

Introduction to Healthcare

A SIMPLE INTERACTION



EFFECTS OF HEALTH CARE'S GROWING SOPHISTICATION

- People want more health care
- Healthcare becomes more expensive

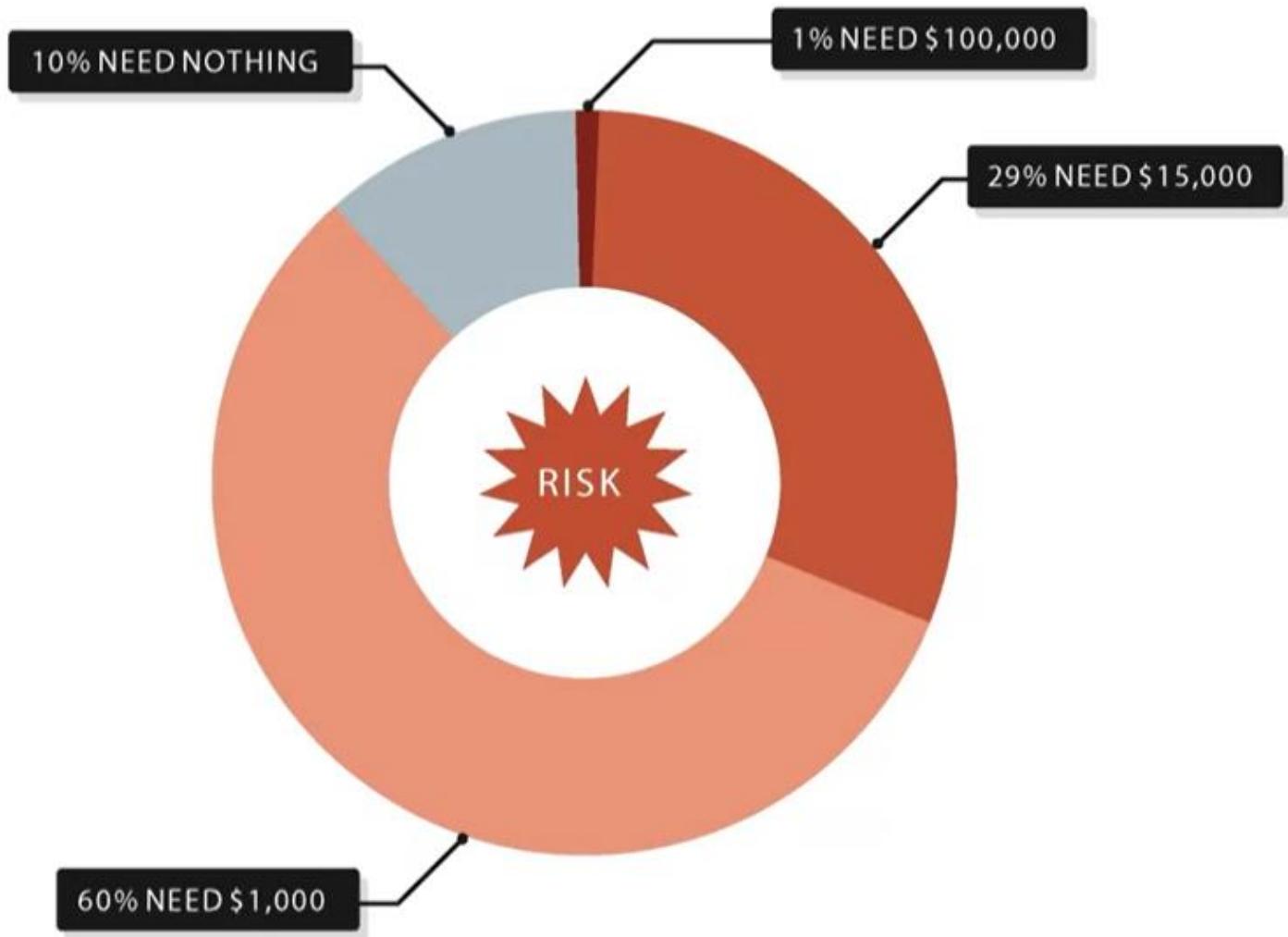
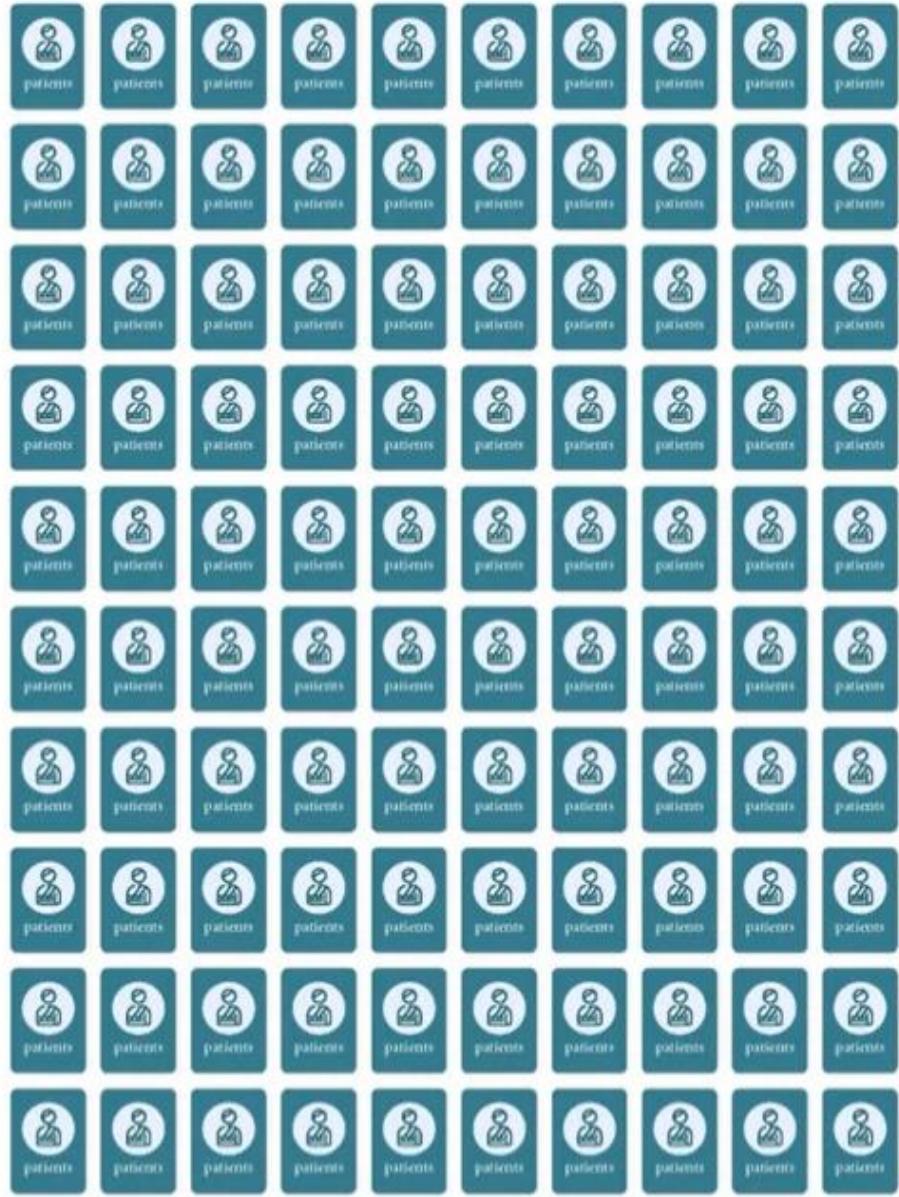
PROBLEMS CAUSED BY UNPLANNED HEALTH CARE EXPENSES

- Financial discomfort or hardship for patients affecting willingness to use health care
- Providers not getting paid affecting their ability to provide services

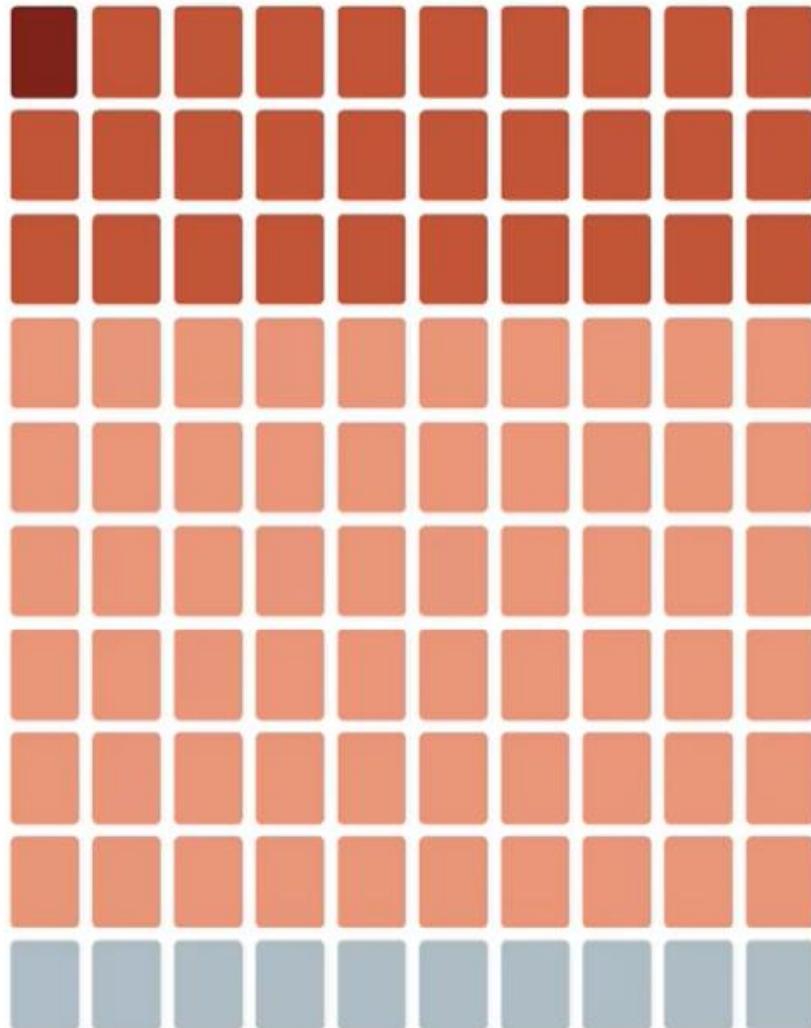
Risk

the possibility of facing a financial loss associated with the use of healthcare.

