



SUSQI PROJECT REPORT

Reducing Paracetamol Co-Prescribing with Strong Opioids on the Sheffield Macmillan Unit for Palliative Care

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Team Members:

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Background:

In 1985, the WHO analgesic ladder for cancer pain was published (1), with the first step being non-opioid analgesics – most commonly paracetamol and anti-inflammatory medications. These are added to with adjuvant analgesics and opioid medications if the pain persists and the next “step” in the ladder is taken. In palliative care, pain is a common symptom – up to 70% of patients have pain as a symptom – but the burden of medication can also be high. Paracetamol is a fairly short acting medication and is administered 4 times a day. The dose in a person over 50kg is 1g per dose – two tablets of 500mg, 20ml of liquid paracetamol, a vial of IV solution, four times a day.

The effectiveness of paracetamol to add to pain control has been studied in patients taking strong opioids (2) and it has been found to be of no real benefit. Clinicians are often reluctant to stop paracetamol “in case it makes things worse” but will do so, usually with no change in symptom control, when the patient begins to struggle with their medication burden.

We were concerned with the potential waste of the paracetamol if it was ineffective, the medication burden on the patient, the nursing time to deliver medication that was unlikely to contribute to the patient’s analgesia and the large amount of waste that was produced from administering the paracetamol – from production, transport, storage, administration and disposal.

Specific Aims:

To achieve a 50% reduction in the usage of paracetamol on Macmillan Unit for Palliative Care (MPCU) through joint decision making with patients, to reduce tablet burden for patients and staff, while reducing environmental and financial costs.

Methods:

Study of the System

In a snapshot of the inpatients on the self-contained, Sheffield Macmillan Unit for Palliative Care (MPCU) (an 18-bedded NHS funded palliative care in-patient unit within the grounds of the Northern General



Hospital- NGH- in Sheffield), over half of the patients were co-prescribed regular (four times a day) paracetamol and strong opioids.

Paracetamol prescribed regularly is prescribed on the electronic prescribing system used within the Trust. Patient's medication is reviewed on admission to MPCU and relevant medication is prescribed on the system. This is done by the admitting doctor or advanced nurse practitioner. The review is always done as part of the admission process. The conversation discussing the paracetamol should take only a few minutes. If the patient feels a benefit from the paracetamol, it will remain prescribed regularly. If the patient is unsure of the benefit or feels no benefit, then the admitting person would suggest making the paracetamol available "as required" rather than having it prescribed regularly. This means the paracetamol is available if the patient feels they need it or is available for reasons other than pain e.g. as an anti-pyretic (if the patient has a fever). To change regular to "as required" paracetamol involves an extra box being ticked on the electronic prescribing system.

Paracetamol is delivered from Pharmacy Stores at NGH to MPCU. Tablets come in boxes of 32, in plastic and foil blister packs. Bottles of the liquid (100ml) contain five doses, arriving on the ward in a box. The effervescent tablets come in foil and paper sachets, in strips, within a bigger box of 24. The IV preparations are in plastic or glass bottles, again within an outer card box. All of these contain a patient information sheet on paper.

To administer each preparation involves consumables – a paper cup for tablets, a glass or plastic cup for effervescent, a dosage syringe for liquid, giving sets, cannula, flushes and syringes as well as a card-carrying tray for IV preparations.

The medication is administered by nursing staff on the ward. The ward is split into 3 for nursing team purposes and therefore each ward drug round is split into 3. Administering paracetamol can be time consuming and is perceived as of little benefit to the patients as compared to the strong opioids that the majority of patients are receiving. Even if the patient declines or is unable to take the dose, the electronic drug record requires updating, with the reason given for the dose not being administered. Every dose creates waste, as outlined above.

Intervention

Our aim is to review the medications prescribed on admission to MPCU (already part of the admission process) and consider, jointly with the patient, whether moving this to the "as required" part of the medication prescription would reduce the medication burden to the patient, with no change to pain control, reduce nursing time spent administering an ineffective treatment and reduce waste (time, money and physical waste) on the ward, and hence the carbon footprint. If this was possible on a single ward with a stable staff cohort, we could look at rolling this out to other, similar patients on other wards in the hospital.

