

**Using RE-AIM to Assess a
Medication Safety Intervention for
Generalizability and Potential for
Translation to Clinical Practice**

David Magid, MD, MPH

Medication Errors

- **Common medical error**
 - **19% of injuries in hospitalized patients were due to medication errors**
- **IOM priority area for transforming health care**

KPCO Medication Safety Project Goals

- **Improve the detection of medication prescribing errors in the ambulatory setting**
- **Develop new uses of this information to reduce errors and improve care**

KPCO Pharmacy-based Interventions

- **Designed in partnership with clinical and operational pharmacy leaders**
- **Supported by KPCO leadership**
- **Implemented with regular pharmacy staff**

Pharmacy-based Intervention Objective

To determine whether an automated tool that alerts pharmacists of potentially unsafe medication orders and prevents these medications from being dispensed is effective in reducing medication errors

Stages of Pharmaceutical Care

- **Prescribing**
- **Dispensing**
- **Administering**
- **Monitoring**

Drug-Drug Interaction Intervention

- **Electronically screen prescriptions for errors**
- **Alert pharmacist of a potential error**
- **Prevent printing of prescription label**
- **Provide pharmacist with an intervention guide (decision support)**
- **Pharmacist resolves with prescriber**

Pharmacy-based Intervention

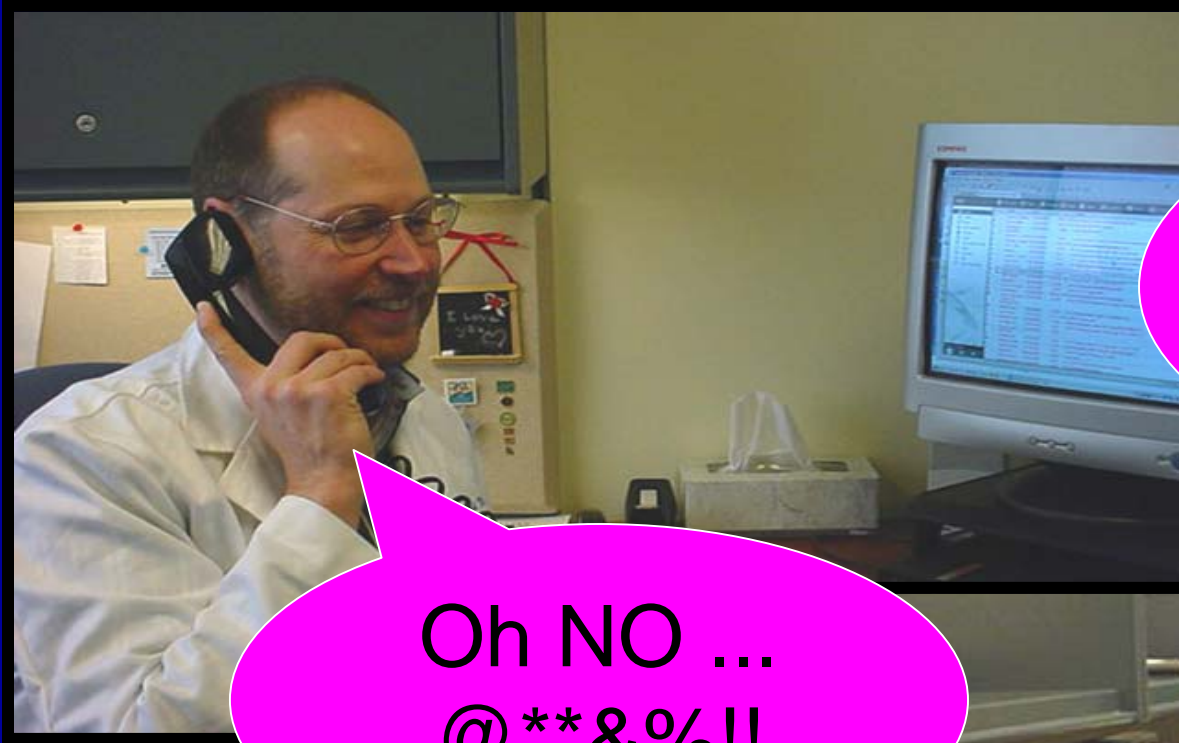
An Example

- Warn against dispensing drugs with known interactions when there is a good alternative
 - phenytoin and cimetidine

Intervention Guide

Phenytoin and Cimetidine

- **Confirm patient is taking both drugs**
- **Inform provider that the drug combination may increase phenytoin blood levels and thereby the risk of neurologic toxicity**
- **Recommend ranitidine or famotidine as alternatives which are less likely to interact significantly with phenytoin**



Dr. Magid,
You've done it
again!!!