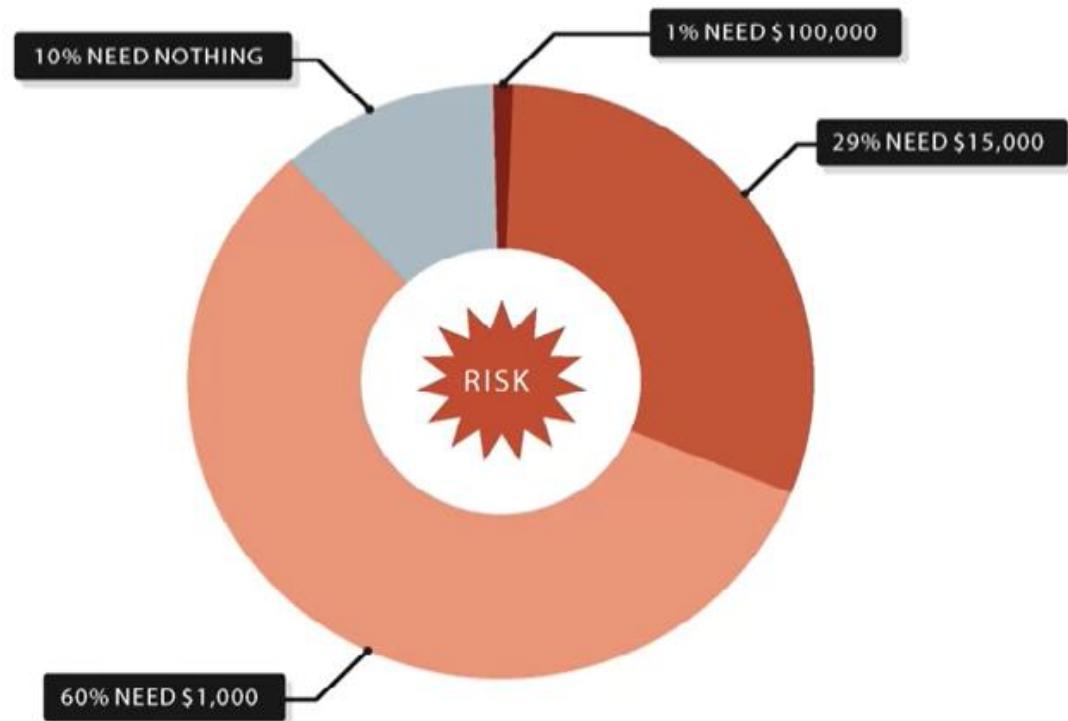
Pool the Risk.



= 10 patients



= 10 patients



$$10 \times \$100,000 = \$1,000,000$$

$$290 \times \$15,000 = \$4,350,000$$

$$600 \times \$1,000 = \$600,000$$

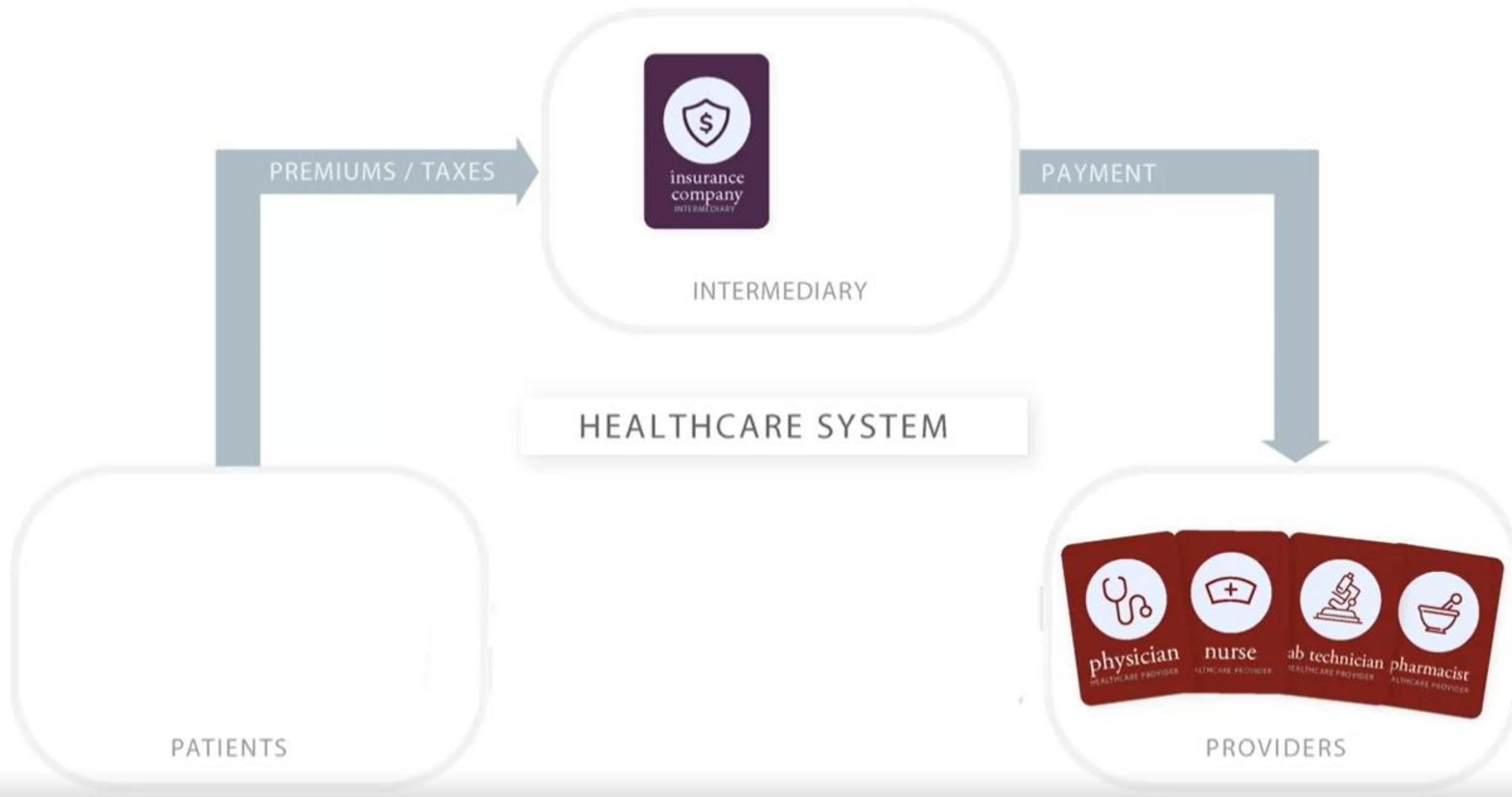
$$\begin{aligned} \$1,000,000 + \$4,350,000 + \$600,000 \\ \$5,950,000 / 1000 = \\ \$5,950 \text{ per person} \end{aligned}$$

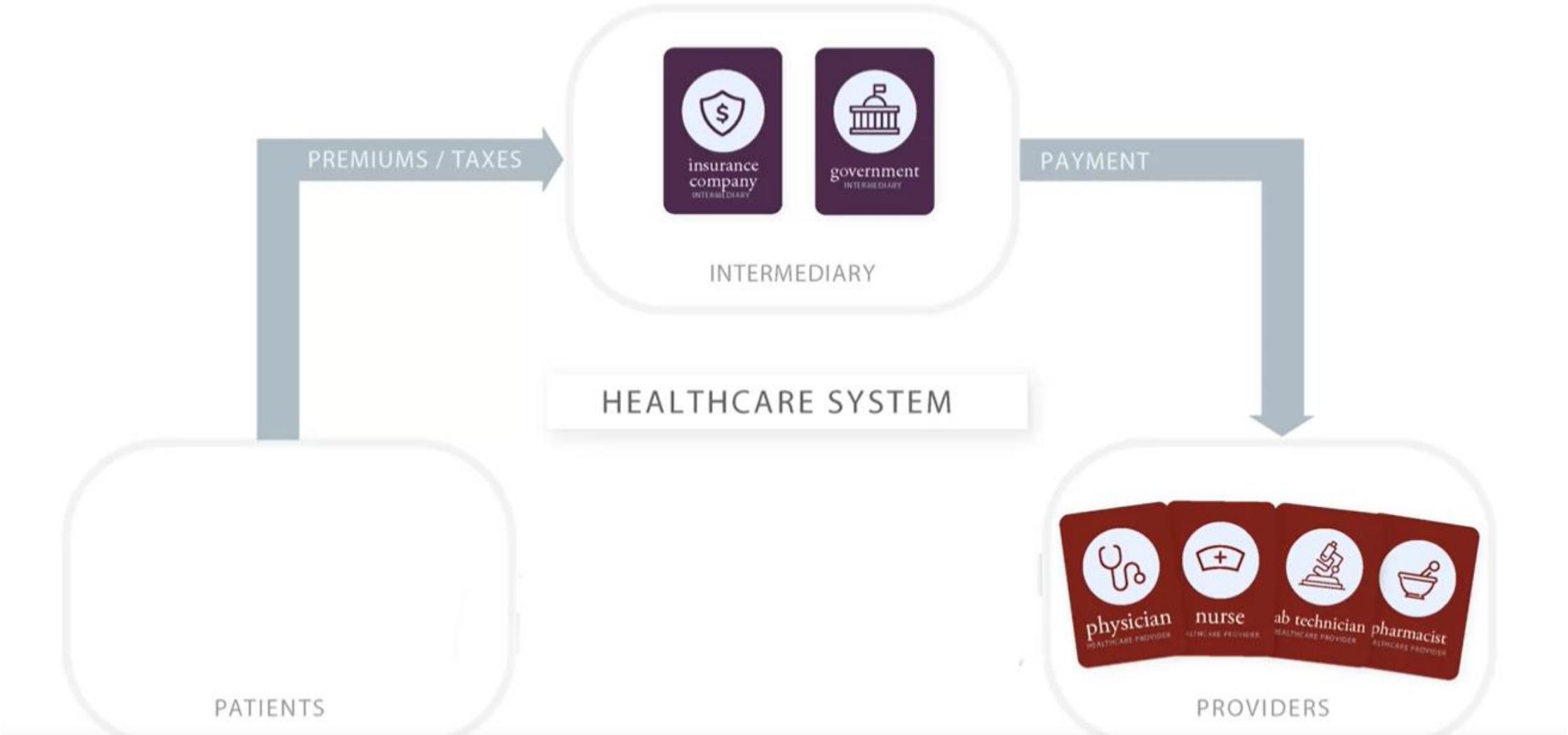
Intermediaries

entities that collects funds from a group of people, pool the funds and uses them to pay for health care for the people who are covered

