INTRODUCTION
The Netherlands is a global leader in the field of pharmacogenomics (PGs). Since 2005, the Dutch Pharmacogenomics Working Group (DPWG) has developed evidence-based guidelines. All guidelines are available through the national drug database (G-standaard). This database is used by all parties within the Dutch healthcare system. However, the implementation and acceptance of PGs testing in primary care is lagging. To further stimulate the use of these guidelines, the Royal Dutch Pharmacists Association (KNMP) initiated a pilot in community pharmacies across the Netherlands.

AIM
To demonstrate the impact of PGs testing by community pharmacists on individual patients.

METHODS
From June 2017 until June 2018 patients in 50 Dutch community pharmacies were offered a PGs test. Prior to this pilot all participating pharmacists were trained in pharmacogenomics. The pharmacists were the lead healthcare provider in this pilot. If applicable, the pharmacists advised changes in pharmacotherapy and monitored the impact on patients. Patient outcomes were reported and PGs test results were added to patients’ medical record. Pharmacists also shared case reports.

RESULTS
The participating pharmacists selected patients to receive a pharmacogenomics test and personal advice. 215 patients were included in the pilot: 148 women and 67 men. The average age was 60 years old. Combined, the 215 included patients had 249 medicines for which PGs guidelines are available. Patients were asked and 67 men. The average age was 60 years old. Combined, the 215 included patients had low expectations of PGx testing and 62% had moderate to high expectations. Patients with high expectations reported a three times higher willingness to pay more than €100 per test when compared to patients with low expectations. An overview of medicines that triggered the pharmacist to consider PGs testing is shown in figure 1. Outcomes of the PGs tests are shown in figure 2 and actions undertaken after PGs testing is shown in figure 3. 28,5% of PGs tests resulted in the pharmacist undertaking actions concerning patients' pharmacotherapy.

CONCLUSION
Pharmacists play a key role in the implementation of pharmacogenomics in primary care. Pharmacogenomic testing is perceived as a valuable addition to the existing pharmaceutical care programs by patients, pharmacists and prescribers.

Figure 1. Medicines that triggered PGs testing

Figure 2. Outcomes tested CYP-enzymes and phenotypes

Figure 3. Actions undertaken after PGs testing

CONCLUSION
Pharmacists play a key role in the implementation of pharmacogenomics in primary care. Pharmacogenomic testing is perceived as a valuable addition to the existing pharmaceutical care programs by patients, pharmacists and prescribers.

ACKNOWLEDGEMENTS
• Dutch Pharmacogenetics Working Group
• All participating pharmacists

‘Finally some recognition! We knew something wasn’t right.’

Quote from the emotional sister of a psychiatric patient who turned out to be a PM for CYP2D6.

Position of pharmacogenomics in the pharmacy
The pharmacist is the expert in medication and PGs. Gene-drug interactions are part of the pharmacists’ routine medication surveillance.

The pharmacist:
- Selects patients that could potentially benefit from personalised treatment;
- Counsels the patient;
- Collects material for PGs test (usual swabs/urina);
- Orders a PGs test;
- Sends material to laboratory;
- Interprets the PGs test results;
- Adds test results to the patients’ medical record;
- Reports test results to other healthcare providers;
- Discusses therapy optimisation with other healthcare providers;
- Provides advice on changes to patients’ pharmacotherapy based on the outcome of the PGs test.

Results
The participating pharmacists selected patients to receive a pharmacogenomics test and personal advice. 215 patients were included in the pilot: 148 women and 67 men. The average age was 60 years old. Combined, the 215 included patients had 249 medicines for which PGs guidelines are available. Patients were asked about their expectations and their willingness to pay. 33% of the included patients had low expectations of PGs testing and 62% had moderate to high expectations.

Case 1
A 47-year-old female patient is diagnosed with polyneuropathy. She is prescribed metoprolol tartrate 100 mg once daily before the night.
- Within a week she develops overspill, sweating and diastolic.
- The metoprolol treatment is discontinued and the side effects are resolved.
- Pharmacogenomic testing later shows the patient is a CYP2D6 poor metabolizer.
- The PGs advice is a 60% dose reduction.