Reducing rates of Taxane-related Hypersensitivity on the Chemotherapy Unit: A Quality Improvement Project

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Introduction

Hypersensitivity reactions to cytotoxic agents are a well-recognised complication. Among the different classes of cytotoxic agents, Taxanes have been shown to have a variable incidence of hypersensitivity (mostly occurring within the first two cycles), some figures reporting up to 50% [1]. Reactions are predominantly mild in nature but can be severe and lead to serious harm. Whilst there is uncertainty regarding the specific cause for Taxane-related hypersensitivity (TRH), postulated theories include direct action from the drug itself, a consequence of the chemical vehicle in which the drug is dissolved or other risk factors including a prior history of allergic phenotype [1]. Symptoms may include any combination of skin rashes, symptomatic bronchospasm, haemodynamic changes, angioedema and most severely anaphylaxis [2]. This may lead to patient harm [physical and psychological], increase chemotherapy chair times and cost associated with additional supportive medications on services which are already under pressure to address the increasing incidence of cancer. Given the significant effects this problem can have, a Quality Improvement project was designed to reduce the rates of TRH on a chemotherapy unit at a single centre.

Baseline characteristics (per administration)	Paclitaxel (n=181)	Docetaxel (n=37)
Median Age	66	59
Mean Dose (mg/m²)	120.34	74.32
Breast Primary site	44	26
Gynaecological Primary site	58	0
Other* Primary site	8	11
Prior hypersensitivity prophylaxis (antihistamine or modified infusion rate)	3	0
Grade 1 reaction	8	0
Grade 2-3 reaction	18	1
Grade 4-5 reaction	0	0
Total reactions (%)	9.8	2.7

Figure 1: Baseline data characteristics by Taxane administration (*Includes Lung, Prostate, Oesophagus and Anal canal)

References

1. [redacted]
2. [redacted]
3. [redacted]
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5. [redacted]
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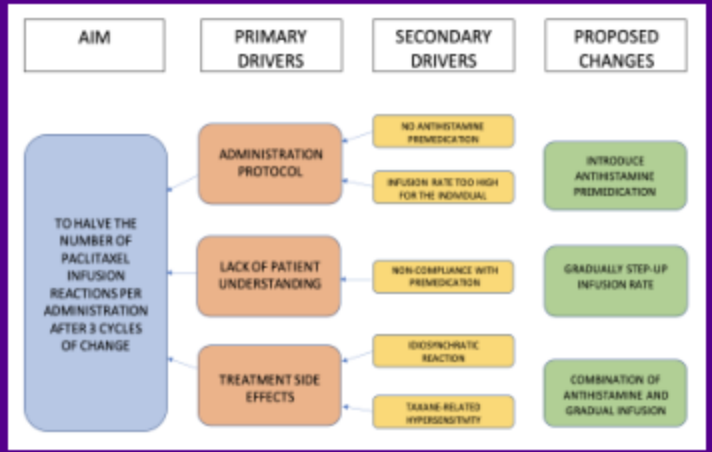

Figure 2: Project Driver Diagram

Method

The project was undertaken at a single cancer centre in collaboration with the Chemotherapy Unit. Initial baseline data was taken retrospectively to assess information over a 2-month period, related to both Paclitaxel and Docetaxel administrations. After initial baseline data collection, the decision was made to focus on reactions to Paclitaxel to reduce patient harm whilst also improving both time- and cost-efficiency on the chemotherapy unit.

The first intervention cycle was to gradually increase the Paclitaxel infusion rate. This was agreed with the Chemotherapy Nursing and Management staff. It involved priming the tubing with a bolus of 20mL over one minute [3]. Following this an incremental increase in Paclitaxel infusion volume was used; specific volumes were used based on the dose scheduling as follows:

3-weekly infusion - 10mL, 25mL, 50mL and 100mL/hour each over 5 minutes followed by 182mL/hour for the remaining 2 hours and 40 minutes [3].

Weekly infusion - 10mL, 25mL, 50mL and 100mL/hour each over 5 minutes followed by 35mL/hour for the remaining 40 minutes [3].

On studying the data yielded in the first cycle of change, the data was so positive that the decision was taken to exclude further cycles of change and terminate the project early.

Results

The results from the first intervention cycle met the overall aim of the project and led to a clinically significant reduction in hypersensitivity reaction rates. The modified infusion rate has now become standard practice on the Chemotherapy Unit and the change has been sustained.

The reduction in hypersensitivity reactions also has potential implications for cost reduction. Using NHS indicative drug costs, the price of one acute administration of Hydrocortisone and Chlorphenamine is £6.62 [4] [5]. In addition, the cost of supportive medications used for subsequent cycles following a reaction must be considered. Locally, this consists of a 3-day supply of Dexamethasone, Cetirizine and Famotidine tablets. Assuming a hypersensitivity reaction during cycle 2 of treatment and a total course of 6 cycles, the sum cost of additional supportive medications per patient is £13.28 [6] [7] [8]. Using the baseline data for extrapolation, 90 hypersensitivity reactions can be expected over the course of one year. This yields a total cost of additional medications of £1,791.66 per year. Therefore, each hypersensitivity reaction avoided would lead to a saving of £19.90, not to mention extra chair-time avoided.

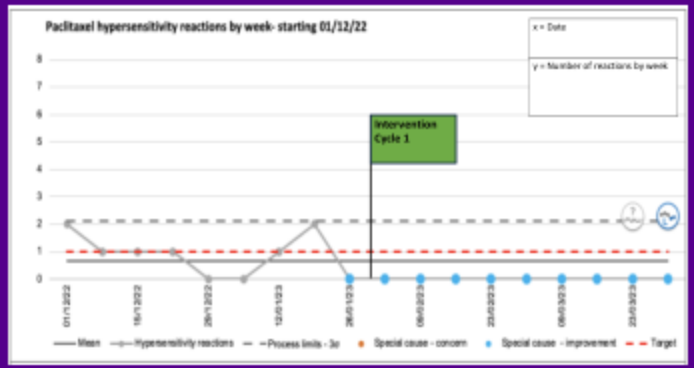

Figure 3: Statistical Process Control (SPC) chart for reactions over time

Conclusion

TRH persists as a clinical entity throughout Chemotherapy Units treating people with cancer. It has implications on physical and psychological health of patients, as well as efficiency of service provision. Designing a project to address this issue had the potential for significant improvement. There is evidence to suggest that modifying the chemotherapy infusion rate can reduce reactions. This project was designed using Quality Improvement methodology to reduce hypersensitivity rates to Paclitaxel in a single centre. The initial aim was to reduce the reaction rates by half, but following the first intervention, reaction rates were reduced to zero over a 2-month period. This was following implementation of a new infusion rate. Whilst improving clinical safety, it also has implications to reduce cost of supportive medications. This change was made permanent because of the work in this project. Further work to assess if this efficacy has been sustained locally would be beneficial, alongside work in other centres among alternative populations.