Welcome!

5th Annual

CAP Center Symposium

Please enjoy the symposium from wherever you feel comfortable.

NDSU CENTER FOR COLLABORATION AND ADVANCEMENT IN PHARMACY

Agenda & Plan for the Day

Virtual Participants:

- After each speaker, you will be placed in a virtual room with 6-8 participants. Please have your list of round table questions pulled up or available.
- Continuing education information will be presented after each round table discussion.
- If you have questions during the presentations, please enter these into the chat and we will monitor these throughout the day. If there is not time to answer questions after the presentation, CAP Center will follow up with all the registered attendees with answers to the questions.
- If you would like follow up after the symposium, please contact Lisa.Nagel@ndsu.edu.

WELCOME — **12:00 PM**
Dr. Elizabeth Skoy, PharmD, FAPhA
Professor, Director of CAP Center

Dean Teresa Connor, PhD, PT, MBS
Dean and Professor of College of Health and Human Services

PHARMACOGENOMICS — **12:15 PM**
Dr. Natasha Petry, PharmD, MPH, BCACP
Associate Professor of Practice, Clinical Pharmacist

NORTH DAKOTA MEDICAID — **1:00 PM**
Dr. LeNeika Roehrich, PharmD, BCGP
Clinical Pharmacist

COLLABORATIVE PRACTICE IMPLEMENTATION — **1:45 PM**
Dr. Carly Smithers, PharmD
Pharmacy Manager

HEALTHY AGING — **2:35 PM**
Dr. Ryan McGrath, PhD
Associate Professor, Director Healthy Aging North Dakota
Dr. Jayme Steig, PharmD, CPHQ
Assistant Professor of Practice, Clinical Pharmacist

COMMUNITY HEALTH WORKERS — **3:20 PM**
Tiffany Knauf, MA
Health Systems and Pharmacy Coordinator, Health Promotion and Chronic Disease Prevention Unit
NACDD North Dakota Chronic Disease Director

All presentations will be followed by round table discussions.

CLOSING REMARKS — **4:00 PM**

SOCIAL — **4:15-5:00 PM**
Optional social to connect with each other.

Exciting News from the School of Pharmacy!

NDSU / DSU PRE-PHARMACY PROGRAM

STARTING FALL 2026!

Traditional Pathway	Early Assurance Pathway (EAP)
• 3-year undergraduate track • Pay DSU tuition and attend classes at DSU	• 2-year undergraduate track • Pay DSU tuition for DSU courses & NDSU differential tuition for 3 Hyflex NDSU courses

- Kickstart your pharmacy career closer to home
- Curriculum designed to prepare you for pharmacy school
- Multi-campus support

FUTURE EXPLORATIONS:

- **NDSU PharmD Professional Program** training in **Dickinson:**
  - Mix of Hyflex courses and in-person learning experiences
  - Occasional infrequent required travel to Fargo
  - Scholarship Opportunities

NDSU CENTER FOR COLLABORATION AND ADVANCEMENT IN PHARMACY

Integrating Pharmacogenomics into Pharmacy Practice:
Foundations, Applications, and Future Directions for Optimized Patient Care

Presented by: Natasha Petry, PharmD, MPH, BCACP
Associate Professor of Practice, North Dakota State University
Clinical Pharmacogenomics Pharmacist, Sanford Health

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Disclosures

- Natasha Petry reports they have no relevant financial relationships with ineligible companies to disclose.

Objectives

1. Describe the foundational principles of pharmacogenomics and its clinical relevance in contemporary pharmacy practice.
2. Apply the patient-care process to a patient case study optimizing drug therapy utilizing pharmacogenomic testing.
3. Identify emerging trends in pharmacogenomics to enhance patient care.
4. Describe actionable steps pharmacists and pharmacy technicians can take to incorporate pharmacogenomics into their pharmacy practice.

The Foundational Principles

- Pharmacogenomics (PGx) is the study of the impact that genetic polymorphisms have on medication response
- Genetic polymorphisms may influence medication effectiveness and risk for toxicity
- The goals of PGx are to optimize medication **efficacy** and limit **toxicity** based on an individual's genetics
- The most common gene variations associated with medication response are single nucleotide polymorphisms (SNPs)
- Pharmacists play a key role in advancing PGx in clinical practice based on a patient's genetic profile

Gammal RS, Cavallari LH, Lam Y. Clinical Pharmacogenomics. In: DiPiro JT, Yee GC, Haines ST, Nolin TD, Ellingrod VL, Posey L. eds. *DiPiro's Pharmacotherapy: A Pathophysiologic Approach, 12th Edition*. McGraw Hill; 2023. Accessed October 20, 2025. https://accesspharmacy-mhmedical-com.ezproxy.lib.ndsu.nodak.edu/content.aspx?bookid=3097&sectionid=267224711

Genotypes to Phenotypes

- The human genome contains ~ 20,000 protein-coding genes intertwined in the DNA double-helix comprised of purines (adenine and guanine) and pyrimidines (cytosine and thymidine)
- According to the central dogma of biology, DNA from genes is transcribed to RNA which is then translated into specific proteins by ribosomes
- The resulting protein is the outward expression of the genotype and is termed as the phenotype, which is the observable trait(s) of an individual
- Genes have a substantial amount of interindividual variety
  - Due to the presence of these variations, the term allele is used to denote a specific version of a gene
  - An individual inherits two alleles for each gene, one from each parent

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Overview of PGx

- PGx combines the fields of pharmacology and genetics to search for impactful genetic variations that lead to interindividual differences with respect to medication response
  - Pharmacogenetics: variations in a single gene that affects a medication response
  - Pharmacogenomics: the entire spectrum of genes that interact to determine medication efficacy and safety
- PGx is now more commonly used to guide clinical decision making as multiple proteins are often involved in determining the ultimate response to most medications
- The goals of clinical PGx are to optimize medication therapy and limit toxicity based on an individual's genetic profile
  - Optimizing make look like choosing the right medication and dose to achieve therapeutic outcomes and/or minimize toxicity

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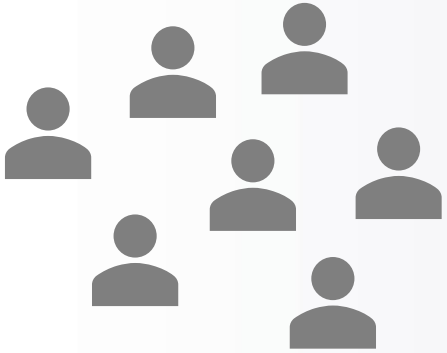
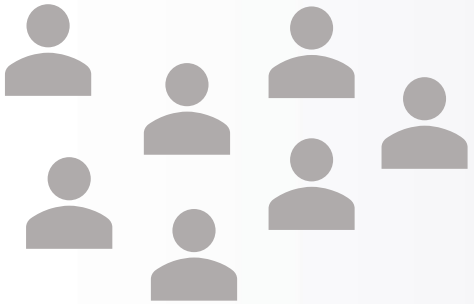
Drug not toxic
and
not beneficial



Drug TOXIC
but
BENEFICIAL



Patient group

Same diagnosis
Receive same prescription

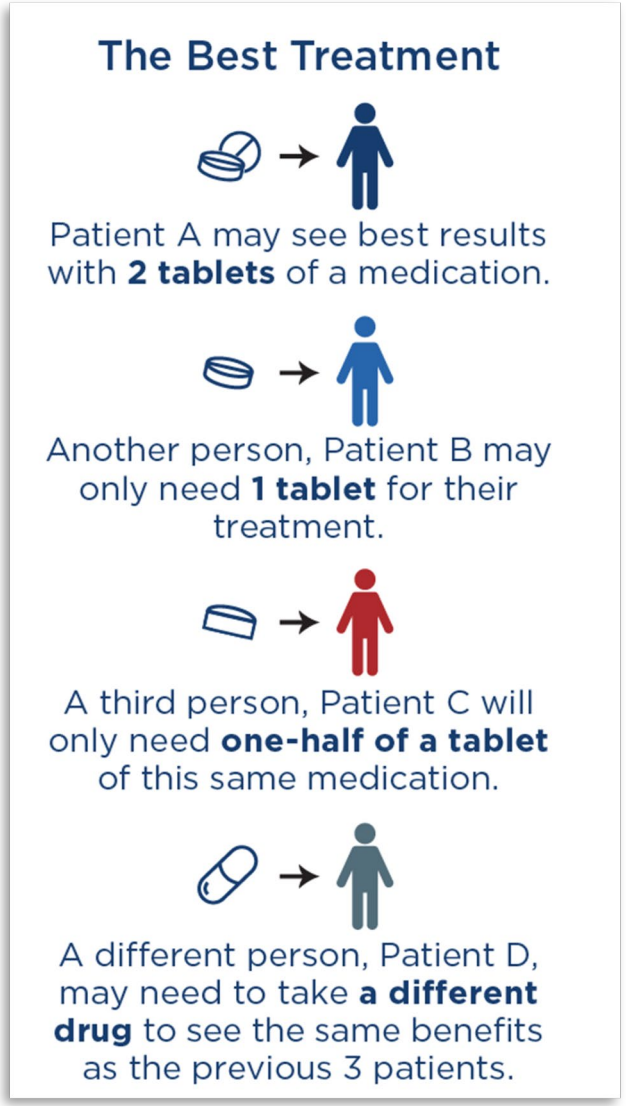
Drug not toxic
but
BENEFICIAL

Drug TOXIC
but
not beneficial

Other factors play a role as well: genetics, age, ethnicity, weight, gender, medications, diet, other conditions

Pharmacogenomics (PGx)

- **Two main areas**:
- Differences in metabolism of medication (increased side effects or decreased efficacy)
- Patient's susceptibility to certain adverse effects of medications (Ex: abacavir and HLA-B*57:01)



Definitions

- **Genotype:** type of variant present at a given location (i.e., a locus) in the genome
  - Variant: change in DNA sequence
  - Single Nucleotide Polymorphism (SNP): genomic variant at a single base position in the DNA.
- **Phenotype:** observable trait
- **Gene:** basic unit of inheritance that mostly codes for proteins
- **Allele:** one of two or more versions of DNA sequence

Benefits of PGx

Drug safety/toxicity avoidance

- Aid drug selection to avoid adverse reactions
- Aid dose selection to avoid toxicity

Increased efficacy

- Aid dose selection for maximum efficacy
- Identify patients who should be responsive to a given drug

Patient self-advocacy

Embedded in EMR

Medication Safety

Reassurance

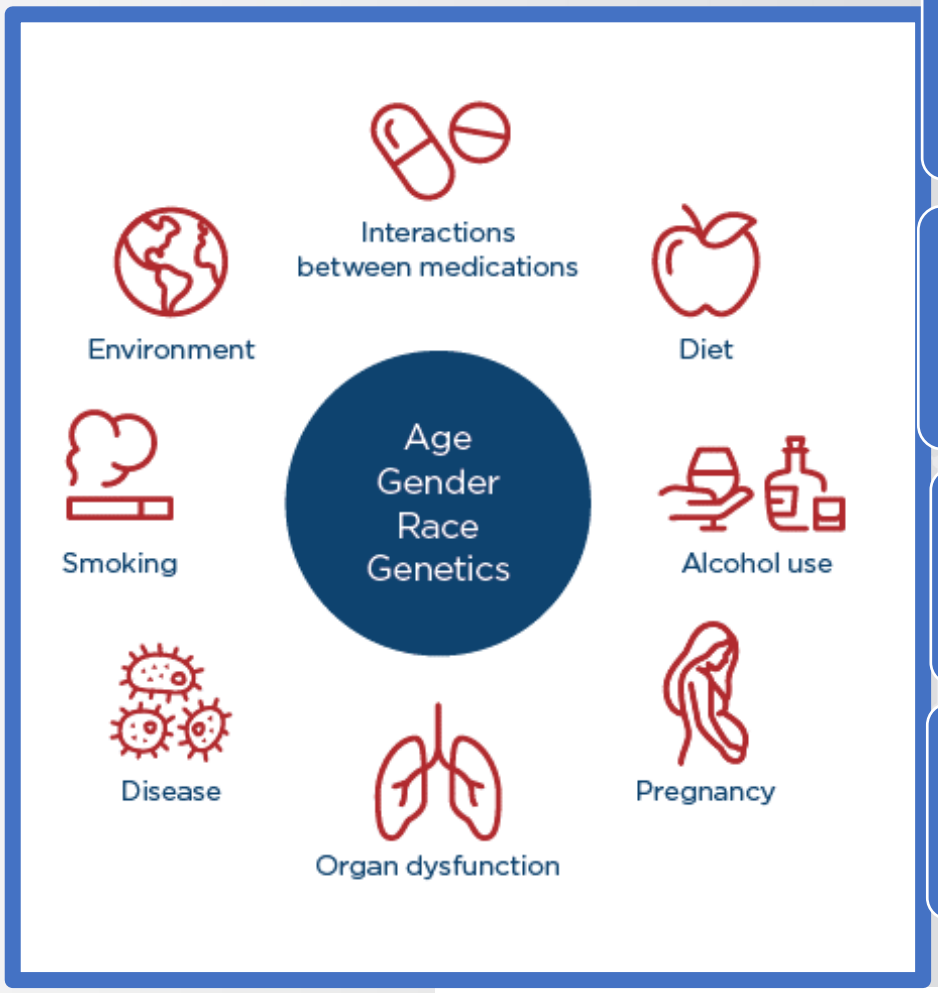
Lifelong information

Prescription and OTC medication

Limitations of PGx

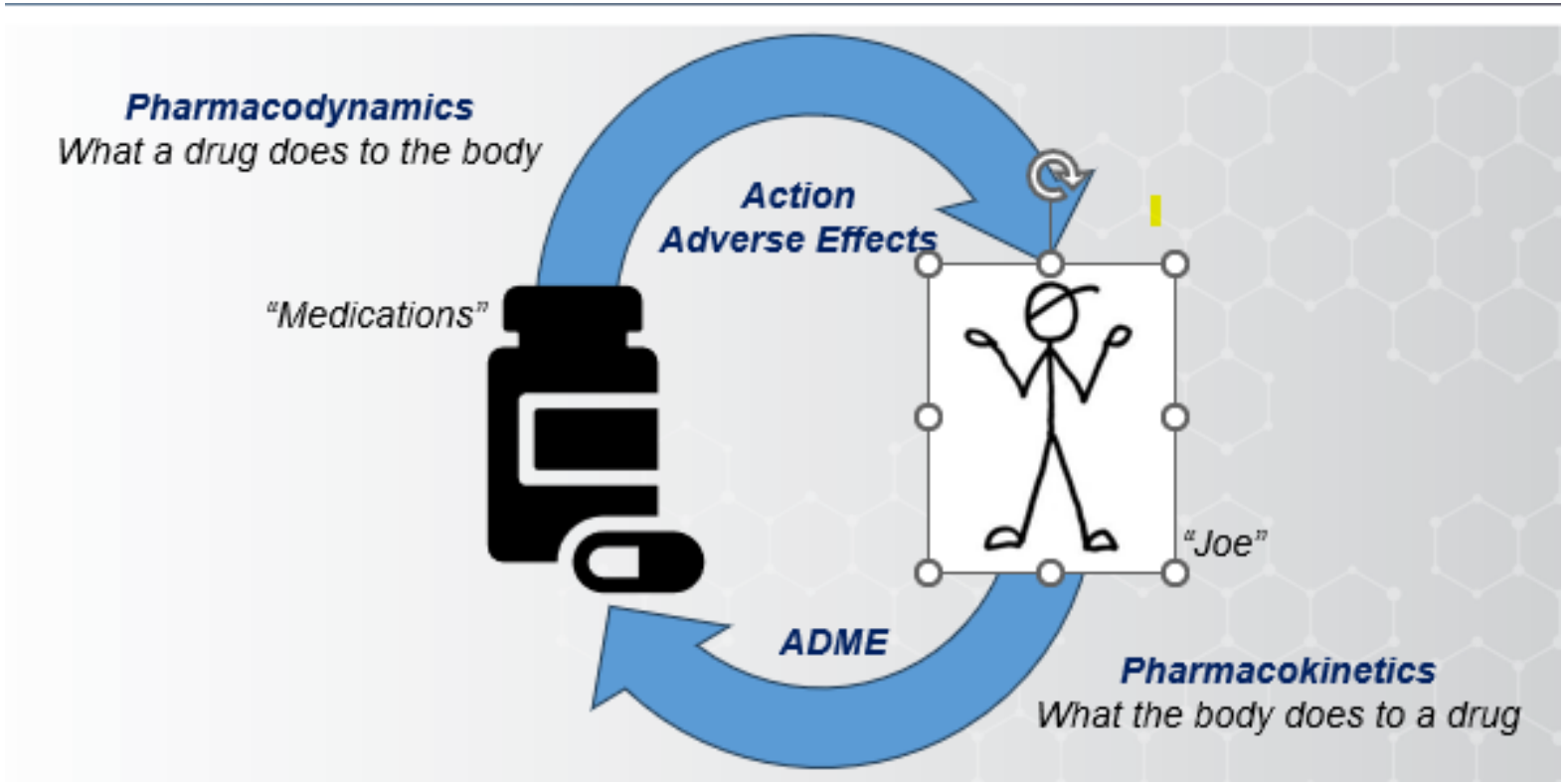
Not all medications!

Only **one** piece of the puzzle



- Cost
- Limited insurance coverage
- Limited or no genetic information for some medications
- Lab approach to testing / return of results / variants tested
- Race/ethnicity

PharmacoKinetics / PharmacoDynamics



PHARMACOKINETICS

How a drug moves through your body and gets metabolized or "absorbed" by the body's systems

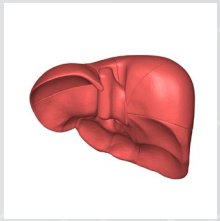
Absorption: How will the medication enter the body?

Distribution: Where will the medication go? (Transporters)

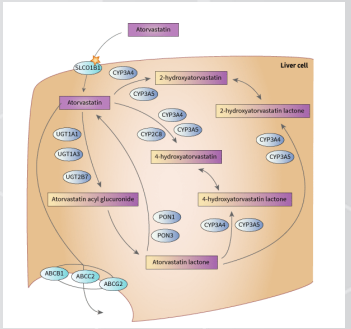
Metabolism: How is the medication broken down? (Liver)

Excretion: How does the medication leave?

Metabolism (Liver)



- Cytochrome P450s
  - *CYP2D6, CYP2C19, et al*
- TMPT/DPYD
- UGT1A1
- G6PD

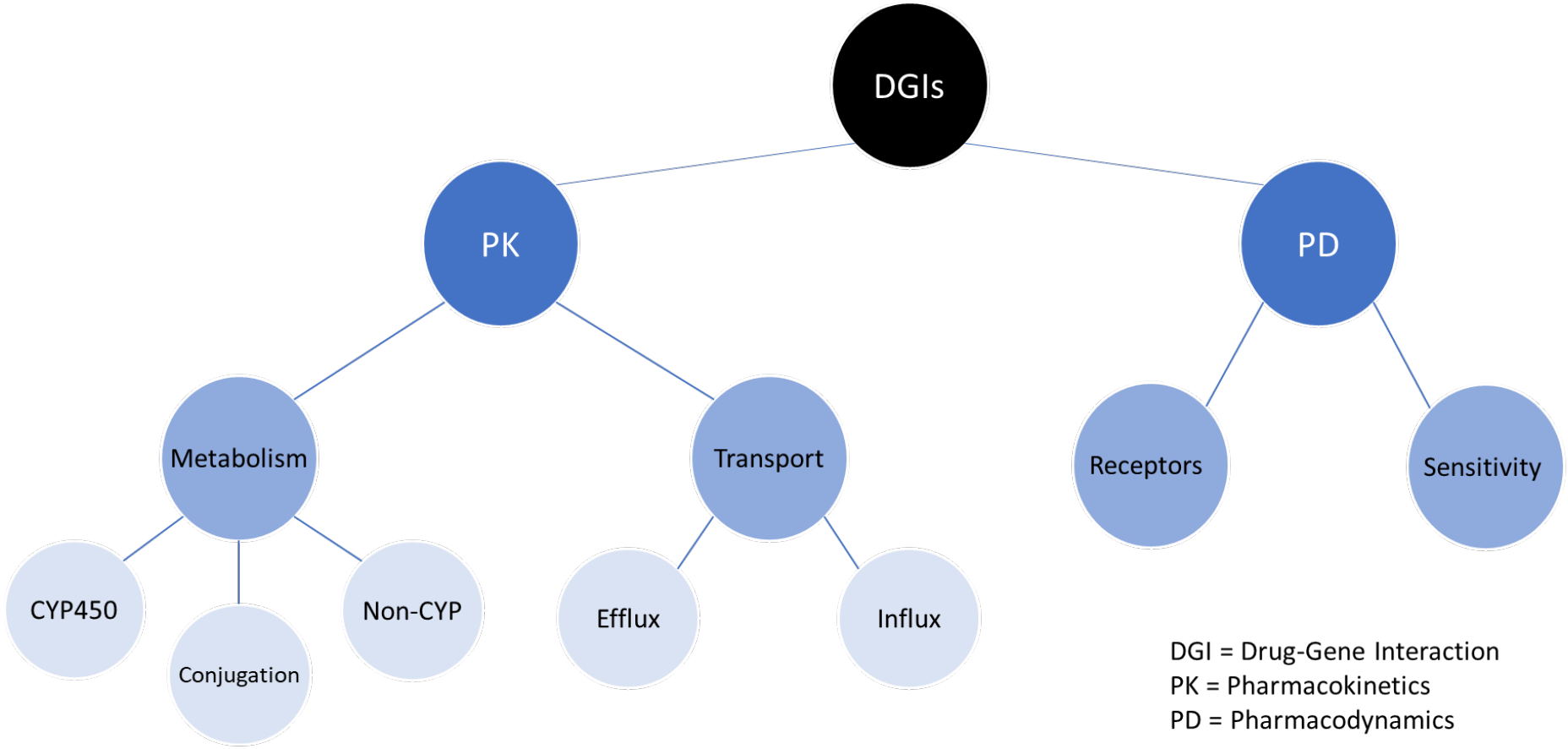


Distribution (Transporters)

- SLCO1B1
- ABCB1

Images from wikimedia commons and ClinPGx.org

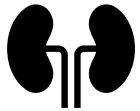
PGx... not just metabolizing enzymes



DGI = Drug-Gene Interaction
PK = Pharmacokinetics
PD = Pharmacodynamics

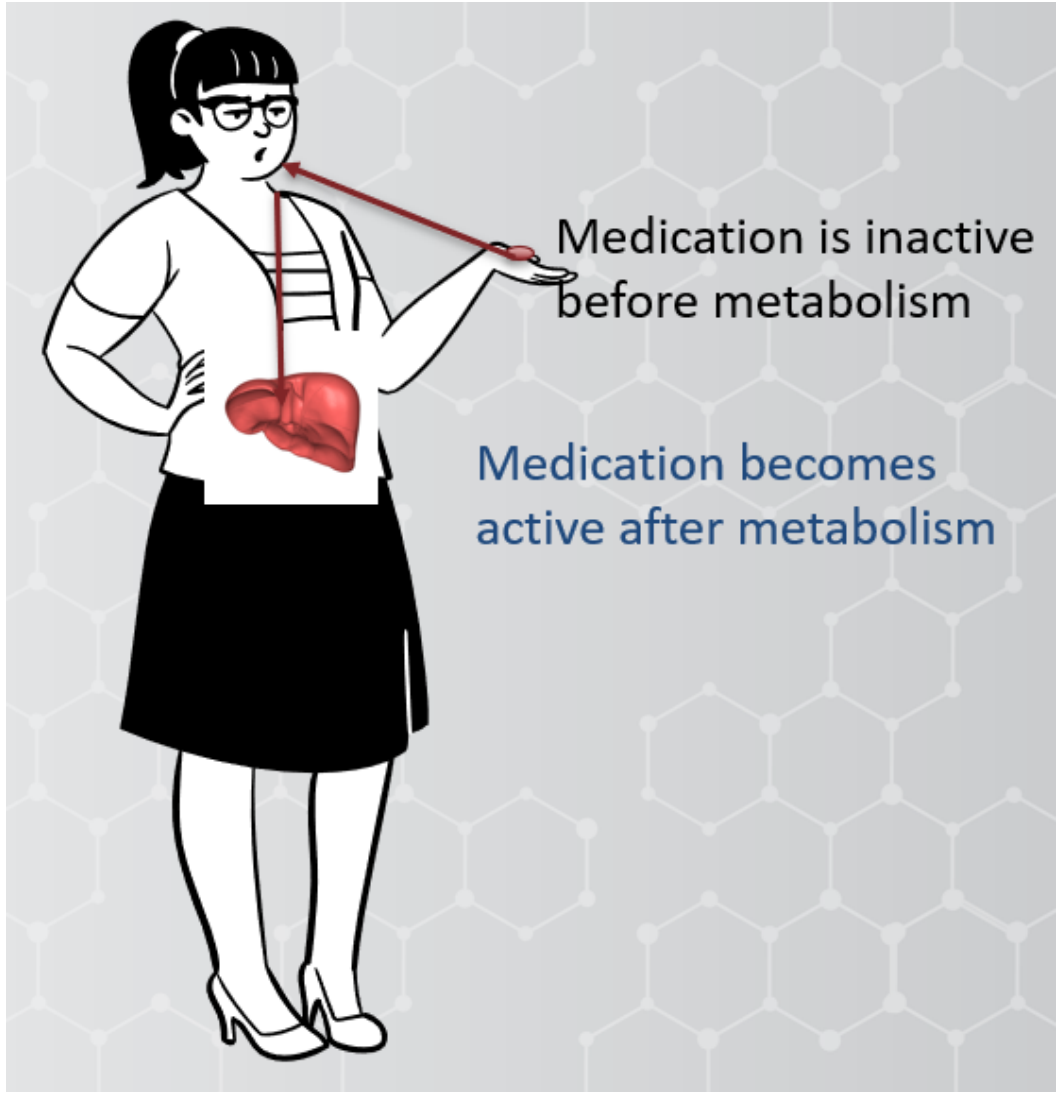
Quality and Strength of Evidence*

Active Drugs

- Absorbed through the GI tract 
- Distributed in the blood 
- Broken down by liver enzymes **CYP**
- Excreted by the kidneys 

Prodrugs

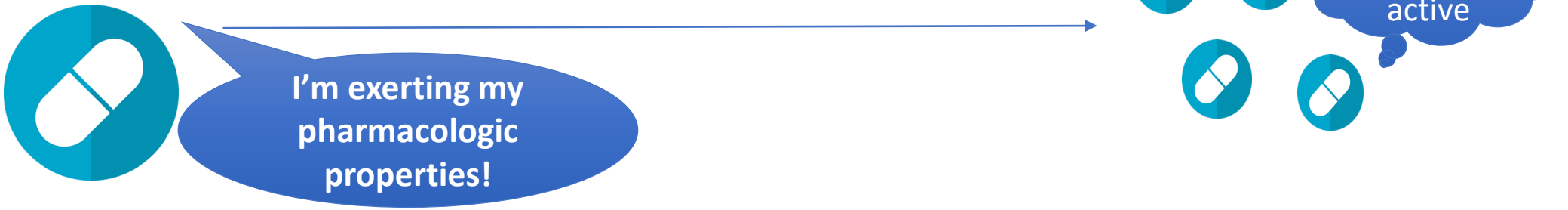
- Require biological activation
  - Improve drug delivery or specificity
  - Improve bioavailability
  - Decrease toxicity
  - Cytochrome P450 enzymes
    - Genetic variants in CYP enzymes
    - Ex. Codeine > Morphine



