Prescription of Lubricating Eye Drops in the Eye Emergency Department

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ABSTRACT

Dry eye disease (DED) is a common condition seen in the emergency eye department (EED). However, prescription choice of lubricating eye drops varies among healthcare providers. This study aimed to develop an up-to-date, standardized algorithm for the prescription of lubricating eye drops in the EED at the Manchester Royal Eye Hospital (MREH) and assess it's impact on the rate of inappropriate lubricant prescriptions for patients. Secondary assessment additionally involved analysis of cost to hospital. Data from 845 EED attendees over a 3-month period were analyzed, with 157 patients meeting study inclusion and exclusion criteria. Following literature review and collaboration with the Corneal department at MREH, an algorithm for the prescription of lubricants in the EED was developed. Three plan-do-study-act (PDSA) cycles were conducted including various interventions such as posters promoting the guideline. The appropriateness of prescriptions was assessed by clinical correlation in conjunction with the algorithm produced, by a specialized ophthalmology registrar. The study found a substantial improvement in the number of appropriate prescriptions, with an increase from 55% to 93% over the three PDSA cycles. There was additionally a 51% reduction in expenditure on lubricant prescriptions, resulting in cost savings for the hospital (approximate saving of £50/week). This study highlights the inconsistent management of DED in the EED and the potential lack of training in this area for healthcare providers. The implementation of a standardized, easy-to-follow guideline for lubricating eye drops can has shown to help improve disease management while also resulting in cost savings for the hospital.

1. BACKGROUND

"Dry eye is a multifactorial disease of the ocular surface characterized by a loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiological roles." [1]. Over the last 10-20 years, significant advances have been made regarding understanding pathology and treatment [2]. Following this, a wide range of lubricating eye drops are available through the NHS, with considerable differences in formulation (drop, gel, ointment), ingredient, and price.

Despite international and national guidelines, there have been concerns regarding inconsistent and inappropriate prescription of second- and third-line lubricating drops in place of first-line agents, with consequences on patient management as well as cost to the EED.

2. AIMS AND STANDARDS

1. Update the MREH guidelines to keep up with current national guidelines and hospital formulary.

2. Measure the degree of inappropriate prescriptions and improve outcomes for this.
   - 100% of prescriptions should be deemed as 'appropriate'.

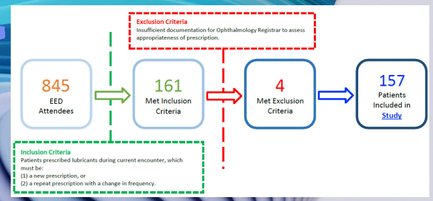
3. Reduce inappropriate prescribing and therefore reduce costs for the Trust.
   - 100% of medical notes should contain reasoning for lubricant choice, as well as signs, symptoms, and examination findings of DED.

3. METHODS

3.1 Literature search

An electronic literature search was conducted using combinations of the following main keywords: dry eye disease, lubricating eye drops, and guidelines. The literature review, in collaboration with the Cornea team at the MREH, led to the development of a lubricant eye drop prescription algorithm (Figure 1) intended for use in the EED. National (BNF, NICE 3]), and international (DEWS2017 [1]) guidance was incorporated to update an algorithm created for MREH, taking into consideration the hospital formulary and cost of drug.

3.2 Inclusion and Exclusion Criteria



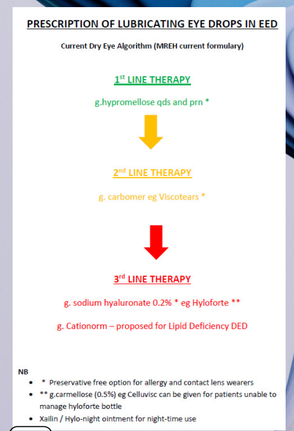


Figure 1

Baseline and PDSA Cycles

Following selection of patients, the following interventions and Plan-Do-Study-Act (PDSA) [4] cycles were performed:

First Cycle

Email distributed to EED staff including physicians, nurses, and pharmacists. There was emphasis placed on **adequate documentation of signs and symptoms of DED**.
The **virtual poster** (Figure 1) was circulated as part of the email.

Second Cycle

Physical copies of poster placed on every consultation desk in EED.
In-person reminders given at morning handover.

Third Cycle

Email and virtual poster re-distributed to EED staff (as above), including **new incoming Ophthalmology trainees.**
A **reminder message** was circulated on trainee social media group.

4. PATIENT DEMOGRAPHICS

Figures 2 and 3 illustrate the gender and age demographics of the patients included in the study respectively.

Literature states one in four patients seen by Ophthalmologists present with symptoms of dry eye [5]. Our study found comparable results, with 20% of EED attendees requiring a lubricant prescription for dry eye symptoms. A total of 195 lubricant prescriptions were made across the 157 patients in this study; 186 prescriptions were new, while 9 were an increase in frequency of an existing prescription.

The patient's clinical background combined with guidance from DEWS 2017 [1], was used to categorize the DED as 'mild', 'moderate', or 'severe' by an ophthalmology registrar (Figure 4). This information, alongside use of clinical judgement and the algorithm produced, was also used to guide a judgement by the registrar on whether a prescription was categorized as "appropriate" i.e. the correct drug was prescribed, or "inappropriate" i.e. a different prescription should ideally have been used.

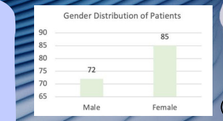


Figure 2

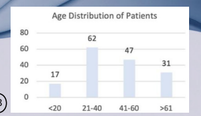


Figure 3

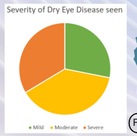


Figure 4

Figure 4 shows ED clinicians were prescribing lubricants for a range of DED severity; roughly equal levels of mild, moderate and severe disease. Often DED is not a patient's primary reason for presenting to ED. Therefore a multi-step algorithm that targets multiple levels of severity is ideal for an EED environment where clearly prescribers are seeing a range of disease severity for which they may be expected to make fast decisions particularly if it is not the primary presenting complaint.