We aimed to use the principle of lean health delivery to implement this project – reducing waste ultimately but with a positive impact on patients (reduced medication burden), staff (on the ward, in pharmacy and transporting the medication to MPCU), our budget (reducing the cost of the paracetamol and consumables) with little upfront cost (medication is reviewed on admission to MPCU already).



Armed with information we had gathered, we ran short education sessions with the nursing and medical team to explain what we were hoping to do (reduce the use of paracetamol on MPCU and the associated burden in medication time, finances and waste), how we hoped to achieve this and what the likely outcomes were. We produced a poster to put up in clinical areas showing the waste associated with paracetamol administration along with some measurements of time spent/cost to encourage the prescribers and administrators of paracetamol. We initially hoped for a 50% reduction in the usage of paracetamol on MPCU.

This project was to run for 10 weeks, interrupted by industrial action and a covid outbreak on the ward where we were restricted as to who could go on to the ward. We undertook the planning and education and have projected our savings over a 6-month period as we have used figures for the 6 months prior to the competition as a base line.

Measurement:

Patient outcomes:

Patients admitted to palliative care are often on many oral medications for several symptoms. These range in frequency from a single tablet once a day up to two tablets four times a day. With a snapshot average of 9.7 different medications prescribed regularly per patient, this can result in between 6 and more than 20 regular doses of medication. Paracetamol, being up to two tablets four times a day, can form a significant percentage of the daily medication burden. Anecdotally, patients either can tolerate the medication burden or would like to significantly reduce the amount of tablets or liquids taken. Improving symptom control is often a trade-off between improved symptoms and adding to the medication burden, which is usually negotiated with the patient. Most patients are delighted to reduce the amount of tablets and syrups they have to ingest if their symptom management is not going to be affected. On a daily basis, symptoms are monitored by both medical and nursing staff - on ward rounds, intentional rounding and at several patient contacts out with these specific times. If a medication is changed, this is specifically followed up on the next ward round. It can be increased as tolerated, reduced or changed if no good effect comes of the change or side-effects are noted. If paracetamol is changed from regular to prn, the use of the prn dose is monitored to discuss with the patient if it needs to be reinstated as regular if this was felt to be appropriate. We have not been able within the time frame of the project to specifically ask patients for their opinions on the change from regular to prn paracetamol - a benefit is inferred if the switch to prn continues, little or no prn paracetamol is used and regular paracetamol does not have to be re-instated.

Environmental sustainability:

A hybrid approach was used to estimate the carbon footprint of each of the different paracetamol administration methods. Table 1 highlights the drug and consumables used per dose per paracetamol administration method per dose for each of the administration methods, as well as the carbon footprint per dose.

To estimate the carbon emissions associated with the pharmaceutical itself (paracetamol), a top-down method was used based on cost. A cost per dose was obtained and converted into carbon dioxide equivalents using the pharmaceutical emission factor (0.621 kgCO₂e/£) taken from the 2020 UK Government Database (3).



To estimate the carbon emissions associated with the consumables, a bottom up process based method was used. Raw material extraction of the item and packaging were included, as well as, transport and disposal emissions. For the paper cup, polystyrene cup and cardboard tray, transport emissions were excluded due to data unavailability. The 2023 UK Government Carbon Conversion Factor Database was used to convert activity into carbon dioxide equivalents (CO₂e).

Table 1

| Formulation and administration method | Items included in footprint | Carbon footprint (kgCO ₂ e) per dose |
|---------------------------------------|---|---|
| Liquid - oral | Pharmaceutical Syringe | 0.476 |
| Tablet - oral | Pharmaceutical Paper cup | 0.020 |
| Effervescent - oral | Pharmaceutical Polystyrene cup Water | 0.081 |
| Liquid - IV | Pharmaceutical Giving set 2 x syringes 2 x saline flush Drawing up needle Cannula (20% allocated per dose) Cardboard tray | 1.430 |

Our CO₂e reduction was translated into miles driven using emission factor 0.3386 kgCO₂e/ mile driven in an average car with unknown fuel, from the UK Government Greenhouse gas reporting: conversion factors 2023.