Active Drug vs. Prodrug

Drug A is an active drug and therefore pharmacologic effects take place quickly, then broken down to less active metabolites

Metabolized to less active metabolites

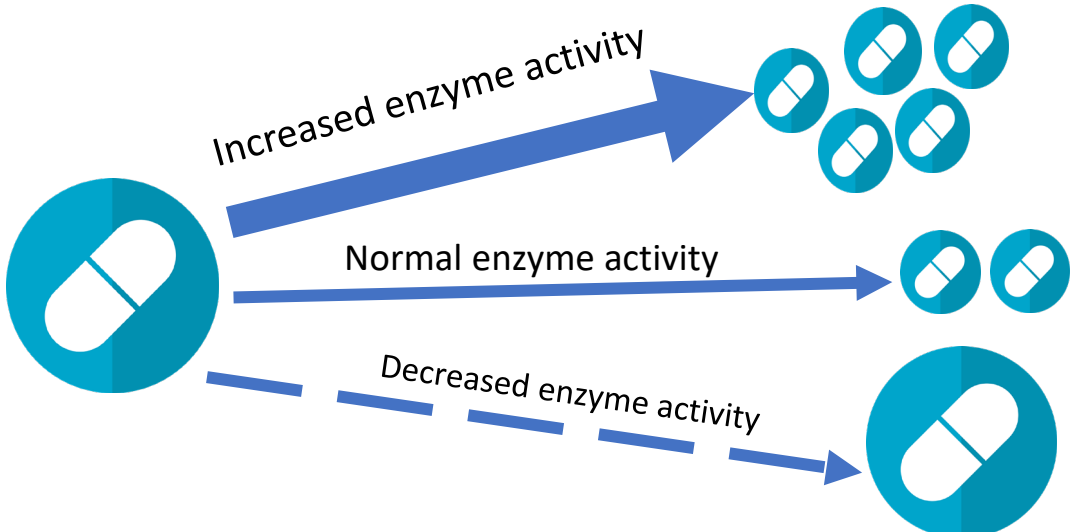


Drug B is a prodrug and therefore requires activation to its active form

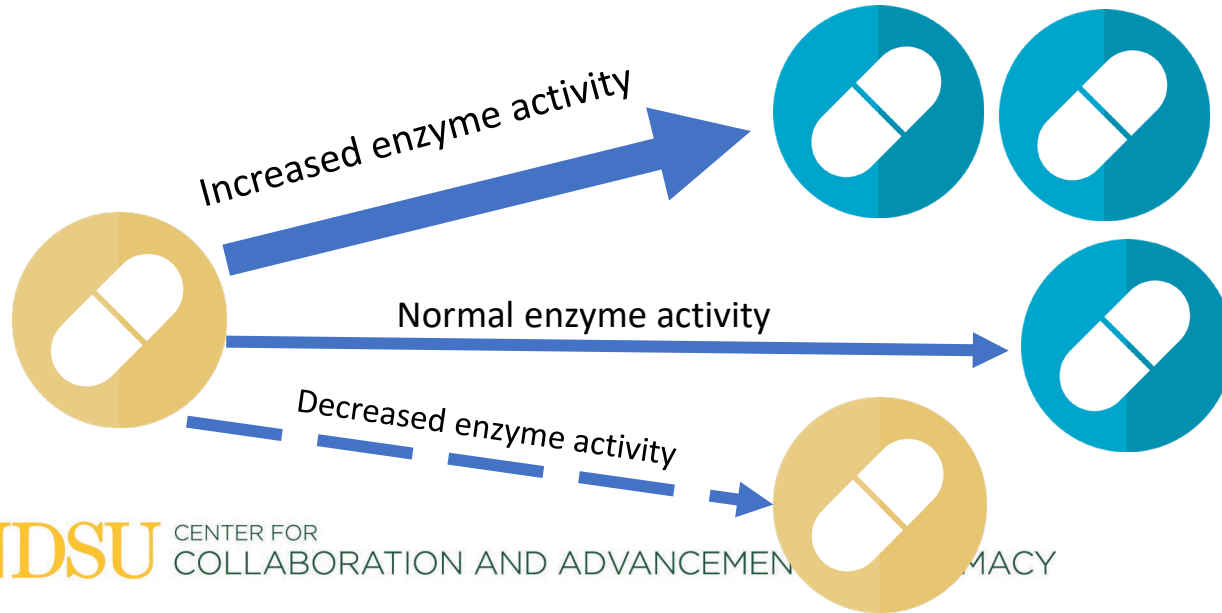
Metabolized to an active drug

Active Drug vs. Prodrug

- Active Drug
  - Increased enzyme activity leads to
    - increased metabolism
    - decreased serum concentrations
    - may decrease efficacy
  - Decreased enzyme activity leads to
    - decreased metabolism to less active metabolites
    - may increase risk of side effects



- Prodrug
  - Increased enzyme activity leads to
    - increased conversion to active drug
    - may increase risk for side effects
  - Decreased enzyme activity leads to
    - decreased conversion to active drug
    - may decrease efficacy

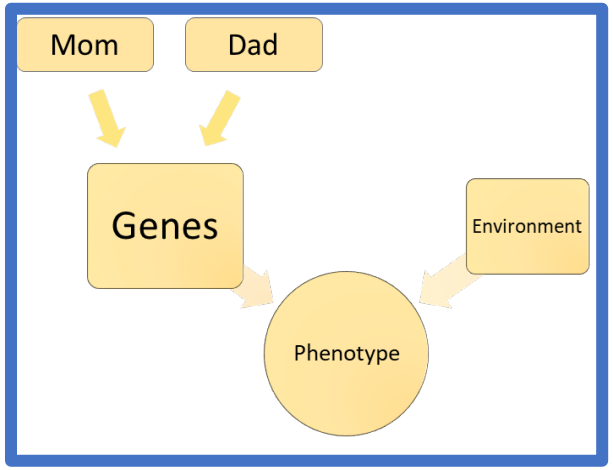


GENOTYPE-PHENOTYPE ASSOCIATION

- Different versions of a gene (alleles) can change gene function
- Pairs of alleles make up a distinct genotype
- For genes affecting drug therapy, the genes are highly predictive of the phenotype

Five Standard Genotype Assignments:

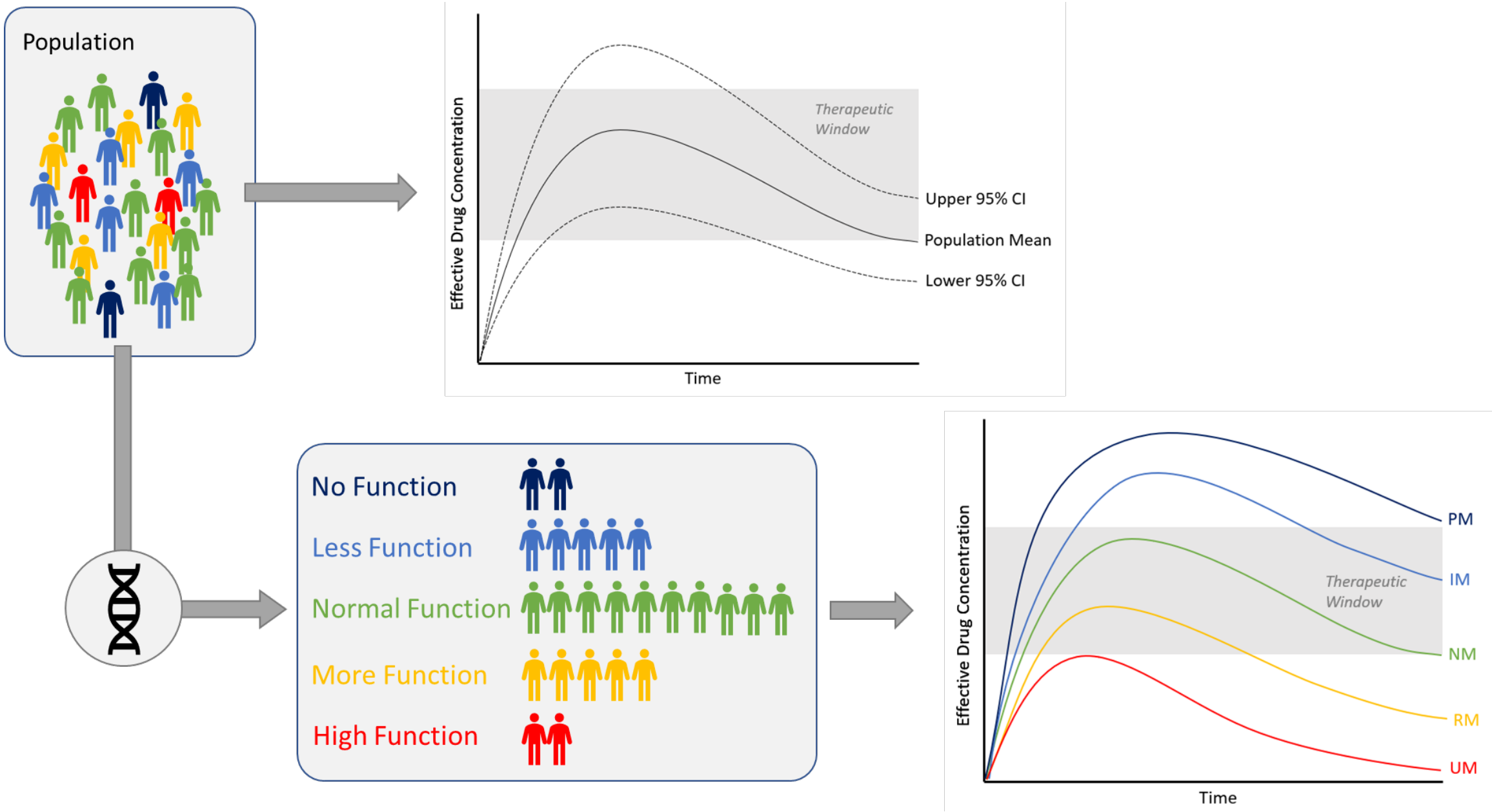
Metabolizer Phenotype	Allele 1	Allele 2
Ultrarapid (UM)	↑ function	↑ function
Rapid (RM)	↑	Normal
Normal (NM)	Normal	Normal
Intermediate (IM)	Normal or ↓	↓
Poor (PM)	↓ or 0	↓ or 0



Phenotypes (drug metabolizing enzymes)

Term	Functional definition	Genetic definition
Ultrarapid metabolizer	Increased enzyme activity compared to rapid metabolizers	2 increased function alleles, or more than 2 normal function alleles
Rapid metabolizer	Increased enzyme activity compared to normal metabolizers but less than ultrarapid metabolizers	Combinations of normal function and increased function alleles
Normal metabolizer	Fully functional enzyme activity	Combinations of normal function and decreased function alleles
Intermediate metabolizer	Decreased enzyme activity (activity between normal and poor metabolizer)	Combinations of normal function, decreased function, and/or no function alleles
Poor metabolizer	Little to no enzyme activity	Combination of no function alleles and/or decreased function alleles

Phenotypes
(drug metabolizing enzymes)



Design credit: Jordan Baye, PharmD, MA, BCPS

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Metabolism Implications

Citalopram (Active Drug)

Phenotype: *Ultra-rapid Metabolizer*

- Increased metabolism when compared to normal metabolizers
- Lower plasma concentrations will increase probability of **pharmacotherapy failure (lack of efficacy)**

Phenotype: *Poor Metabolizer*

- Greatly reduced metabolism when compared to normal metabolizers
- Higher plasma concentrations may increase the probability of **side effects**

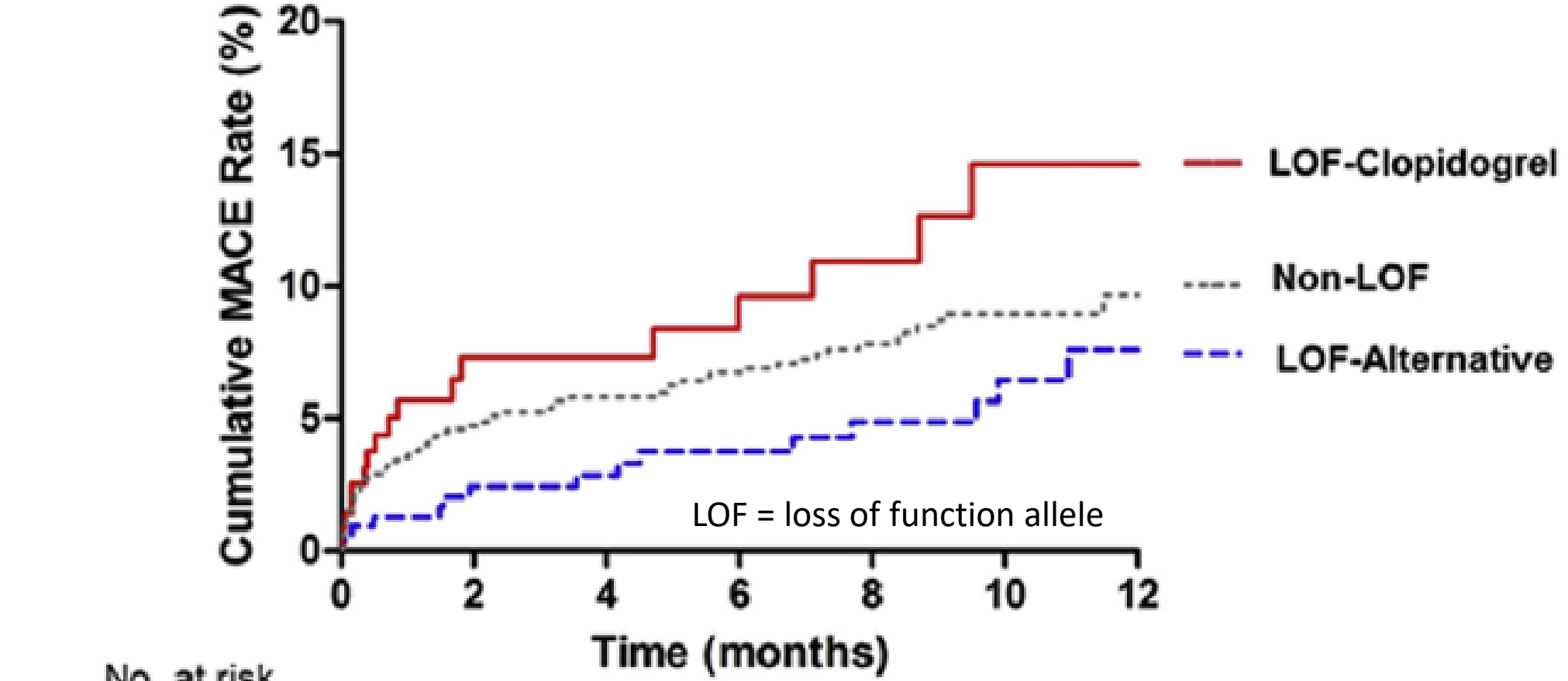
Clopidogrel (ProDrug)

Phenotype: *Ultra-rapid Metabolizer*

- Increased platelet inhibition
- Decreased residual platelet aggregation
- (in theory potential for **increased side effects** of increased bleeding)

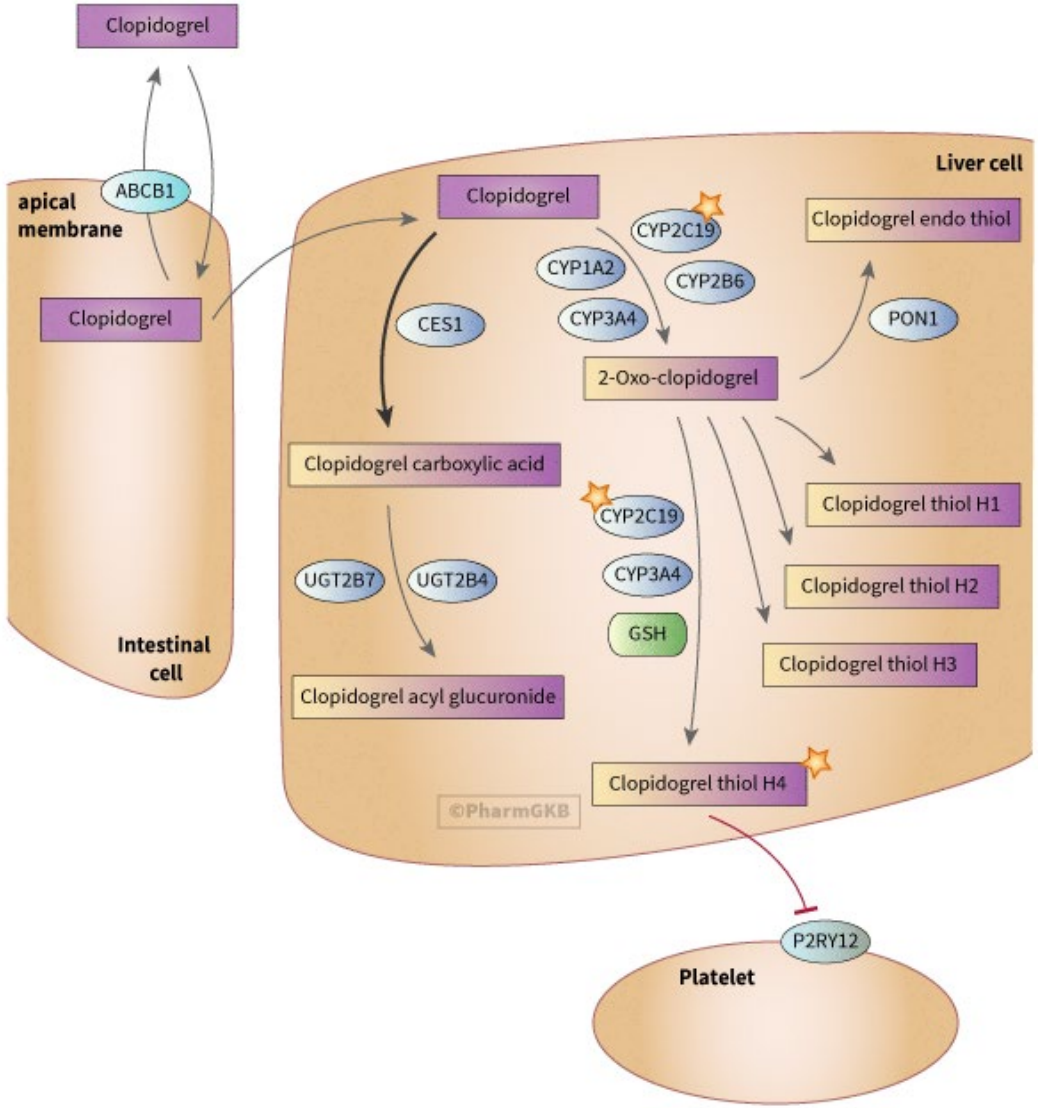
Phenotype: *Poor Metabolizer*

- Significantly reduced platelet inhibition
- Increased residual platelet aggregation
- Increased risk for adverse cardiovascular events due to **lack of efficacy**



No. at risk							
LOF-Clopidogrel	226	112	89	76	63	39	3
Non-LOF	1243	759	636	577	451	293	28
LOF-Alternative	346	245	221	195	161	112	9

Representation of genes involved in metabolism of clopidogrel.



Drug-Transporter Genes of Interest

- Several transporters on the cell surface have genetic polymorphisms that have clinical PGx implications
- The *SLCO1B1* gene encodes for OAT polypeptide B1, which mediates the uptake of β-hydroxy-β-methylglutaryl-coenzyme A (HMG-CoA) reductase inhibitors (i.e., statins) into the liver
- The *ABCB1* gene encodes for the p-glycoprotein (*P-gp*) transporter, which typically functions to expel both drugs and xenobiotics from the cytoplasm of the cell
- Variations typically result in reduced function, increased bioavailability of drugs/xenobiotics, and increased risk for adverse effects

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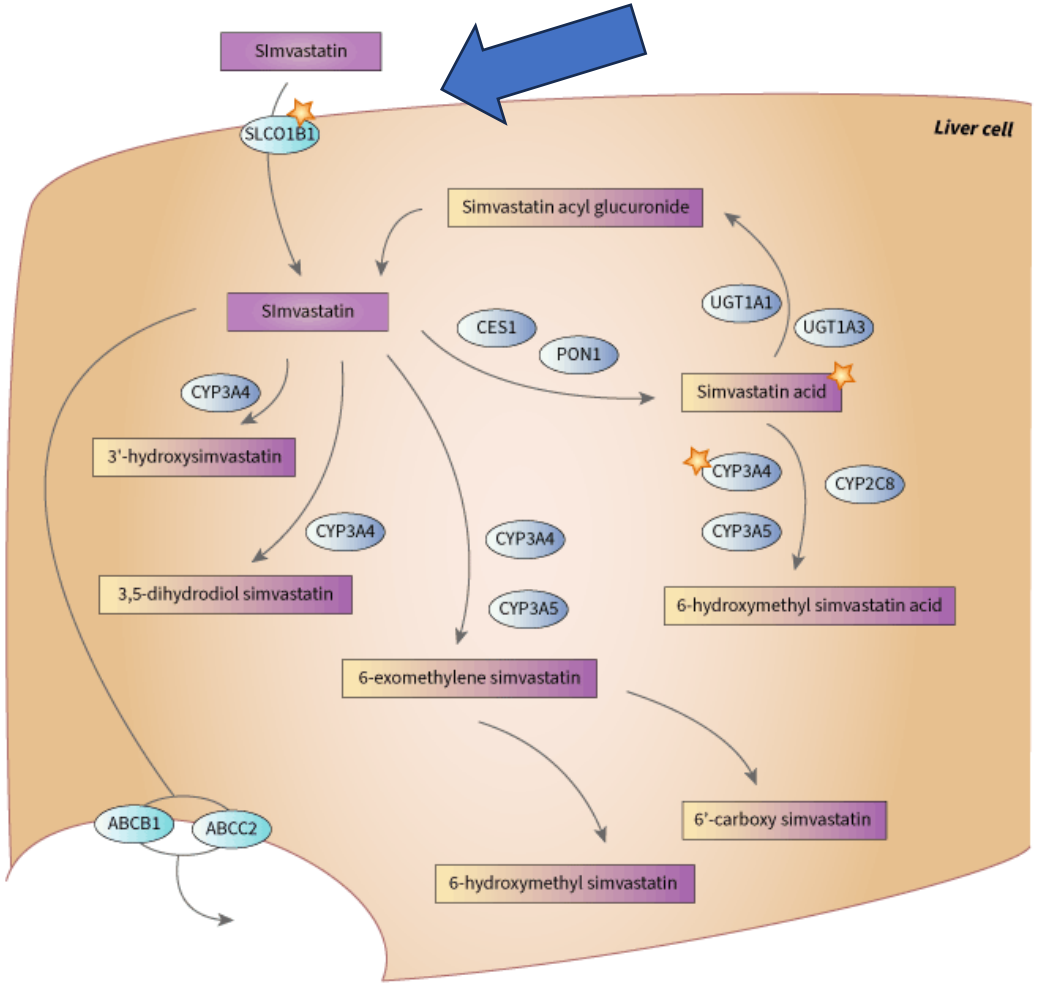
Transporter

Summary

Representation of the candidate genes involved in transport and metabolism of simvastatin.



Immune-Related Genes of Interest

- The human leukocyte antigen (*HLA*) genes encode for proteins that recognize "self" from "non-self" and play a key role in the function of the immune system
  - They are among the most polymorphic genes in the human genome
- The presence of certain *HLA* alleles has been linked to serious, potentially life-threatening adverse skin reactions including Stevens-Johnson Syndrome, toxic epidermal necrosis, and/or hypersensitivity reactions
- *HLA* genes of interest and the medications associated with them include:
  - *HLA-B*57:01*: abacavir
  - *HLA-B*58:01*: allopurinol
  - *HLA-B*15:02*: carbamazepine, oxcarbazepine, phenytoin, and lamotrigine

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Resources

- ClinPGx
  - https://www.clinpgx.org/
- FDA
  - https://www.fda.gov/medical-devices/precision-medicine/table-pharmacogenetic-associations

PGx testing approaches

Pre-emptive

- Screening
- Test results available in chart at time of prescribing
- Usually panels

Reactive

- Targeted approach to therapy
  - Anticipation of beginning certain therapies
    - clopidogrel
  - Explain previous reactions
    - Medication failure
    - Adverse reactions
- Can be single gene or panel

CPIC guidelines

Guidelines	Drugs	Genes
CFTR and Ivacaftor	ivacaftor	CFTR
CYP2B6 and efavirenz	efavirenz	CYP2B6
CYP2B6 and methadone	methadone	CYP2B6
CYP2C19 and Clopidogrel	clopidogrel	CYP2C19
CYP2C19 and Proton Pump Inhibitors **PPIs!**	dexlansoprazole esomeprazole lansoprazole omeprazole pantoprazole rabeprazole	CYP2C19
CYP2C19 and Voriconazole	voriconazole	CYP2C19
CYP2C9 and NSAIDs **NSAIDs!**	aceclofenac aspirin celecoxib diclofenac flurbiprofen ibuprofen indomethacin lornoxicam lumiracoxib meloxicam nabumetone naproxen piroxicam tenoxicam	CYP2C8 CYP2C9
CYP2C9, HLA-B and Phenytoin	fosphenytoin phenytoin	CYP2C9 HLA-B
CYP2C9, VKORC1, CYP4F2 and Warfarin	warfarin	CYP2C9 CYP4F2 VKORC1
CYP2D6 and Atomoxetine	atomoxetine	CYP2D6
CYP2D6 and Ondansetron and Tropisetron	ondansetron tropisetron	CYP2D6
CYP2D6 and Tamoxifen	tamoxifen	CYP2D6
CYP2D6, ADRB1, ADRB2, ADRA2C, GRK4, and GRK5 and Beta-Blockers	acebutolol atenolol betaxolol bisoprolol carvedilol esmolol labetalol metoprolol nadolol nebivolol pindolol propranolol sotalol	ADRA2C ADRB1 ADRB2 CYP2D6 GRK4 GRK5
CYP2D6, CYP2C19 and Tricyclic Antidepressants	amitriptyline clomipramine desipramine doxepin imipramine nortriptyline trimipramine	CYP2C19 CYP2D6
CYP2D6, CYP2C19, CYP2B6, SLC6A4, HTR2A and Serotonin Reuptake Inhibitor Antidepressants **SSRIs/SNRIs!**	citalopram desvenlafaxine duloxetine escitalopram fluoxetine fluvoxamine levomilnacipran milnacipran paroxetine sertraline venlafaxine vilazodone vortioxetine	CYP2B6 CYP2C19 CYP2D6 HTR2A SLC6A4
CYP2D6, OPRM1, COMT, and Opioids **Opioids!**	alfentanil buprenorphine codeine fentanyl hydrocodone hydromorphone levomethadone methadone morphine naltrexone oxycodone remifentanil sufentanil tramadol	COMT CYP2D6 OPRM1

