Population pharmacokinetic modelling of fentanyl for pain management in cancer patients

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Background: Pain is a frequent complication of advanced cancer. Opioids are used to control severe pain. Unfortunately, they have a number of side-effects with little difference between the dose that will control pain and that which will cause toxicity. A range of factors such as age/sex/dose/delivery system/genetic variations/kidney and liver function influence how opioids are processed by the body. A better understanding of this will allow us to improve the way we manage cancer pain.

Aims: This research will explore the most effective methods of managing severe pain caused by cancer by selecting the best dose of pain medication (specifically fentanyl) for individual patients. This information is crucial in determining whether patients will benefit from individualised dosing regimens. This can be achieved by monitoring the concentrations of the drug in the blood or in the saliva. Furthermore, it will assess the suitability of saliva over blood sampling which would ease the burden in frail patients providing samples for PK/PD studies.

Methods: A pilot study has been conducted on 16 paired plasma and salivary samples from subjects (n = 16) receiving fentanyl for cancer pain via a transdermal patch.

Results and Conclusions: This pilot study has demonstrated the suitability of the HPLC MS/MS assay to analyse the samples and demonstrated our ability to collect qualitative data. Future research on an expanded sample size will describe any relationship between saliva and plasma concentrations and develop a population PK model to optimize the dosing of fentanyl.

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