2 TYPES OF INTERMEDIARIES

- Insurance companies
- Government payers





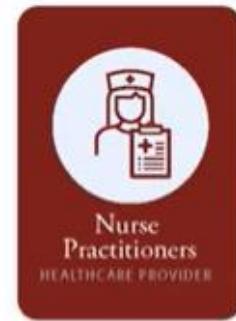
INTERMEDIARY ROLES

- Pool risk
- Manage use and costs of health care

EXAMPLES OF MANAGED CARE

- HMOs
- PPOs
- High deductible plans

MEDICAL PROFESSIONALS



ORGANIZATIONS



TEAM



Outpatient setting

Outside a hospital, for example in a physician office or clinic.

Generally same day

Inpatient setting

in a hospital, generally where the patient stays overnight or longer

LEVELS OF CARE

QUATERNARY CARE

The most specialized care for rare and very complex conditions

TERTIARY CARE

Referred from secondary or primary care physicians

Provided mostly by highly specialized physicians often in large referral centers

Even less common and more complex conditions

Mostly inpatient, some outpatient

SECONDARY CARE

Often referred by primary care

Provided by specialists/consultants – e.g. cardiologist

Less common, more complex conditions

Outpatient and inpatient

PRIMARY CARE

Often first point of entry for medical care

Provided by primary care physicians, nurse practitioners and physician assistants

Wide range of mostly common conditions

Commonly outpatient

COMMON SPECIALTIES OF PRIMARY CARE PROVIDERS

- General practice
- Family medicine
- Internal medicine
- Pediatrics (children)
- Geriatrics (older patients)
- OB-GYN (women)



Percent of GDP
allocated to health care



Healthcare spending

Gross domestic product (GDP)



WHY HAVE THERE BEEN INCREASES OVER TIME?

- Populations getting older
- Population income and living standards have increased
- Price increases
- Increases in utilization resulting from technological advances

3 CHALLENGES FOR QUALITY OF CARE

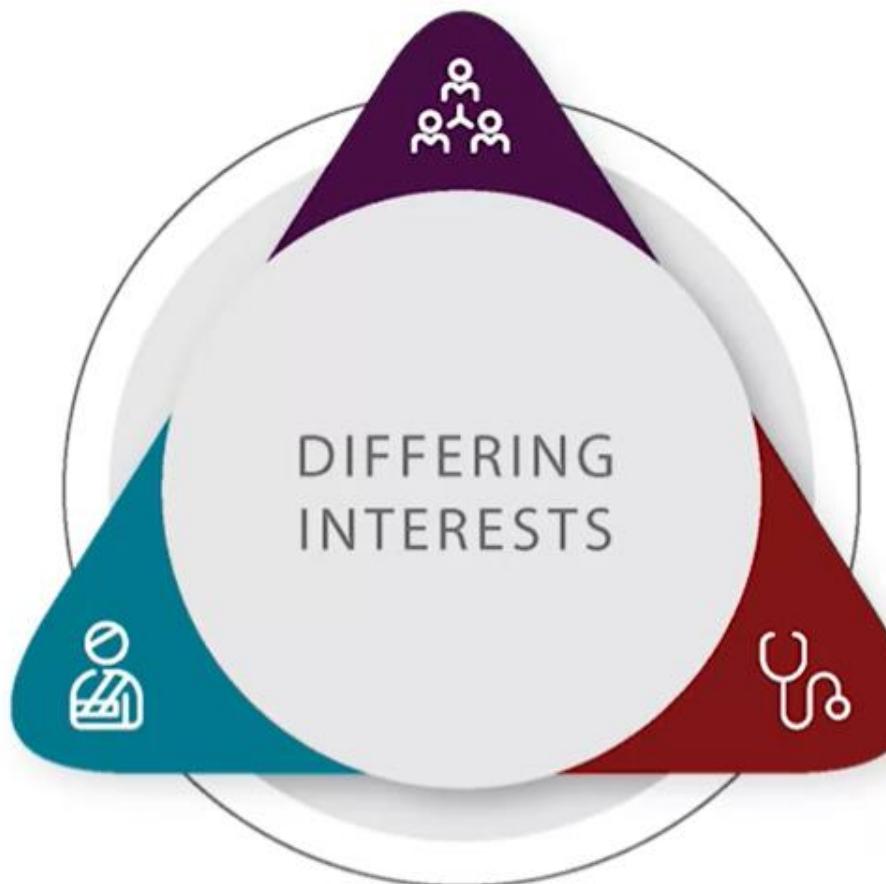
- Underuse
- Overuse
- Misuse

ACCESS CHALLENGES

- Lack of insurance coverage
- Socioeconomic disparities
- Differing levels of education
- Cultural issues
- Language barriers
- Lack of providers

INTERMEDIARIES

- Manage healthcare risks
- Identify possible health issues
- Help patients get access to resources



PATIENTS

- Keep themselves healthy
- Get needed medical care

PROVIDERS

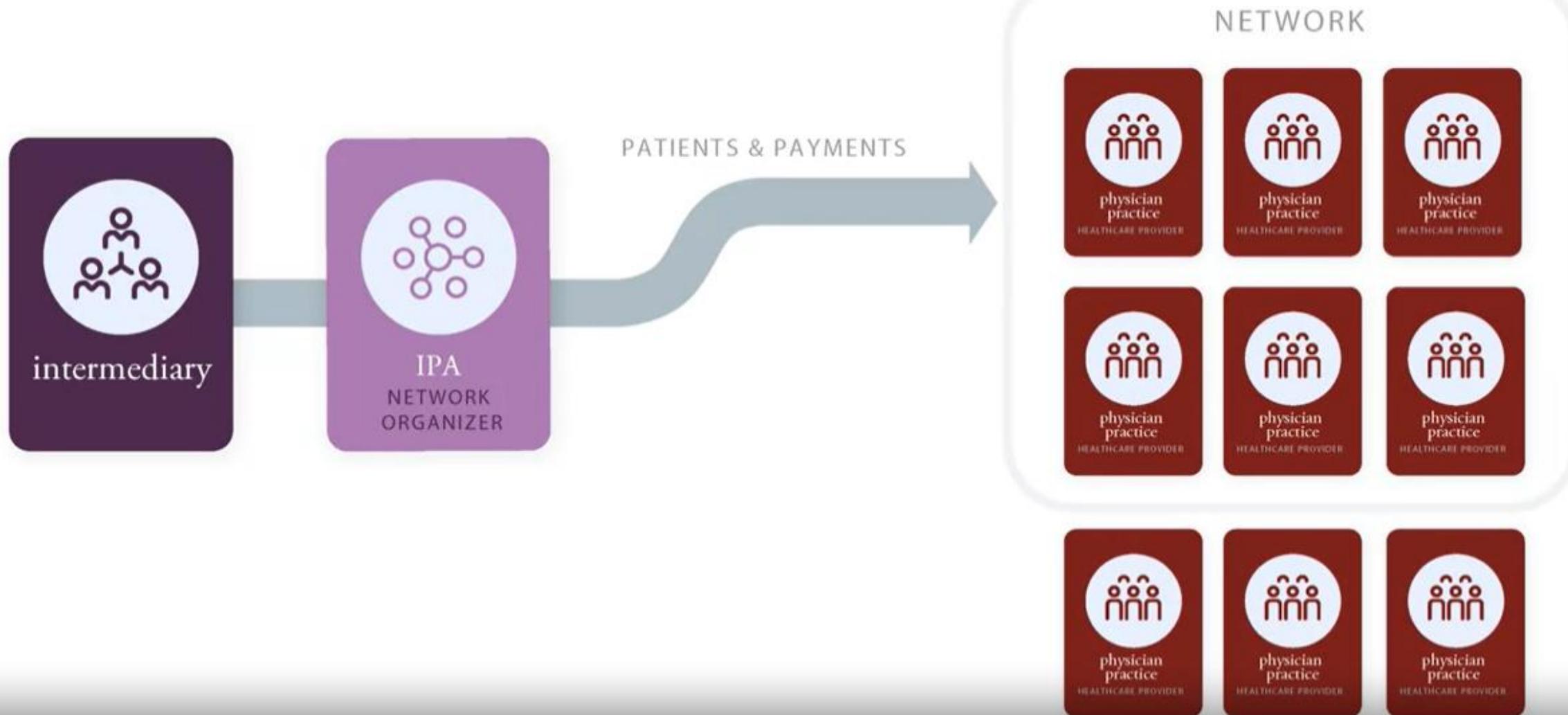
- Provide health care to patients
- Manage incoming information
- Assimilate data from colleagues or systems
- Better identify patients

PHYSICIAN PRACTICES SPECTRUM



NAME	Solo Practice	Physician practice or medical group	Physician organization
OWNERSHIP	Physician ownership common		Corporate ownership structure common
MANAGEMENT	Physician management common		More elaborate management structures
STAFFING	Fewer, less specialized, administrative staff		More and more specialized administrative staff
MULTI-SPECIALTY PRACTICES	Single specialty practice common		Multi-specialty practice common
IN-HOUSE ANCILLARY SERVICES	Less common		More common
LOCATIONS	Single location common		Multiple locations common