CYP3A5 and Tacrolimus	tacrolimus	CYP3A5
DPYD and Fluoropyrimidines	capecitabine fluorouracil tegafur	DPYD
HLA-A, HLA-B and Carbamazepine and Oxcarbazepine	carbamazepine oxcarbazepine	HLA-A HLA-B
HLA-B and Abacavir	abacavir	HLA-B
HLA-B and Allopurinol	allopurinol	HLA-B
IFNL3 and Peginterferon-alpha-based Regimens	peginterferon alfa-2a peginterferon alfa-2b ribavirin	IFNL3 IFNL4
MT-RNR1 and Aminoglycosides	amikacin dibekacin gentamicin kanamycin neomycin netilmicin paromomycin plazomicin ribostamycin streptomycin tobramycin	MT-RNR1
NAT2 and Hydralazine	hydralazine	NAT2
RYR1, CACNA1S and Volatile anesthetic agents and Succinylcholine	desflurane enflurane halothane isoflurane methoxyflurane sevoflurane succinylcholine	CACNA1S RYR1
SLCO1B1, ABCG2, CYP2C9, and Statins	atorvastatin fluvastatin lovastatin pitavastatin pravastatin rosuvastatin simvastatin	ABCG2 CYP2C9 CYP3A4 CYP3A5 HMGCR SLCO1B1
TPMT, NUDT15 and Thiopurines	azathioprine mercaptopurine thioguanine	NUDT15 TPMT
UGT1A1 and Atazanavir	atazanavir	UGT1A1

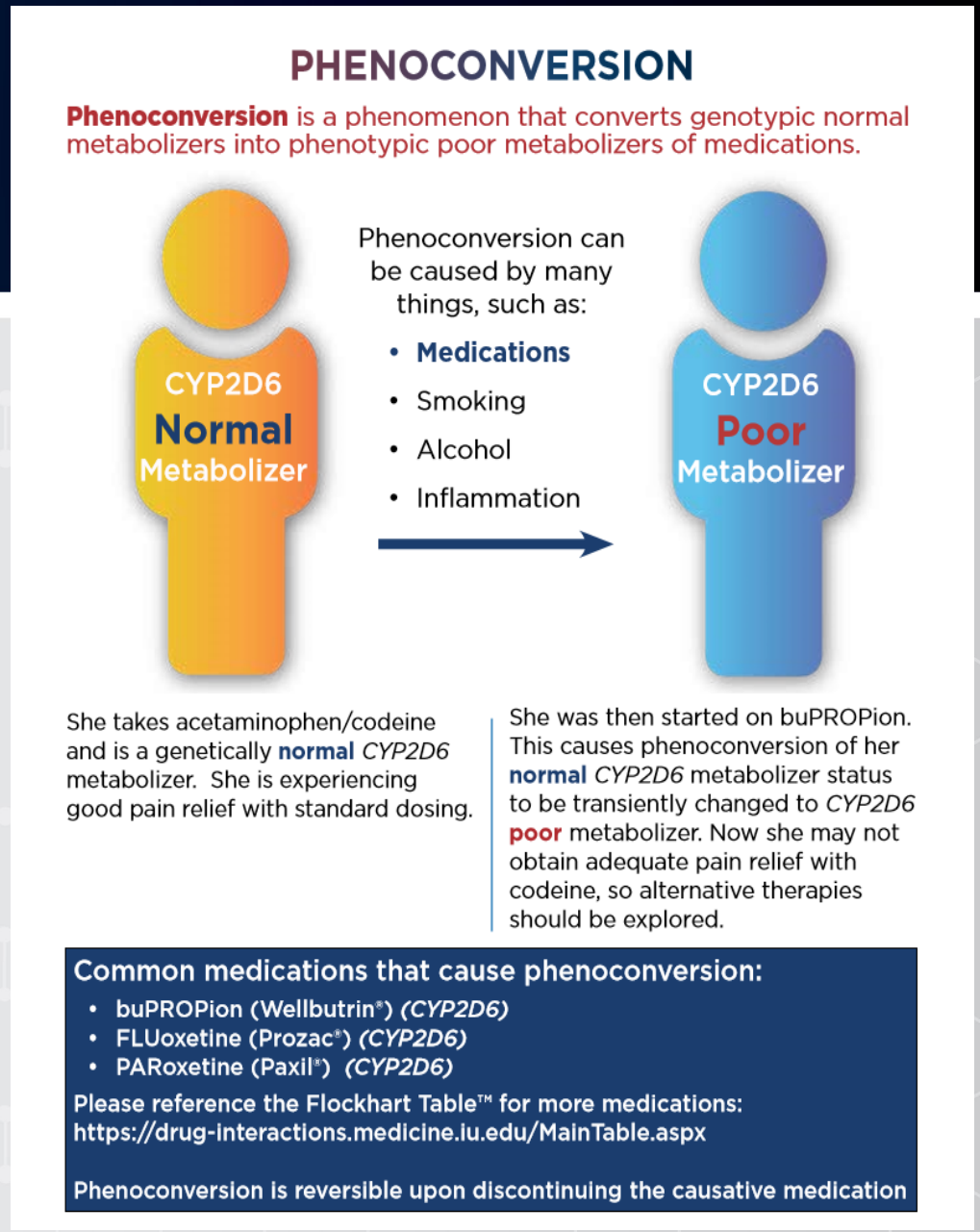
Statins!

G6PD	aminosalicylic acid aspirin chloramphenicol chloroquine chlorpropamide ciprofloxacin dabrafenib dapsone dimercaprol doxorubicin furazolidone gliclazide glimepiride glipizide glyburide hydroxychloroquine mafenide mepacrine mesalazine methylene blue moxifloxacin nalidixic acid nicorandil nitrofural nitrofurantoin norfloxacin ofloxacin pegloticase phenazopyridine primaquine probenecid quinine rasburicase sodium nitrite sulfacetamide sulfadiazine sulfadimidine sulfamethoxazole / trimethoprim sulfanilamide sulfasalazine sulfisoxazole tafenoquine tolazamide tolbutamide toluidine blue trametinib vitamin c	G6PD

MORE THAN JUST PGX RESULTS

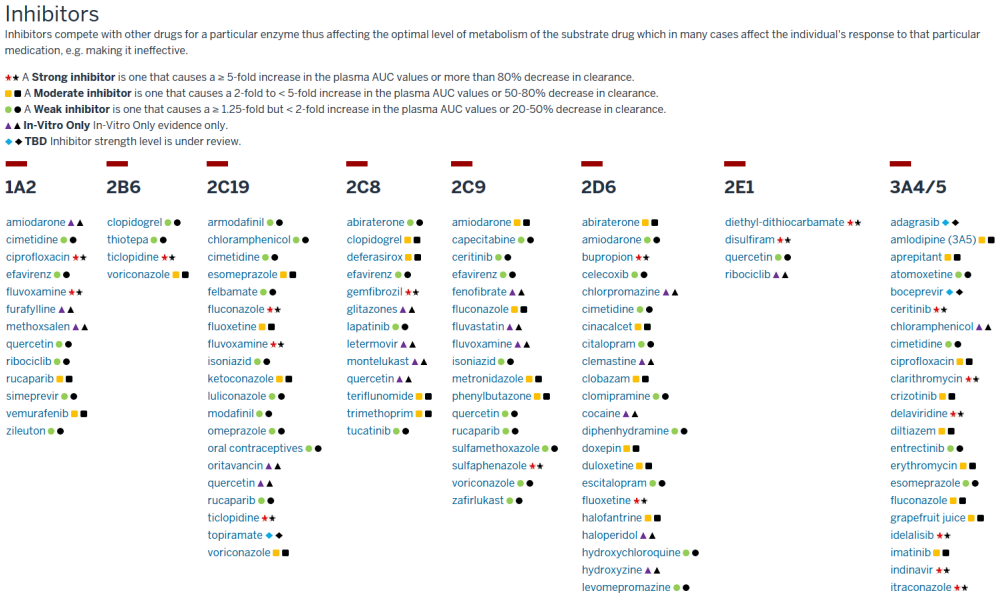
- **Phenoconversion**
  - A phenomenon by which an individual's genotype-predicted phenotype is transformed into another by factors such as drug interactions or diseases.
  - Reversible upon discontinuation of offending medication

  - **<u>Commonly Used Strong CYP2D6 Inhibitors:</u>**
    - Paroxetine, fluoxetine, bupropion



Phenoconversion Resources

- Flockhart Table
  - https://drug-interactions.medicine.iu.edu/main-table
- UF PROP Calculator
  - https://precisionmedicine.ufhealth.org/how-to-interpret-results/phenoconversion-calculator/



Inhibitors

Inhibitors compete with other drugs for a particular enzyme thus affecting the optimal level of metabolism of the substrate drug which in many cases affect the individual's response to that particular medication, e.g. making it ineffective.

★★ A **Strong inhibitor** is one that causes a ≥ 5-fold increase in the plasma AUC values or more than 80% decrease in clearance.
■■ A **Moderate inhibitor** is one that causes a 2-fold to < 5-fold increase in the plasma AUC values or 50-80% decrease in clearance.
●● A **Weak inhibitor** is one that causes a ≥ 1.25-fold but < 2-fold increase in the plasma AUC values or 20-50% decrease in clearance.
▲▲ **In-Vitro Only** In-Vitro Only evidence only.
◆◆ **TBD** Inhibitor strength level is under review.

1A2

amiodarone ▲▲
cimetidine ●●
ciprofloxacin ★★
efavirenz ●●
fluvoxamine ★★
furafylline ▲▲
methoxsalen ▲▲
quercetin ●●
ribociclib ●●
rucaparib ■■
simeprevir ●●
vemurafenib ■■
zileuton ●●

2B6

clopidogrel ●●
thiotepa ●●
ticlopidine ★★
voriconazole ■■

2C19

armodafinil ●●
chloramphenicol ●●
cimetidine ●●
esomeprazole ■■
felbamate ●●
fluconazole ★★
fluoxetine ■■
fluvoxamine ★★
isoniazid ●●
ketoconazole ■■
luliconazole ●●
modafinil ●●
omeprazole ●●
oral contraceptives ●●
oritavancin ▲▲
quercetin ▲▲
rucaparib ●●
ticlopidine ★★
topiramate ◆◆
voriconazole ■■

2C8

abiraterone ●●
clopidogrel ■■
deferasirox ■■
efavirenz ●●
gemfibrozil ★★
glitazones ▲▲
lapatinib ●●
letermovir ▲▲
montelukast ▲▲
quercetin ▲▲
teriflunomide ■■
trimethoprim ■■
tucatinib ●●

2C9

amiodarone ■■
capecitabine ●●
ceritinib ●●
efavirenz ●●
fenofibrate ▲▲
fluconazole ■■
fluvastatin ▲▲
fluvoxamine ▲▲
isoniazid ●●
metronidazole ■■
phenylbutazone ■■
quercetin ●●
rucaparib ●●
sulfamethoxazole ●●
sulfaphenazole ★★
voriconazole ●●
zafirlukast ●●

2D6

abiraterone ■■
amiodarone ●●
bupropion ★★
celecoxib ●●
chlorpromazine ▲▲
cimetidine ●●
cinacalcet ■■
citalopram ●●
clemastine ▲▲
clobazam ■■
clomipramine ●●
cocaine ▲▲
diphenhydramine ●●
doxepin ■■
duloxetine ■■
escitalopram ●●
fluoxetine ★★
halofantrine ■■
haloperidol ▲▲
hydroxychloroquine ●●
hydroxyzine ▲▲
levomepromazine ●●

2E1

diethyl-dithiocarbamate ★★
disulfiram ★★
quercetin ●●
ribociclib ▲▲

3A4/5

adagrasib ◆◆
amlodipine (3A5) ■■
aprepitant ■■
atomoxetine ●●
boceprevir ◆◆
ceritinib ★★
chloramphenicol ▲▲
cimetidine ●●
ciprofloxacin ■■
clarithromycin ★★
crizotinib ■■
delaviridine ★★
diltiazem ■■
entrectinib ●●
erythromycin ■■
esomeprazole ●●
fluconazole ■■
grapefruit juice ■■
idelalisib ★★
imatinib ■■
indinavir ★★
itraconazole ★★

CYP2D6 Phenoconversion Calculator

The PROP™ Pharmacogenetics Calculator is intended to help clinicians integrate a standardized method of assessing CYP2D6 phenoconversion into practice when a CYP2D6 genotype is available. The CYP2D6 drug metabolizing enzyme is susceptible to inhibition by concomitant drugs, which can lead to a clinical phenotype that is different from the genotype-based phenotype, a process referred to as phenoconversion. Phenoconversion is highly prevalent but not widely integrated into practice because of either limited experience on how to integrate or lack of knowledge that it has occurred.

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Pharmacists Role

ASHP REPORT

ASHP Statement on the Pharmacist's Role in Clinical Pharmacogenomics

- Knowledge gaps are a well-known barrier for both healthcare professionals and patients
  - Be the point of contact for patients and healthcare professionals in interpreting PGx test results and providing educational resources
- Pharmacists are broadly trained in a number of medication-related areas, including pharmacology, pharmacokinetics, and pharmacodynamics
  - This places pharmacists in a unique position in dealing with the complexities of pharmacotherapy in the era of PGx
- Guide PGx implementation efforts and educate healthcare professionals in the adoption of PGx testing
- Create and advocate for PGx clinical decision support services to minimize drug-drug interactions
- Provide consultations about PGx test results to patients
- Collaborate with healthcare providers from multiple disciplines (e.g. physicians, nurse, genetic counselors) to ensure their patients receive the best possible care
- Involvement in PGx research and facilitating the development of clinical practice guidelines

Haidar et al Am J Health-Syst Pharm. 2022;79:704-707
Maruf AA, Aziz MA. *Pharmacy (Basel)*. 2023;11(6):180.
Smith et al CP&T doi:https://doi.org/10.1002/cpt.3736

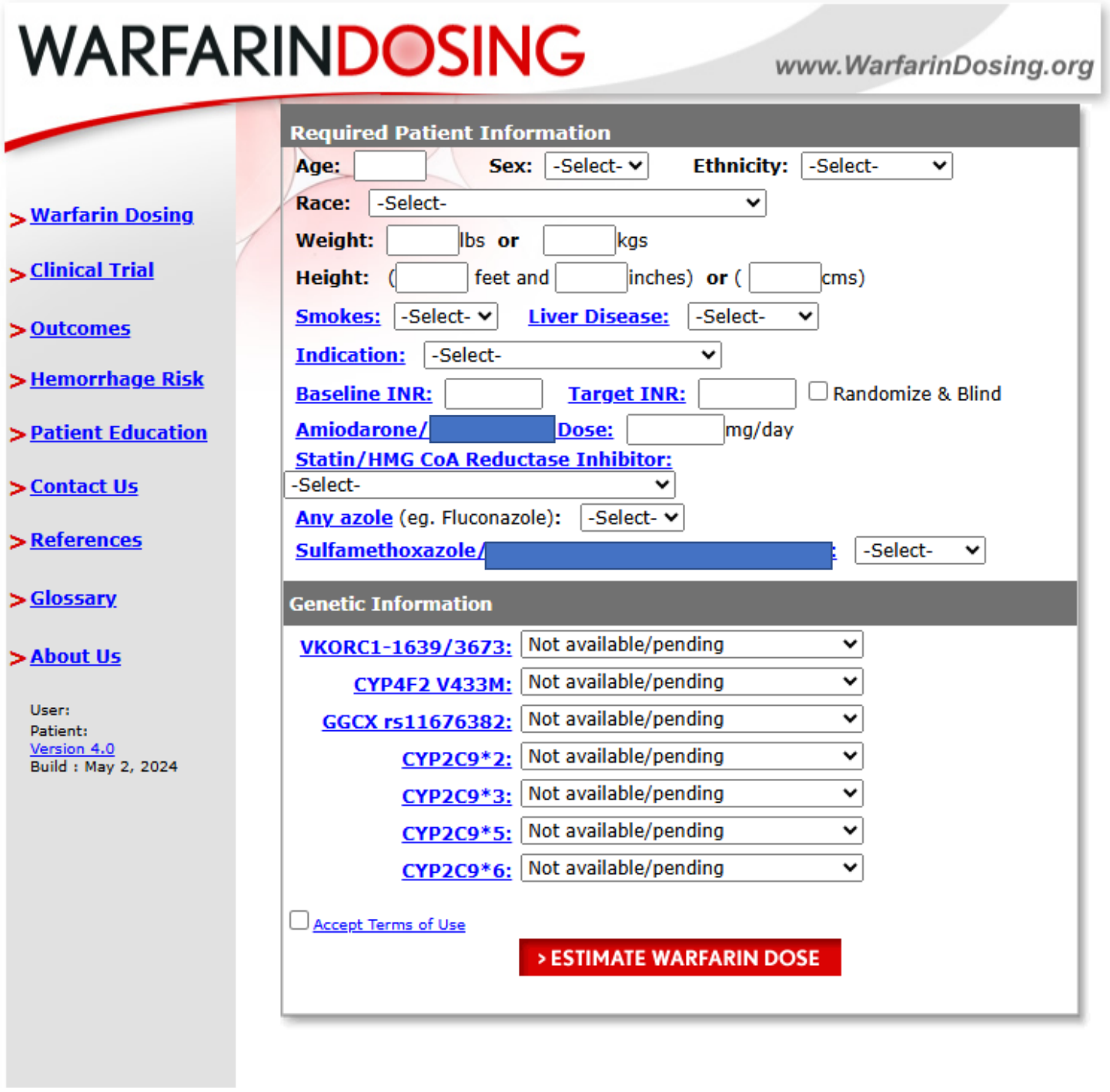
Emerging trend: adding PGx into clinical calculators and algorithms

Genetics is just one piece of the patient puzzle.

Important to consider other factors.

Clinical Factors

- http://www.warfarindosing.org/Source/Home.aspx



Models of Delivering PGx Services

- Health-system Prescriber-led:
  - Sole provider-led
    - Physician, mid-level provider (genetic counselor, nurse practitioner, physician associate/assistant), pharmacist provides all PGx services to patient
    - Supported largely through clinical decision support (CDS) tools built into electronic health record (EHR)
      - Alert prescriber to offer PGx testing prior to prescription of PGx-relevant medication
      - Actionable recommendations for medication prescription
  - Interdisciplinary team
    - Prescriber works collaborative with other members of interdisciplinary team who interact with patient to provide PGx services
      - Team may include a clinical pharmacist, genetic counselor, and nurses
    - Discusses PGx testing with patient and orders testing
    - PGx results are interpreted by a member of the team and recommendations are discussed with team members before a final decision is made about the medication

Waheed Z et al. *Pharmacogenomics*. Published online October 14, 2025.

Models of Delivering PGx Services (cont.)

- PGx consultation service
  - Patient is referred to or independently decides to visit a consultation individual/team who provides PGx services
    - Team can include clinical pharmacists, genetic counselors, nurses, etc.
  - Consultation note with recommendations can be provided to prescriber
- Community pharmacist-led:
  - Pharmacist provides PGx services to patient and discusses recommendations with prescriber
    - Recommending PGx testing
    - Ordering the test
    - Interpreting PGx results
    - Provide recommendations to prescriber

Waheed Z, Bunka M, Edwards L, et al. Characterizing models for delivery of pharmacogenomic testing: a scoping review. *Pharmacogenomics*. Published online October 14, 2025. doi:10.1080/14622416.2025.2571387

Incorporating PGx into Community Pharmacy Practice

- Direct-to-consumer (DTC) PGx testing is become more readily available for patients
  - Testing that is not prescriber-ordered
  - Some downsides – so use with caution
- The expansion of DTC testing in addition to prescriber-ordered PGx testing will continue to increase the awareness of PGx testing and desire for PGx interpretation services
- Community pharmacies are ideal locations to implement PGx services due to:
  - Easy access for many patients
  - Direct pharmacist to patient contact to provide knowledgeable PGx education to patients
  - Point of care PGx testing can be completed in the pharmacy
  - PGx services can be implemented into already existing medication therapy management (MTM) services

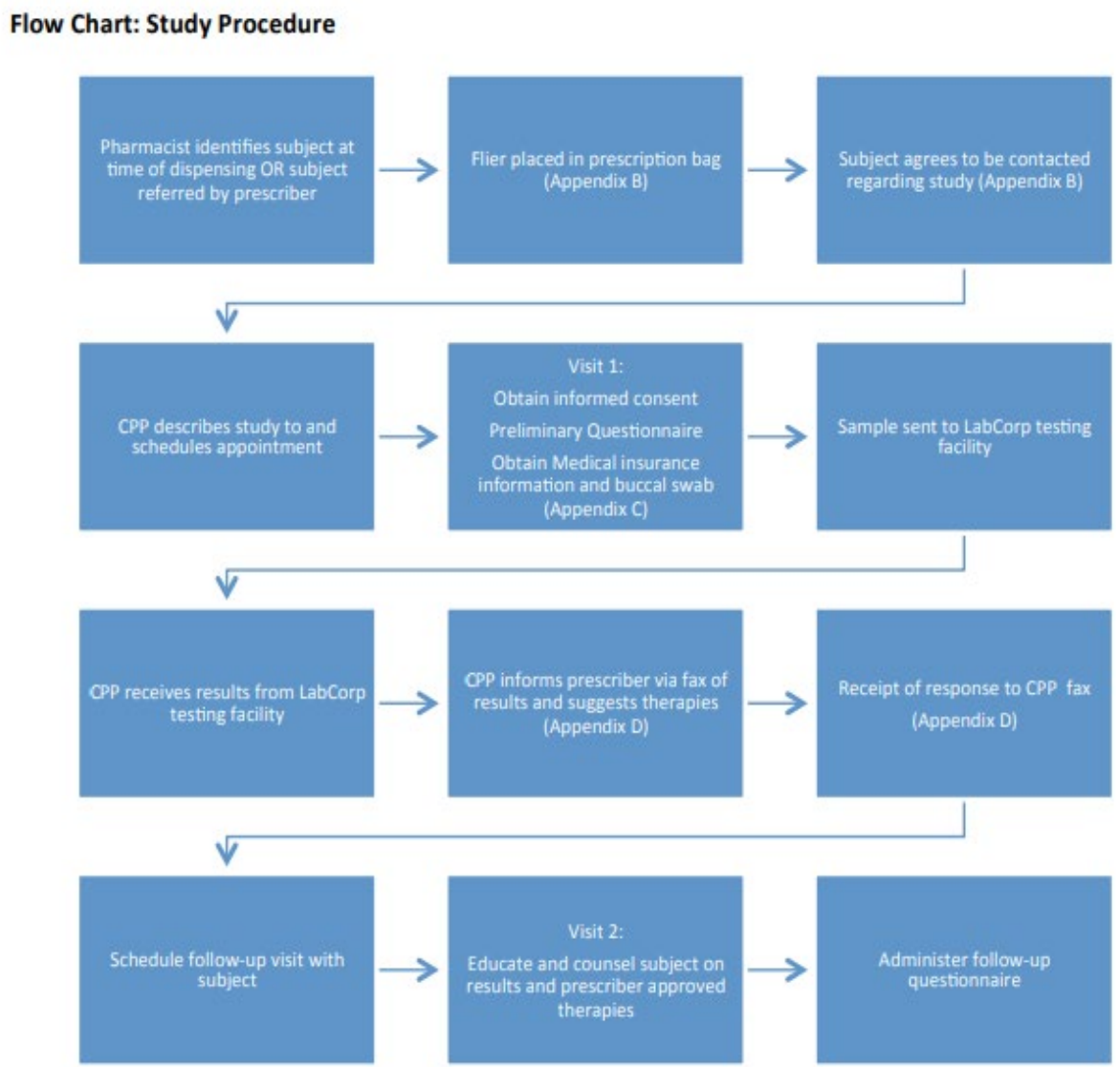
Kisor DF, Petry NJ, Bright DR. *Pharmgenomics Pers Med*. 2021;14:569-577. 2021.

Incorporating PGx into Community Pharmacy Practice (cont.)