5. RESULTS AND OUTCOMES

The proportion of appropriate prescriptions, based on the criteria explained above, improved significantly across the study period as shown in Figure 5.

Hypromellose prescriptions increased from 20% pre-intervention to 45% post-third cycle, while Hylo-Forte prescriptions decreased from 26% to 7% (Figure 6). Perhaps, the use of Carbomer drops over Hylo-Forte in managing comparable cases may account for this. This is reflected in Figure 7 by the inversely proportional relationship between the two drugs following the second interventional cycle. Overall, there was a significant increase in the prescription of first- and secondline lubricant drops, replacing the inappropriate high rates of third-line prescriptions prior to the study.

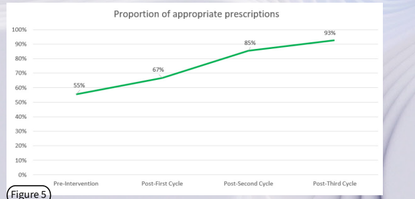


Figure 5

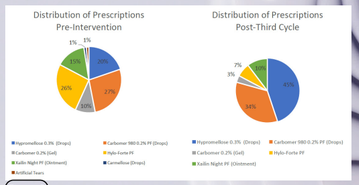


Figure 6

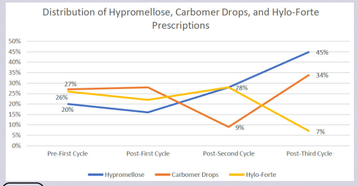


Figure 7

6. COST ANALYSIS

The cost per pack of formulation was provided by the hospital pharmacy at MREH, as shown below:

Cost analysis combines the cost of the drugs (Figure 9) and data on distribution of prescriptions across all interventional cycles. It is calculated per 100 patients attending the EED who required a lubricant prescription.

The following calculations were used determine cost analysis for all prescriptions made per interventional cycle; results are shown in of Figure 10:

Percentage Distribution of Drug A (per cycle) x Cost per Pack of Drug A (£) = Total Cost of Drug A (£)

Sum of the Total Cost of All Drugs (per cycle) = Total Cost of Prescriptions per Cycle

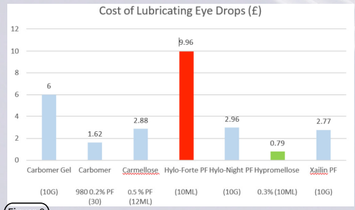


Figure 8

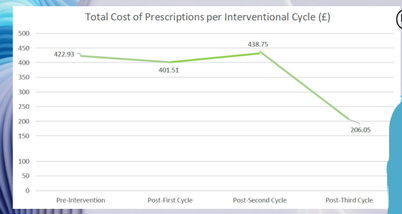


Figure 9

7. DISCUSSION

Dry eye disease impacts patients' quality of life: patients with worse DED were found to have a greater decline in socioemotional functioning, vision-related quality of life, daily activities, and work productivity, in a patient reported questionnaire-based study by Hassan et al [7]. Due to the volume of patients seen in EED, improved management of DED may have significant impacts on the quality of lives of the patient population as a whole.

Overall our study yielded positive results. The interventions resulted in a clear improvement in the number of appropriate prescriptions.
The greatest outcomes resulted from interventions of the third PDSA cycle. This may have been due to the influx of new ophthalmology Specialty Trainees (STs) who were exposed to the updated algorithm from the beginning of their training, in comparison to trainees who were asked to change their pre-existing prescribing habits and patterns, as would have been the case during the earlier phases of the study. The cumulative effects of prior cycles may additionally have contributed to better outcomes during the last phase of the study.

8. CONCLUSION

The quality improvement project resulted in an overall 38% improvement in the appropriateness of prescriptions, as well as providing a 51% reduction in the total expenditure of lubricant prescriptions across the time period investigated. In addition, the rate of adequate documentation regarding signs, symptoms, and examination findings of DED improved across all three interventional cycles (92%, 83%, and 85% respectively) compared to pre-intervention (74%).

We therefore conclude that the introduction of an easy-to-follow algorithm for lubricant prescription in the EED can help to standardize and improve management of DED in the EED and also potentially reduce costs to the trust. Continued clinical application of the updated algorithm will standardize the management of dry eye symptoms presenting to the EED, allowing the prescriber scope for appropriate escalation, whilst being mindful of cost.

9.1 Limitations:

Patients were excluded from the study due to insufficient documentation; as such, the Ophthalmology Registrar could not assess the appropriateness of prescriptions or severity of the condition. It may be the case that milder cases of DED were more likely to have poorer documentation, thus biasing study results.
Additionally, patients are not always compliant with lubricating eye drops and thus sources such as the Greater Manchester Care Record [6] may not be an accurate reflection of what the patient is currently taking. In cases where this was not clearly documented in the notes, it was assumed patients were using their drops as prescribed on GMCR, which poses a limitation as this may not always be the case in practice.

9.2 Recommendations:

Formal teaching sessions on prescribing lubricating eye drops in the EED should be incorporated into the training curriculum for all trainees. The successful outcomes of the third interventional cycle in this study may indicate a potential lack of standardized knowledge on DED prescribing. Upon informally speaking to trainees while conducting this study, many trainees also felt this to be the case.

Lastly, mentioning the algorithm during induction of new trainees to the department may be beneficial as the project shows lubricants are frequently prescribed in the EED, therefore as well as improving management of DED, the cost reduction for the department can be significant if the algorithm is properly followed.

10. REFERENCES

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