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Recommendations for Medication Errors Prevention

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Drugs that are used in intensive care settings are numerous and often have narrow therapeutic margins. Patients have severe conditions that evolve quickly and require frequent adaptation of treatments. In such a dynamic and complex environment, medication errors are admittedly common and, given the low physiological reserves of patients, have therefore potential critical consequences. However, incidence figures are somewhat puzzling. According to a recent review of the available literature (Kane-Gill and Weber, 2006), the frequency of medication errors varies from 1.2 to 947 per 100 patient-days. When the number of administrations is used as denominator, large variations still remain, the frequency of medication errors being in the range of 3.3 10-2 and 4.4 10-1. (Tissot et al. 1999; Calabrese et al. 2001; van den Bemt et al. 2002). Unfortunately, given the large differences in actual medication processes and evaluation methodologies, it is unlikely that more accurate figures that could be generalised to various types of settings would be available soon.

Whatever the true figures, one has to consider that such high rates characterise unreliable processes and would require immediate corrective actions in other areas (Leape, 1994; Garnerin, 2007). Therefore, in order to guide prevention strategies, we present a model eliciting the various ways in which the medication process can fail during drug preparation or administration. On the basis of this model and despite the lack of strong scientific evidence, recommendations for error prevention are suggested.

Modelling Medication Errors

The model is based on an event tree (IEC, 1990) which combines the different human errors leading to medication errors using AND and OR logical gates (Fig. 1). In this model, medication errors are the result of either preparation errors (incl. Wrong drug, dilution and labelling errors) or administration errors (syringe swap, route, amount/flow, time patient errors).

Prevention of Drug, Syringe Swap and Route Errors

The model materialises that wrong drug errors, syringe swap errors and wrong route errors are the result of both a selection error and a check failure. Consequently, prevention strategies should be based both on limiting opportunities for mixingup drugs, syringes or injection lines and on increasing check reliability. A five-fold decrease in the probability of selection errors associated with a five-fold decrease in the probability of check failures will result in a 25-fold decrease in the risk of wrong-drug, syringe swap or wrong route errors.

To reduce the probability of selection errors, several actions could be combined such as limiting the variety and quantity of available drugs, improving the stowage of drugs or syringes in medication cabinets, trolleys or trays, increasing the visual differentiation of drugs, syringes or injection lines using shapes or labels. In particular, labels should always mention complete drug strength information, concentration, amount and volume, and be printed at fixed locations. Labels should also incorporate Tall-Man letters, as well as colour to discriminate between different drug classes, and be attached to ampoules along their main axis. Decreasing the probability of check failure could be obtained via a variety of complementary means such as checklists, barcodes, electronic tags and dedicated line connectors in addition to continuous education and team work.

Prevention of Other Errors

Although our model still does not detail the various mechanisms leading to other errors, several options for prevention can already be mentioned. Developing dilution protocols and standardising dilutions across healthcare institutions could be a first step to limiting dilution errors. But resorting to ready-to-use products prepared either by hospital pharmacies or pharmaceutical companies could represent a decisive fix. Labelling errors could be reduced by filling up and identifying syringes one at a time and more effectively, by using, once again, ready-to-use products. Finally,

information technologies could have the potential to limit amount/flow, time and patient errors. For instance, having medical devices coupled with computerised physician order entry systems could help to administer accurate boluses and select appropriate flows, whereas electronic reminders could facilitate the timely administration of drugs. In addition, reading barcodes or electronic tags both on patient wrist bands and drugs could contribute to a reliable verification of drugs administered to the patient.

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