- Various steps can be taken to implement PGx services into pharmacy practice:
  - Assess pharmacy readiness
  - Establish a workflow
  - Collaborate with prescribers (if needed)
  - Identify suitable patients for PGx testing
  - Obtain PGx testing and results
  - Interpret PGx test results
  - Provide a recommendation

Community Pharmacy Foundation

- Implementation of a Personalized Medicine (Pharmacogenomics) Service in a Community Pharmacy
- Chapel Hill, NC



https://www.communitypharmacyfoundation.org/resources/grant_docs/CPFGrantDoc_44468.pdf
Accessed: 10/31/2025

Assess Pharmacy Readiness

- Evaluate pharmacy's scope and whether PGx services can be implemented alongside other services offered
  - Implementation alongside MTM can provider further optimization of pharmacotherapy
- Ensure pharmacists are properly educated about PGx
  - Lack of knowledge and confidence about PGx has been identified as a barrier for many pharmacists
- There are several options for pharmacists to educate themselves on PGx (including but not limited to):
  - ASHP Pharmacogenomics Certificate
  - NCPA Implementing Pharmacogenomics
  - ACCP Precision Medicine: Applied Pharmacogenomics
  - Test2Learn

Caudle KE, Whirl-Carrillo M, Relling MV, et al. Advancing Clinical Pharmacogenomics Worldwide Through the Clinical Pharmacogenetics Implementation Consortium (CPIC). *Clinical Pharmacology & Therapeutics*. Published online July 18, 2025. doi:https://doi.org/10.1002/cpt.70005

American Society of Health-System Pharmacists. *Pharmacogenomics Certificate* [online course]. Release date April 24 2024. Accessed October 20 2025. https://elearning.ashp.org/products/11488/pharmacogenomics-certificate.

https://www.test2learn.org/

National Community Pharmacists Association. Implementing Pharmacogenomics [online course]. Release date June 15, 2023. Accessed October 20, 2025. https://ncpa.org/implementing-pharmacogenomics ncpa.org

American College of Clinical Pharmacy. *Precision Medicine: Applied Pharmacogenomics Certificate Program* [online course]. Release date September 9 2025. Accessed October 20 2025. https://www.accp.com/PGX

Establish a Workflow

- Determining how to implement PGx services into the community pharmacy workflow is extremely important
- Factors to consider include:
  - Adequate staffing for services
  - Appropriate space for conducting testing (e.g. a consultation room)
  - Patient identification to be collected
    - (e.g. date of birth, gender, ethnicity, medication use, etc.)
  - Obtaining informed consent from patients
  - Time and staff to interpret PGx results and provide recommendations

Thornley T, et al. *Pharmacy (Basel)*. 2021;9(1):38. Published 2021

Collaborate with Prescribers

- Collaborating with prescribers is important to ensure that recommendations made by community pharmacists can be implemented
- Engaging with prescribers also:
  - Raises awareness of PGx services
  - Allows the prescribers to ask questions
  - Can ensure a reliable method of communication between pharmacy and prescriber is established

Thornley T, Esquivel B, Wright DJ, Dop HVD, Kirkdale CL, Youssef E. Implementation of a Pharmacogenomic Testing Service through Community Pharmacy in the Netherlands: Results from an Early Service Evaluation. *Pharmacy (Basel)*. 2021;9(1):38. Published 2021 Feb 12. doi:10.3390/pharmacy9010038

Identify Suitable Patients for PGx Testing

- Patients who are suitable for PGx testing can be recruited to the pharmacy in various ways:
  - Identification by community pharmacists
  - Referral from prescribers
  - Patient request of the service
    - Marketing materials can be created to display within the pharmacy
- Potential suitable candidates for PGx testing include patients who:
  - Are on medications with actionable PGx recommendations (e.g. clopidogrel)
  - Have a lack of response to various medications (e.g. multiple antidepressants)
  - Experience many side effects from their medication

Thornley T, Esquivel B, Wright DJ, Dop HVD, Kirkdale CL, Youssef E. Implementation of a Pharmacogenomic Testing Service through Community Pharmacy in the Netherlands: Results from an Early Service Evaluation. *Pharmacy (Basel)*. 2021;9(1):38. Published 2021 Feb 12. doi:10.3390/pharmacy9010038

Obtain PGx Test Results

- PGx test results can come from various sources:
  - Direct-to-consumer (DTC) PGx tests
  - PGx data located in electronic health records
    - Internal vs external labs
  - Healthcare provider-ordered PGx tests
  - Community pharmacist-ordered PGx tests

Kisor DF, Petry NJ, Bright DR. Pharmacogenomics in the United States Community Pharmacy Setting: The Clopidogrel-*CYP2C19* Example. *Pharmgenomics Pers Med*. 2021;14:569-577. Published 2021 May 18. doi:10.2147/PGPM.S224894

Direct-to-Consumer (DTC) Testing

- Direct-to-consumer (DTC) tests can be sold in pharmacies
  - Includes CYP2C19 DTC tests, which is clinically relevant for clopidogrel and citalopram dosing
- With DTC testing, patients can bring PGx results directly to the community pharmacy
- A pharmacist can interpret the results and provide information and recommendations to the patient's prescriber
- Consider collaborative practice agreement for access to more clinically relevant PGx tests

Kisor DF, Petry NJ, Bright DR. Pharmacogenomics in the United States Community Pharmacy Setting: The Clopidogrel-*CYP2C19* Example. *Pharmgenomics Pers Med*. 2021;14:569-577. Published 2021 May 18. doi:10.2147/PGPM.S224894

Healthcare Provider- and Community Pharmacist-Ordered PGx Testing

- PGx testing can be ordered by healthcare providers (e.g. physicians, nurse practitioners, etc.)
- Community pharmacists can establish collaborative practice agreements (CPAs) with prescribers that allows them to order PGx testing
  - Allowing pharmacists to order tests can increase efficiency and decrease clinic visits for patients
- DNA samples for testing can be collected in the pharmacy
  - After collection, samples can then be sent to a CLIA accredited lab who report the results

Waheed Z, Bunka M, Edwards L, et al *Pharmacogenomics*. Published online October 14, 2025.
Kisor DF, Petry NJ, Bright DR. *Pharmgenomics Pers Med*. 2021;14:569-577.2021

PGx Data in Electronic Health Records

- A patient's PGx information can also be accessed through electronic health records (EHR), if accessible
- For example, some EHRs can integrate CPIC guidelines into its system and provide:
  - Prescribing alerts
  - PGx clinical decision support
  - Therapeutic recommendations
- Pharmacists can use these tools and their knowledge to create their recommendations

Caudle KE, Whirl-Carrillo M, Relling MV, et al. Advancing Clinical Pharmacogenomics Worldwide Through the Clinical Pharmacogenetics Implementation Consortium (CPIC). *Clinical Pharmacology & Therapeutics.* Published online July 18, 2025. doi:https://doi.org/10.1002/cpt.70005

Interpret PGx Test Results

- Once the results are received, pharmacists can then interpret the results
- Perform a medication review with consideration of patient's genotypes and phenotypes
- Examples:
  - Patient's genotype is CYP2C19 *1/*1 and phenotype is a normal metabolizer
    - If this patient was taking clopidogrel, they would have the expected response to this drug in terms of efficacy and side effect profile
    - No action needed
  - Patient's genotype is CYP2C9 *2/*3 and phenotype is a poor metabolizer
    - If this patient was taking meloxicam, they would be at risk for increased plasma concentrations and adverse effects
    - Suggest an alternate medication
  - Patient's genotype is CYP2D6 *1/*2x2 and phenotype is ultrarapid metabolizer
    - If this patient was taking codeine, they would be at risk for increased formation of morphine and toxicity
    - Suggest an alternate medication

Clinical Pharmacogenomics Resource (ClinPGx). Genotype. Accessed October 21, 2025. https://www.clinpgx.org/genotype

Provide a Recommendation

- After completing the medication review and interpreting a patient's PGx results, provide a recommendation with actionable steps
  - Examples:
    - Reduce medication dose due to increased risk of adverse effects
    - Increase medication dose to achieve desired clinical effect
    - Suggest an alternate medication that is not affected by the patient's specific PGx results
    - Increased monitoring
    - No action needed if no medications implicated
- CPIC or DPWG clinical guidelines and FDA labels can be helpful for determining recommendations
- Counsel patient on PGx limitations, their PGx results, including what the results mean, how it affects their current medications, recommended changes to pharmacotherapy, additional monitoring, how it may affect future medications, and how it may explain previous medication failures
- Communicate recommendation to prescriber via previously determined method of communication

Thornley T, et al. *Pharmacy (Basel)*. 2021;9(1):38. Published 2021 Feb 12. doi:10.3390/pharmacy9010038

Build on what has been done

Pharmgenomics Pers Med. 2021 Jul 15;14:877–886. doi: 10.2147/PGPM.S314972

Independent Community Pharmacists' Experience in Offering Pharmacogenetic Testing

Susanne B Haga [1,✉], Rachel Mills [1], Jivan Moaddeb [1], Yiling Liu [1], Deepak Voora [1]

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Journal of the American Pharmacists Association

Volume 52, Issue 6, November–December 2012, Pages e259-e265

Experience

Making pharmacogenetic testing a reality in a community pharmacy

Shanna K. O'Connor PharmD, BCPS (professor), Stefanie P. Ferreri PharmD, CPP, BCACP, CDE, FAPhA (Clinical Associate Professor and Director) ✉,
Natasha M. Michaels PharmD, CPP (Clinical Coordinator),
Rebecca W. Chater BSPharm, MPH, FAPhA (Executive Vice President), Anthony J. Viera MD, MPH (Associate Professor), Hawazin Faruki (Vice President), Howard L. McLeod PharmD, FCCP, Mary Roederer (Research Assistant Professor)

REVIEW · Volume 63, Issue 2, P459-476.E6, March-April, 2023 Download Full Issue

Mapping the implementation of pharmacogenomic testing in community pharmacies 2003-2021 using the Theoretical Domains Framework: A scoping review

Heba A.T. Aref · Mark J. Makowsky · Janice Y. Kung · Lisa M. Guirguis ✉

Pharmacogenomics. 2017 Feb 22;18(4):327–335. doi: 10.2217/pgs-2016-0175

Assessing feasibility of delivering pharmacogenetic testing in a community pharmacy setting

Susanne B Haga [1,1,*], Jivan Moaddeb [1,1], Rachel Mills [1,1], Deepak Voora [1,1]

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PMCID: PMC5558549 PMID: 28244804

Research | Open access | Published: 22 March 2022

Co-designing a community pharmacy pharmacogenomics testing service in the UK

Tim Rendell ✉, Julie Barnett & David Wright

BMC Health Services Research **22**, Article number: 378 (2022) | Cite this article

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Key Takeaways

- PGx is the study of how a person's genes may affect their response to medications
- PGx seeks to:
- Improve drug safety (avoid toxicity) and increase drug efficacy
- Reputable resources are available for pharmacogenomics information and clinical recommendations (ClinPGx, FDA)

Case Study

YT is a 68 yof who had a PGx panel drawn preemptively. Their relevant past medical history is significant for hypertension, dyslipidemia, coronary artery disease, glaucoma, erosive esophagitis, and depressive disorder.

Drug allergies: lisinopril (cough)

Current medications with PGx considerations:

- Atorvastatin 40 mg once daily
- Metoprolol tartrate 50 mg twice a day
- Paroxetine 20 mg once daily
- Pantoprazole 40 mg once daily

Results of PGx Panel

Gene	Genotype	Activity
CYP2B6	*1/*1	Normal metabolizer
CYP2C19	*1/*17	**Rapid metabolizer**
CYP2D6	*1/*2 (activity score of 2)	Normal metabolizer
CYP2C9	*1/*1	Normal metabolizer
VKORC1	c.-1639G>A	**Intermediate warfarin sensitivity**
CYP3A5	*1/*3	**Intermediate metabolizer**
HLA-B*57:01	Not present	Low risk
SLCO1B1	*1/*14	Normal function

Question: Given that the patient is a CYP2C19 rapid metabolizer, which of the following options would be most appropriate?

a) Increase the dose of atorvastatin from 40 mg to 80 mg due to SLCO1B1

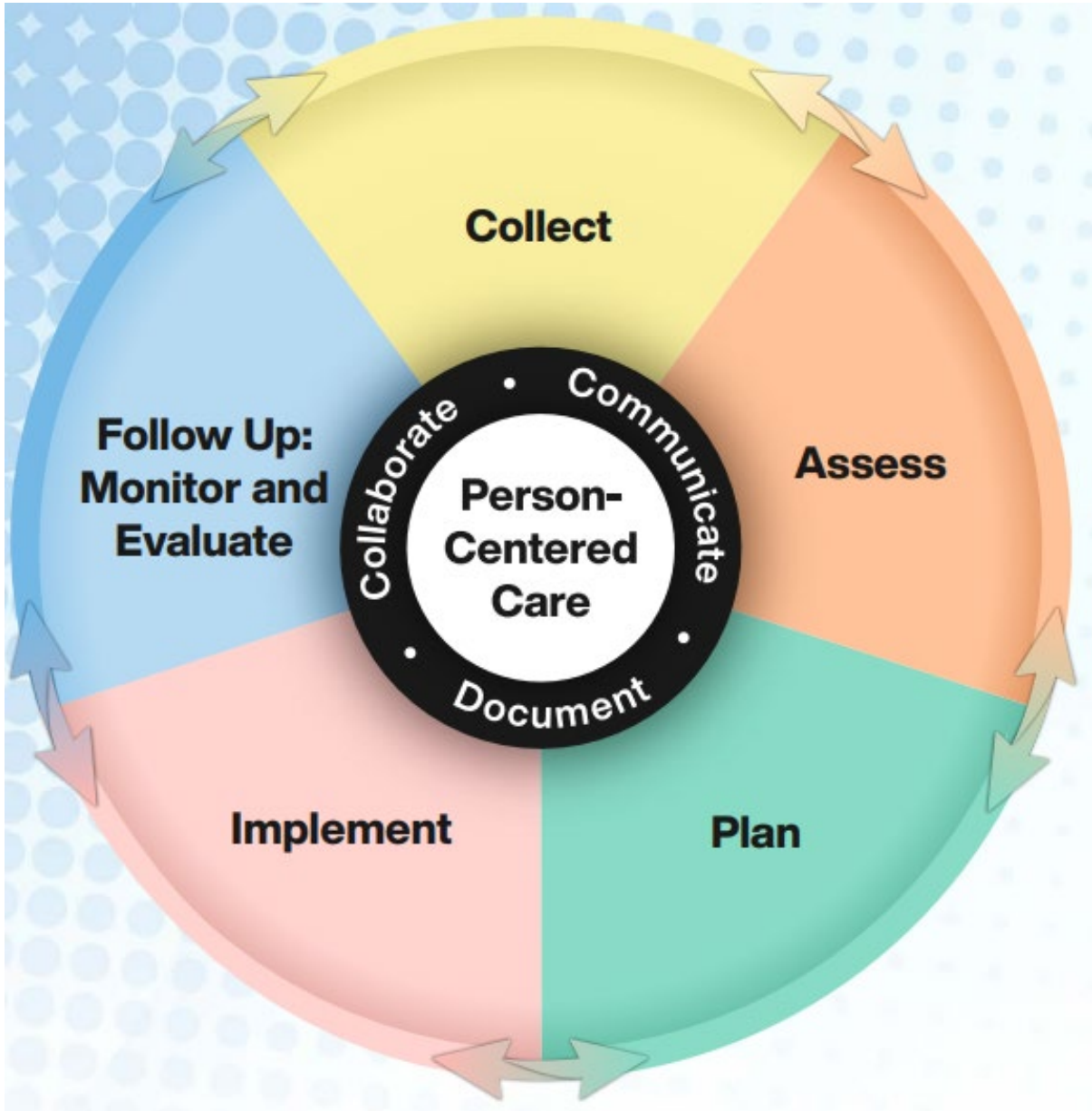
b) Switch metoprolol tartrate to bisoprolol due to CYP2D6

c) Decrease the dose of paroxetine due to CYP2D6

d) Increase the dose of pantoprazole by 50-100% due to CYP2C19

Collect

- Pertinent medical history in relation to PGx includes dyslipidemia, hypertension, depression and erosive esophagitis
- Genes of interest include CYP2D6, SLCO1B1, ABCG2, CYP2C19



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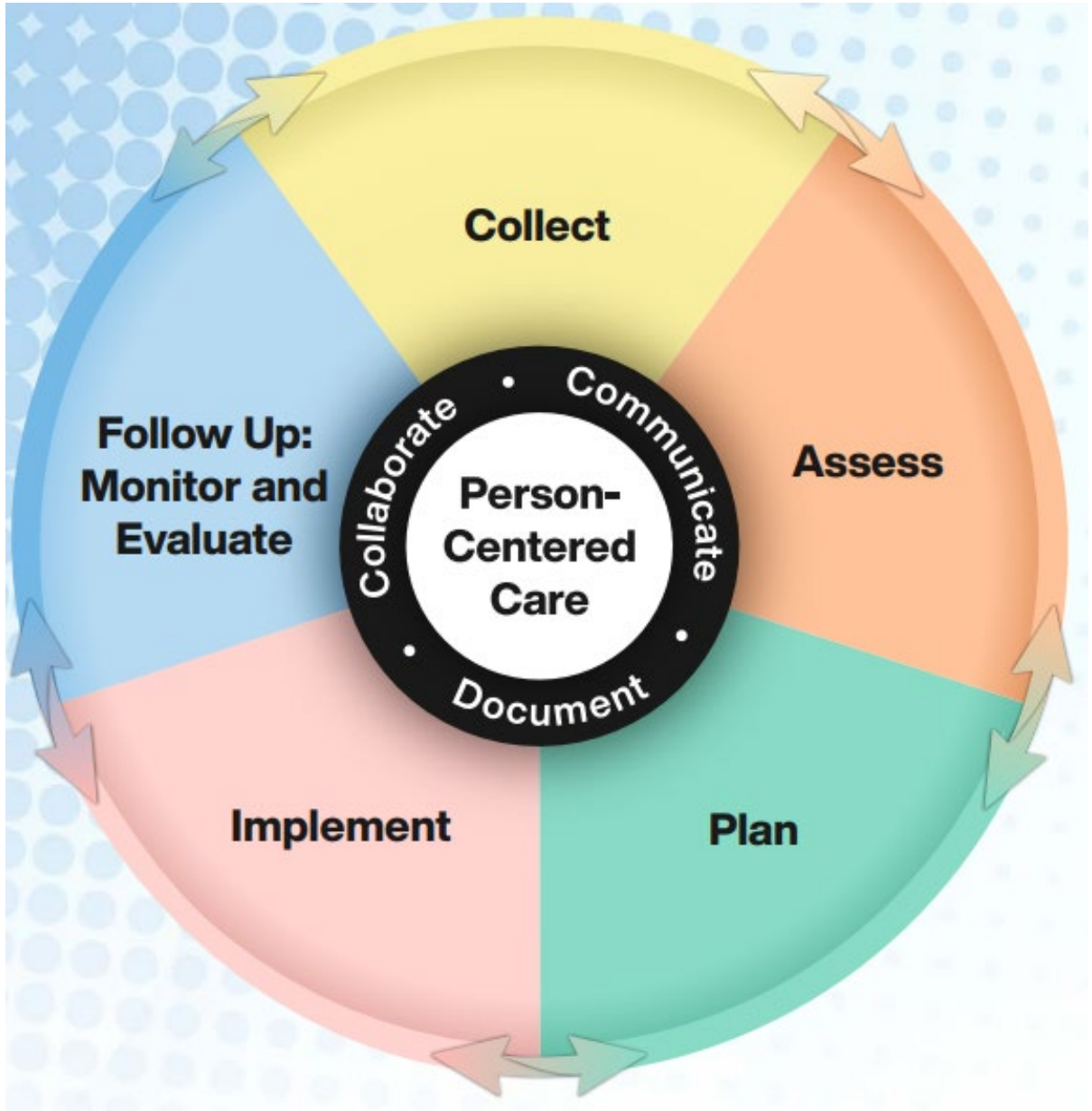
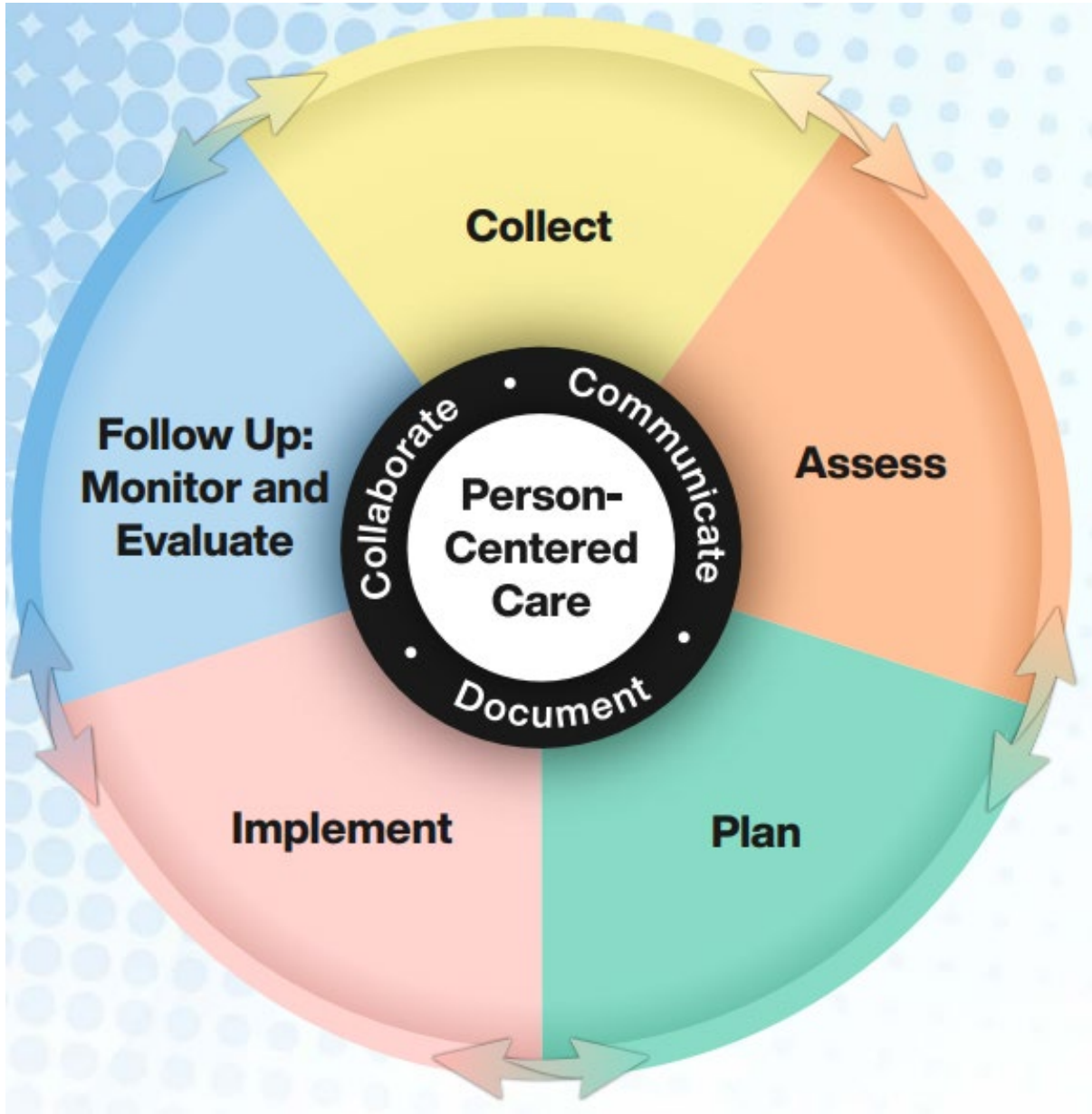


Assess

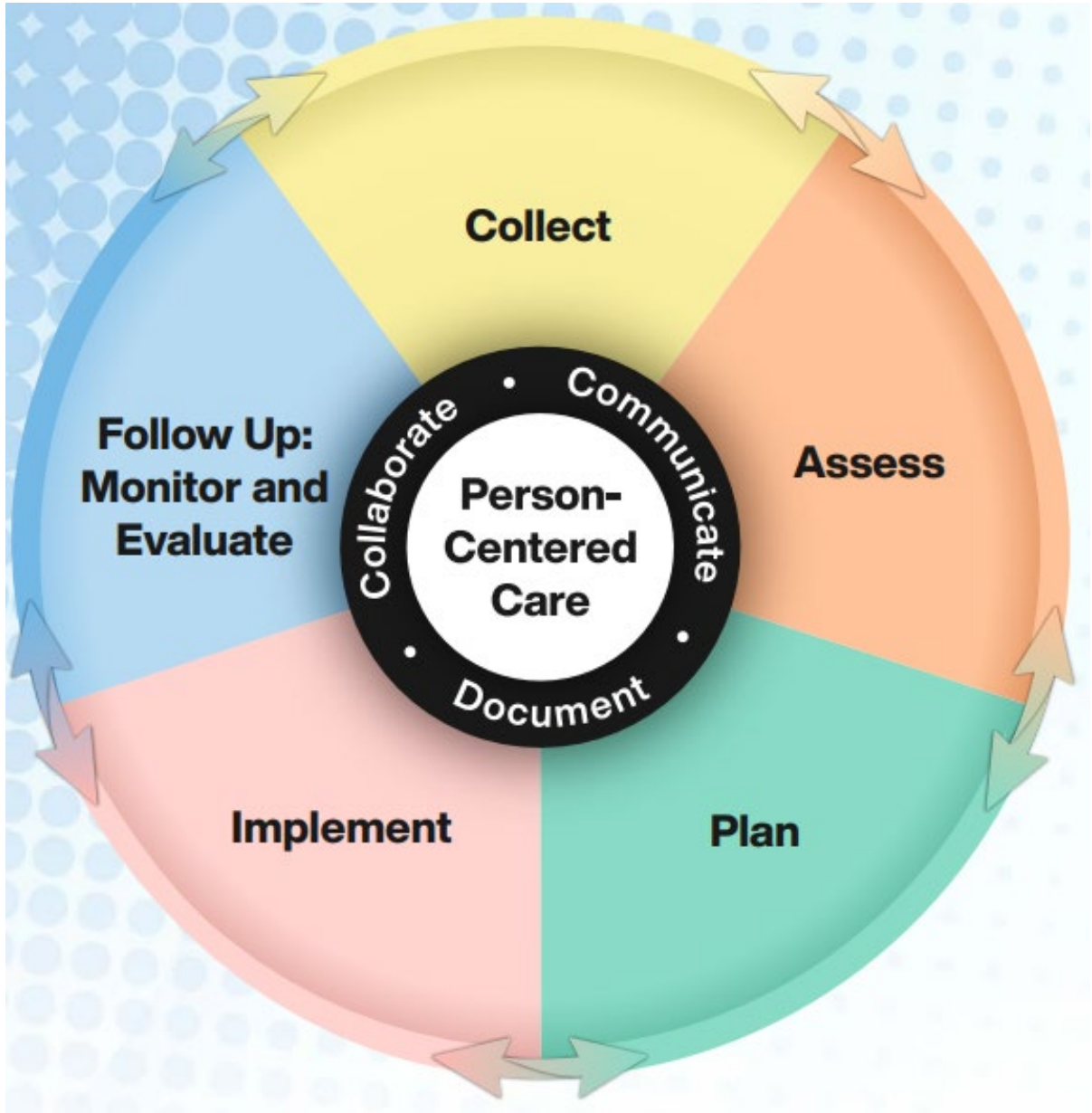
- Regarding dyslipidemia, the patient is SLCO1B1 normal function, suggesting that they are not at an increased risk of statin-associated muscle symptoms (SAMS)
- Regarding erosive esophagitis, the patient is a rapid metabolizer of CYP2C19, which is the primary metabolizer of pantoprazole
  - They are at a higher risk of therapeutic failure
- On metoprolol and paroxetine, CYP2D6 normal metabolizer – continue with usual care – but wait – paroxetine is a CYP2D6 strong inhibitor affecting metoprolol

Plan

- Patient's daily dose of pantoprazole should be considered for increase by 50-100% for erosive esophagitis
  - Can be given in divided doses
  - Could also consider rabeprazole or esomeprazole (less dependent on CYP2C19)
- Monitor for side effects on metoprolol



NDSU CENTER FOR COLLABORATION AND ADVANCEMENT IN PHARMACY

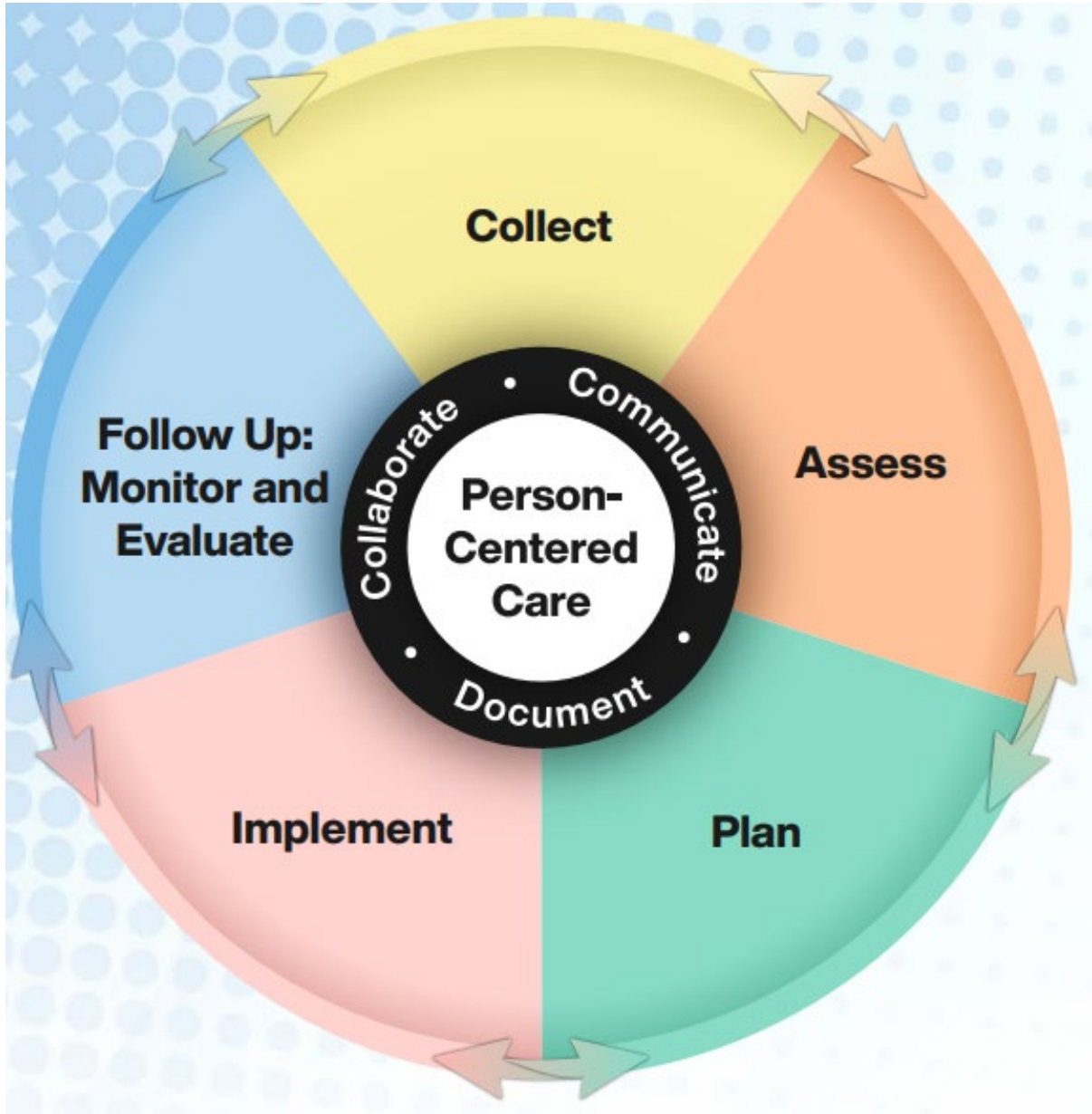


Implement

- Contact patient's prescriber to consider PPI recommendation (and monitoring of BP and HR with metoprolol)
- Counsel patient on CYP2C19 rapid metabolizer status and implications for PPI dosing as well as metoprolol monitoring

Follow Up: Monitor and Evaluate

- Resolution of symptoms and avoidance of side effects
- Development of adverse effects
  - Bradycardia, dizziness
  - Bone loss and fractures
  - Serum Mg^{2+}, Ca^{2+}
- Adherence and understanding



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Special Thanks

- Nathan Carlson and Autumn Grasswick
- Sanford PGx Imagenetics Team
- CAP Center
- All of you!