Oh NO ...
@**&%!!



Critical Drug Interactions

Macrolides

- carbamazepine
- digoxin
- theophylline
- cyclosporine

Phenytoin

- cimetidine
- fluconazole

Theophylline

- cimetidine
- ciprofloxacin

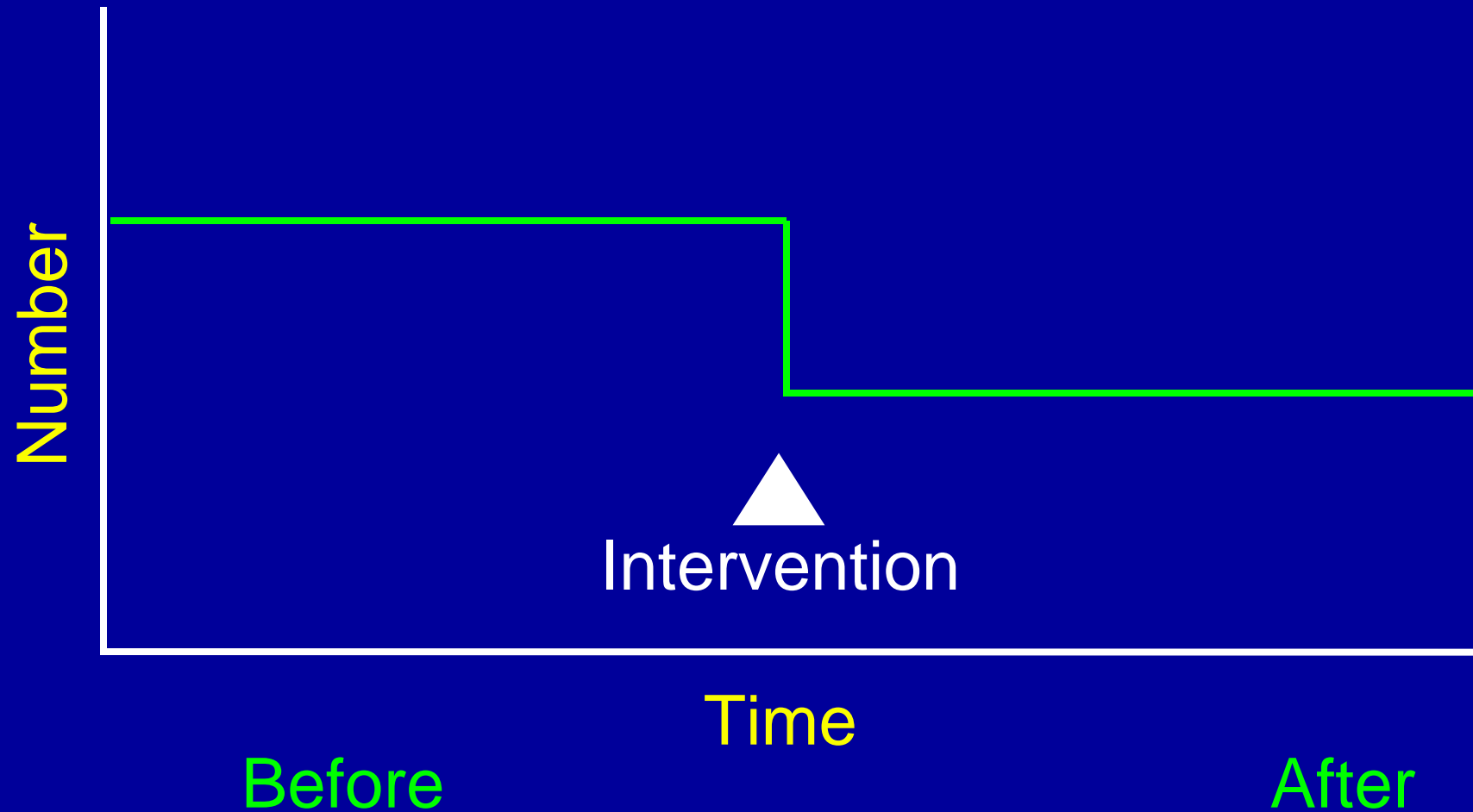
RE-AIM Outcome Measures

- **Reach**
 - Participation rate of KPCO members
 - Representativeness of participants
- **Adoption**
 - Participation rate of pharmacies and pharmacists
 - Representativeness of pharmacies and pharmacists
- **Effectiveness**
 - Medication Dispensing Errors