INDEPENDENT PRACTICE ASSOCIATIONS (IPA)





FEE FOR SERVICE



Retrospective payment system

the amount of the payment is set after the services are delivered and responds to the services

PROCEDURE CODES

- CPT- Current Procedure Terminology
- HCPCS - Healthcare Common Procedure Coding System
- ICD-10 PCS - International Classification of Diseases, 10th revision, Procedure Coding System

DIAGNOSES CODES

- ICD-10 - International Classification of Diseases

Medicare

the US government payer that provides coverage for people over age 65, and some others

CALCULATING PAYMENTS UNDER THE MEDICARE FEE SCHEDULE



SPECIFIC SERVICES
PERFORMED



HCPCS / CPT CODE



RVU AMOUNTS

EXAMPLE RVUs FOR SELECTED CODES

CODE	RVUS
12032 Intermediate wound repair; scalp, axillae, trunk, extremities 2.6-7.5 cm	5.46
27227 Treat hip fracture(s)	47.85
33510 Coronary artery bypass graft, vein, single	56.04
47562 Laproscopic cholecystectomy	19.19
99213 Intermediate office visit with established patient	2.11

*assumes office visit is done in a physician office, and other procedures are done in a facility (a facility is typically inpatient or outpatient hospital, ED, SNF, or ASC)

Source: CMS, "2020 National Physician Fee Schedule Relative Value File"

EXAMPLE MEDICARE FEE SCHEDULE PAYMENT CALCULATION

TOTAL RVU*	X	CONVERSION FACTOR	=	FEE SCHEDULE ALLOWED AMOUNT
2 RVUs		\$35		\$70
4 RVUs		\$35		\$140

*Note: In the Medicare Fee Schedule, Total RVUs reflect work, practice expenses, and malpractice risk, and are adjusted for geographic variations

Capitation

payment per person, per unit of time

CAPITATION PAYMENT MODEL

- 1.** Identify panel of patients
- 2.** Define scope of services
- 3.** Practice and intermediary agree on fixed payment amount

CAPITATION-RATE-EQUATION

NUMBER OF PATIENTS	X	PMPM AMOUNT	=	PAYMENT TO PRACTICE
1000 patients		\$25		\$25,000

INCENTIVES AND RISK TRANSFER IN PHYSICIAN PAYMENT SYSTEMS



FEE FOR SERVICE



CAPITATION



Incentive tends to favor **more care**

Creates more concern about potential **overuse**



Less risk transferred to provider



Incentive tends to favor **less care**

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Prospective system

payment amount is determined before any services are provided,
and does not change depending on the services

SCOPE OF CAPITATION

GLOBAL CAPITATION

PRIMARY CARE (PARTIAL) CAPITATION



Outpatient
primary care



Specialist
care



Inpatient

PHYSICIAN PAYMENT MODELS

- Episode based payments
- Salary model

EPISODE BASED PAYMENT



FEE FOR SERVICE



CAPITATION



EPISODES HAVE 2 COMPONENTS

- Clinical dimension
- Time dimension

LESSONS FOR AI AND DATA

- Patients may see physicians in different practices resulting in multiple systems
- Payment systems are a valuable source of data, especially in fee-for-service model
- Different AI tools are needed depending on the size and structure of a physician practice

PROVISION OF BEDS AND INFRASTRUCTURE FOR INPATIENT CARE

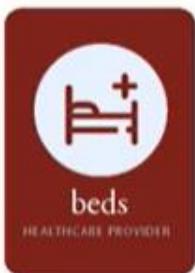
- Outpatient facilities

DIFFERENT CHARACTERISTICS OF HOSPITALS

- 1.** Level of services provides
- 2.** Focus of the hospital

HOSPITAL

INFRASTRUCTURE (examples)



beds

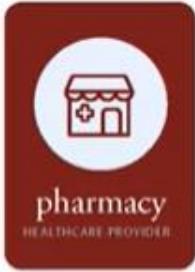


beds

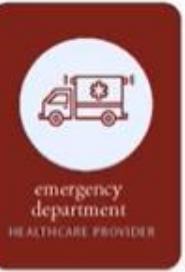


beds

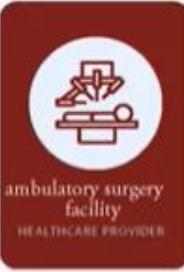
OTHER INFRASTRUCTURE LIKE



pharmacy



emergency
department



ambulatory surgery
facility

STAFF (examples)



nurse



nutritionist



pharmacist



X ray technician



rehabilitation
specialist



business
personnel



HOSPITAL EMPLOYS PHYSICIAN DIRECTLY



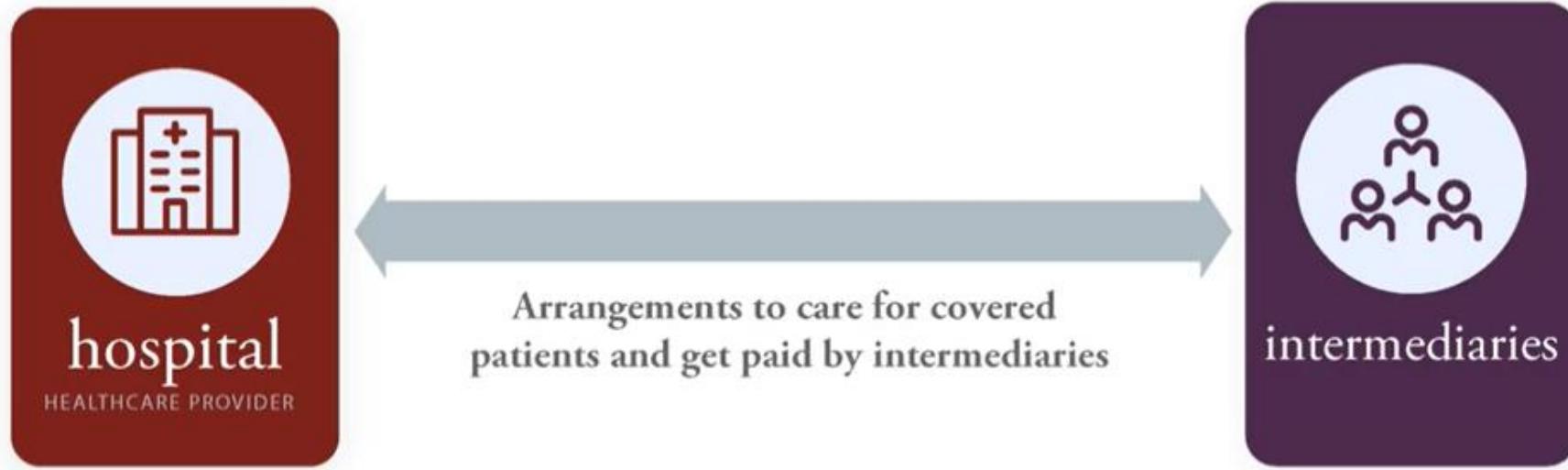
PHYSICIAN HAS A SEPARATE PRACTICE WITH
AN ARRANGEMENT TO PRACTICE AT THE HOSPITAL
admitting privileges





Arrangements to care for covered
patients and get paid by intermediaries





Hospital Network

A group of hospitals with whom an insurer works, and which enrollees are required or encouraged to use

Fee-for-service

a fee is paid for each service provided to a patient

CHARGEMASTER

A list of all the services the hospital provides and the amount the hospital charges for each

Example of charges from an example 2019 hospital chargemaster

RADIOLOGY SERVICES (CPT CODES 70010-79999)	2019 CPT CODE	AVERAGE CHARGE
--	---------------	----------------

CT Scan Abdomen with contrast	74160	\$4,180.00
CT Scan, Head or Brain, without contrast	70450	\$3,712.00
CT Scan, Pelvis, with contrast	72193	\$5,148.00
Mammography, Screening, Bilateral	77067	\$300.00
MRI, Brain, without contrast, followed by contrast	70553	\$7,483.00
Ultrasound, Abdomen, Complete	76700	\$2,103.00
Ultrasound, OB, 14weeks or more, transabdominal	76805	\$137.35
X-Ray, Lower Back, minimum four views	72110	\$1,346.00
X-Ray, Chest, two views	71046	\$752.00

MEDICINE SERVICES (CPT CODES 90281-99607)	2019 CPT CODE	AVERAGE CHARGE
---	---------------	----------------

Cardiac catheterization, Left Heart, percutaneous	93452	\$15,282.00
Echoradiography, Transthoracic, complete	93307	\$3,322.00
Echoradiography, routine, with interpretation and report	93000	
Inhalation Treatment, pressurized or nonpressurized	94640	\$319.00
Physical Therapy, Evaluation	97161-97163	\$766.00
Physical Therapy, Gait Training	97116	\$222.00
Physical Therapy, Therapeutic Exercise	97110	\$200.00



Per-diem

payment per patient day

PER-DIEM PAYMENTS CAN VARY

- by type or complexity of services
- by the day of the hospital stay



Carve out

when specific services are paid separately from the per-diem



Hospital Payment Methods: DRGs

DRG

Diagnosis Related Group

Patients with similar diagnoses
assigned to the same DRG

DRG ASSIGNMENT

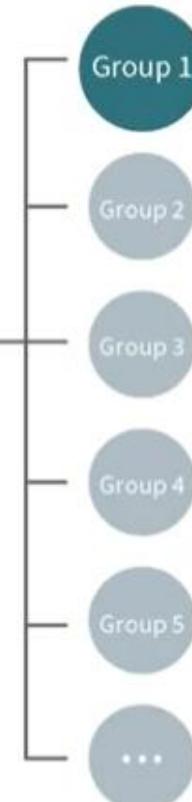


HOSPITAL
ADMISSION



DRG GROUper CRITERIA

- Primary Diagnosis
- Comorbidities & Complicating Conditions
- Surgical procedures
- Age
- Sex
- Discharge disposition