Questions?

- Feel free to reach out: Natasha.Petry@ndsu.edu

Round Table Discussion Points

Pharmacogenomics

1. In what capacity do you feel you or the pharmacies you work with could participate in pharmacogenomics? Some options include sample collection, interpretation of results, screening for interactions, incorporation into MTM, and referral for pharmacogenomic consultation.

2. What additional resources would you need to make this happen?

3. Do you think patients would be interested in pharmacoeconomic services or hesitant?

Medicaid Billing in ND Pharmacies: Strategies for Accuracy and Service Expansion

LeNeika Roehrich, PharmD, BCGP

Clinical Pharmacist – ND Medicaid

NDSU CENTER FOR COLLABORATION AND ADVANCEMENT IN PHARMACY

Disclosure

LeNeika Roehrich reports they have no relevant financial relationships with ineligible companies to disclose.

Objectives

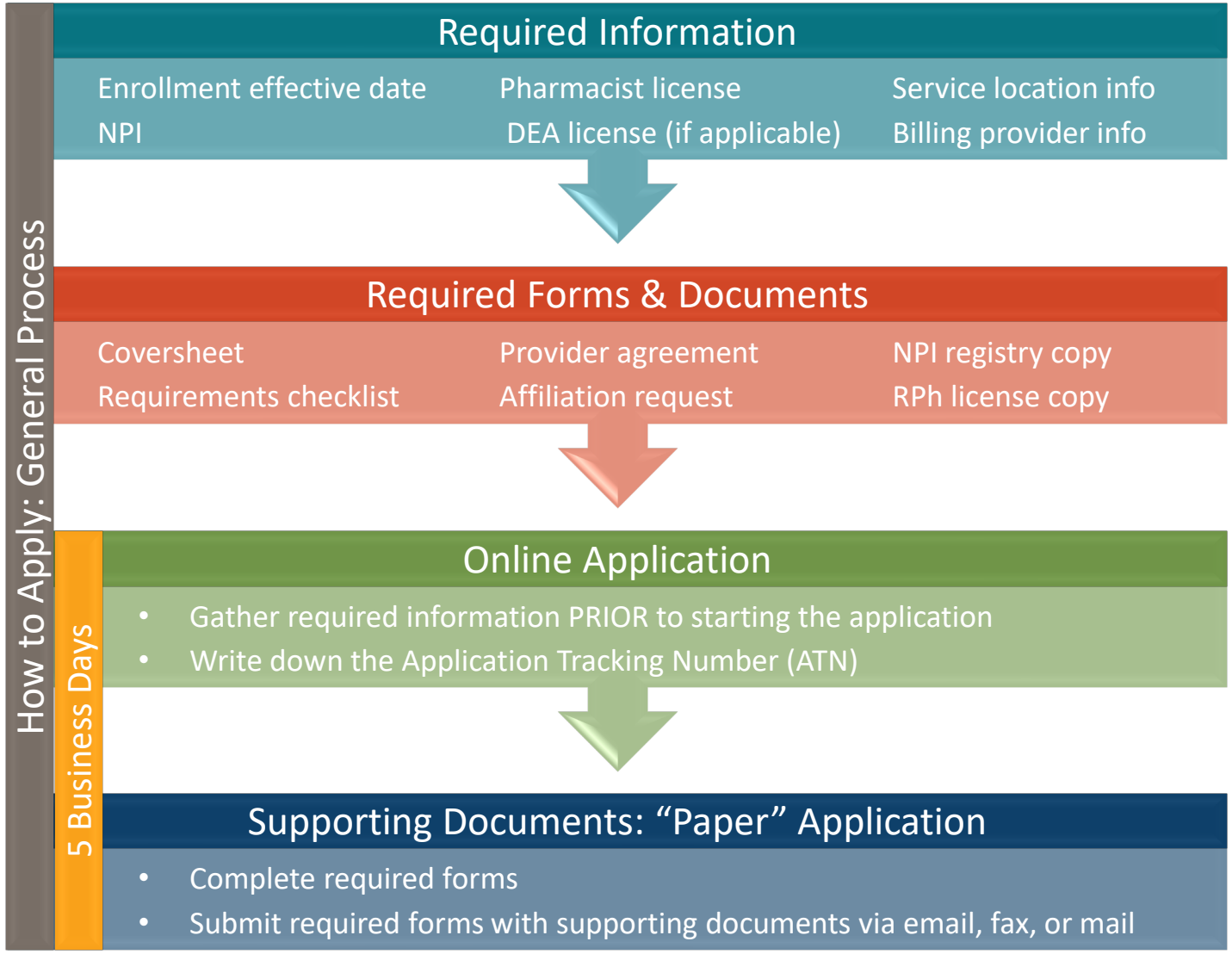
- Review the Medicaid billing process for pharmacy services in North Dakota including eligibility criteria and documentation requirements
- Identify common billing challenges encountered by pharmacies and practical strategies to improve accuracy in Medicaid claims submission
- Describe opportunities for expansion of pharmacy services and leveraging Medicaid to improve patient health outcomes

Billing for Services

- Enrollment
- Determining Medicaid member eligibility
  - Traditional
  - Expansion – BCBSND
- Covered services
  - Medical necessity
  - Pharmacist scope of practice
  - Code requirements
- Performing and documenting the service
- Submitting a medical claim

Provider Enrollment

[Online Application]



NORTH Dakota | Health & Human Services
Be Legendary.

NDSU CENTER FOR COLLABORATION AND ADVANCEMENT IN PHARMACY

Medicaid Member Eligibility

Verify

- Always check prior to providing services
- Member Eligibility Instructions
- MMIS portal: mmis.nd.gov
- Provider Relations Call Center
- Automated Voice Response System

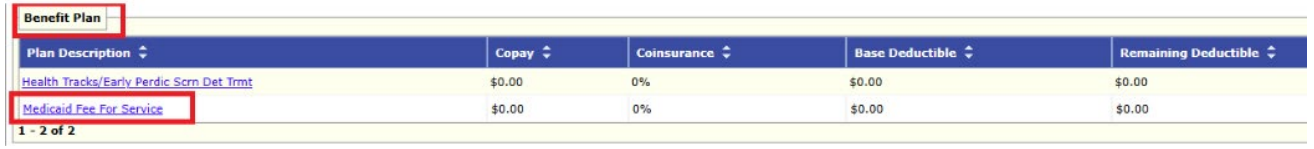
Information

- You need 3 of the 4 following pieces of member information
  - First name
  - Last name
  - Date of birth
  - Medicaid ID

Medicaid Member Eligibility

Coverage

- Traditional Medicaid
  - Medicaid Fee for Service
  - Pharmacy and medical claims are billed to ND Medicaid
- Medicaid Expansion
  - ACA Medicaid Expansion
  - Pharmacy claims are billed to ND Medicaid
  - Medical claims are billed to the MCO



Benefit Plan

Plan Description	Copay	Coinsurance	Base Deductible	Remaining Deductible
Health Tracks/Early Perdic Scrn Det Trmt	$0.00	0%	$0.00	$0.00
Medicaid Fee For Service	$0.00	0%	$0.00	$0.00

1 - 2 of 2

Eligibility Confirmation

* Required Field

Eligibility is under ND Medicaid Expansion - Submit medical claims through the MCO and Rx claims through ND Medicaid

Service From Date: 11/29/2024 | Service To Date: 11/29/2024 | Confirmation Number: [redacted]
Eligibility As of date: 11/29/2024 | Eligibility Status: Yes | Last EPSDT Date:

Member Information

Name: [redacted] | Suffix: | Date of Birth: [redacted] | Date of Death: [redacted] | Member ID: [redacted]
Street Address: [redacted] | P.O.Box: | City: [redacted] | State:ND | Zip: [redacted]

Eligibility Status

Program Code	Case Number	Case Head Of Household
M076	[redacted]	[redacted]

1 - 1 of 1

Benefit Plan

Eligibility is under ND Medicaid Expansion - Submit medical claims through the MCO and Rx claims through ND Medicaid

Plan Description	Copay	Coinsurance	Base Deductible	Remaining Deductible
1915I Services	$0.00	0%	$0.00	$0.00
ACA Medicaid Expansion	$0.00	0%	$0.00	$0.00

1 - 2 of 2

Covered Services

Scope of Practice

- Medication Therapy Management (MTM)
- Anticoagulation management
- Continuous glucose monitoring
- Drug/vaccine administration
- Tobacco cessation

Tools & Links

- ND Medicaid Provider Information
- Pharmacy Provider Manual
- Provider Guidelines, Manuals and Policies
- Procedure Code Look-Up Tool
- Fee Schedules

Effective July 1, 2011, the North Dakota Medicaid Program will pay for services provided by licensed and registered pharmacists.

MTM

[Pharmacy Provider Manual]

Disease State Management

- Guideline-based therapy

Medication Use

- Adherence/Deprescribing
- Transition of care
- Health Literacy

Harm Reduction

- Hepatitis C PA
- Risk of overdose
- PWID

NDSU CENTER FOR COLLABORATION AND ADVANCEMENT IN PHARMACY

CHAPTER 61-04-12
LIMITED PRESCRIPTIVE AUTHORITY FOR NALOXONE

CHAPTER 61-04-14
LIMITED PRESCRIPTIVE AUTHORITY FOR IMMUNIZATIONS

CHAPTER 61-04-15
LIMITED PRESCRIPTIVE AUTHORITY FOR TOBACCO CESSATION THERAPIES

FDA NEWS RELEASE

FDA Approves First Over-the-Counter Naloxone Nasal Spray

Agency Continues to Take Critical Steps to Reduce Drug Overdose Deaths Being Driven Primarily by Illicit Opioids

Share | Tweet | Linkedin | Email | Print

For Immediate Release: March 29, 2023

CENTER FOR DRUG EVALUATION AND RESEARCH
DIVISION of DRUG INFORMATION

Your source for the latest drug information. Know the moment it happens.

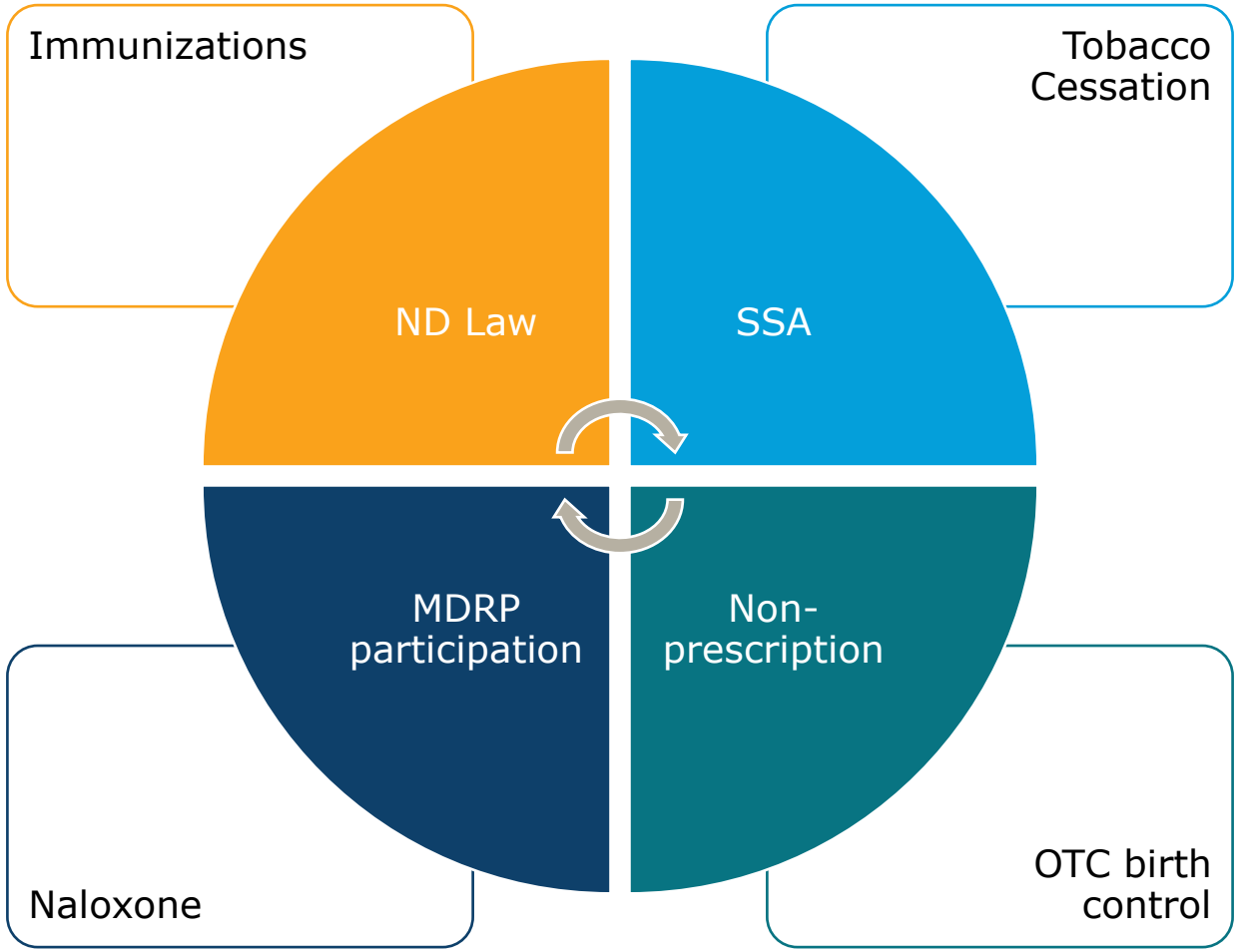
FDA Approves First Nonprescription Daily Oral Contraceptive

Today, the U.S. Food and Drug Administration approved Opill (norgestrel) tablet for nonprescription use to prevent pregnancy— the first daily oral contraceptive approved for use in the U.S. without a prescription. Approval of this progestin-only oral contraceptive pill provides an option for consumers to purchase oral contraceptive medicine without a prescription at drug stores, convenience stores, and grocery stores, as well as online.

https://www.fda.gov/news-events/press-announcements/fda-approves-first-over-counter-naloxone-nasal-spray

https://www.fda.gov/news-events/press-announcements/fda-approves-first-nonprescription-daily-oral-contraceptive?utm_medium=email&utm_source=govdelivery

https://www.nodakpharmacy.com/pdfs/lawbooknew.pdf



Non-prescription drugs must be prescribed

Standing order

Pharmacist prescriber

ND Medicaid is only able to pay if prescribed by an enrolled provider

(4) Nonprescription drugs.—If a State plan for medical assistance under this title includes coverage of prescribed drugs as described in section 1905(a)(12) and permits coverage of drugs which may be sold without a prescription (commonly referred to as "over-the-counter" drugs), if they are prescribed by a physician (or other person authorized to prescribe under State law), such a drug shall be regarded as a covered outpatient drug.

https://www.ssa.gov/OP_Home/ssact/title19/1927.htm

Documentation

Pharmacy Provider Manual

ND Medicaid Billing and Policy Manual

Documentation includes:

- Medical records including:
  - Member's name and date of birth;
  - Date of service;
  - Start and stop time spent with the member performing the service, to support payment for time-based billed services;
  - Name and title of provider rendering the service, if other than the billing practitioner;
  - Chief complaint or reason for each visit;
  - Pertinent medical history;
  - Pertinent findings on examination;
  - Medication, equipment and/or supplies prescribed or provided;
  - Description of treatment or service provided;
  - Recommendations for additional treatments, procedures, or consultations;
  - Diagnostic tests and results;
  - Dental photographs/teeth models;
  - Certification of medical necessity (if applicable);
  - Plan of treatment and/or care and outcome; and
  - Signature and date by the person ordering or rendering the service.
- Service authorization information;
- Claims, billings, and records of Medicaid payments and amounts received from other payers for services provided to members;
- Records and original invoices for items that are prescribed, ordered, or furnished;
- Any other related medical or financial data that may include appointment schedules, account receivable ledgers, and other financial information; and
- Service-specific documentation requirements per policy.

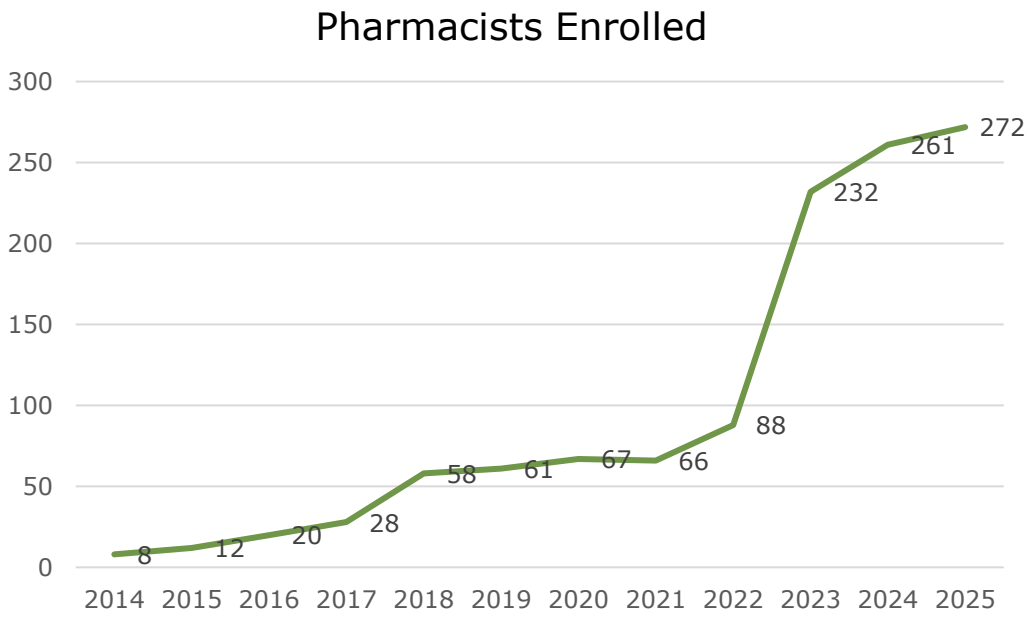
Submitting Claims for Services

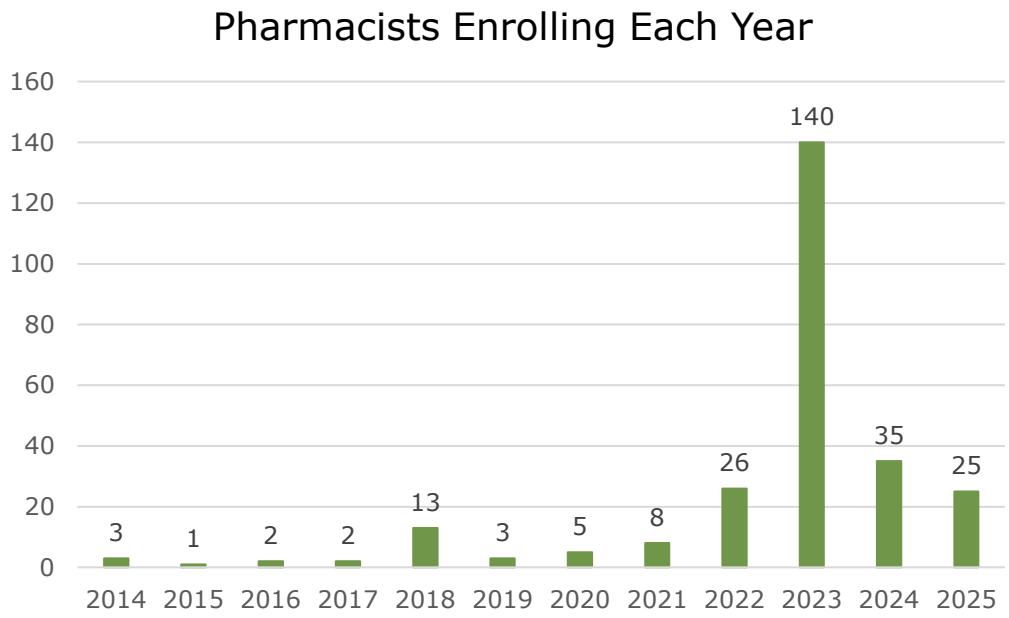
- Medical claim
- Coverage
  - Reimbursement
  - Procedure Code Lookup tool
- Improving accuracy in claims submission
  - O/R/P provider NPIs
  - Code definitions and billing parameters
  - Taxonomy and specialty for enrolled NPI
  - Service authorization number (if applicable)

Opportunities

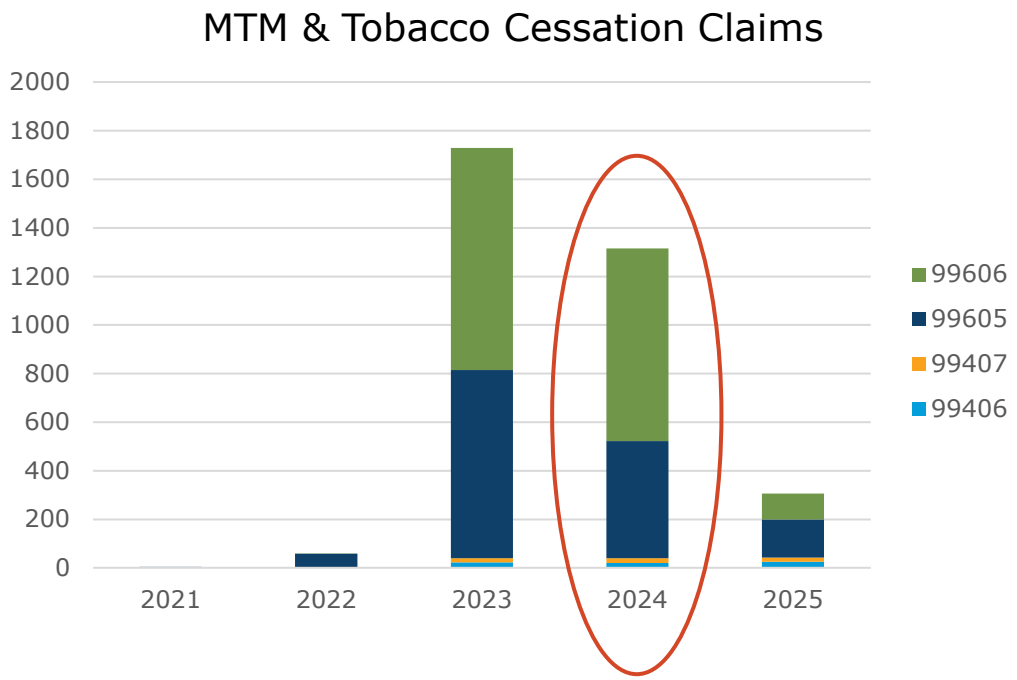
- Review point-of-sale messages on pharmacy claims
  - Paid claims and rejected claims
  - Identify potential interventions
- Leverage the monthly retrospective drug utilization review letters sent to the pharmacy
- Enroll, provide services, and bill for the work you do