Economic sustainability:

With input from the pharmacy team, we established the financial cost for the paracetamol in all forms for a 6 month period for the inpatient unit, prior to the project. We took a single snapshot of prescribed paracetamol from before implementing the project and 2 snapshots (a month apart) after the implementation to establish if there had been an average reduction in paracetamol usage. The proportional decrease was multiplied by the known supply and cost before the project to establish the economic impact - the project length did not allow time to follow actual numbers available from pharmacy. This will be followed up after the project is completed.

Social sustainability:

We timed the administration of each preparation to establish nursing time taken per dose. We recorded the space used for storage of the medication.

We asked staff for their opinion of the effectiveness, usefulness and burden of paracetamol using a Google survey.



Results:

Patient outcomes:

A snapshot of the patient medications prescribed on the unit before the start of the project revealed more than half the patients (10/18, 55%) were prescribed regular paracetamol. By the end of the study period, an average of 3.5/18 (19%) patients had regular paracetamol prescribed. This is a 66% reduction in regular paracetamol usage.

Of the 19 patients that had switched to prn paracetamol on admission, only six doses of paracetamol were administered in a two week period. If the patients had stayed on regular paracetamol on admission to MPCU, each patient could have had 56 doses in 2 weeks, a total of 1,058 doses avoided. No patient that was switched to prn paracetamol had a regular dose reinstated during the project period.

Environmental sustainability:

Based on estimated carbon footprint and six months paracetamol supply to MPCU:

| Formulation | Carbon footprint/dose (kgCO ₂ e) | Number of doses (assuming each dose in 1g) | Total Carbon Footprint pre project (kgCO ₂ e) | 66% reduction in usage due to project (kgCO ₂) |
|----------------|---|--|--|--|
| Tablets 1g | 0.020 | 16x120= 1920 | 38.4 | |
| liquid 1g | 0.476 | 5x48 =240 | 114.24 | |
| Soluble tab 1g | 0.081 | 12x4=48 | 3.888 | |
| IV 1g | 1.430 | 1x40=40 | 57.2 | |
| Total | | | 213.728 | 141.06 |

A saving of 141.06 kgCO₂e is equivalent to 417 miles driven in an average car. This is just further than the distance between London and Edinburgh! Projected to a whole year, the savings would be **282.12 kgCO₂e**, equivalent to 833 miles driven in an average car, or a return trip between London and Edinburgh.

Economic sustainability:

Figures for the six months prior to implementing the project:

| Paracetamol Formulation | Doses per unit | No units used | Cost per unit (£) | Total Cost (£) |
|----------------------------|----------------|---------------|-------------------|----------------|
| Tablets (500mg) | 32 | 120 | 0.48 | 57.60 |
| Soluble tablets (500mg) | 24 | 4 | 1.42 | 5.68 |
| Suspension (500mg in 10ml) | 10 | 48 | 3.11 | 149.28 |
| IV 1g | 1 | 40 | 1.62 | 64.80 |
| IV 500mg | 1 | 20 | 0.8 | 16.00 |
| | | | | 293.36 |

A total of £293.36 was spent in 6 months on paracetamol for inpatients on MPCU before the project was implemented. If the 66% reduction in regular paracetamol prescription continues to be seen, this would see a saving of £193.61 per 6 months, or **£387.23** in a year.

Social sustainability:

We timed the administration of each preparation to establish nursing time taken per dose. There were many variables affecting the administration time - a reasonably well patient who could accept the tablets directly from the nurse and self-administer (pouring out own water, swallowing the tablets whole, needing no support) was different to a confused patient that required encouragement, help with pouring a drink etc. Someone not confused but required tablets broken in half and individual pieces administered one at a time took longer, if help was needed to reposition a patient prior to taking the paracetamol, then even longer was taken. IV paracetamol differed if the patient had a simple cannula or a PICC line requiring sterile access. Our numbers were small for the time available to record the administration of the paracetamol - however this could vary from under a minute to over 10 and occurred 4 times a day in 55% of patients before the project was implemented. The regular prescriptions dropped by 66%, hence administration time will have been saved but we don't have exact figures as abilities of patients varies from day to day and the time taken to administer the paracetamol. We averaged the time taken for administering a dose of paracetamol during a period of observation, extrapolated that time to the percentage of patients prescribed paracetamol and multiplied that by the number of drug rounds done per day, then days per week/month.