ADMISSION ASSIGNED
TO DIAGNOSIS RELATED
GROUP (DRG)

DRG weight

a value assigned to a DRG reflecting complex

DRG Incentives

Hospitals paid based on patient characteristics, not length of stay or services performed

Outlier payments

payments in addition to the DRG for patients using much more care than expected for their group

Hospital Payment Methods: Global Budgets

**GLOBAL BUDGET: A PAYMENT SYSTEM WHERE HOSPITAL
IS PAID A FIXED AMOUNT FOR A PERIOD OF TIME**

- 1.** Often one year
- 2.** To take care of a known or predicted population
- 3.** To provide a defined scope of services

Payment arrangements for inpatient
and outpatient care can vary

Payment arrangements for hospital-provided services and physician services can vary

MEDICAL SERVICES



PROFESSIONAL
COMPONENT



FACILITY
COMPONENT



INCENTIVES AND RISK TRANSFER IN HOSPITAL PAYMENT SYSTEMS



FEE FOR SERVICE



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Less risk transferred from intermediary to hospital



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INCENTIVES AND RISK TRANSFER IN HOSPITAL PAYMENT SYSTEMS



FEE FOR SERVICE



PER DIEM



DRG



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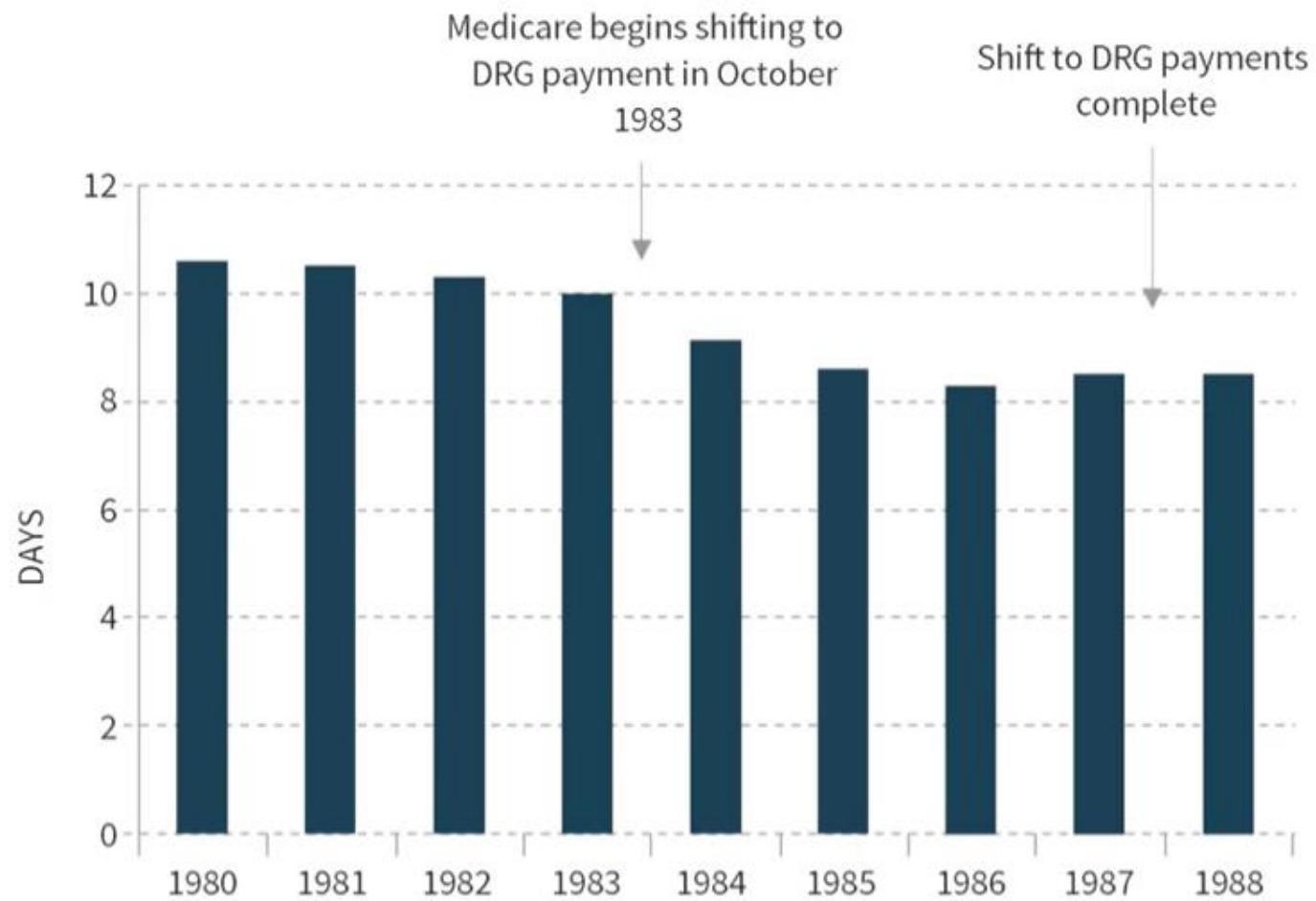
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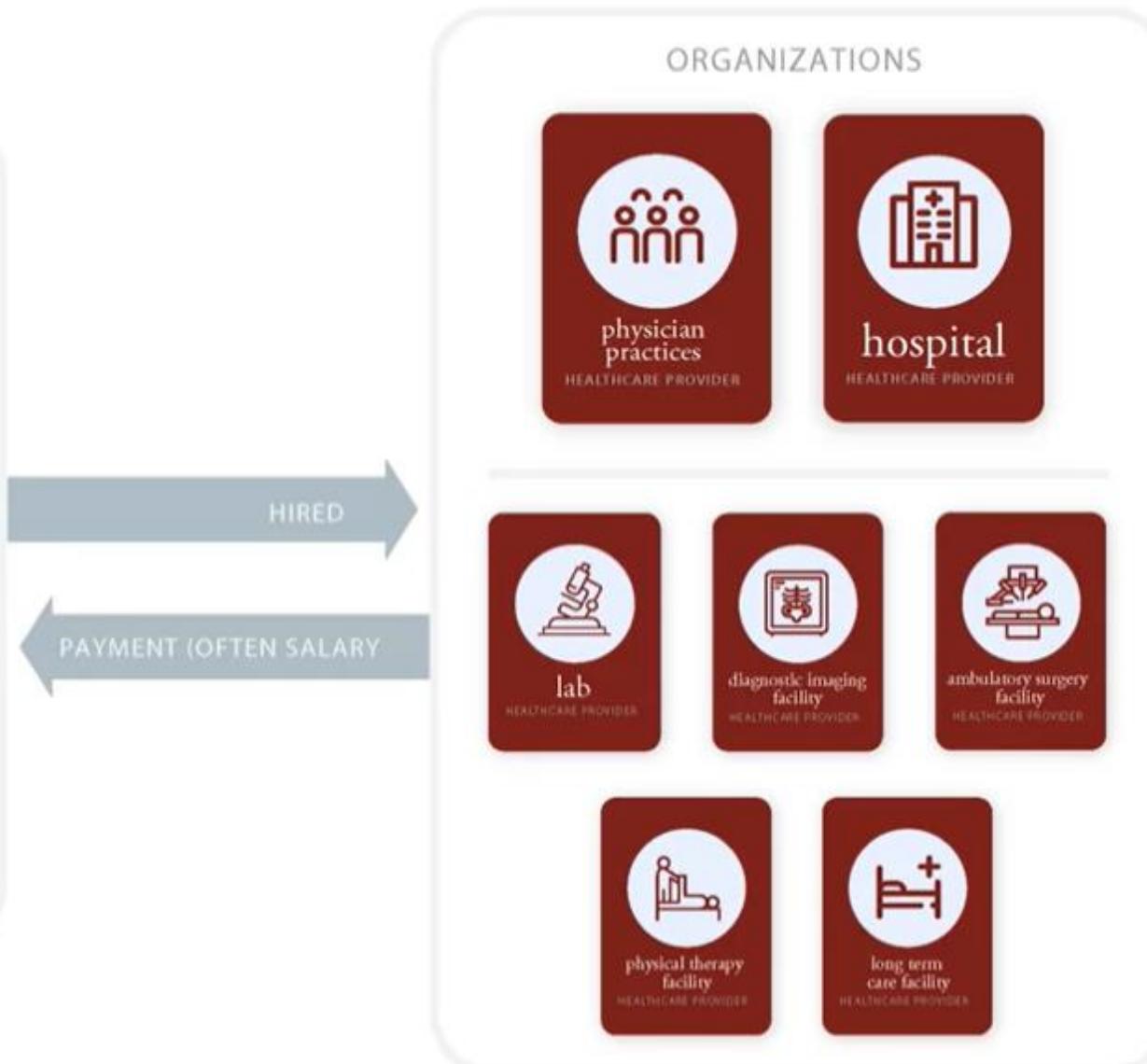
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AVERAGE LENGTH OF STAY FOR MEDICARE BENEFICIARIES ADMITTED TO SHORT-STAY HOSPITALS



Source: Phelps, "Health Economics" p349



HOSPITAL SYSTEMS



PHYSICIAN-HOSPITAL ORGANIZATIONS



Integrated delivery network

an entity that owns, or closely integrates, many providers of different types to provide a broad range of care

Financial integration

providers work as part of the same business,
with a unified bottom line

Accountable care organization

An entity that works to integrate and coordinate care involving a range of providers that work together but are not necessarily financially integrated

Larger Provider Organizations



Pay for Performance in Payment



PAY FOR PERFORMANCE

P4P performance metrics commonly include quality of care measures

ISSUES IN PAY-FOR-PERFORMANCE SYSTEM DESIGN

- what set of measures to use?
- what is the goal or expectation to be met?
- whether and how to adjust for variations in patient characteristics?
- how much money to put at stake?

