

# MediCheck: AI-Personalized Medication Advisor

Presented by Jimmy Baek, Hunter Qin

**Problem Statement:** Medication Literacy is Critical, but it is prevalent and can lead to life-threatening complications.

## Medication Literacy

- **1/3 of Patients** have low medication literacy, making it 3.4x more likely for them to interpret medication warning labels incorrectly
- **Older and less educated patients** have a higher risk of lower medication literacy (Plaza-Zamora, et al. 2020)

## Lack of Digestible Documentation On Warnings, Precautions, Tailored to Individuals

**Precautions:** [1]  
"Precautions: General: As with other anti-infectives, prolonged use may result in overgrowth of nonsusceptible organisms, including fungi. If superinfection occurs discontinue use and institute alternative therapy. Whenever clinical judgment dictates, the patient should be examined with the aid of magnification, such as slit lamp biomicroscopy and, where appropriate, fluorescein staining. Ofloxacin should be discontinued at the first appearance of a skin rash or any other sign of hypersensitivity reaction. The systemic administration of quinolones, including ofloxacin, has led to lesions or erosions of the cartilage in weight-bearing joints and other signs of arthropathy in immature animals of various species. Ofloxacin, administered systemically at 10 mg/kg/day in young dogs (equivalent to 110 times the maximum recommended daily ophthalmic dose) has been associated with these types of effects. Information for Patients: Avoid contaminating the applicator tip with material from the eye, fingers or other source. Systemic quinolones, including ofloxacin, have been associated with hypersensitivity reactions, even following a single dose. Discontinue use immediately and contact your physician at the first sign of a rash or allergic reaction. Drug Interactions: Specific drug interaction studies have not been conducted with ofloxacin ophthalmic solution. However, the systemic administration of some quinolones has been shown to elevate plasma concentrations of theophylline, interfere with the metabolism of caffeine, and enhance the effects of the oral anticoagulant warfarin and its derivatives, and has been associated with transient elevations in serum creatinine in patients receiving cimetidine concurrently. Carcinogenesis, Mutagenesis, Impairment of Fertility: Long term studies to determine the carcinogenic potential of ofloxacin have not been conducted. Ofloxacin was not mutagenic in the Ames test, in vitro and in vivo cytogenetic assay, sister chromatid exchange assay (Chinese hamster and human cell lines), unscheduled DNA synthesis (UDS) assay using human fibroblasts, the dominant lethal assay, or mouse micronucleus assay. Ofloxacin was positive in the UDS test using rat hepatocyte, and in the mouse lymphoma assay. In fertility studies in rats, ofloxacin did not affect male or female fertility or morphological or reproductive performance at oral dosing up to 300 mg/kg/day (equivalent to 3000 times the maximum recommended daily ophthalmic dose) and 100 mg/kg/day (equivalent to 1000 times the maximum recommended daily ophthalmic dose). These dosages resulted in decreased fetal body weight and increased fetal mortality in rats and rabbits, respectively. Minor fetal skeletal variations were reported in rats receiving doses of 110 mg/kg/day. Ofloxacin has not been shown to be teratogenic at doses as high as 110 mg/kg/day and 100 mg/kg/day when administered to pregnant rats and rabbits, respectively. Nonteratogenic Effects: Additional studies in rats with doses up to 300 mg/kg/day during late gestation showed no adverse effect on late fetal development, labor, delivery, lactation, neonatal viability, or growth of the neonates. There are, however, no adequate and well-controlled studies in pregnant women. Ofloxacin ophthalmic solution should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus. Nursing Mothers: In nursing women a single 200 mg oral dose resulted in concentrations of ofloxacin in milk which were similar to those found in plasma. It is not known whether ofloxacin is secreted in human milk following topical ophthalmic administration. Because of the potential for serious adverse reactions from ofloxacin in nursing infants, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother. Pediatric Use: Safety and effectiveness in infants below the age of one year have not been established. Quinolones, including ofloxacin, have been shown to cause arthropathy in immature animals after oral administration; however, topical ocular administration of ofloxacin to immature animals has not shown any arthropathy. There is no evidence that the ophthalmic dosage form of ofloxacin has any effect on weight bearing joints, skeletal use, or growth of the animal. There are no overall differences in safety or effectiveness have been observed between elderly and younger patients."