Oral paracetamol - if this takes one minute per dose, this would be 4 minutes per day per patient, 28 minutes a week and 2 hours a month for a single patient taking regular paracetamol. For liquid paracetamol this extends to 6 hours per month and IV paracetamol to 26 hours a month - equivalent to more than two long day shifts per month of nursing time for one patient to have IV paracetamol regularly. Nursing staff were actually not too surprised by these figures.

Storage space:

Due to the previous amount of paracetamol prescribed regularly, a stock level had been established that was maintained on the ward. As this project has not been running long enough to have longer term data on pharmacy supply to MPCU, we have not reduced the stock level yet on the ward. We are aware that the volume used in the drug cupboard and on drug trolleys for all types of paracetamol in significant (especially the liquid version), are anticipating a reduction in the amount ordered from pharmacy and eventually this will lead to a stored stock reduction and hence volume reduction in the space used in the drug cupboards and trolleys on MPCU by paracetamol.

From the staff survey:

In summary, 1. the majority of nursing staff felt that patients on strong opioids who were not convinced of a benefit from taking paracetamol, did not gain much benefit from regular paracetamol 2. the burden of taking a short acting medication often seemed to outweigh the benefit, especially as patients became frailer and had to be assisted more to take the medication. 3. Paracetamol was often the medication omitted as not being seen as important when patients started to struggle to take their medications 4. There is a minority of patients who feel paracetamol either on its own or alongside another medication makes a significant difference to their pain - these are not the target of this project and will remain on



regular paracetamol for as long as is appropriate 5. All nursing staff were horrified when shown the waste from a single drug round relating to paracetamol on MPCU, obviously multiply this up by 4/day x 365 and there would be a huge amount of waste.

Staff were receptive to the project change. Many had not realised the cumulative time impact of relatively “simple” analgesia but were actually not surprised when presented with the numbers. They were surprised and horrified at the waste produced from administering paracetamol for an entire drug round (nurses will generally do a third of the ward drug round at a time), which happened 4 times a day, 7 days a week, 365 days a year. The project brings benefits to the team, reducing nursing time spent administering and documenting the administration of the paracetamol, not including time taken for restocking drug trolleys, stocking up on medication pots, cups for dissolving effervescent medication and disposing of the waste which we did not measure in this project.

Patients:

We did not have time within this project to formally assess the views of patients about the change in medication from regular to prn paracetamol. There is scope to do this as an extension to the project.

Discussion:

At the start of the project we were looking for an intervention that could be carried out relatively simply due to the proposed length of the project - 10 weeks. The project nudged us to make a small change with a relatively big impact which would positively benefit the patients (reduced medication burden compared to perceived effect), the nursing staff (time saved administering paracetamol), the environment (kgCO₂ saved), the drug budget (money not spent) with little impact on the medical staff enabling the change (asking if the patient felt the paracetamol helped and would they like to not have it regularly if not). We were hampered by industrial action, a COVID outbreak, a project team member leaving the department and annual leave within the 10 weeks - this meant that non-clinical time that would have been spent on the project was limited compared to the time we thought we would be able to commit to the project. Having said that, the medical and nursing team were so receptive to the project (the benefits were apparent to them from the outset), very little time was required to embed the change. No time was spent convincing late adopters of the benefits of the change, and a poster showing the waste produced and the nursing time taken was very well received. We have shown a reduction in regular paracetamol saves CO₂ emissions and money, extrapolated this to nursing time saved but only assumed patients feel no detriment and some benefit. This will need to be clarified in ongoing work. As the stock on the ward has been maintained thus far we have not freed up storage space on the ward - the length of the project has not shown a reduction in supply just yet but we are anticipating this in the next few months.