EMR = electric medical record

an electric version of a patient's medical record

EHR = electronic health record

an entity that collects funds from a group of people, pools the funds
and uses them to pay for the pepole who are covered

PHR = personal health record

an entity that collects funds from a group of people, pools the funds
and uses them to pay for the pepole who are covered

Providers, Provider Incentives, Data, and Tools

Intermediaries, Health Insurance Plan, and Healthcare Financing



Public intermediaries

intermediaries run by, or under the auspices, of a government

Private intermediaries

intermediaries that operate as private businesses

PATIENTS



PROVIDERS



intermediaries



PURCHASERS

BROADER FORCES THAT AFFECT INTERMEDIARIES

- high and rising health care costs
- the need to provide high quality health care
- the need to enable access to care

Networks and Selective Contracting

Network or provider panel

the set of providers organized by an intermediary to care for enrolled patients

Selective contracting

intermediaries selecting some but not all available providers to be included in their network

SOME POSSIBLE CRITERIA FOR CHOOSING PROVIDERS

- Quality
- Efficiency
- Payments required
- Location

Closed panel

an intermediary requirement that enrollees only see providers in a network set up by the intermediary

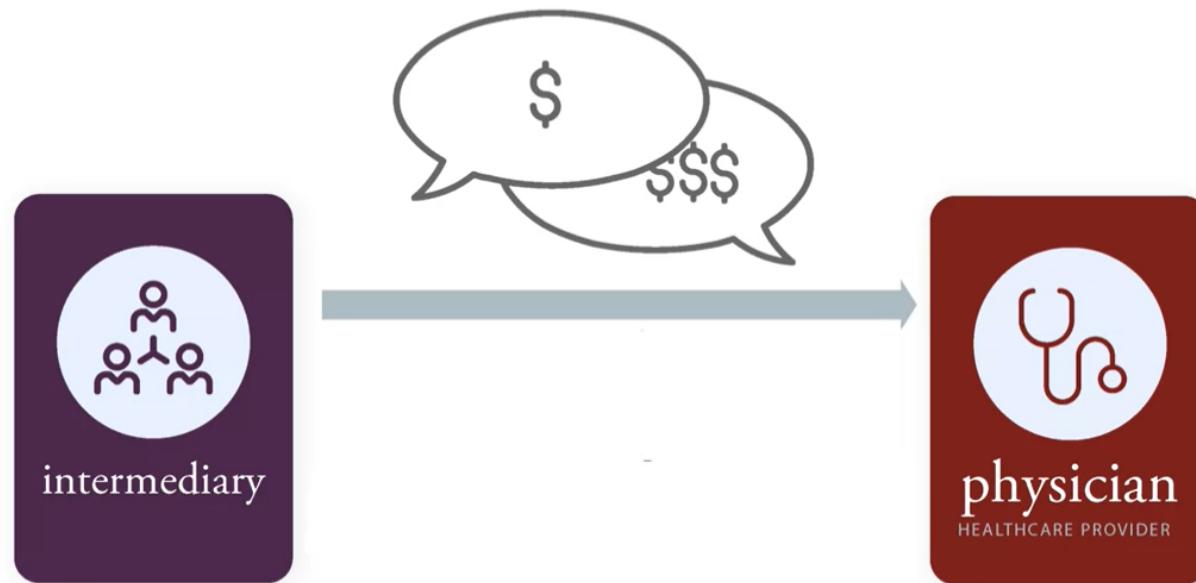
Open panel

intermediary enrollees can see any provider

Semi-open or semi-closed panel

enrollees are incentivized to see providers in a network, but can see non-network providers with reduced coverage

Provider Payment Methods and Levels



FORMS OF PAYMENT

Paying Physicians



FEE FOR SERVICE



CAPITATION



EPISODE BASED PAYMENT

Paying Hospitals



FEE FOR SERVICE



PER DIEM



DRG



GLOBAL BUDGET

INCENTIVES AND RISK TRANSFER IN HOSPITAL PAYMENT SYSTEMS



FEE FOR SERVICE



PER DIEM



DRG



GLOBAL BUDGET



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PATIENT COST
SHARING



Cost sharing or out-of-pocket payments
money paid by patients to providers when they receive care

Deductible

an amount enrollees pay out of their own pocket before the intermediary will cover costs

Copayment

a payment of a fixed amount a patient must make every time a provider is used

Coinsurance

a percent of the bill that the patient is responsible for when a provider is used

VARIATIONS IN COST SHARING

- across different types of services
- By level of spending
- by network status of the provider
- by tier

Utilization Review, Gatekeepers, and Other Methods of Directly Influencing Care

Gatekeeper requirement

a requirement that patients see their primary care provider before receiving care from specialists or other providers if care is to be covered



Utilization review

intermediary requirements that care use be approved by the intermediary to be covered

Pre-authorization or prior review

a requirement that the intermediary approve care in advance

Concurrent review

intermediaries monitor care as it is being delivered

Retrospective review

intermediaries review care that has been delivered for appropriateness

EXAMPLE CRITERIA FOR COVERAGE DECISIONS

- efficacy
- cost or cost-effectiveness



INTERMEDIARIES ARE EXPECTED TO BE GOOD AT

- Determining specific goals
- Determining the providers and people they work with
- Determining how to deal and compete with other intermediaries
- Designing their approach to meet their goals
- Mixing and matching existing tools and sometimes making new ones
-

Common Health Plan Design

- Three Stereotypical Plan Designs: "Traditional," HMO, and PPO

COMMON FEATURES OF TRADITIONAL INSURANCE

- open panel
- fee-for-service
- no gatekeepers
- limited utilization review
- often higher patient cost sharing

HMO - health maintenance organization

an entity that collects funds from a group of people, pools the funds
and uses them to pay for the pepole who are covered

COMMON HMO FEATURES

- defined network and closed panel
- stronger provider payment incentives
- gatekeeper and utilization review common
- often less patient cost sharing



PREFERRED PROVIDER ORGANIZATION

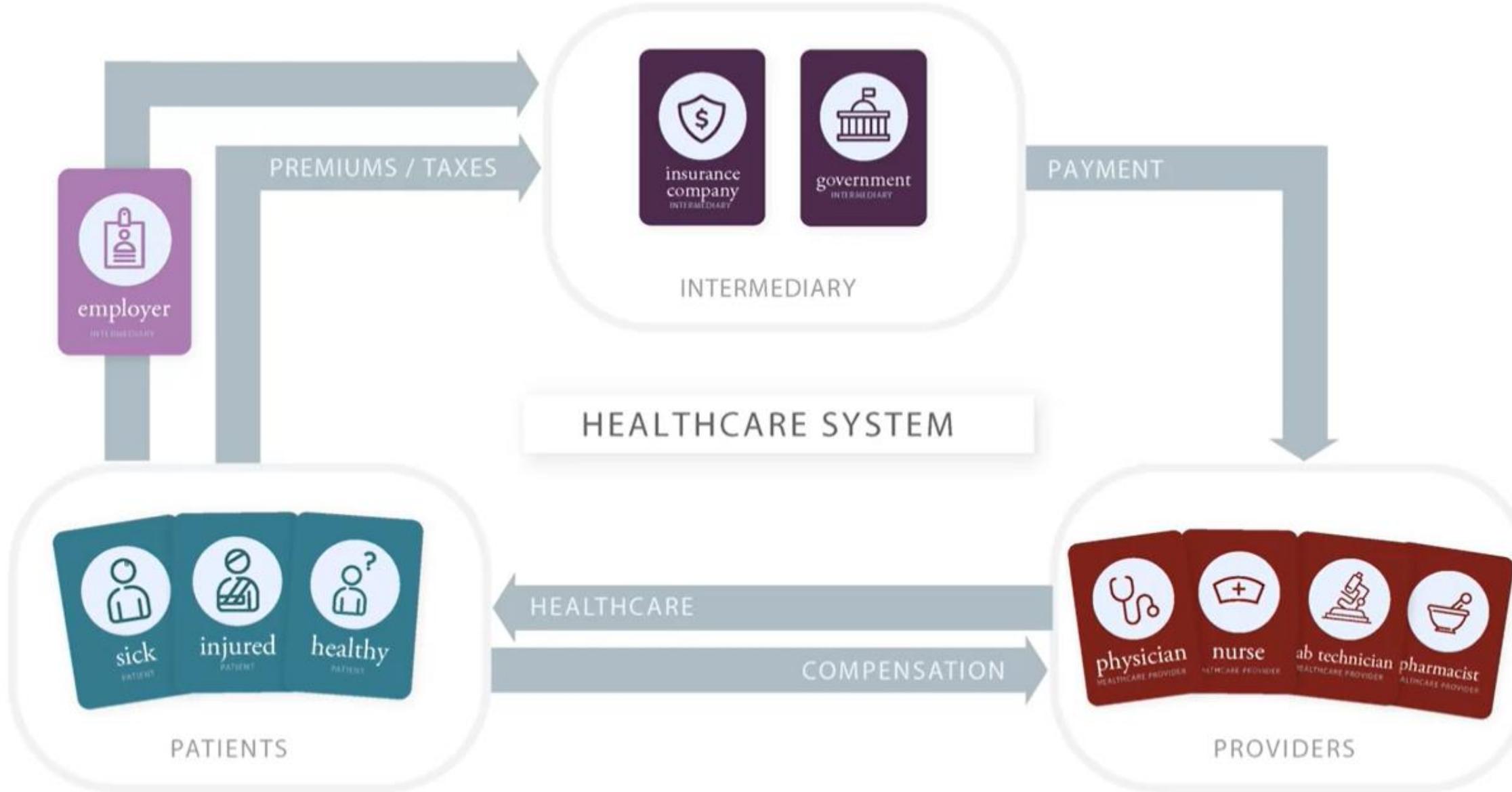
COMMON PPO FEATURES

- semi-open/semi-closed panel
- moderate provider payment incentives
- gatekeeper uncommon
- some patient cost sharing



insurance
company
INTERMEDIARY





The U.S. Medicare Program

CMS: Center for Medicare and Medicaid Services
oversees the Medicare program and aspects of the Medicaid
program

MEDICARE

- large public intermediary
- covers people over 65, permanently disabled, end-stage renal disease
- largely financed through taxes, with some premiums from enrollees

TRADITIONAL MEDICARE (PART A AND B)

