Towards Safer Use of Opioids

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Abstract
The main aim of our work was to improve the safety of opioid use in our institution, an acute general hospital with 620 beds. Initially, all reported opioid errors from 2001 â€“ 2006 were audited. The findings directed a range of multidisciplinary staff educational inputs to improve opioid prescribing and administration practice, and encourage drug error reporting. 448 drug errors were reported, of which 54(12%) involved opioids; of these, 43(79%) involved codeine, morphine or oxycodone. 31 of the errors (57%) were associated with administration, followed by 12(22%) with dispensing and 11(20%) with prescribing. There were 2 reports of definite patient harm. A subsequent audit examined a 17−month period following the introduction of the above teaching: 17 errors were noted, of which 14(83%) involved codeine, morphine or oxycodone. Again, drug administration was most error−prone, comprising 11(65%) of reports. However, just 2(12%) of the reported errors now involved prescribing, which was a reduction.

Introduction
Opioids are indicated for the relief of pain, particularly in the context of cancer, where the WHO Analgesic Ladder has provided a logical approach to their use[1]. They also have antitussive action, and may be used for palliation of dyspnoea refractory to medical treatment. In addition to codeine and morphine, there are many other strong opioids now available, including oxycodone, hydromorphone, fentanyl and buprenorphine, which may be less familiar to general hospital medical and nursing staff. Given the array of opioids, with varying potency, modified−release formulations, and a range of administration routes (including subcutaneous and transdermal), there is the potential for incorrect prescribing, mistakes in drug administration, and consequent risk of harm to patients. For these reasons, opioids are recognised as â€˜high alertâ€™ medications by many international bodies, including the American Institute for Safe Medication Practices (ISMP)[2]. The prescribing of medicines is the commonest healthcare intervention in developed countries[3]. Internationally, it is estimated that around 6.5% of hospital in−patients experience an adverse drug event during their stay[4]. It is noted that medication error is the single most preventable cause of patient injury[5].

Methods
A retrospective audit of our hospitalâ€™s medication event record was carried out. The study period was June 2001 â€“ May 2006 inclusive. All events involving opioids were recorded, and classified as errors of prescribing, dispensing or administration. Prescribing error was defined as an incorrect drug selection for a patient, with respect to any of dose, strength, route, quantity, indications or contraindications[6]; dispensing error was defined as that occurring at any stage during the dispensing process, from the time of notification of prescription in pharmacy to supply of dispensed product on the ward; administration error was defined as any discrepancy between drug treatment received by patient and that intended by prescriber[7]. Any cases where patients suffered harm[8] were noted.

This audit (results of which are described below) formed the basis of educational initiatives directed at medical and nursing staff in our hospital. The work was presented to medical staff at Grand Rounds in early February 2007, and included a discussion on opioid prescribing, including appropriate choice of drug, dose and route of administration in different clinical circumstances. At ward level, informal teaching was provided to nursing staff, whose responsibility includes the safe administration of medication to patients. Particular emphasis was placed on the difference between sustained and normal release formulations of common strong opioids and their associated brand names. In addition, any opioid prescribing or administration errors detected on review of drug kardexes or ward MDA records were brought to the attention of ward managers, and the submission of a formal drug error report was encouraged. Where possible, the doctors or nurses associated with such errors were identified, and informal feed−back and teaching was given. The palliative care team, in conjunction with the hospital pharmacy department, produced guidelines on opioid dose conversions, which were circulated to most wards and clinical areas (a section of this is shown in table 1). A further formal teaching session to reinforce safe prescribing of common opioids was provided for interns in January 2008.

Results
Initial audit: June 2001 â€“ May 2006 (Tables 2 and 3)
Over the five years from June 2001 to May 2006, a total of 448 medication errors were reported; of these, 54 errors (12%) involved opioids. Thirty one (57%) of the opioid errors were associated with drug administration, another 12 (22%) occurred during dispensing, and 11 (20%) were prescription errors. Seventeen (31%) of the opioid errors involved codeine or dihydrocodeine, and 13 (24%) involved each of morphine and oxycodone.

Of the codeine/dihydrocodeine errors, 6 (35%) were associated with each of prescribing and administration, and the remaining 5 (29%) with dispensing. Of the oxycodone errors, 9 (69%) occurred at the administration stage, and just under half of these resulted from confusion between the brand names *OxyContin* (slow release oxycodone), *OxyNorm* (normal release oxycodone) and other unrelated drugs with similar sounding names, such as oxybutynin. Of the morphine errors, 7 (54%) occurred at the administration stage, and 3 (23%) at each of prescribing and dispensing. All of the dispensing errors (typically, shortfalls in tablets/ampoules identified during ward−level MDA check counts) were intercepted before reaching patients.

There were only 2 reported instances of harm suffered by patients as a result of opioid errors during the study period. The single most serious event occurred when pethidine 25mg had been correctly prescribed, but *Palladone* (hydromorphone) 25mg was administered. The patient concerned suffered severe respiratory compromise, and required a period of ventilatory support in the intensive care unit, before making a full recovery. The second most serious event occurred when a subcutaneous infusion of hydromorphone was incorrectly administered as 40mg over 24 hours, rather than the prescribed 10mg over 24 hours. Although the patient suffered sedation resulted, a full recovery was made without any specific emergency intervention.