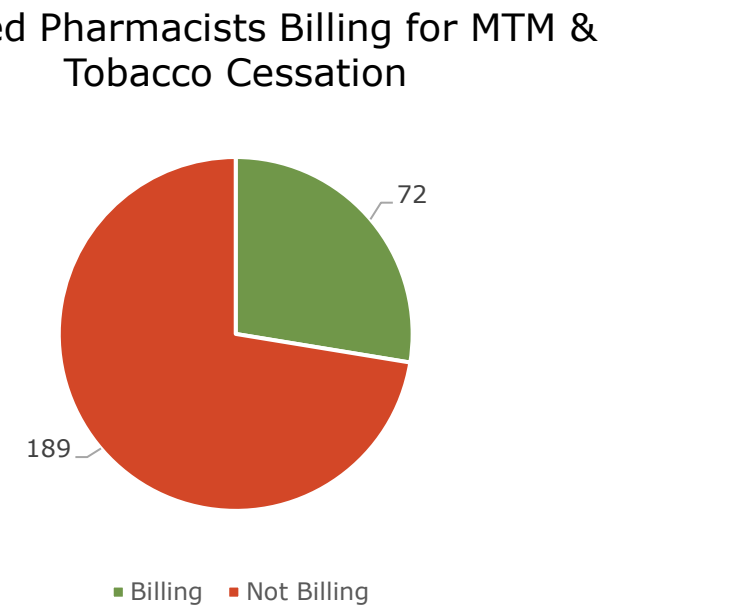
Pharmacists Enrolled



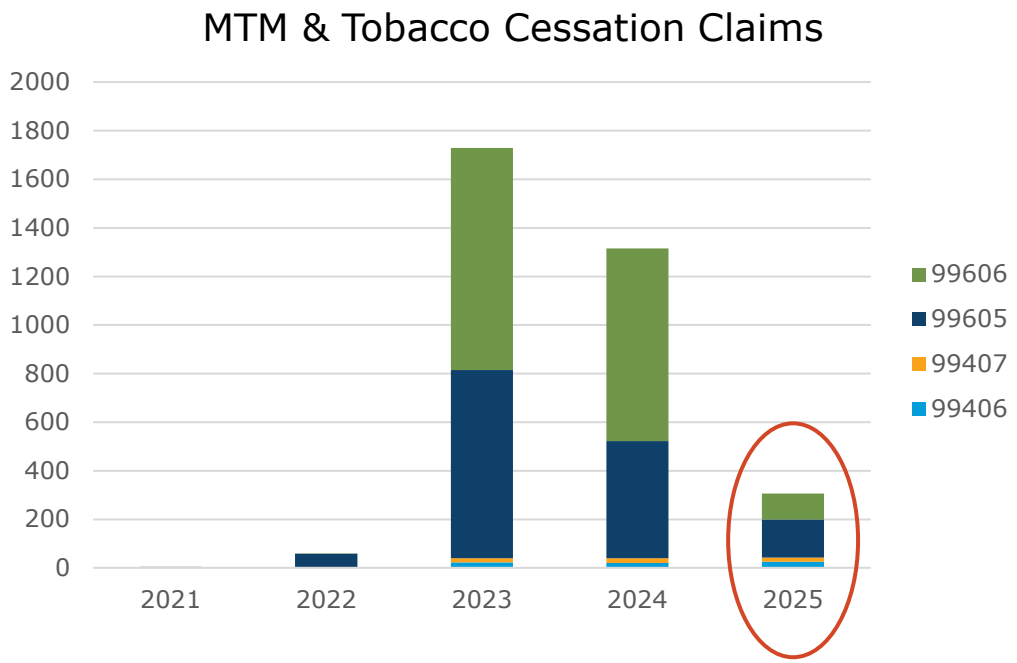


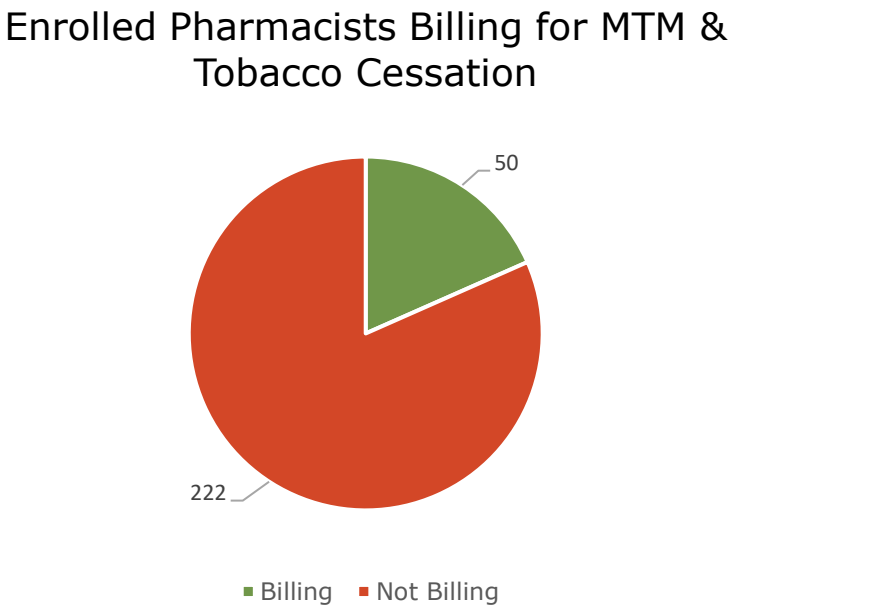
Pharmacists Billing



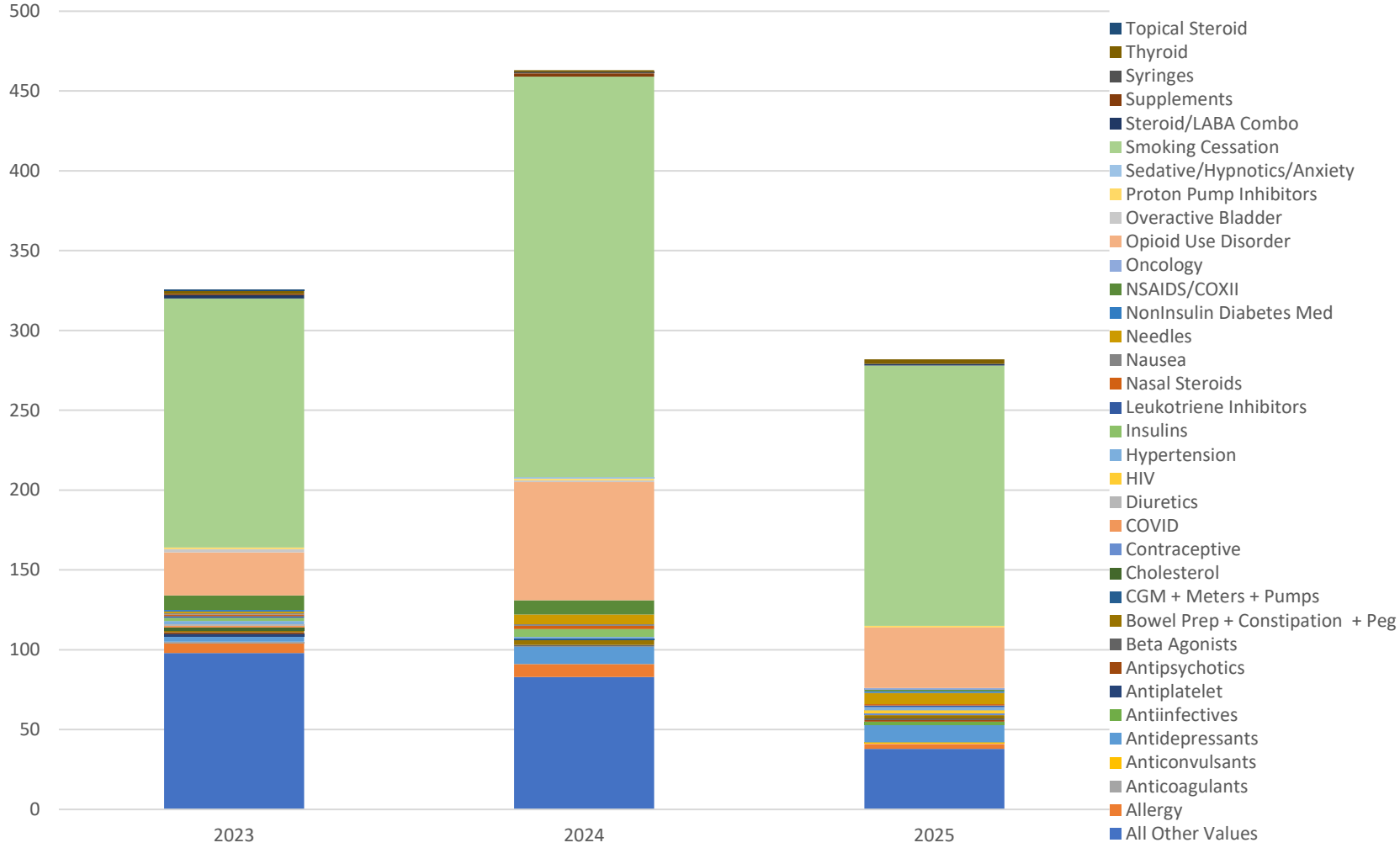


Pharmacists Billing





Pharmacist Prescribing



Questions

Round Table Discussion Points

Medicaid

1. What Medicaid services are you currently providing/billing?

2. What tips do you have for others? (challenges you've had to navigate)

3. What additional resources would you need to start or expand your services?

4. What other payers besides Medicaid are you currently billing? What are the services? are providing/billing?

Implementing Collaborative Practice Agreements in North Dakota Pharmacies – Frameworks, Integration, & Action Steps

Carly Smithers, PharmD
Pharmacist/Pharmacy Manager
Dakota Clinic Pharmacy

NDSU CENTER FOR COLLABORATION AND ADVANCEMENT IN PHARMACY

Disclosures

Carly Smithers reports to have no financial relationships with ineligible companies to disclose.

Objectives:

1. Describe the structural framework and collaborative practice agreements available in North Dakota.
2. Explain how test-to-treat services can be integrated into an existing pharmacy practice model and workflow.
3. Identify required resources, action steps, success and challenges to implement test-to-treat in a community pharmacy.

What is a collaborative practice agreement (CPA)?

- CDC defines a pharmacist CPA as “a formal agreement in which a licensed provider makes a diagnosis, supervises patient care, and refers patients to a pharmacist under a protocol that allows the pharmacist to perform specific patient care functions”.
- ND lawbook describes it as “the written document signed by a physician and pharmacist which describes the limited prescribing authority granted to the pharmacist”

CPA's in North Dakota

- Agreement made between a NP (nurse practitioner) or MD (medical doctor) and a PharmD/RPh (pharmacist)
- Most often done at the hospital level or public heath
- Element Health- **NEW** CPA option for community pharmacists
  - No residency or board certification required for pharmacist
  - Partnership between a NP and pharmacist in ND
  - 11 different CPA's which allow pharmacist to prescribe
  - Must sign contract

Why are CPA's important?

- Closing gaps in care for patients
- Preventing delayed treatment
- Relieve burden of healthcare systems with simple disease state management
  - *NOT* a replacement for a PCP (primary care provider)
- Broader access for patient care
  - Community pharmacists = first direct line to health care in ND
  - Rural community access
- Patient affordability/decreasing financial burden
- Reimbursement decline – new avenues for revenue
- Job satisfaction

Importance of CPA's cont.

- In 2021, data polled within the state to assess PCP needs within the state
  - 39% tobacco users
  - >10% living in poverty

- Rural areas of ND
  - 30% PCP's statewide work in these regions
  - PCP average age for rural zones higher than Midwest and US
  - Recruitment issues

Element Health

- CPA Options

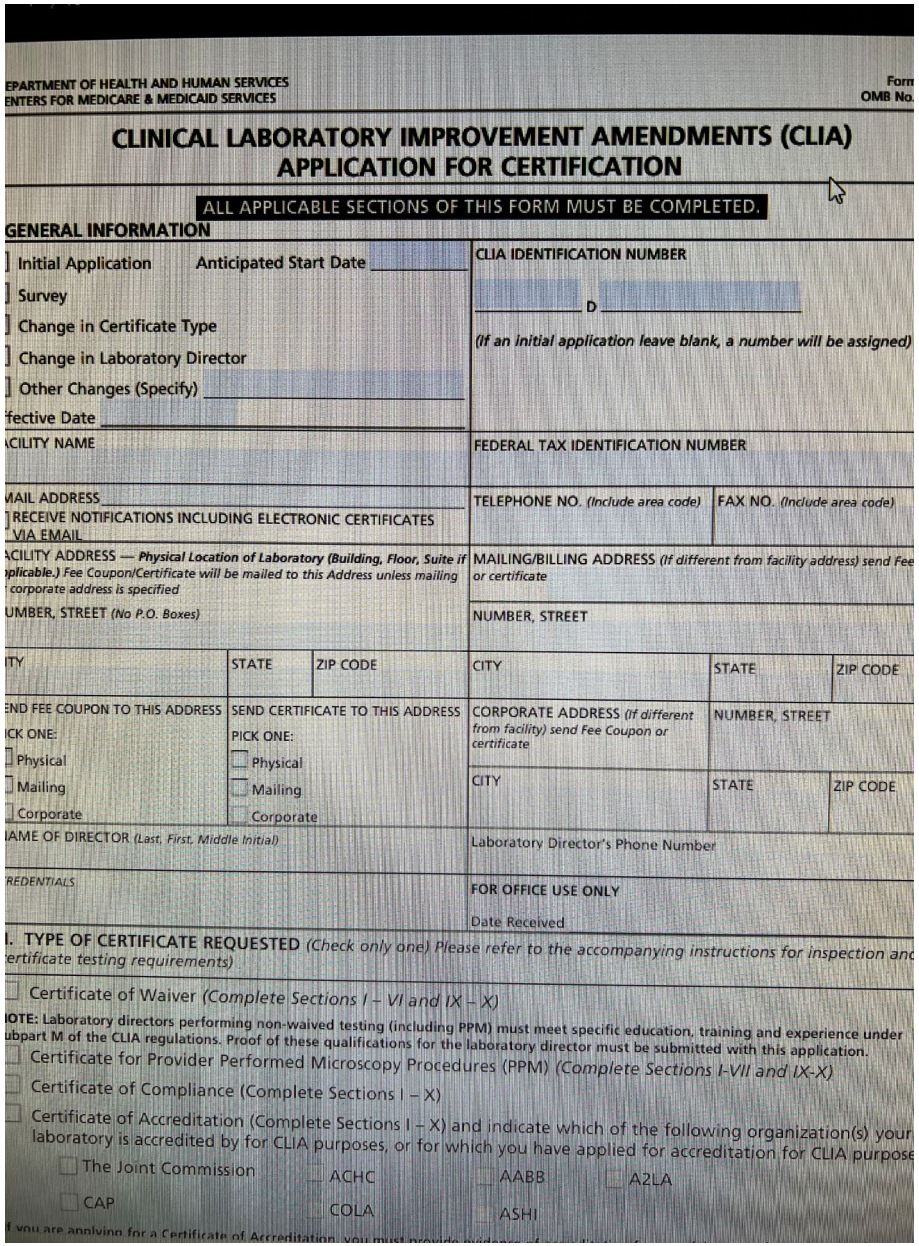
Test-to-treat CPA's	Other CPA's
Strep Throat (Antibiotics)	Albuterol Inhaler
Covid (Paxlovid)	Tobacco Cessation
Influenza (Oseltamivir)	Cold Sore Treatment
UTI (Antibiotics)	Birth Control
	GLP-1's
	Glucagon (CGM management)
	EpiPen

Getting started with Element Health- Step 1

- Point(s) of contact
  - Jesse Rue, Jesse Johnson
- CAP Center involvement
  - Elizabeth Skoy webinar on test-to-treat
- CLIA waiver
- Strategize with team
  - Designate leader
  - Refresh training

CLIA Waiver

- https://www.cms.gov/Regulations-and-Guidance/Legislation/CLIA/Downloads/HowObtainCertificateofWaiver.pdf
- https://www.cms.gov/Medicare/CMS-Forms/CMS-Forms/Downloads/CMS116.pdf
- Form CMS 116
- $248
- Good for two years
- Clialab@nd.gov
- Ph: 701-328-2352 Fax: 701-328-1890



EPARTMENT OF HEALTH AND HUMAN SERVICES
ENTERS FOR MEDICARE & MEDICAID SERVICES

Form
OMB No.

CLINICAL LABORATORY IMPROVEMENT AMENDMENTS (CLIA) APPLICATION FOR CERTIFICATION

ALL APPLICABLE SECTIONS OF THIS FORM MUST BE COMPLETED.

GENERAL INFORMATION

] Initial Application Anticipated Start Date _____
] Survey
] Change in Certificate Type
] Change in Laboratory Director
] Other Changes (Specify) _____
ffective Date _____

CLIA IDENTIFICATION NUMBER

_____ D _____

(If an initial application leave blank, a number will be assigned)

ACILITY NAME

FEDERAL TAX IDENTIFICATION NUMBER

MAIL ADDRESS
] RECEIVE NOTIFICATIONS INCLUDING ELECTRONIC CERTIFICATES VIA EMAIL

TELEPHONE NO. *(Include area code)*

FAX NO. *(Include area code)*

ACILITY ADDRESS — ***Physical Location of Laboratory (Building, Floor, Suite if pplicable.)*** *Fee Coupon/Certificate will be mailed to this Address unless mailing corporate address is specified*

MAILING/BILLING ADDRESS *(If different from facility address) send Fee or certificate*

UMBER, STREET *(No P.O. Boxes)*

NUMBER, STREET

CITY	STATE	ZIP CODE	CITY	STATE	ZIP CODE

END FEE COUPON TO THIS ADDRESS	SEND CERTIFICATE TO THIS ADDRESS	CORPORATE ADDRESS *(If different from facility) send Fee Coupon or certificate*	NUMBER, STREET	
ICK ONE:	PICK ONE:			
] Physical	Physical			
] Mailing	Mailing	CITY	STATE	ZIP CODE
] Corporate	Corporate			

AME OF DIRECTOR *(Last, First, Middle Initial)*

Laboratory Director's Phone Number

REDENTIALS

FOR OFFICE USE ONLY

Date Received

I. TYPE OF CERTIFICATE REQUESTED *(Check only one) Please refer to the accompanying instructions for inspection and ertificate testing requirements)*

Certificate of Waiver *(Complete Sections I – VI and IX – X)*

OTE: Laboratory directors performing non-waived testing (including PPM) must meet specific education, training and experience under ubpart M of the CLIA regulations. Proof of these qualifications for the laboratory director must be submitted with this application.

Certificate for Provider Performed Microscopy Procedures (PPM) *(Complete Sections I-VII and IX-X)*

Certificate of Compliance (Complete Sections I – X)

Certificate of Accreditation (Complete Sections I – X) and indicate which of the following organization(s) your laboratory is accredited by for CLIA purposes, or for which you have applied for accreditation for CLIA purpose

The Joint Commission ACHC AABB A2LA

CAP COLA ASHI

f you are applying for a Certificate of Accreditation, you must provide evidence of

In the next three sections, indicate testing performed and estimated annual test volume.

VI. WAIVED TESTING *If only applying for a Certificate of Waiver, complete this section and skip sections VII (PPM Testing) and VIII (Non-Waived Testing).*

Identify the waived testing (to be) performed by completing the table below. Include each analyte, test system, or device used in the laboratory.

ANALYTE / TEST	TEST NAME	MANUFACTURER
Example: Streptococcus group A	Ace Rapid Strep Test	Acme Corporation

Indicate the **ESTIMATED TOTAL ANNUAL TEST** volume for all waived tests performed _____

☐ Check if no waived tests are performed

If additional space is needed, check here ☐ and attach additional information using the same format.

VII. PPM TESTING *If only applying for a Certificate for PPM, complete this section and skip section VIII (Non-Waived Testing).*

Listed below are the **only** PPM tests that can be performed by a facility having a Certificate for PPM. Mark the checkbox by each PPM procedure(s) to be performed.

- ☐ Direct wet mount preparations for the presence or absence of bacteria, fungi, parasites, and human cellular elements
- ☐ Potassium hydroxide (KOH) preparations
- ☐ Pinworm examinations
- ☐ Fern tests
- ☐ Post-coital direct, qualitative examinations of vaginal or cervical mucous
- ☐ Urine sediment examinations
- ☐ Nasal smears for granulocytes
- ☐ Fecal leukocyte examinations
- ☐ Qualitative semen analysis (limited to the presence or absence of sperm and detection of motility)

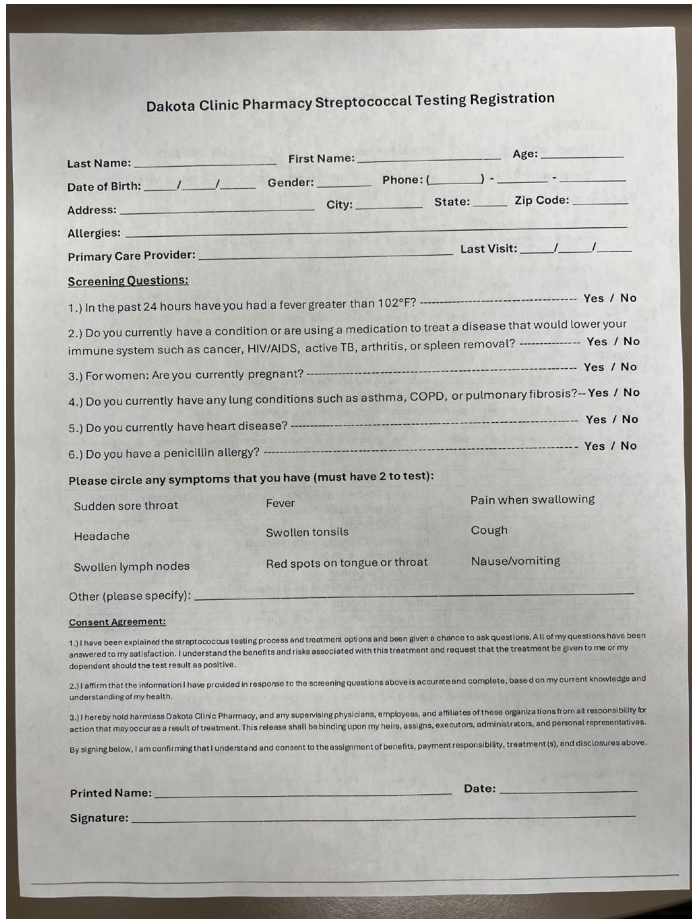
CLIA approved supplies

- Can contract with current wholesaler
  - Most wholesalers have direct CLIA sales information/additional resources such as advertising
- CAP center has list of options
  - No affiliations or discounts
- Cliawaived.com

Getting started with Element Health- Step 2

- Decide on what protocols you'd like to initiate
- Sign contracts & submit payment (with provider associated with protocols, Element Health, Starfield)
- Read through protocols and assess other supply needs
  - Scale (weight-based treatment)
  - BP monitor (pediatric and adult)
  - Thermometer
  - Test to treat supplies (tests, UTI kits, tongue compressors, etc.)
  - Spill pads and appropriate PPE for staff
- Create templates (electronic or paper) and after visit summaries for all protocols involved
- Decide on patient out of pocket cost or billing strategies
  - Test to treat vs pharmacist office visit
  - Incorporate into software/platforms

Intake Form Example:



Dakota Clinic Pharmacy Streptococcal Testing Registration

Last Name: _____ First Name: _____ Age: _____

Date of Birth: ____/____/____ Gender: _____ Phone: (_____) - _____ - _____

Address: _____ City: _____ State: _____ Zip Code: _____

Allergies: _____

Primary Care Provider: _____ Last Visit: ____/____/____

Screening Questions:

1.) In the past 24 hours have you had a fever greater than 102°F? ---------- Yes / No

2.) Do you currently have a condition or are using a medication to treat a disease that would lower your immune system such as cancer, HIV/AIDS, active TB, arthritis, or spleen removal? ---------- Yes / No

3.) For women: Are you currently pregnant? ---------- Yes / No

4.) Do you currently have any lung conditions such as asthma, COPD, or pulmonary fibrosis?-- Yes / No

5.) Do you currently have heart disease? ---------- Yes / No

6.) Do you have a penicillin allergy? ---------- Yes / No

Please circle any symptoms that you have (must have 2 to test):

Sudden sore throat	Fever	Pain when swallowing
Headache	Swollen tonsils	Cough
Swollen lymph nodes	Red spots on tongue or throat	Nause/vomiting

Other (please specify): _____

Consent Agreement:

1.) I have been explained the streptococcus testing process and treatment options and been given a chance to ask questions. All of my questions have been answered to my satisfaction. I understand the benefits and risks associated with this treatment and request that the treatment be given to me or my dependent should the test result as positive.

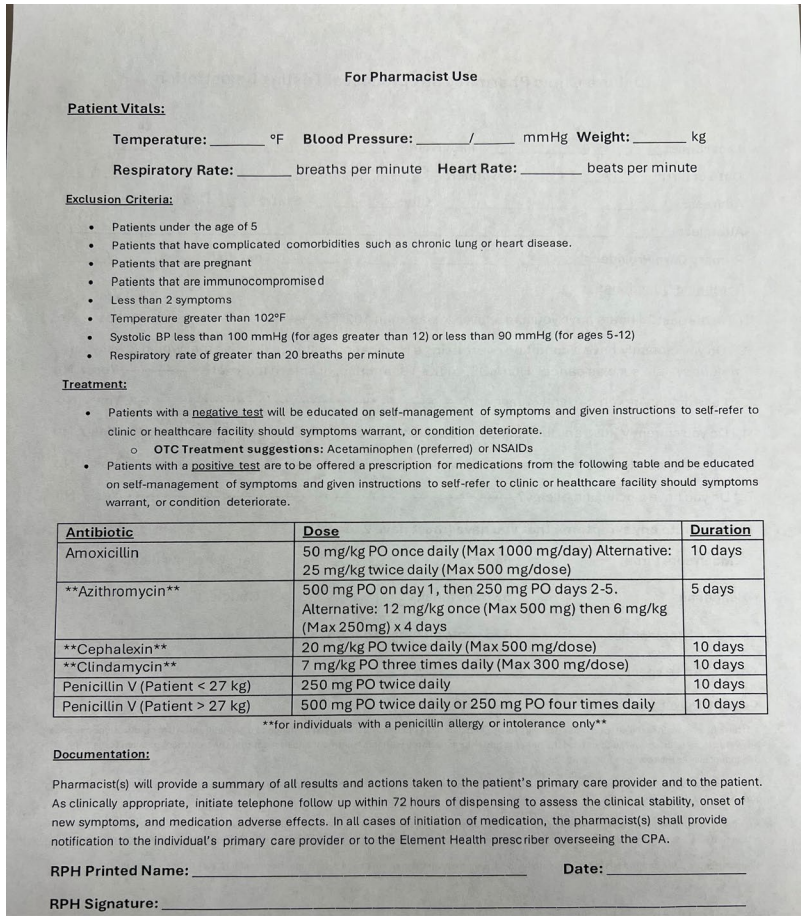
2.) I affirm that the information I have provided in response to the screening questions above is accurate and complete, based on my current knowledge and understanding of my health.

3.) I hereby hold harmless Dakota Clinic Pharmacy, and any supervising physicians, employees, and affiliates of these organizations from all responsibility for action that may occur as a result of treatment. This release shall be binding upon my heirs, assigns, executors, administrators, and personal representatives.

By signing below, I am confirming that I understand and consent to the assignment of benefits, payment responsibility, treatment(s), and disclosures above.

Printed Name: _____ Date: _____

Signature: _____



For Pharmacist Use

Patient Vitals:

Temperature: _____ °F Blood Pressure: _____/_____ mmHg Weight: _____ kg

Respiratory Rate: _____ breaths per minute Heart Rate: _____ beats per minute

Exclusion Criteria:

- Patients under the age of 5
- Patients that have complicated comorbidities such as chronic lung or heart disease.
- Patients that are pregnant
- Patients that are immunocompromised
- Less than 2 symptoms
- Temperature greater than 102°F
- Systolic BP less than 100 mmHg (for ages greater than 12) or less than 90 mmHg (for ages 5-12)
- Respiratory rate of greater than 20 breaths per minute

Treatment:

- Patients with a negative test will be educated on self-management of symptoms and given instructions to self-refer to clinic or healthcare facility should symptoms warrant, or condition deteriorate.
  - **OTC Treatment suggestions:** Acetaminophen (preferred) or NSAIDs
- Patients with a positive test are to be offered a prescription for medications from the following table and be educated on self-management of symptoms and given instructions to self-refer to clinic or healthcare facility should symptoms warrant, or condition deteriorate.

Antibiotic	Dose	Duration
Amoxicillin	50 mg/kg PO once daily (Max 1000 mg/day) Alternative: 25 mg/kg twice daily (Max 500 mg/dose)	10 days
Azithromycin	500 mg PO on day 1, then 250 mg PO days 2-5. Alternative: 12 mg/kg once (Max 500 mg) then 6 mg/kg (Max 250mg) x 4 days	5 days
Cephalexin	20 mg/kg PO twice daily (Max 500 mg/dose)	10 days
Clindamycin	7 mg/kg PO three times daily (Max 300 mg/dose)	10 days
Penicillin V (Patient < 27 kg)	250 mg PO twice daily	10 days
Penicillin V (Patient > 27 kg)	500 mg PO twice daily or 250 mg PO four times daily	10 days

for individuals with a penicillin allergy or intolerance only

Documentation:

Pharmacist(s) will provide a summary of all results and actions taken to the patient's primary care provider and to the patient. As clinically appropriate, initiate telephone follow up within 72 hours of dispensing to assess the clinical stability, onset of new symptoms, and medication adverse effects. In all cases of initiation of medication, the pharmacist(s) shall provide notification to the individual's primary care provider or to the Element Health prescriber overseeing the CPA.

