Heparin Prescribing in Patients with Renal Impairment – have PCIS Pathways made a difference?

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INTRODUCTION AND AIMS

Low Molecular Weight Heparins (LMWH) have generally replaced the use of unfractionated heparin (UFH) as they are seen to provide as safe and efficacious a treatment as UFH, but with reduced incidence of side-effects, as well as the requirement for only once or twice daily dosing and limited monitoring.[1] LMWH are predominately eliminated by the kidney and therefore dose reduction is required in renal impairment to decrease the risk of bleeding.

For the past 15 years, Wirral Hospital NHS Trust has used an integrated electronic record system (PCIS) of which electronic prescribing is a component. This system incorporates prescribing pathways that aim to provide the prescriber with appropriate clinical decision support. Such a pathway was introduced for LMWH to ensure patients with renal impairment were prescribed the appropriate LMWH at the appropriate dose. Screens guide the prescriber to the appropriate drug and dose, dependent on the patient's weight, creatinine clearance (CrCl) and the treatment indication; an example can be seen in Fig. 1. This research aimed to establish if the pathway was being used correctly and if modifications had improved prescribing in patients with renal impairment.

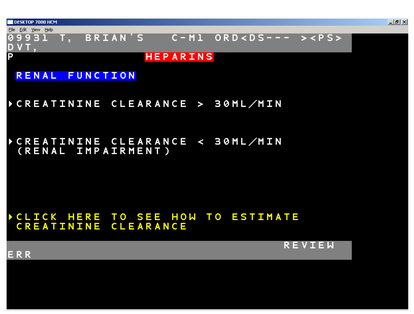

Fig. 1 Example of a prescribing screen used as part of the LMWH prescribing pathway.

METHOD

The data collection took place over a four-week period in early January 2007 at the Arrowe Park Hospital site of Wirral Hospital NHS Trust. All patients prescribed a LMWH in the preceding 24 hours were identified and those relevant to the study were assessed with necessary data collected via perusal of their medical notes. Body Mass Index (BMI) was calculated for each patient and, if necessary, their Ideal Body Weight (IBW). Each patient's renal function was calculated using the Cockcroft and Gault equation and then their LMWH prescription was assessed to establish if the patient had received the appropriate LMWH and dose for their renal function.

RESULTS

A total of 268 patients were suitable for inclusion in this research. Initial examination of the data showed 79.9% (214 patients) were prescribed the correct LMWH for their condition with the correct dose, 17.1% (46 patients) were prescribed the correct LMWH for their condition but the incorrect dose, and 3% (8 patients) were prescribed both the incorrect LMWH and thus the incorrect dose (see Fig. 2).

When examined as two separate groups, those with CrCl >30ml/min and a CrCl <30ml/min the results show a difference. Patients with a CrCl >30ml/min totalled 211. Of these, 90% (190 patients) were prescribed the correct LMWH and dose, the remaining 10% (21 patients) of prescriptions contained some sort of error, be it the incorrect drug, incorrect dose or both (see Fig. 4).

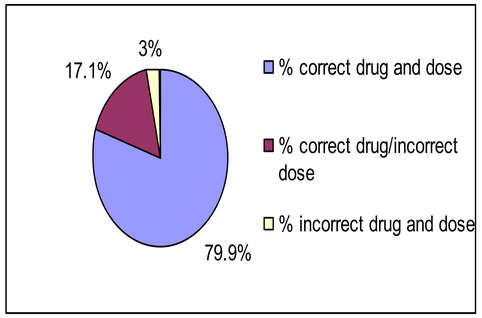

Fig. 2 Percentage of prescriptions that were prescribed appropriately for the patient's renal function.

Patients with a CrCl <30ml/min totalled 57. Of these, 42.2% (24 patients) were prescribed the correct LMWH and dose, the remaining 57.8% (33 patients) of prescriptions contained an error (see Fig. 3).

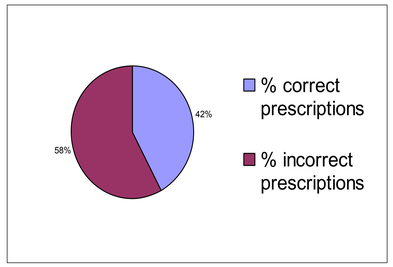

Fig. 3 Percentage of prescriptions that were prescribed correctly for patients with CrCl <30ml/min (renal impairment).

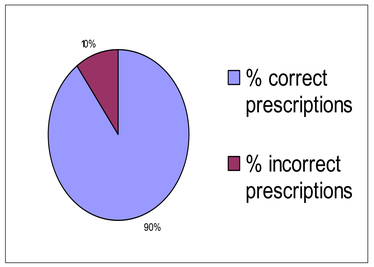

Fig. 4 Percentage of prescriptions that were prescribed correctly for patients with CrCl >30ml/min (no renal impairment).

Of the 57.8% of incorrect prescriptions for patients with severe renal impairment (CrCl <30ml/min), the majority were overdoses. These overdoses can be separated into two discrete groups; patients who were prescribed for using the 'Surgical high risk' or 'Medical at risk' pathways received Enoxaparin 40mg nocte when the appropriate dose was Enoxaparin 20mg nocte and patients who received LMWH's using the 'Unstable angina' pathway who were prescribed Enoxaparin 1mg/kg BD when they should have received Enoxaparin 1mg/kg OD.

Patients with renal impairment who were prescribed for prior to the introduction of the pathway were also reviewed. Of the 23 patients, one patient was prescribed the correct LMWH for their condition and the correct dose, the percentage of prescriptions containing some sort of error totalled 95.7%.

DISCUSSION

These results mirror previously published research: studies in the US indicated that, in general, the introduction of electronic prescribing resulted in significant reductions in medication errors. [2,3] Another showed a decrease in medication errors by 55 per cent.[4] The findings of this research supports other published evidence for patients with renal impairment. A study carried out at Brigham and Women's Hospital, Boston, Massachusetts showed the introduction of a computer-based decision support system to be a complete success, improving both dose and frequency errors in patients with renal impairment.[5] This research concurs with the study carried out in Brigham and Women's Hospital, although it appears that the decision support system at Wirral Hospital NHS Trust is not as successful. The system at Brigham and Women's automatically calculates a patient's creatinine clearance and then makes dose adjustments where necessary.[5] The system at Wirral Hospital NHS Trust does not have these functionalities and their addition could benefit LMWH prescribing accuracy.

Prescribing of LMWH under the appropriate indication was shown to be very successful. This supports previous research carried out by Wirral Hospitals NHS Trust that showed the prescribing of LMWH was appropriate for the indication and that success in this area of the pathway has continued.[6]

CONCLUSION

- The modified pathway has improved prescribing of LMWH in patients with renal impairment, but the research has highlighted areas for improvement
- It is essential to direct prescribers to the need for accurate calculation of creatinine clearance and ensure that they appreciate that merely consulting serum creatinine levels is inappropriate when assessing a patient's renal function.
- Ensure nursing staff appreciate the need for accurate and consistent recording of patients' heights and weights. Also, recording of these measurements using the electronic patient record system to increase data accessibility.
- Need to consider the addition of an extra indication to the pathway for the prescribing of LMWH post-MI.
- Investigate the possibility of modifying the current system to calculate creatinine clearance automatically. If this is not possible, ensure that new electronic prescribing systems not only have the level of functionality to calculate creatinine clearance but also direct prescribers to the correct dose for those drugs where dosage adjustment is needed.

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