**General precautions:** [1]  
"General: As with other anti-infectives, prolonged use may result in overgrowth of nonsusceptible organisms, including fungi. If superinfection occurs discontinue use and institute alternative therapy. Whenever clinical judgment dictates, the patient should be examined with the aid of magnification, such as slit lamp biomicroscopy and, where appropriate, fluorescein staining. Ofloxacin should be discontinued at the first appearance of a skin rash or any other sign of hypersensitivity reaction. The systemic administration of quinolones, including ofloxacin, has led to lesions or erosions of the cartilage in weight-bearing joints and other signs of arthropathy in immature animals of various species. Ofloxacin, administered systemically at 10 mg/kg/day in young dogs (equivalent to 110 times the maximum recommended daily ophthalmic dose) has been associated with these types of effects."

**Information for patients:** [1]  
"Information for Patients: Avoid contaminating the applicator tip with material from the eye, fingers or other source. Systemic quinolones, including ofloxacin, have been associated with hypersensitivity reactions, even following a single dose. Discontinue use immediately and contact your physician at the first sign of a rash or allergic reaction."

**Drug Interactions:** [1]  
"Drug Interactions: Specific drug interaction studies have not been conducted with ofloxacin ophthalmic solution. However, the systemic administration of some quinolones has been shown to elevate plasma concentrations of theophylline, interfere with the metabolism of caffeine, and enhance the effects of the oral anticoagulant warfarin and its derivatives, and has been associated with transient elevations in serum creatinine in patients receiving cimetidine concurrently."

**Carcinogenesis, Mutagenesis, Impairment of fertility:** [1]  
"Carcinogenesis, Mutagenesis, Impairment of fertility: Long term studies to determine the carcinogenic potential of ofloxacin have not been conducted. Ofloxacin was not mutagenic in the Ames test, in vitro and in vivo cytogenetic assay, sister chromatid exchange assay (Chinese hamster and human cell lines), unscheduled DNA synthesis (UDS) assay using human fibroblasts, the dominant lethal assay, or mouse micronucleus assay. Ofloxacin was positive in the UDS test using rat hepatocyte, and in the mouse lymphoma assay. In fertility studies in rats, ofloxacin did not affect male or female fertility or morphological or reproductive performance at oral dosing up to 300 mg/kg/day (equivalent to 3000 times the maximum recommended daily ophthalmic dose)."

**Pregnancy:** [1]  
"Pregnancy: Teratogenic Effects: Ofloxacin has been shown to have an embryocidal effect in rats and in rabbits when given in doses of 110 mg/kg/day (equivalent to 1000 times the maximum recommended daily ophthalmic dose) and 100 mg/kg/day (equivalent to 1000 times the maximum recommended daily ophthalmic dose). These dosages resulted in decreased fetal body weight and increased fetal mortality in rats and rabbits, respectively. Minor fetal skeletal variations were reported in rats receiving doses at 110 mg/kg/day. Ofloxacin has not been shown to be teratogenic at doses as high as 110 mg/kg/day and 100 mg/kg/day when administered to pregnant rats and rabbits, respectively. Nonteratogenic Effects: Additional studies in rats with doses up to 300 mg/kg/day during late gestation showed no adverse effect on late fetal development, labor, delivery, lactation, neonatal viability, or growth of the neonates. There are, however, no adequate and well-controlled studies in pregnant women. Ofloxacin ophthalmic solution should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus."

**Nonteratogenic effects:** [1]  
"Nonteratogenic Effects: Additional studies in rats with doses up to 300 mg/kg/day during late gestation showed no adverse effect on late fetal development, labor, delivery, lactation, neonatal viability, or growth of the neonates. There are, however, no adequate and well-controlled studies in pregnant women. Ofloxacin ophthalmic solution should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus."

**Nursing mothers:** [1]  
"Nursing Mothers: In nursing women a single 200 mg oral dose resulted in concentrations of ofloxacin in milk which were similar to those found in plasma. It is not known whether ofloxacin is secreted in human milk following topical ophthalmic administration. Because of the potential for serious adverse reactions from ofloxacin in nursing infants, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother."