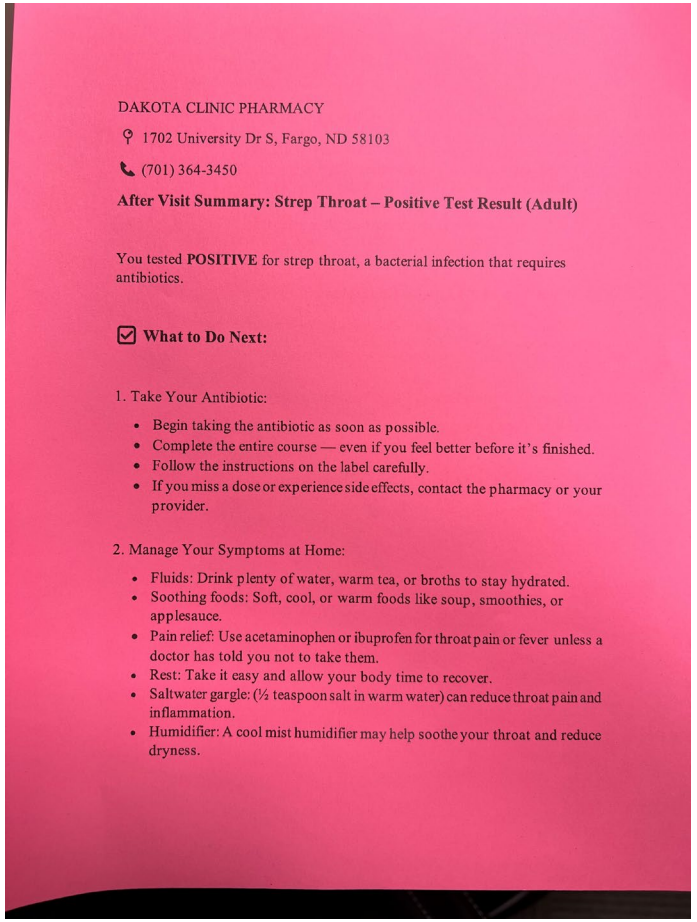
RPH Printed Name: _____ Date: _____

RPH Signature: _____

Helpful Tips:

- List exclusion criteria up top or screen upon patient inquiry
- Create spot for PCP information
- List medication allergies

After Visit Summary Example:



DAKOTA CLINIC PHARMACY

1702 University Dr S, Fargo, ND 58103

(701) 364-3450

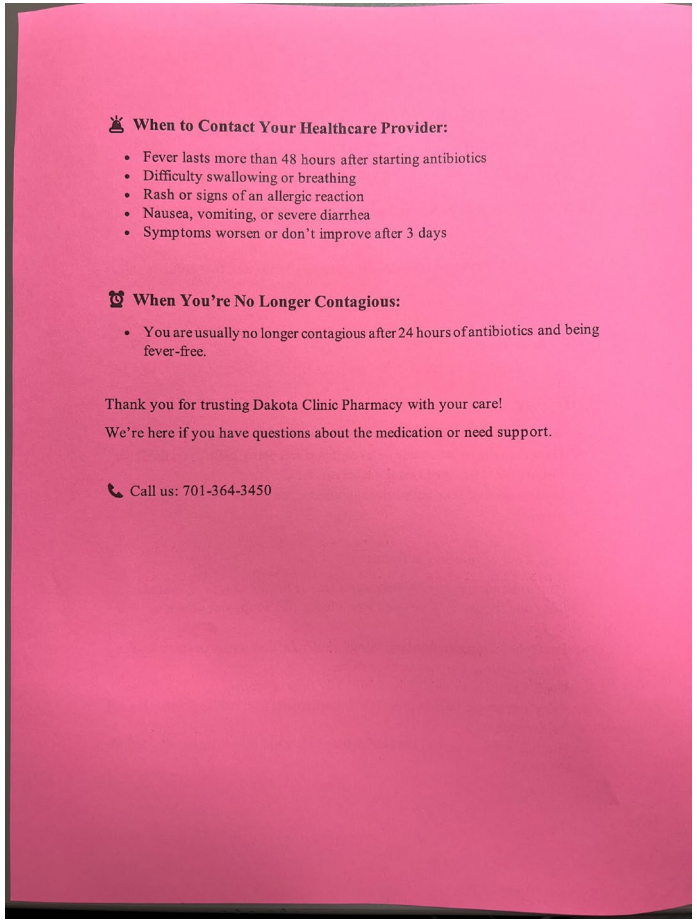
After Visit Summary: Strep Throat – Positive Test Result (Adult)

You tested **POSITIVE** for strep throat, a bacterial infection that requires antibiotics.

What to Do Next:

1. Take Your Antibiotic:
   - Begin taking the antibiotic as soon as possible.
   - Complete the entire course — even if you feel better before it's finished.
   - Follow the instructions on the label carefully.
   - If you miss a dose or experience side effects, contact the pharmacy or your provider.

2. Manage Your Symptoms at Home:
   - Fluids: Drink plenty of water, warm tea, or broths to stay hydrated.
   - Soothing foods: Soft, cool, or warm foods like soup, smoothies, or applesauce.
   - Pain relief: Use acetaminophen or ibuprofen for throat pain or fever unless a doctor has told you not to take them.
   - Rest: Take it easy and allow your body time to recover.
   - Saltwater gargle: (½ teaspoon salt in warm water) can reduce throat pain and inflammation.
   - Humidifier: A cool mist humidifier may help soothe your throat and reduce dryness.



When to Contact Your Healthcare Provider:

- Fever lasts more than 48 hours after starting antibiotics
- Difficulty swallowing or breathing
- Rash or signs of an allergic reaction
- Nausea, vomiting, or severe diarrhea
- Symptoms worsen or don't improve after 3 days

When You're No Longer Contagious:

- You are usually no longer contagious after 24 hours of antibiotics and being fever-free.

Thank you for trusting Dakota Clinic Pharmacy with your care!

We're here if you have questions about the medication or need support.

Call us: 701-364-3450

Helpful Tips:

- Color coded
- AVS both positive AND negative results
- AVS geared towards pediatrics vs adults

Getting started with Element Health: Step 3- Marketing and Implementation

- Strategize how you plan to market it
  - Social media, podcast, bag tags, signage, word of mouth
- Adding into workflow
  - Doing “test trials” to ensure process is smooth
  - Staff training days
- Tech involvement
  - Screen for candidates
  - Check patients in
- Student involvement
  - Create forms
  - Medical billing
  - Patient consultations

Medical Billing Options

- If credentialed, can choose to forgo self pay options and seek reimbursement from insurance
- Billed as an office visit
  - CPT code: 99202
- Could be a way to provide service for patients who can’t afford out of pocket
  - NDMA

Barriers/challenges

- Local healthcare providers
  - Pushback of us taking over services/compensation
  - Downplaying validity of tests
- Patient not wanting to pay
- Office visit does NOT go into EMR (electronic medical record)
- Negative results
- Pediatrics
- Exclusion criteria
- Marketing
  - State level education to inform community and other health care workers of new pharmacy services

Patient Example 1:

MS is a 6-year-old female presented to the pharmacy with the following:

Fever 101, red irritated throat with white patches, pain when swallowing, upset stomach, swollen tonsils

*TIP: Parent fills out form and pays before throat swab

Pharmacist inspected throat, took vitals (BP 95/65, respirations 20 breaths per minute, temp 101, weight 55 lbs), and performed swab of the back of the throat

*TIP: distraction method for kids

Patient dismissed back to waiting area while test loads

Test was positive. Pharmacist evaluated antibiotic options based on protocol. Patient was prescribed Azithromycin due to Amoxicillin allergy. Azithromycin dosed appropriately based on weight and billed through insurance.

Patient/Parent given after visit summary, antibiotic, medication handouts, and given a pharmacist consult on symptom management and antibiotic use. Entire interaction was about 20 minutes.

Patient Example 2:

LP is a 55-year-old man with asthma who presented to the pharmacy in search of an albuterol inhaler. He had filled an albuterol inhaler with our pharmacy in the past, but the Rx had since expired. Patient worried about going without inhaler due to smoke content in environment.

Technician screened for possible CPA candidate and found he would be eligible if interested.

Patient filled out questionnaire, pharmacist met with patient in the office to review form and screen for any drug interactions such as beta blockers.

Pharmacist prescribed albuterol, and Rx was run through patient insurance. Patient provided AVS, Rx, and consultation.

What happens after?

- Documentation
- Alert provider in agreement as per their discretion
- Alert patient’s PCP

References

- Centers for Disease Control and Prevention. Collaborative Practice Agreements and Pharmacists' Patient Care Services: A Resource for Pharmacists. Atlanta, GA: US Dept. of Health and Human Services, Centers for Disease Control and Prevention; 2013.
- North Dakota State Board of Pharmacy. Lawbook. Collaborative Agreement. September 2015.
- Bauman, Sonja; Kusler, Stacy; Will, Bobbie. "North Dakota Primary Care Office Needs Assessment". 2021.

Questions?

Round Table Discussion Points

Collaborative Practice Implementation

1. Has the pharmacy you work in implemented collaborative practice agreements?

2. If no, what CPAs do you think would be beneficial to your patient population?

3. What would some of the barriers be to implement a collaborative practice agreement?

Pharmacy Partnerships for Healthy Aging and Chronic Disease: Current Initiatives and Future Opportunities in North Dakota

Ryan McGrath, PhD

Jayme Steig, PharmD

NDSU CENTER FOR COLLABORATION AND ADVANCEMENT IN PHARMACY

Before We Begin

- The off-label use of medications will be discussed during this presentation
- Conflicts and disclosures
  - None to report

Before We Begin

- Learning objective
  1. Describe current initiatives and opportunities for pharmacies to support the health and well-being of older adults

  2. Describe pharmacy-led initiatives and opportunities to support individuals with chronic diseases, including those prescribed GLP-1 receptor agonists

  3. Identify future opportunities for pharmacy involvement in research and collaboration with North Dakota State University to improve health outcomes

Greetings!

- Ryan McGrath, PhD
  - Associate Professor: Department of Health, Nutrition, and Exercise Sciences; North Dakota State University
    - Director of "Healthy Aging North Dakota" (HAND Lab)
    - CAP Center Scientist
  - Department of Geriatrics; University of North Dakota
  - Fargo VA Healthcare System
  - Research agenda
    - Topics related to aging and health

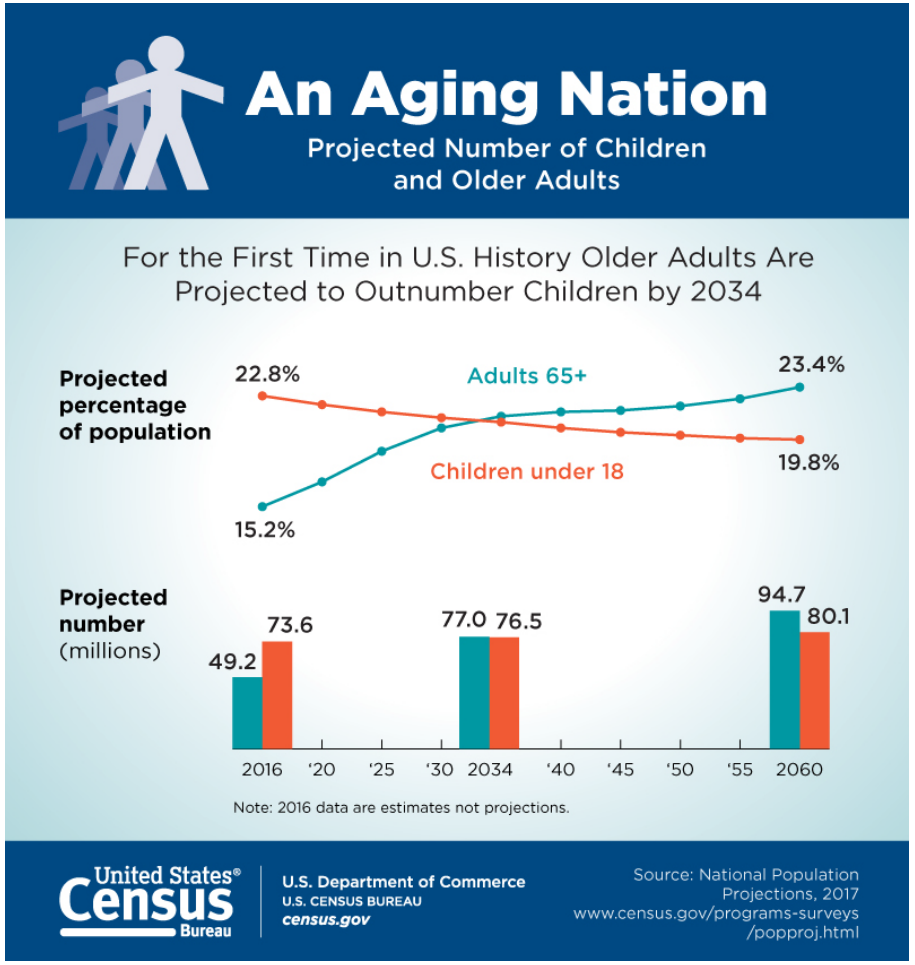
Healthy Aging NORTH DAKOTA

Greetings!

- Jayme Steig, PharmD
  - Assistant Professor of Practice
  - Department of Pharmacy Practice
  - Practice site at Southpointe Pharmacy
  - Research interests
    - Community pharmacy practice
    - Quality improvement
    - Medication therapy management

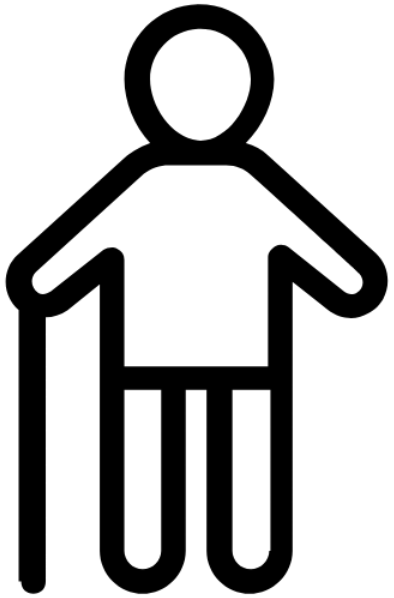
Pharmacy and Aging

Pharmacy and Aging



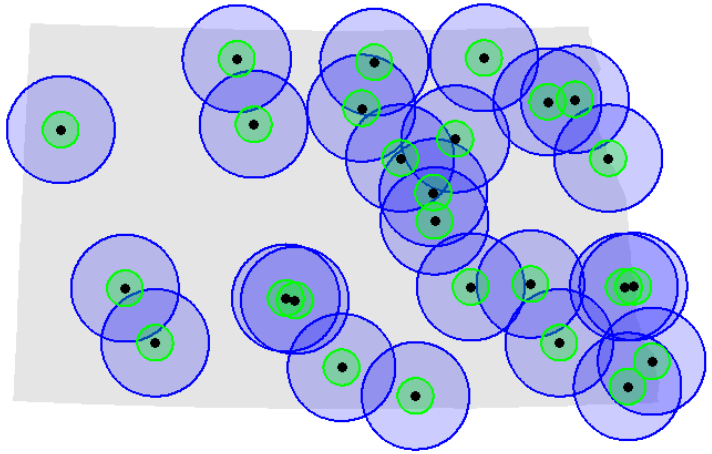
Pharmacy and Aging

- What may come with a large older adult population demographic increase?
  - Examples
    - Need for healthcare providers (including pharmacists and related personnel)
    - Economic implications
    - Caretakers
    - Healthcare infrastructure
    - Reach to all older adults
    - Education on aging and health
    - Student and early career experiences working with older adults



Pharmacy and Aging

- Rural older adults
  - Disproportionally reside in rural areas, but life expectancy might be lower
  - Role of healthcare access
  - Lack representation in research
  - Part of rural health
  - Approximately 97% of Americans live within 10 miles of a pharmacy



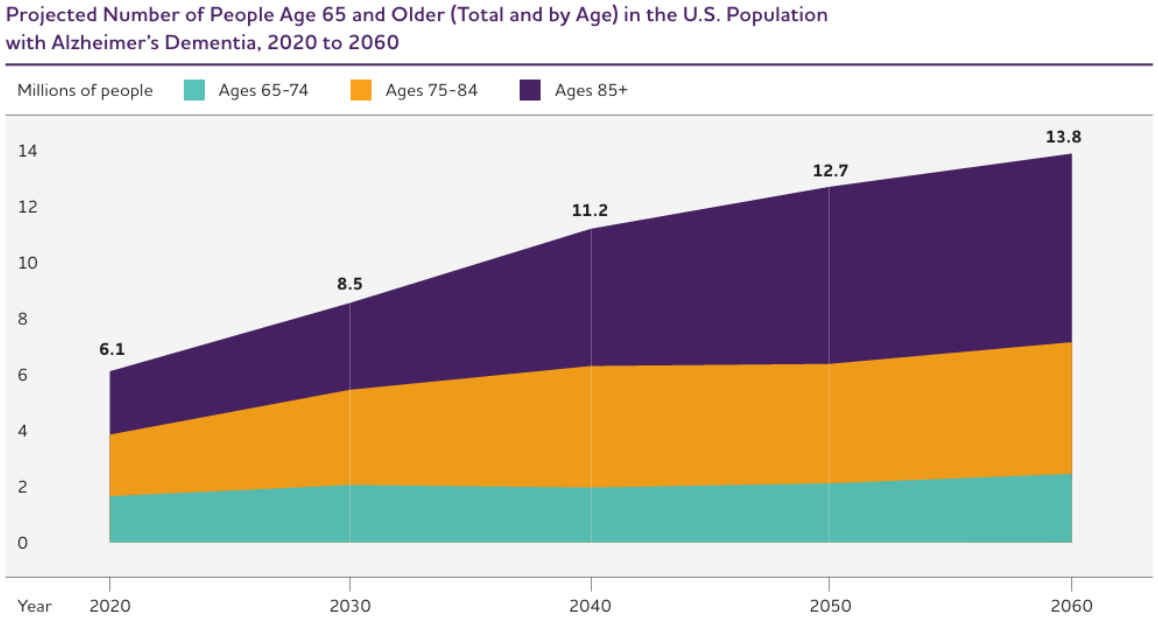
Monnat (2025); Croff et al. (2020); Berenbrok et al. (2022)

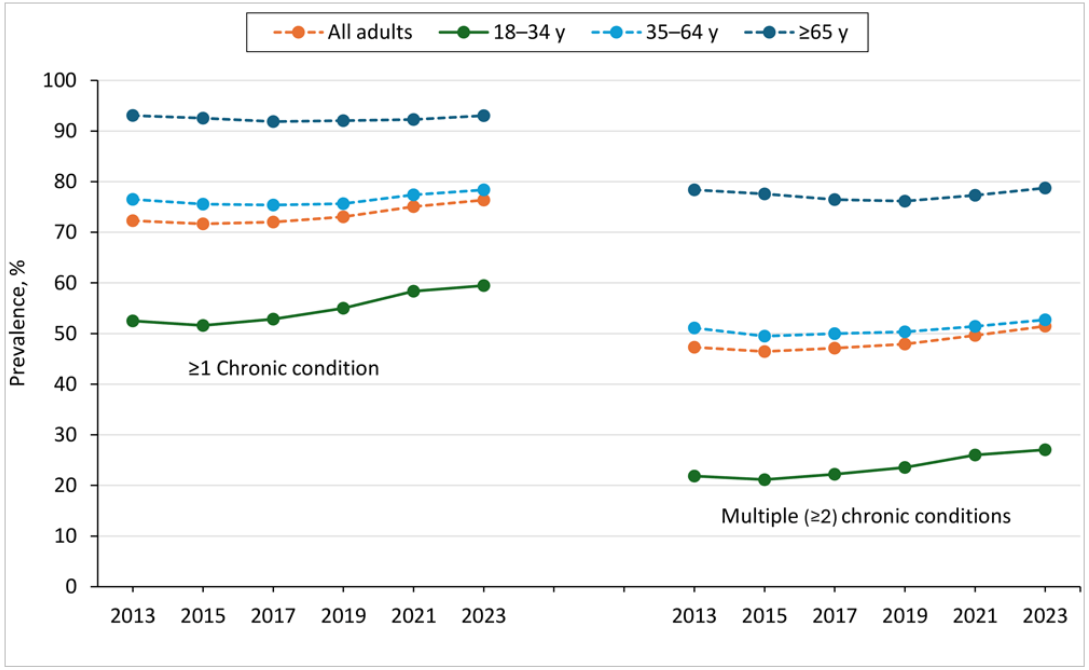
Pharmacy and Aging

- Pharmacists and older adults
  - Older adults trust pharmacists
  - Viewed as a places of healthcare
  - Older adults are interested in talking about their medications
  - Location of pharmacy matters
  - Opportunity to communicate with prescribing physicians (fax/efax)
- Opportunities to interact
  - Medication therapy management
    - Distinct service or group of services that optimize therapeutic outcomes for individual patients (American Pharmacists Association)
      - Prevents adverse advents, lowers costs, patient benefit, delivery from pharmacist, Medicare

Wrzesniewska-Wal et al. (2025)

Pharmacy and Aging

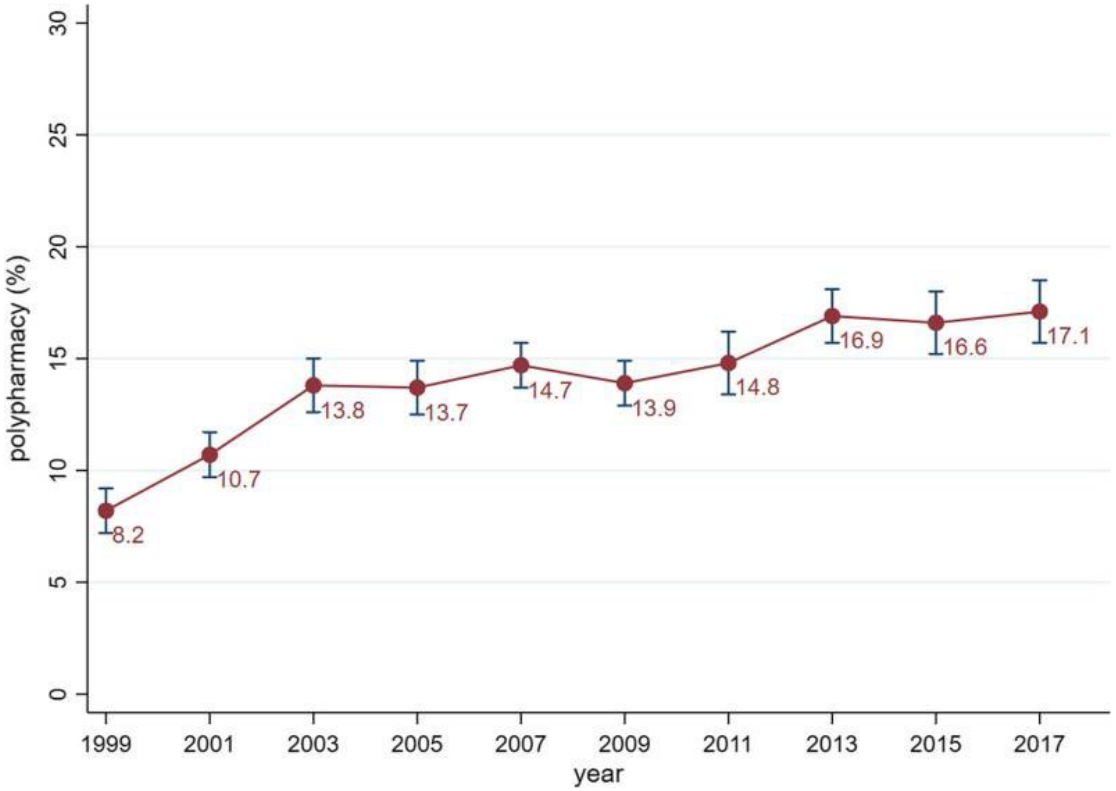


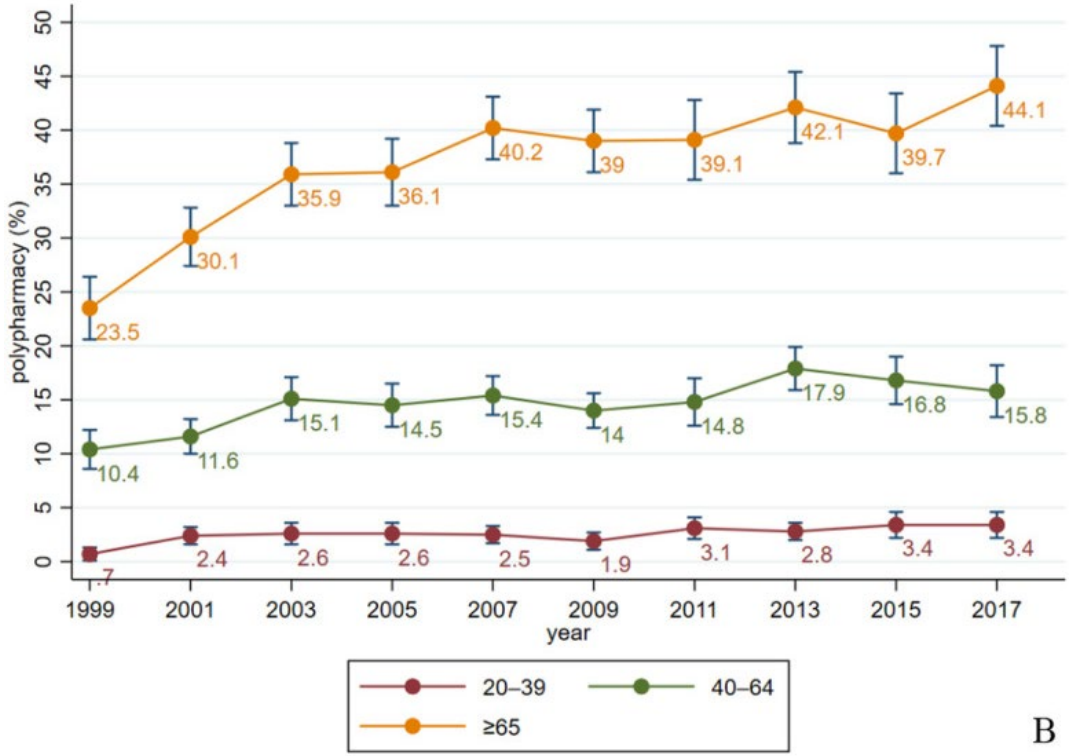


Watson et al. (2025); Alzheimer's Disease Facts and Figures (2025)

NDSU CENTER FOR COLLABORATION AND ADVANCEMENT IN PHARMACY

Pharmacy and Aging



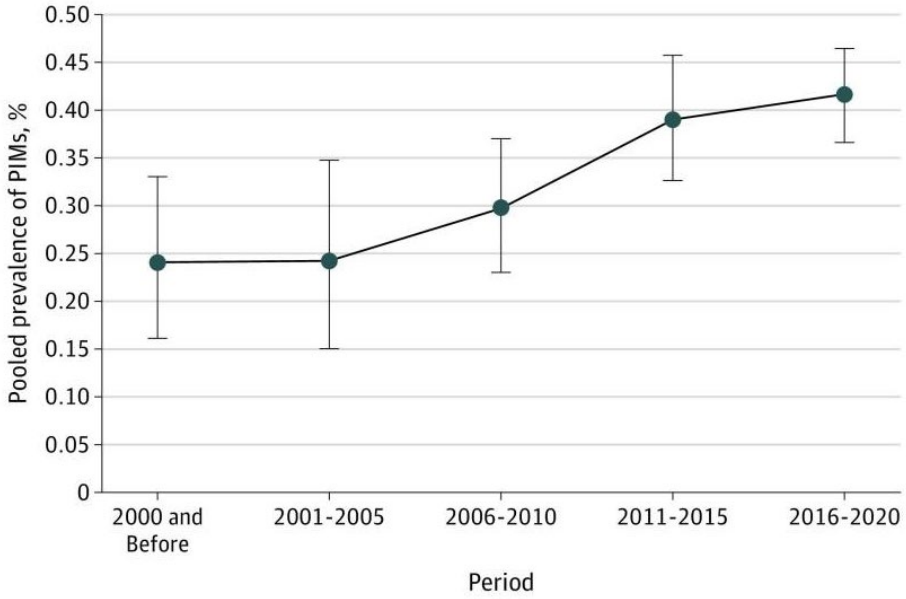


[Wang et al. (2023)]

NDSU CENTER FOR COLLABORATION AND ADVANCEMENT IN PHARMACY

Pharmacy and Aging

- Potentially inappropriate medications (PIM)
  - Medications that may present an elevated risk of adverse events or interactions in older adults
  - AGS Beers Criteria®
    - Rural areas
    - Age
    - Multimorbidity
    - Polypharmacy



Nguyen et al. (2023); AGS (2023)

Pharmacy and Aging

- Examination of PIM use at local community pharmacies
  - Medication therapy management
  - n=42 older adults (age: 76.4±7.9 years)
    - n=37 (88%) using a PIM
      - 9.7%: benefits outweighed risks
      - 83.9%: education on PIM risk provided
      - 1.1%: pharmacist recommended discontinuation
      - 5.3%: pharmacist contacted provider for deprescribing
    - Barriers and facilitators to implementing PIM review
      - Effective training strategies
      - Solidifying processes
      - Lessons for the future
      - Value to patients and pharmacies

Journal of the American Geriatrics Society

Journal of the American Geriatrics Society

RESEARCH LETTER

Integration of Potentially Inappropriate Medication Screening Into Community Pharmacies: A Pilot Study of Feasibility and Impact

Elizabeth Skoy[1] | Jayme Steig[1] | Heather Fuller[2] | Rebecca Brynjulson[1] | Ryan McGrath[3]

[1]Department of Pharmacy Practice, North Dakota State University, Fargo, North Dakota, USA | [2]Department of Human Development and Family Science, North Dakota State University, Fargo, North Dakota, USA | [3]Department of Health, Nutrition, and Exercise Science, North Dakota State University, Fargo, North Dakota, USA

Correspondence: Elizabeth Skoy (elizabeth.skoy@ndsu.edu)

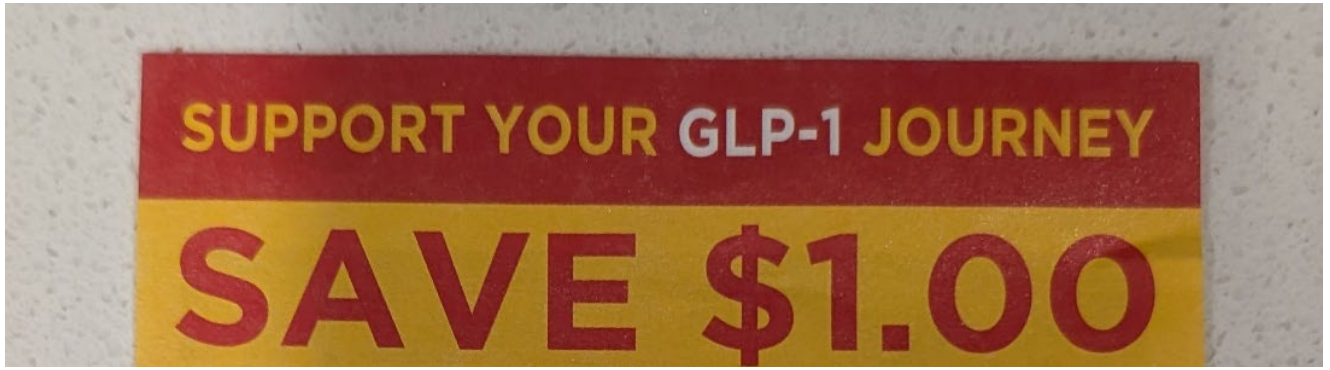
Received: 4 August 2025 | **Revised:** 21 August 2025 | **Accepted:** 27 August 2025

Funding: This work was supported by North Dakota Economic Diversification Research Funds (FAR38182).

