, it should be made clear to both the patient and their primary care provider that these are intended for the short-term relief of acute pain only and should be stopped as early as possible. Given that co-codamol pack sizes could not be reduced, it is essential that patients are given clear advice as to how to dispose of any pills that they have not used, as it is well-recognised that diversion of prescription opioids among friends and family members occurs on a large scale[41] and unused stock could easily contribute to this. Assessing and improving the information given to ED patients and their primary care providers about opioid prescriptions is expected to form the next stage of this Implementation project.

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Contributors Both authors contributed in equal measure to the conception and design of this Implementation Study. Both authors collected the relevant audit and survey data and contributed equally to the educational interventions described. RR drafted the manuscript, which was then edited and approved by LF.

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Patient consent for publication Not required.

Ethics approval This Implementation Study was registered and approved by the Clinical Effectiveness Team, Victoria Hospital Kirkcaldy, Hayfield Road, Kirkcaldy KY2 5AH. RR conceived the project. RR and LF jointly attended all stakeholder meetings in the planning of this project. RR carried out the literature review. RR and LF jointly carried out all audits, surveys and educational interventions involved in the project. The manuscript was drafted by RR and edited by LF.

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