Sustainability (and probable expansion) of the Intervention

Being able to share the savings of medication burden, time, finances and waste with specific numbers is very impactful – everyone can see the difference they are making to patient care, the budget and themselves as well as reducing the carbon footprint of the department. It has encouraged others to look at other small changes that can be made to add to this improvement. We are looking to continue the education of new rotating medical staff by incorporating “Think Paracetamol” into the clerk-in documentation used only on our ward, and into the induction programme we have for doctors new to



palliative care. As one of the project team members will be staying at MPCU, that will leave one of the change agents to carry on the encouragement of the change, which will be a major factor in sustaining the change where medical staff turnover very regularly.

We are hoping to present our findings at palliative care conferences as a poster – there are several different events being attended by members of the palliative care team in 2024 – as this project has both a symptom management aspect as well as environmental impact. With more than 200 independent hospices in the UK, this relatively small change could have a much bigger impact if adopted by even a proportion of these. We will also incorporate the findings into education events hosted locally and look to rolling the intervention out to other areas in the hospital in the future.

Conclusions:

Within the confines of a short project, we have shown that patients on a strong opioid who do not feel their regular paracetamol is particularly beneficial can have this discontinued as a regular, four times a day medication with a reduction in CO2 emissions, nursing time spent, waste produced and a modest cost saving to the department. We have assumed this is not detrimental to the patient as none of the patients had this reinstated as a regular medication while on the ward. Further work could be done looking at patient's views on the tablet burden and effect of not being on regular paracetamol, out with the timeframe of this project.

References

1. Ventafridda V, Saita L, Ripamonti C, De Conno F. WHO guidelines for the use of analgesics in cancer pain. *Int J Tissue React.* 1985;7(1):93-6.
2. Is Acetaminophen beneficial in patients with cancer pain who are on strong opioids? A randomized controlled trial. Leiva-Vasquez et al, *JPSM* 2023 Sep;66(3):183-192
3. UK and England's carbon footprint to 2020. Department for Food, Environment and Rural Affairs. <https://www.gov.uk/government/statistics/uks-carbon-footprint#full-publication-update-histor> (accessed 17/12/23).
4. [Greenhouse gas reporting: conversion factors 2023 - GOV.UK \(www.gov.uk\)](#)



Critical success factors

Please select one or two of the below factors that you believe were most essential to ensure the success of your project changes.

| People | Process | Resources | Context |
|--|--|--|---|
| <input type="checkbox"/> Patient involvement and/or appropriate information for patients - to raise awareness and understanding of intervention <input checked="" type="checkbox"/> Staff engagement <input type="checkbox"/> MDT / Cross-department communication <input type="checkbox"/> Skills and capability of staff <input checked="" type="checkbox"/> Team/service agreement that there is a problem and changes are suitable to trial (Knowledge and understanding of the issue) <input checked="" type="checkbox"/> Support from senior organisational or system leaders | <input type="checkbox"/> clear guidance / evidence / policy to support the intervention. <input type="checkbox"/> Incentivisation of the strategy – e.g., QOF in general practice <input type="checkbox"/> systematic and coordinated approach <input type="checkbox"/> clear, measurable targets <input type="checkbox"/> long-term strategy for sustaining and embedding change developed in planning phase <input checked="" type="checkbox"/> integrating the intervention into the natural workflow, team functions, technology systems, and incentive structures of the team/service/organisation | <input checked="" type="checkbox"/> Dedicated time <input type="checkbox"/> QI training / information resources and organisation process / support <input type="checkbox"/> Infrastructure capable of providing teams with information, data and equipment needed <input checked="" type="checkbox"/> Research / evidence of change successfully implemented elsewhere <input type="checkbox"/> Financial investment | <input type="checkbox"/> aims aligned with wider service, organisational or system goals. <input checked="" type="checkbox"/> Links to patient benefits / clinical outcomes <input checked="" type="checkbox"/> Links to staff benefits <input checked="" type="checkbox"/> 'Permission' given through the organisational context, capacity and positive change culture. |