Evaluation of Effectiveness Critical-Drug Interactions

- **Before-After Study Design**
- **Compare occurrence of co-dispensing of interacting drugs in the pre (before) and post (after) intervention periods**

Critical Drug Interactions



Statistical Analysis

Time Series Model

- **Poisson Distribution**
 - **outcome - number of occurrences of co-prescribing**
 - **predictor - before versus after intervention periods**
- **Adjusted for total patients and number of prescriptions of the interacting drugs**

RE-AIM Outcome Measures

- **Implementation**
 - **Validity of Alerts**
 - **System Reliability**
 - **Census Note Documentation**
 - **Adherence to Recommendations**
- **Maintenance**
 - **Sustainability of intervention for 6 months after study completion**

RESULTS

REACH

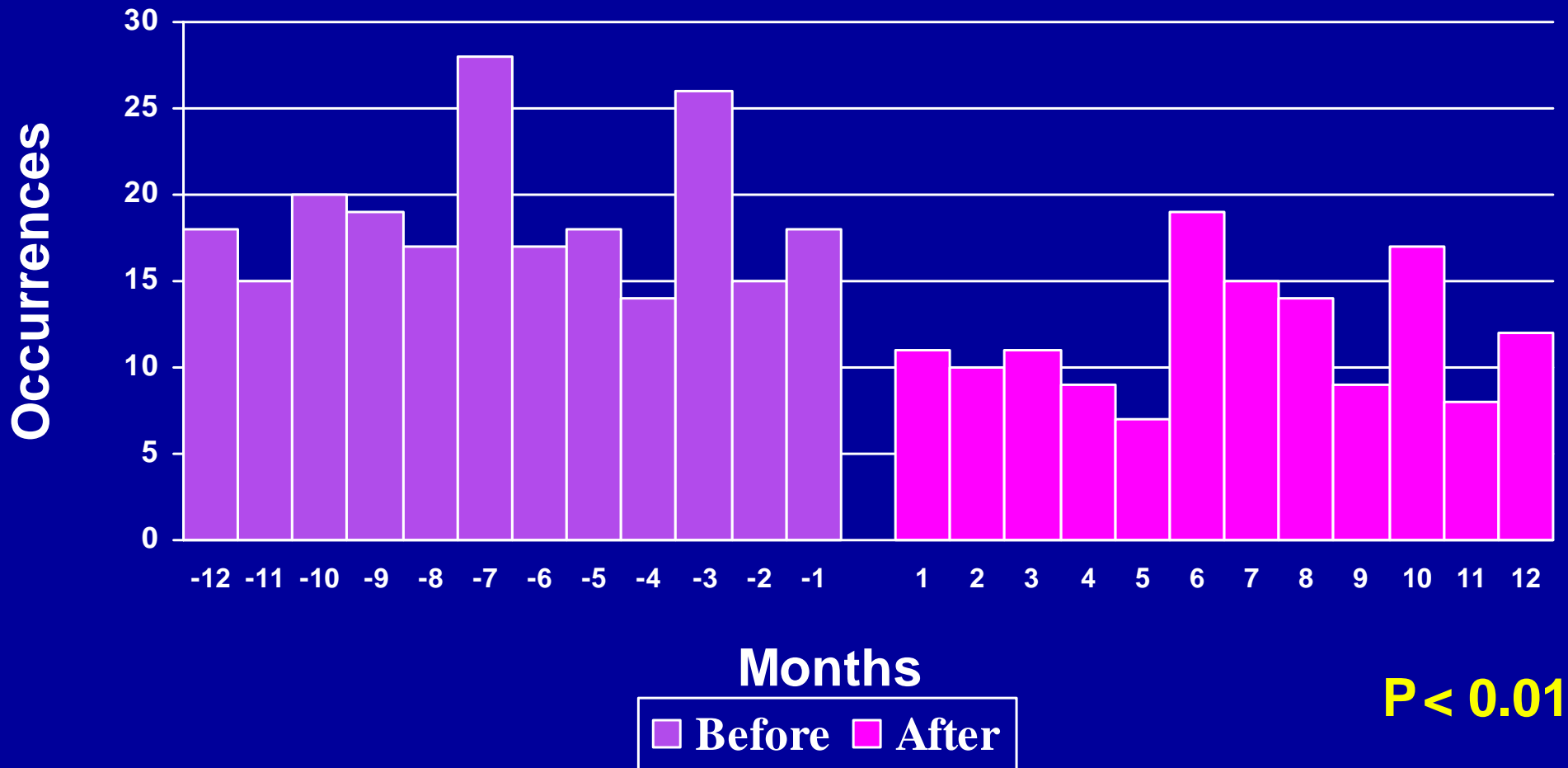
- **97% of the 350,000 KPCO Health Plan members**
- **Participants were representative of the Health Plan as a whole**

