

Individual Research Project Presentations Day 10th June 2024, Kent and Medway Medical School.

The impact of pharmacogenomics on opioid induced adverse drug reactions in patients with perioperative pain

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Abstract

Background: The management of perioperative pain is critical for postoperative recovery, with opioids being a primary treatment option. However, opioid induced adverse drug reactions (ADRs) can significantly affect patient outcomes. Research indicates that genetic variation may influence the incidence and severity of opioid ADRs. However, a comprehensive review into this relationship is lacking. This systematic review aims to fill this gap in the literature by exploring the impact of pharmacogenomics on opioid induced ADRs in the perioperative setting.

Methods: This review was led by the Prisma guidelines, to ensure a rigorous and consistent methodology. A thorough and comprehensive search of databases PubMed and Embase was done. Inclusion and exclusion criteria were applied to identify relevant papers. Data on opioid use, ADRs, and genetic polymorphisms were extracted and synthesized. Data was collected on two primary outcomes concerning the ADRs associated with opioid usage, and the frequency and severity of opioids in relation to specific genetic polymorphisms.

Results: 624 papers were initially identified, from this, 20 met the inclusion criteria for analysis and qualitative synthesis. This resulted in a wide range of key genes reported. These were implicated in drug transport (ABCB1, ABCC3), opioid receptor function (OPRK1, OPRM1, OPRD1), and metabolic pathways (CYP2D6, CYP3A4, CYP2B6, UGT2B7, COMT). Additionally, genes related to ion channel function (KCNJ6, KCNJ9) and other molecules (FAAH, OCT1, CGRP) were also assessed. Key findings suggest significant associations between selected genetic polymorphisms in the cytochrome enzyme family, OPRM1, FAAH, OCT1 and ABCC3 genes, and the occurrence of opioid ADRs including respiratory depression, nausea, and vomiting.

Conclusions: This systematic review has explored the potential role of pharmacogenomics in perioperative ADRs. It can be concluded that while pharmacogenomics may look promising for enhancing personalized medicine, in the context of perioperative opioid induced ADRs, the current evidence does not yet allow for clinical application. Future larger studies

are needed that could provide the statistical power to clarify the relationships observed. This could lead to a reduction of the burden of perioperative opioid induced ADRs through personalised medicine strategies.

Keywords: Perioperative Pain | Genetic Variation | Opioids | Adverse Effects | Toxicity |

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