- traditional indemnity coverage

MEDICARE ADVANTAGE (PART C)

- Medicare contracts with private plans to cover Medicare recipients
- Plans offered are often HMO or PPO plan types

MEDICARE PART D

- coverage for prescription drugs
- purchased as an add-on to traditional medicare
- often incorporated into Medicare Advantage plans

Medicare Supplement or Medigap

Supplemental insurance obtained by enrollees in traditional Medicare, to cover cost sharing or other things not covered by Medicare

The U.S. Medicaid Program

MEDICAID

- large public intermediary
- covers lower income populations
- overseen by both federal and state governments

Traditional Medicaid

Original offering; generally traditional indemnity-style coverage

Medicaid Managed Care

More commonly found; HMOs or other managed care plans for Medicaid recipients

INTERMEDIARIES' FUNCTIONS

- Try to figure out which tools to use and how to use them well
- Determine which providers to contract with
- Determine which providers in their network to drop
- Provide feedback to design payment approaches
- Determine complex medical care enrollees
- Determine which requests for pre-authorization should be approved
- Determine which hospital stays by their numbers are too long
- How to optimally set cost sharing

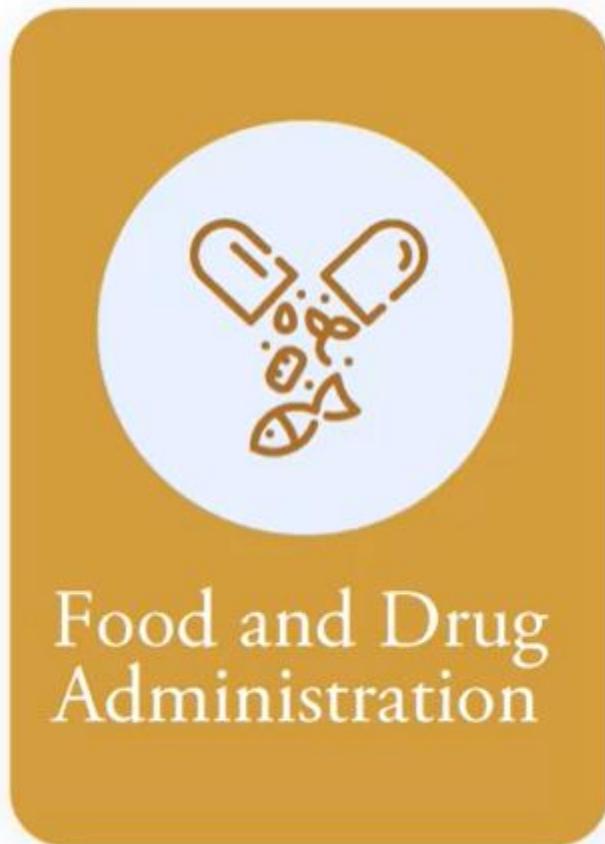
INTERMEDIARIES' FUNCTIONS

- Find most likely customers and market to them
- Process loads of bills for medical care claims
- Determine which claims to pay and which not
- Determine which, if any, have errors
- Determine which be fraud and which not

Health care products and Prescription Drugs, and Quality Management & Improvement

SOME TYPES OF PRODUCTS AND EQUIPMENT

- medical devices
- imaging equipment
- biologic products
- drugs



Food and Drug
Administration

Drugs

substances intended for use in the diagnosis, treatment, mitigation,
cure, or prevention of disease

Prescription Drugs

drugs that require a prescription to obtain

Over-the-counter drugs

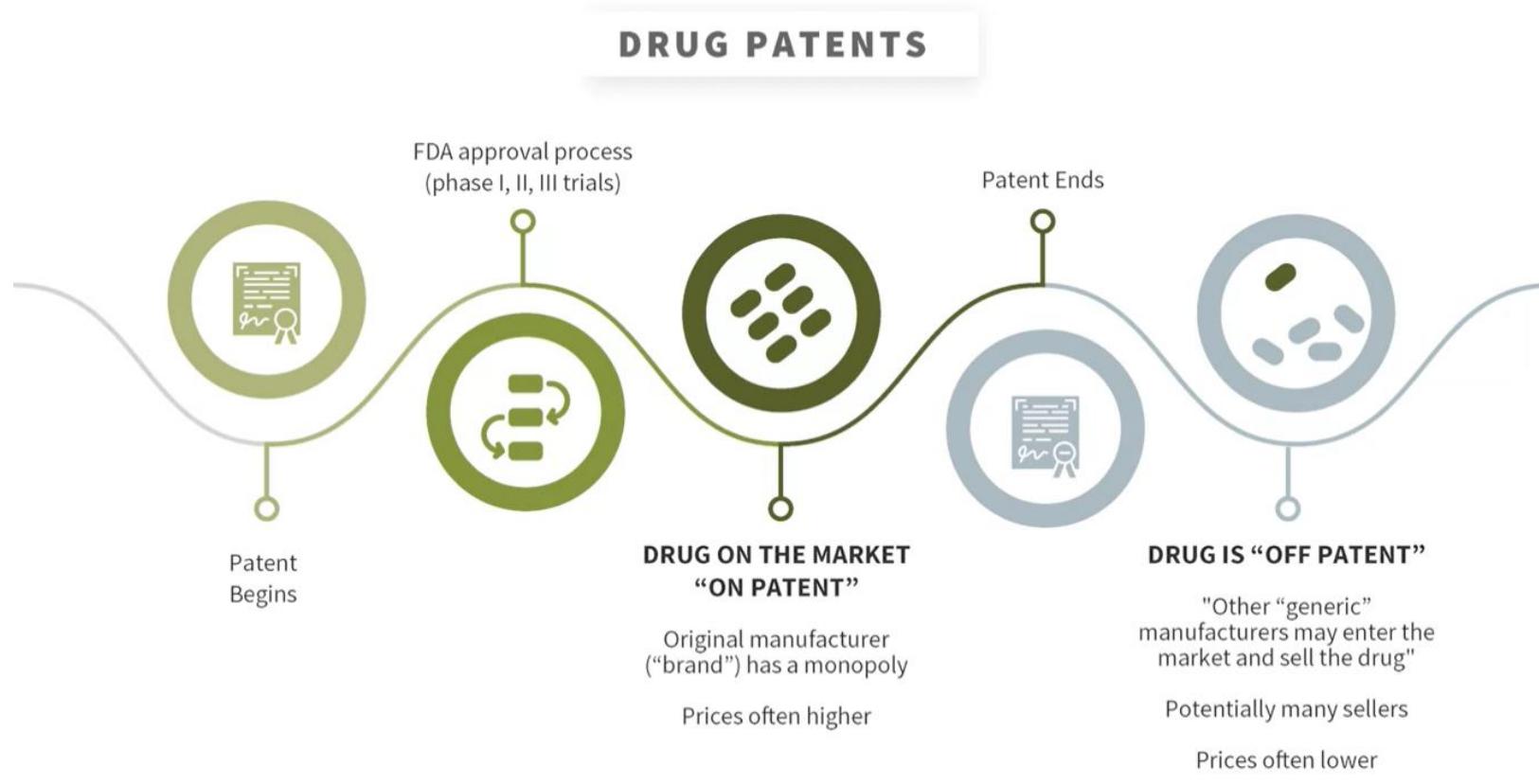
drugs that do not require a prescription to obtain

Prescription Drug Approval Processes

FDA APPROVAL PROCESS FOR PRESCRIPTION DRUGS

PURPOSE	PRE-CLINICAL TESTING	PHASE 0-I TRIALS	PHASE II TRIALS	PHASE III TRIALS	NDA
	Preliminary assessments of drug activity and safety	Basic determinations of whether the drug is safe in humans; investigation of dosing and methods of administration	Investigation of efficacy; further investigation of side effects	Final confirmation of safety and efficacy; investigation of rare or long-term side effects; comparisons to alternative therapies	Submit NDA Application
	In-vitro studies and animal studies	Phase 0: Commonly 10-15 healthy subjects; Phase 1: Commonly 20-80 healthy subjects	Commonly 100-300 subjects with the target condition	Commonly 1000-3000 subjects with the target condition	

Patents, Branded Drugs, and Generic Drugs



"Branded" drugs

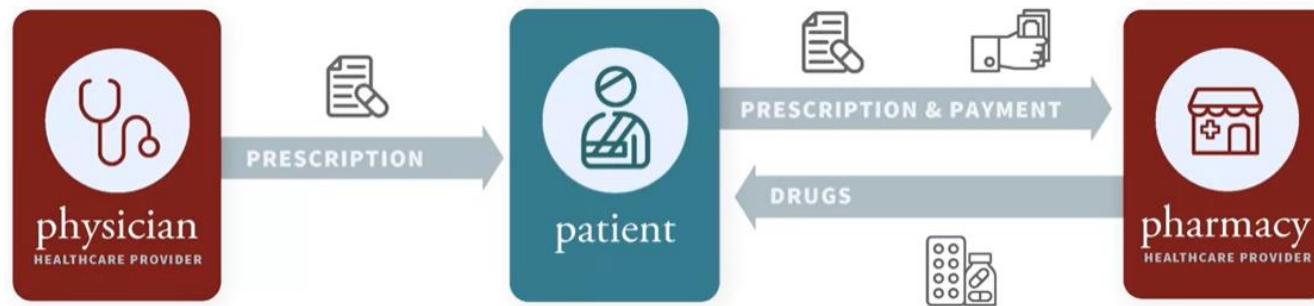
Drugs sold by the manufacturer that first brings the drug to market
with patent protection

"Generic" drugs

Drugs sold by additional manufactures after the primary manufacturer's patent expires

While a drug is covered by a patent, and there is only the one seller allowed, prices tend to be higher. Once generics enter the market, the arrival of more competition often leads to reductions in the prices charged for the drug.