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## ML-Based Medication Recognition



OR



"Dayquil, Nyquil..."



Rapid Fuzz



Vector Embedding  
(Lexical Similarity)

openFDA **K-Nearest Neighbors** Search of Dataset

**3 Most Likely Matching Medications, User Chooses One**

## Augmented LLM for Personalized Medication Guidance

openFDA

Drug Facts  
Warnings  
Adverse Effects  
Dosage  
Ingredients

AND



Age:  
Gender:  
Pregnancy Status:

ex) **PROMPT**: "Here is the patient profile. Translate the FDA medication data, tailor to the user's literacy level."



**Medication Summary with ingredients, purpose, dosage, side effects, warnings**  
**Tailored to User's Reading Level and patient health profile**

## Interaction Checker

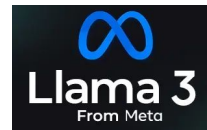
openFDA

+

Current List of Medications

**Drug Interactions Data**

ex) **PROMPT**: "Here is the list of medications they're currently taking. Use FDA data to check for interactions, tailor to the user."

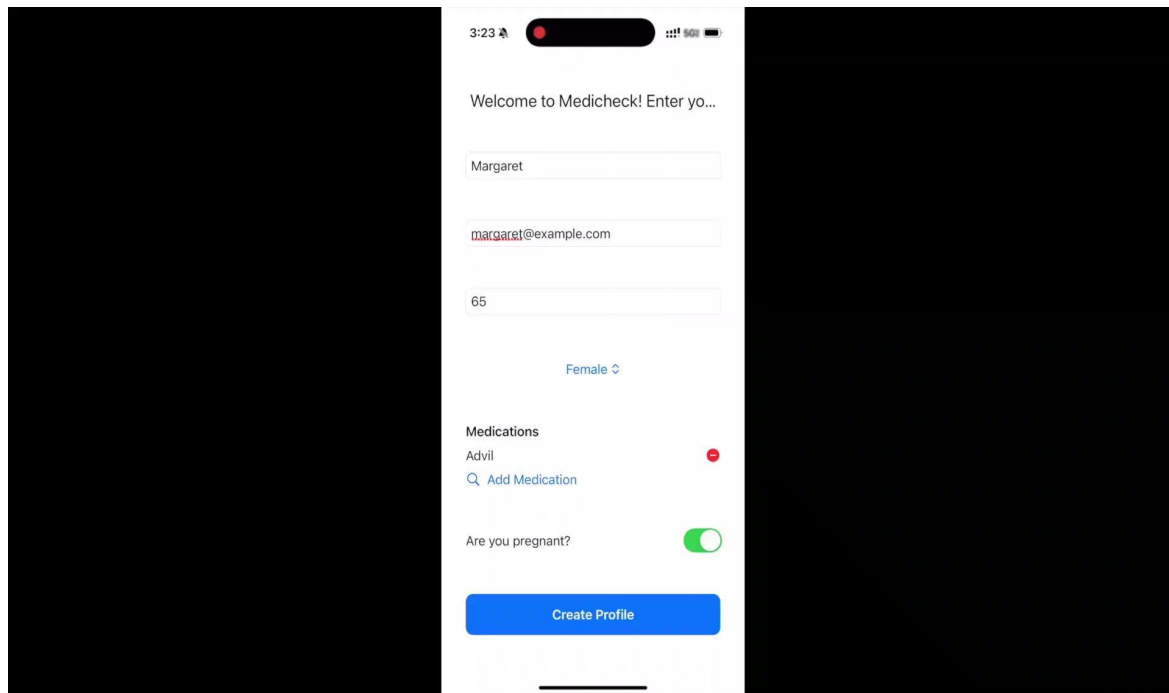


**Personalized check for interactions on a medication, update patient profile with new medication**

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## Demo 1: Pregnant Woman + Finasteride?