Keywords: community pharmacy | medication therapy management | potentially inappropriate medications

Skoy et al. (2025); AGS (2023)

Pharmacy and Aging



Pharmacy and Aging

Figure 1. Percent distribution of adults aged 18 and over who met 2018 Physical Activity Guidelines for Americans for aerobic and muscle-strengthening activities: United States, 2020

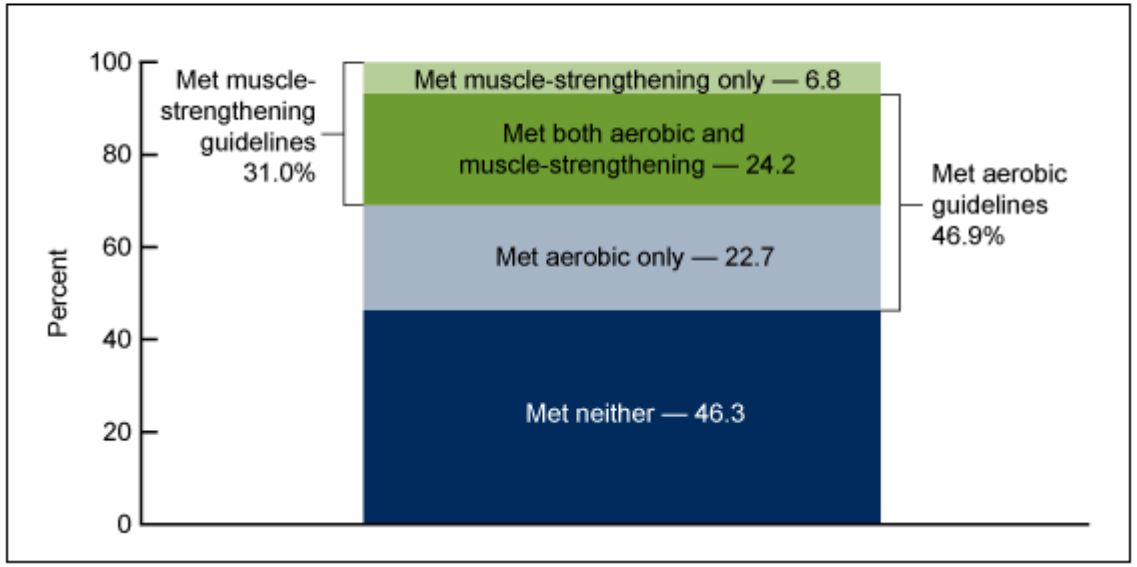
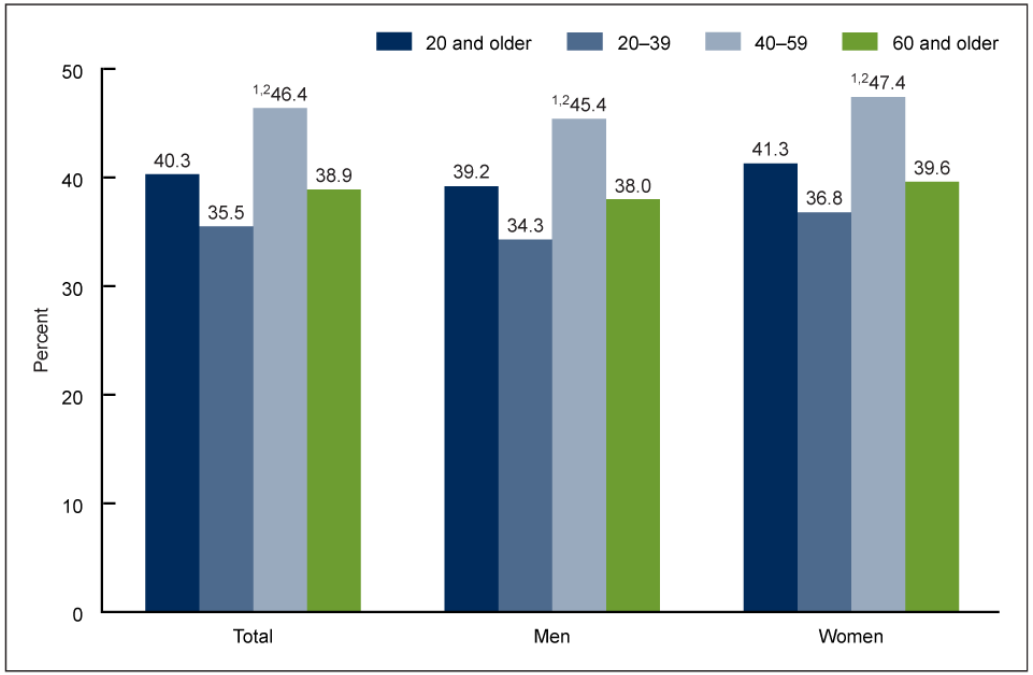


Figure 1. Prevalence of obesity in adults age 20 and older, by sex and age: United States, August 2021–August 2023



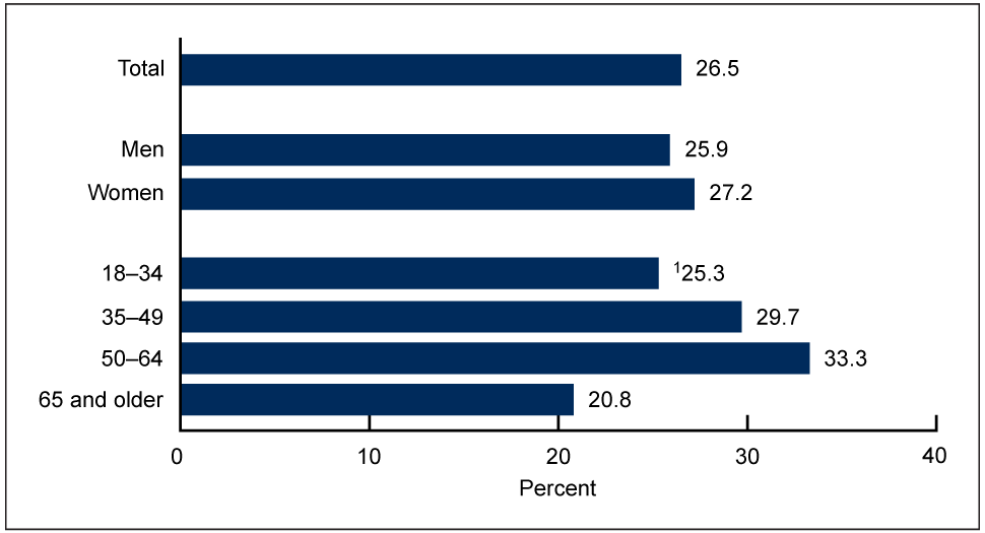
[1]Significantly different from ages 20–39 ($p < 0.05$).
[2]Significantly different from age 60 and older ($p < 0.05$).
NOTE: Age-adjusted estimates for adults age 20 and older are 40.3% for the total population, 39.3% for men, and 41.4% for women and were age adjusted by the direct method to the U.S. Census 2000 population using age groups 20–39, 40–59, and 60 and older.
SOURCE: National Center for Health Statistics, National Health and Nutrition Examination Survey, August 2021–August 2023.

Elgaddal et al. (2022); Emmerich et al. (2024)

Pharmacy and Aging

- Glucagon like peptide-1 receptor agonists (GLP-1RA)
  - Show promise for reducing body weight/mass
  - ~700% increase in use, including for off-label and cosmetic purposes
  - Risks
    - Many
      - Muscle mass loss

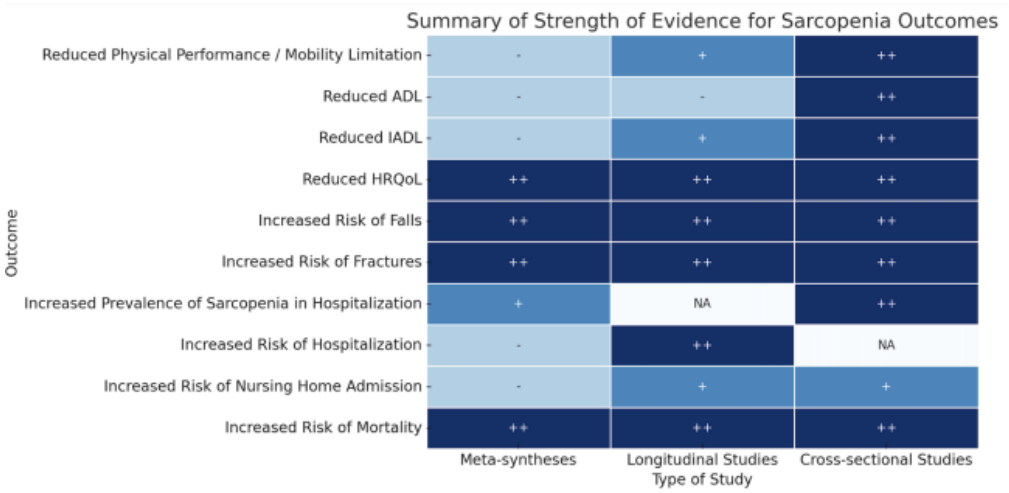
Figure 1. Percentage of adults with diagnosed diabetes who used GLP-1 injectables, overall and by sex and age group: United States, 2024



Vahratian & Warren (2025)

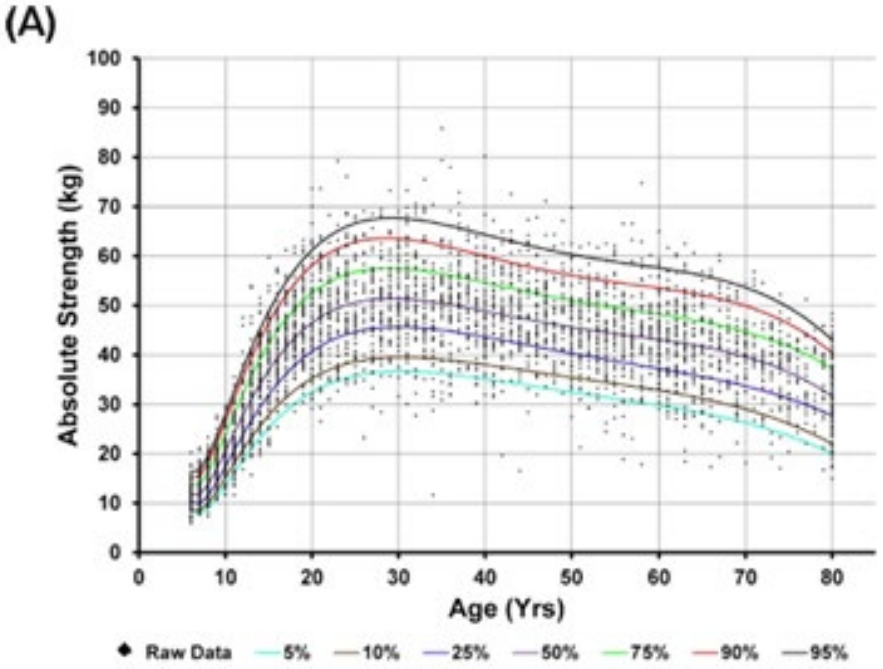
Pharmacy and Aging

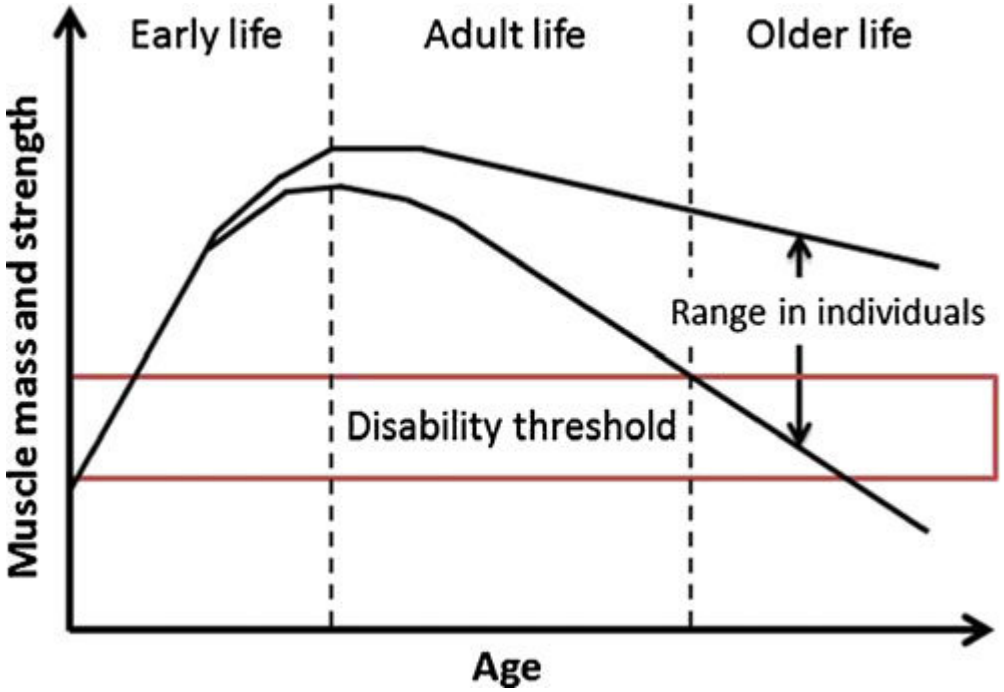
- GLP-1RA have shown promise
  - Adverse events are present
  - Strong consideration for risk-benefit balance
- Longer-term health implications should be examined
  - Sarcopenia
    - Age-related loss of muscle mass and strength/function
  - Sarcopenic obesity
    - Inclusion of obesity



Drucker (2025); Ghusn et al. (2024); Beaudart et al. (2025); Prado et al. (2024)

Pharmacy and Aging

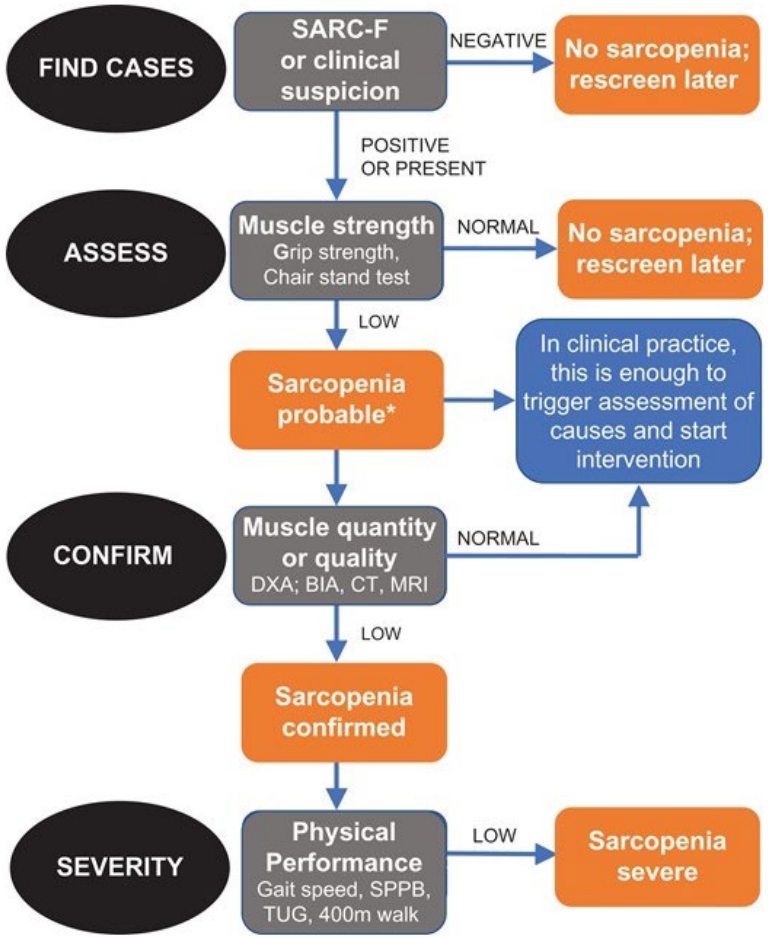




Mithal et al. (2012); Peterson et al. (2015)

Pharmacy and Aging

- Sarcopenia screening
  - Handgrip strength
  - Muscle mass
  - Physical performance



Cruz-Jentoft et al. (2019)

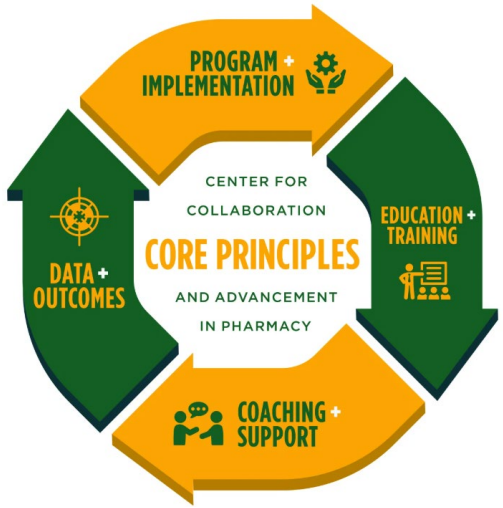
Pharmacy and Aging

- Community pharmacies can connect patients with their healthcare providers
  - Heart, muscle, and brain health are all important for aging
    - Electrocardiogram (arrhythmia)
    - Handgrip dynamometer (weakness)
    - Cognitive assessment (cognitive impairment)
- n=106 older adults (age: 74.1±9.6 years; 57% female)
  - Arrhythmia referral: 8%
  - Weakness referral: 23%
  - Cognitive referral: 29%
    - **Followed-up with healthcare provider: 24%**

Unpublished preliminary data

Pharmacy and Aging

- I am interested; tell me more!
  - North Dakota State University and School of Pharmacy (only in state)
  - CAP Center is an excellent resource
    - Education and training
    - Programs and implementation
    - Consulting and support
    - Data and outcomes
  - Improve public health
  - Advance healthcare services including in rural areas
  - Engage in significant and meaningful research to advance human health
  - Improve pharmacy operations and patient care
  - Great and committed people
  - **<u>Opportunity to engage is excellent!</u>**



How may we answer your questions?

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jayme.steig@ndsu.edu

Round Table Discussion Points

Healthy Aging

1. What opportunities for research and quality improvement do you have through your observation and experience of work in your pharmacy?

2. What barriers exist for you to engage in research or provide additional healthcare services at your pharmacy?

3. How would you envision participating in a research opportunity at your pharmacy? What support would you need from the CAP Center?

Expanding the Role of Community Health Workers in North Dakota Pharmacies: Policy, Partnerships, and Practice Integration

NORTH Dakota | Health & Human Services
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NDSU CENTER FOR COLLABORATION AND ADVANCEMENT IN PHARMACY

Tiffany R. Knauf, *MA*

Health Systems and Pharmacy Coordinator, Health Promotion and Chronic Disease Prevention Unit

NACDD North Dakota Chronic Disease Director

- *I have no financial relationships with ineligible companies to disclose.*

Learning Objectives

- Describe current rules and regulations guiding the role and integration of Community Health Workers (CHWs) in North Dakota.
- Identify how the roles of the Community Health Worker align with and complement those of the pharmacy technician.
- Discuss funding mechanisms, training requirements, and policy support needed to expand the impact of CHWs in North Dakota.
- Explain opportunities for integrating CHWs into pharmacy teams to address social determinants of health and improve patient outcomes.

What is a CHW?

- Trusted frontline public health worker
- Connects people to care and resources
- Shares lived experiences with community
- Serves as advocate, educator, navigator

NORTH Dakota | Health & Human Services
Be Legendary.

Key Functions:

- Health education, care coordination, resource navigation, and patient advocacy
- Address SDOH barriers affecting medication adherence and chronic disease outcomes

Evidence of impact:

- CHW interventions reduce A1c, improve BP control, increase preventive care uptake
- Integration with pharmacists leads to improved adherence and outcomes

American Diabetes Association. *Resources for CHWs.* professional.diabetes.org
Annual Review of Public Health / CHW Central. *CHW Integration with Health Care.* https://doi.org/10.1146/annurev-publhealth-071521-031648

Pharmacy & CHWs: Working Together

Pharmacy Technicians

- Eligible to become *Certified CHWs* in North Dakota.
- May provide patient education, follow-up, and resource navigation as part of pharmacy workflow.

Pharmacists

- Can **refer patients** to Certified CHWs for follow-up, SDOH support, or chronic disease management.
- CHW services may be **reimbursed through Medicaid** when referred by a qualified provider, including pharmacists.
- Collaboration enhances care coordination and expands patient reach.

Legislative Action & Impact

2023 – HB 1028 Passed

- Required NDHHS to seek Medicaid state plan amendment for CHW reimbursement
- Created a time-limited CHW Task Force

2024 – Task Force Recommendations Due

- Scope of work, education and training
- Certification and regulation
- Medicaid reimbursement (including FQHCs)
- ND CHW Collaborative

2025 – Rules, SPA Certification

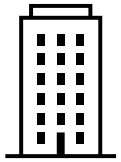
- ND Administrative Code Chapter 33-03-38 (rules for CHWs) approved.
- Medicaid State Plan Amendment submitted for CHW reimbursement
- Certification process and application launched on Oct. 1

Behind the Scenes: The Statewide Team Supporting CHWs

Certification

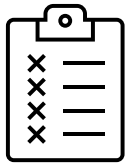
Four Pathways for Certification:

1. Training + Internship
2. Community Health Representative (CHR) Training
3. Supervised Work Experience
4. Reciprocity with Another State



Reimbursement Policy and Payment

- ND Medicaid coverage
- Monitor claims and utilization.
- Provider enrollment



Programmatic Support, Outreach, Association

- Develop supporting documents for adoption
- Provide education and TA
- Develop resources
- Establish Association

NORTH Dakota Be Legendary. | Health & Human Services

NDSU CENTER FOR COLLABORATION AND ADVANCEMENT IN PHARMACY

CHW Certification Pathways

1. Training + Internship
   - Complete a CHW Training Program + 200-hour internship
2. Community Health Representative (CHR) Training
   - Completed the Indian Health Service (IHS) Community Health Representative training
3. Supervised Work Experience
   - At least 1,000 hours of supervised work experience within past 3 years
   - Letter of recommendation from supervisor
4. Reciprocity with Another State

Funding and Reimbursement

Medicaid Reimbursement

- CHW services reimbursable under specific CPT codes
- Requires referral/order from qualified provider (including pharmacist)
- CHW must be certified and services documented

Grant and Programmatic Support:

- NDDHHS working on CHW expansion, training, and integration through CDC-funded initiatives

Billing Process Example:

Implementation Considerations

- Integrating CHWs into pharmacy teams
  - Workflow design (screen → refer → follow-up)
  - Communication and documentation protocols
- Training and continuing education opportunities
- Leveraging CHWs to meet quality metrics (BP control, adherence, A1c improvement)

Case Study & Discussion

- Example: Pharmacy CHW pilot improving hypertension control
- Open discussion:
  - How could CHWs fit into your workflow?
  - What barriers do you anticipate (space, billing, training)?

Questions?

NORTH Dakota | Health & Human Services
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Points of Contact

Certification

Tim Wiedrich

Health Response & Licensure

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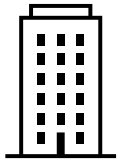

Reimbursement Policy and Payment

Wendy Schmidt

Medical Services

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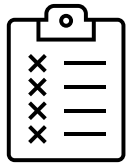

Programmatic Support, Outreach, Association

Tiffany Knauf

Healthy & Safe Communities

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Round Table Discussion Points

Community Healthcare Workers

1. How do you see CHWs working within your current pharmacy workflow?

2. What impact do you think a CHW/technician could have on your patients and pharmacy?

3. Take a moment and imagine it's 2030. All the pharmacies you know of are fully staffed and have unlimited resources. What services, related to CHW work, is your pharmacy providing?

Thank You!

Please contact NDSU.CAPCenter@ndsu.edu
or Lisa.Nagel@ndsu.edu
If you have any questions!

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