ADOPTION

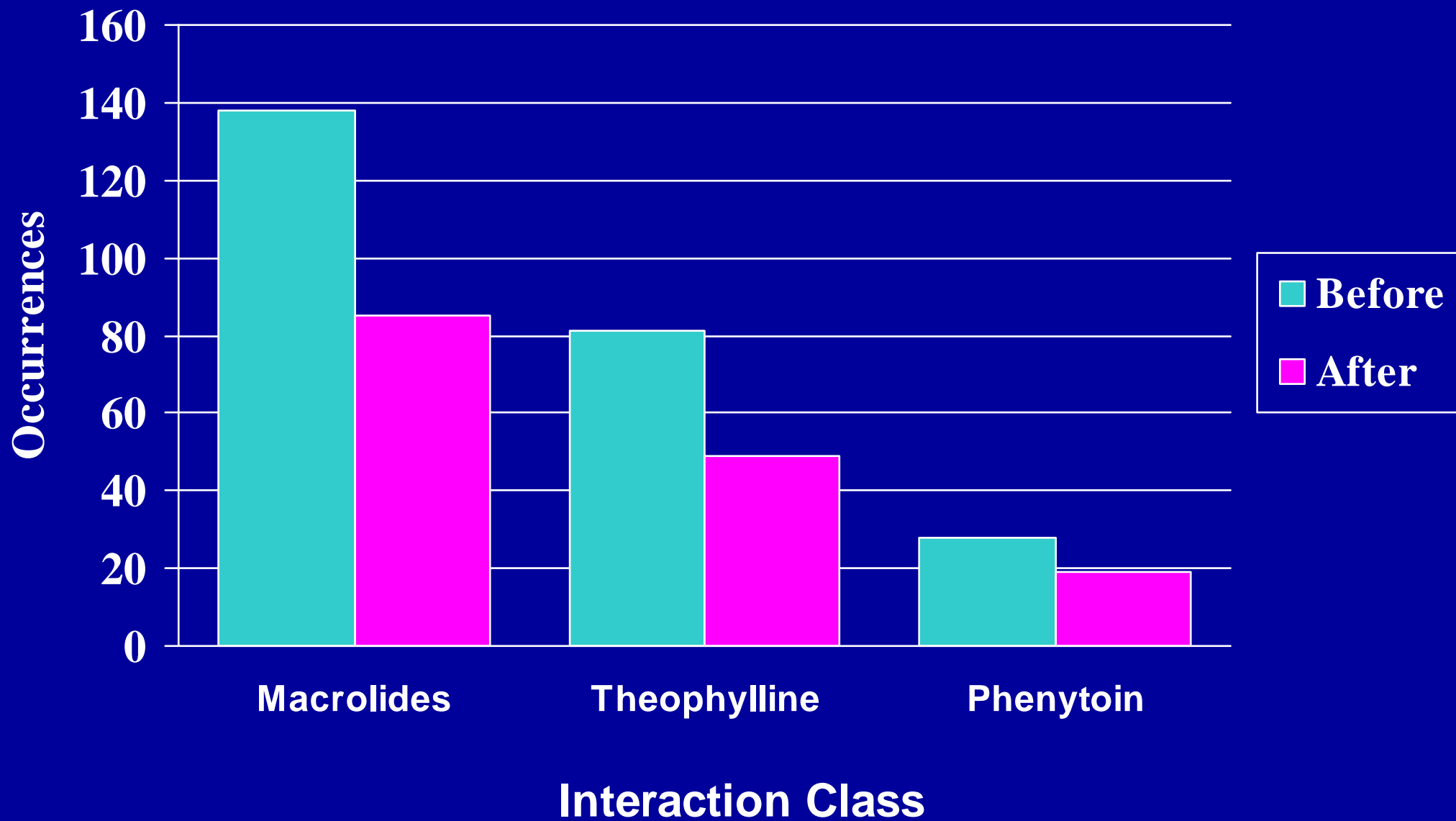
- **All 19 pharmacies adopted the program**
- **All 240 dispensing pharmacists participated in the program**