There were 2 other serious prescribing errors which had the potential to cause harm. The first of these involved *OxyNorm Concentrate* (normal release oxycodone liquid), where 2mg had been the intended dose in the particular case, but 2ml was prescribed and administered. Given that *OxyNorm Concentrate* is of 10mg/ml strength, the patient concerned received approximately ten times the intended dose; fortunately, no apparent adverse effects were noted. The other potentially harmful error was the prescription of morphine sulphate 1 gram, but this mistake was intercepted by ward nursing staff, and the dose error subsequently corrected.

Follow−up audit: February 2007 â€“ June 2008 (Tables 2 and 3)
Following the introduction of staff educational initiatives in February 2007, we repeated the audit of reported opioid errors, examining a 17−month period up to the end of June 2008. Over this time, a total of 123 drug errors were reported, and 17 (14%) of these involved opioids. 11 (65%) of these errors were associated with drug administration, 4 (23%) with dispensing, and 2 (12%) with prescribing. This time, morphine was involved in the majority of reported errors (41%), and of these, 86% were associated with administration, and 14% with dispensing. There were no reported morphine prescription errors. Oxycodone featured in 24% of reported errors, and these were evenly divided between administration and dispensing errors (50% each). There were no reported oxycodone prescription errors. Codeine/dihydrocodeine was involved in approximately 18% of reported errors, and 67% of these were associated with administration, the other 33% with prescription.

Discussion
Given the voluntary nature of medication event reporting, the foregoing data almost certainly underestimate the true extent of opioid error in our hospital. The low level of error reporting in both audits meant that statistical significance of interventions could not be measured. Nevertheless, our figure of 12% for opioid errors as a proportion of all drug errors reported, is similar to that obtained in a similar, but larger American study (15.8%)[9]. Our work identified three opioids, codeine/dihydrocodeine, morphine and oxycodone, which together accounted for the vast majority of reported opioid errors: 79% in the initial audit, and 83% in the follow−up study. Overall, it seems that most errors were associated with medication administration (54% of errors in the initial audit, 65% in the follow−up audit). Many of these errors appeared to result from confusion between similar−sounding drug names, e.g. OxyNorm / Oramorph; Tylex/ Toilax; OxyContin/ OxyNorm; OxyContin/ oxybutynin. The single most serious error, which lead to an adverse patient outcome (see text above) is likely to have resulted from confusion between the names pethidine and Palladone.

It is concerning that the proportion of opioid administration errors was higher in the follow−up audit than in the initial study (65% compared to 54%). This may reflect increased medication error reporting by clinical staff as a result of the teaching effort. However, it is clear that this area needs continued attention with respect to promoting care and attention to detail when medications are being administered[10]. Drug dispensing was the second largest source of opioid errors in both audits. Detailed discussion of this is beyond the scope of this article. The Pharmaceutical Society of Ireland has previously advised pharmacists in relation to this matter[11]. Prescribing accounted for the smallest proportion of reported opioid errors (22% in the initial audit, reduced to 12% in the follow−up study). There were very few clinically serious events in this category; the most notable was an instance where OxyNorm Concentrate (normal release oxycodone liquid) had been prescribed as a volume in millilitres, rather than as a specific dose in milligrams. Our experience is that this is a common point of confusion among medical and nursing staff, who may not always appreciate that, given the concentration of normal release oxycodone liquid (10mg per 1ml), typical doses are measured in tenths of a millilitre.

Safe prescribing is largely a matter of care and attention to detail in the selection of particular medicines for individual patients. The various elements of safe prescribing have been described in detail elsewhere[12]. One notable issue is that of generic versus branded prescribing. Whilst generic prescribing is widely accepted as best practice for most drugs, this is not the case for products with modified−release formulations, whose composition and pharmacokinetic characteristics are more difficult to standardise[13]. The British National Formulary advises that modified−release forms of diltiazem and nifedipine be prescribed by their respective brand names. Many authorities recommend that the same principle be applied to strong opioids, both oral drugs and transdermal preparations[14]. Whilst electronic prescribing might have potential to reduce some of the human error associated with handwritten prescriptions, a major obstacle to its provision in Ireland would be the development and rolling−out of the necessary information technology[15].

Medication safety is a global healthcare issue. It is desirable that local error−reporting systems (hospital level), feeding into regional and national systems, should collect information accurately on baseline medication error rates and their distribution, in order to direct appropriate preventative measures. Much can be learnt from our international and local colleagues in this regard. The US operates a national medication error reporting system , which is a collaborative effort involving the Food and Drugs Administration(FDA), the Institute for Safe Medication Practices(ISMP) and the US Pharmacopoeia (USP); since 2000, over 95,000 error reports have been registered[16]. Four Irish hospitals recently piloted the use of a software package from the ISMP to obtain a standardised central record of medication error, with potential to facilitate comparison with international data[17]. At hospital level, pharmacists have an integral role in medication safety, increasingly as part of multidisciplinary teams. The ISMP philosophy of â€˜fixing the system rather than blaming the individualâ€™ is at the heart of safe medication use in hospital. Our local approach has been to encourage error reporting as a learning opportunity, and part of the process of maintaining high professional standards, which is what our patients deserve.

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Comments:
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Acknowledgement: