A Universal Implementation in Hispanics (MedeA Cohort)

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Pharmacogenetics has emerged as a critical pillar in precision therapeutics, offering mechanistic insights into interindividual variability in drug metabolism, response, and toxicity. Despite its demonstrated clinical utility, its systematic deployment within publicly funded healthcare systems remains inconsistent. In Extremadura, we undertook the ambitious goal of operationalizing a comprehensive, evidence-aligned pharmacogenetic framework embedded directly into routine clinical practice. This initiative centered on implementing a robust multi-gene panel encompassing highly actionable pharmacogenes with substantial relevance for drug disposition, enzymatic activity modulation, and toxicity risk.

The program was progressively integrated across multiple medical specialties, accompanied by harmonized genotype-to-phenotype translation and standardized clinical decision support. Embedding pharmacogenomic outputs into the electronic health record enabled clinicians to access interpretative reports with immediate therapeutic implications. As the program expanded, variant frequencies observed within the population—particularly in CYP450 enzymes and fluoropyrimidine-related genes—underscored the relevance of pharmacogenetic stratification for Hispanic cohorts.

Oncology rapidly demonstrated measurable clinical benefit through systematic DPYD screening, substantially mitigating the incidence of severe fluoropyrimidine-related adverse reactions. In neuropsychopharmacology, CYP2C19 and CYP2D6-guided prescribing facilitated more rational selection and titration of psychotropics, reducing trial-and-error approaches. Complex, polymedicated patients represented a major area of impact, as pharmacogenomic data provided essential clarity in clinical contexts characterized by significant drug–drug interactions and comorbidities driven by underlying clinical factors. The experience gained demonstrates the feasibility, scalability, and clinical validity of integrating pharmacogenetic into a regional public health system. Clinical adoption has increased steadily, and the program has shown tangible contributions to safer, more individualized therapeutic strategies across disciplines. Collectively, these findings illustrate how pharmacogenomics can evolve from a specialized resource to an integral component of standard-of-care prescribing, advancing precision medicine at the population level.

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