EFFECTIVENESS

Critical Drug Interactions



Critical Drug Interactions

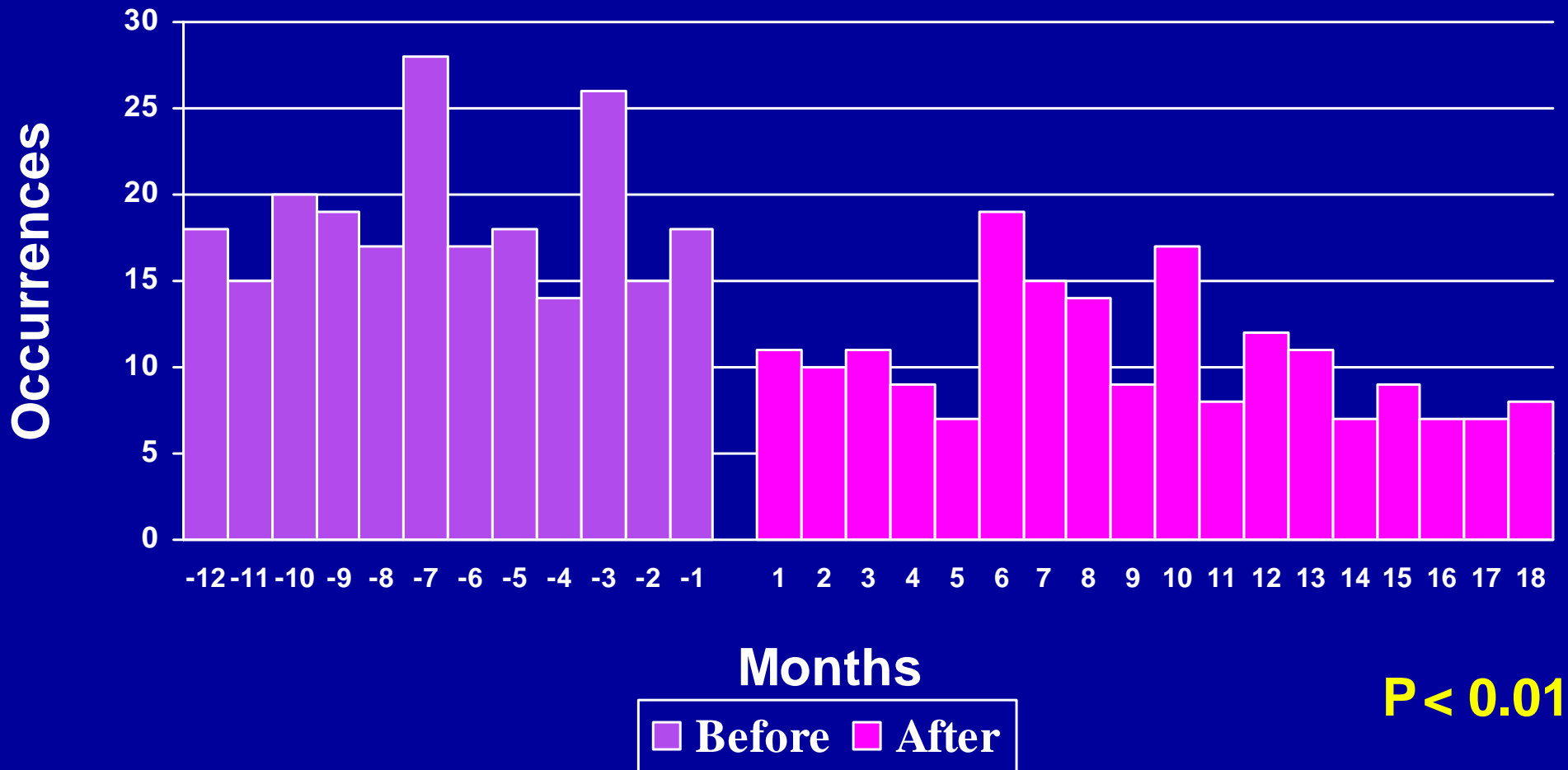


IMPLEMENTATION

- **Validity of alerts > 95%**
- **System reliability > 95%**
- **Census note documentation > 85%**
- **Adherence to recommendations > 75%**

MAINTENANCE

Critical Drug Interactions



Limitations

- **Single Intervention**
- **Before-After Study Design**
- **Single Health Plan**

Summary

Automated Pharmacy Tool

- Reduced co-dispensing of interacting drugs

Intervention Demonstrated Good Potential for Translation

- **Reached almost all members**
- **Adopted in all pharmacies by all pharmacists and physicians**
- **Implemented reliably**
- **Improvements maintained for a 6 month follow-up period**