The image shows a mobile application interface for 'MediCheck'. The screen is divided into three main sections: a top header, a central form area, and a bottom navigation bar. The top header is white with a black status bar at the very top showing the time '3:23' and battery level. The central form area has a white background and contains several input fields and a toggle switch. The bottom navigation bar is a solid blue bar with a white text label 'Create Profile'.

3:23

Welcome to Medichack! Enter yo...

Margaret

margaret@example.com

65

Female

Medications

Advil

Q Add Medication

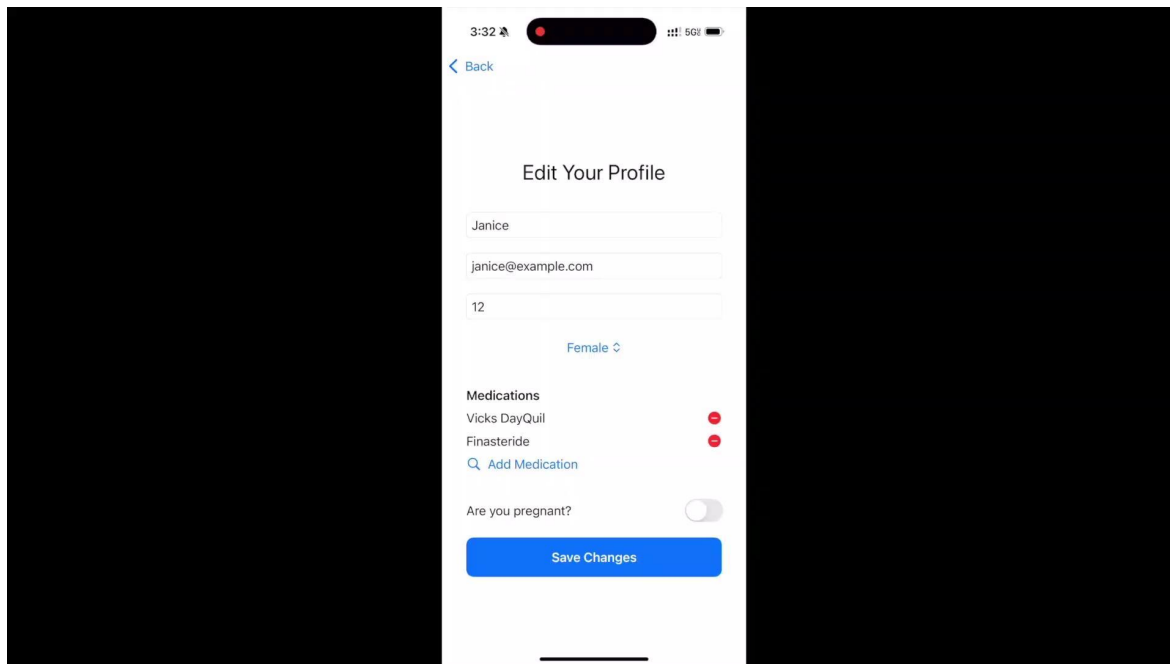
Are you pregnant?

Create Profile

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## Demo 2: Medication Recognition w/ Photo + 12 year old user



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## Demo 3: Interaction Checker

The image shows a mobile application interface for editing a user's profile. The screen is framed by a black border, suggesting a mobile device. At the top, the status bar shows the time as 3:48, a red indicator light, and signal strength icons. Below the status bar is a blue back arrow and the text '< Back'. The main heading is 'Edit Your Profile'. There are four input fields: 'Margareti' (name), 'margareti@example.com' (email), '40' (age), and 'Male' (gender with a dropdown arrow). Below these is a 'Medications' section with a red minus icon, showing 'Naproxen' and a blue magnifying glass icon followed by 'Add Medication'. At the bottom is a blue button with the text 'Save Changes'.

3:48

< Back

### Edit Your Profile

Margareti

margareti@example.com

40

Male

#### Medications

Naproxen

+ Add Medication

Save Changes

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## Next Steps:

- **Prompt Differentiation**
- **Allergy Checking**
- **graphRAG: Using a Knowledge Graph generated from FDA Corpus**
- **Methodical Evaluation through Test Dataset:**
  - **developing information coverage metric, employing reading level metrics, reliability metrics**