Patients, Insurance, Formularies, and Prescription Drugs



Formularly

the set of drugs the insurance company will cover

Tiered formulary

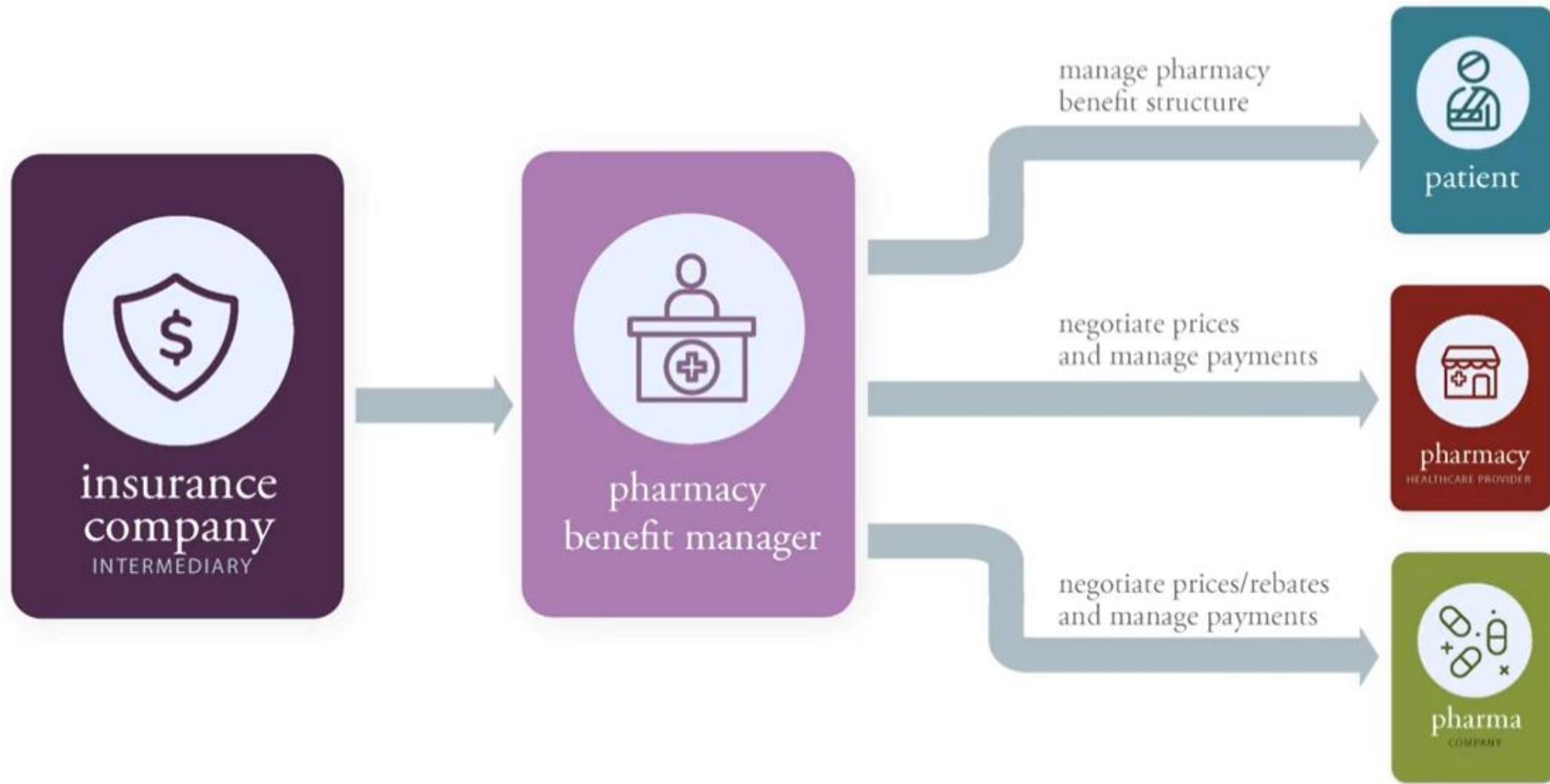
a formulary arrangement in which drugs are placed in different "tiers" with different levels of patient cost sharing

Intermediaries, Pharmacy Benefit Managers, Drug Prices, and Rebates



TWO THINGS INTERMEDIARIES DO WITH RESPECT TO PRESCRIPTION DRUG BENEFITS

- 1.** Work out prices to be paid to manufacturers when covered patients use prescription drugs
- 2.** Set up the structure of insurance benefits for prescription drugs



THREE THINGS PBMS CAN DO

- 1.** Manage the design of prescription drug benefits, e.g. formularies or networks
- 2.** Manage payments to pharmacies
- 3.** Negotiate prices with pharmacies and negotiate rebates with manufacturers

Pharmacy Switch

A third-party vendor used by pharmacists to transmit claims from the pharmacy to the PBMs



Quality of Care Overview and Key Organizing Concepts

SIX DOMAINS OF QUALITY IN HEALTH CARE

- 1.** Safe
 - 2.** Effective
 - 3.** Patient-centered
 - 4.** Timely
 - 5.** Efficient
 - 6.** Equitable
-

The Overuse-underuse-misuse Framework

When the healthcare system either uses too much health care, or not enough health care, or uses the tools at their disposal in the wrong way or at the wrong time.

STRUCTURE - PROCESS -OUTCOME FRAMEWORK



STRUCTURE

Availability of facilities, staff, equipment, and expertise required to deliver care appropriately

- Does a same-day surgery center have infection control procedures in place?
- Are all doctors in a group board certified ?



PROCESS

Appropriateness of the care delivered. Adherence to guidelines and evidence.

- Did heart attack patients receive beta-blockers?
- Did diabetics receive foot exams?



OUTCOMES

Results of health care. Does patient health improve?

- Mortality rates after heart attack
- Infection rates after surgery

Individuals & Teams

DIFFERENT MEASUREMENT LEVELS

- Measure quality for a provider or group of providers
- Measure quality for a health plan or intermediary
- Measure quality of care provided to an individual or a group of people

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- Infection rates after surgery

STRUCTURE-PROCESS-OUTCOME

- How is care delivered?
- Does the health care system have a structure conducive to delivering quality?
- Are there enough providers, in the right places, with the right training and skills?
- Is the equipment and infrastructure organized and financed in ways that enable them to work effectively?

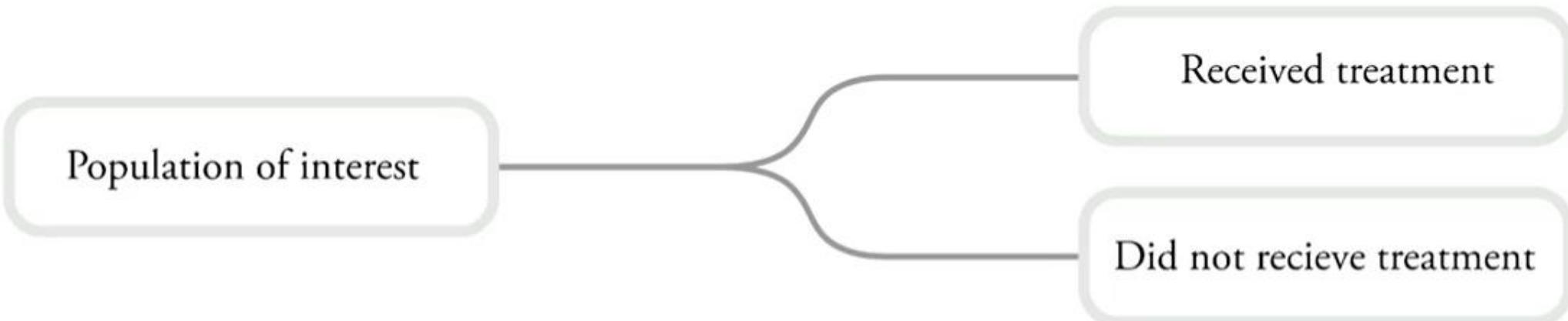
STRUCTURAL QUALITY MEASURES FOR PROVIDERS

- 1.** Is a good EMR or EHR system in place?
- 2.** Can an organization document that they have emergency protocols in place, can that document have protocols to prevent the spread of infections?
- 3.** Are the physicians or other providers appropriately credentialed?

STRUCTURAL QUALITY MEASURES FOR HEALTH PLANS OR POPULATIONS

- 1.** Are there enough physicians and other professionals for the population being served?
- 2.** Are there enough hospital beds?
- 3.** Where are they located with respect to the population?

PROCESS MEASUREMENT



Outcome Quality Measures and Satisfaction Measures

OUTCOME MEASURE EXAMPLES

- 1.** Mortality Rates
- 2.** Readmission Rates
- 3.** Complication Rates
- 4.** "Potentially Preventable" Admissions
- 5.** Patient-reported outcome measures

Risk Adjustment

Approaches designed to correct for differing characteristics of patients

Quality Measurement

USES OF QUALITY DATA

- 1.** Monitoring and improving provider quality
- 2.** Public reporting
- 3.** Designing payment incentives

PREScription DRUGS

- 1.** The approval process
- 2.** Issues with brand and generic drugs
- 3.** Insurance coverage for prescription drugs and the role of tiered formularies
- 4.** The role of PBMs in the prescription drug world

QUALITY OF CARE

- 1.** Basic constructs that define common understandings about quality
- 2.** Key concepts in measurement
- 3.** Applications of quality data

Ethics in Healthcare System

POTENTIAL APPLICATIONS OF ARTIFICIAL INTELLIGENCE

- Increasing the accuracy of diagnosis
- Robotic surgeries
- Identifying candidates for drug development
- Determining the best treatments to use for specific patients

QUESTIONS WE SHOULD ASK

- 1.** Do artificial intelligence tools help or harm patients, families and caregivers, or health providers?
- 2.** Are artificial intelligence tools socially just or not?

ASPECTS WHERE ETHICAL ISSUES CAN ARISE

- The nature of data that are used
- The way the data are collected
- The way the AI models are designed
- The way the AI models' data is interpreted and used

A big concern is about the privacy and security of digital data, especially in the domain of health care because healthcare data are sensitive.

Biased

based on systematic error

Ethical frameworks for health care and for AI

Professionals

Those entrusted with the well-being of people who seek their specialized expertise in times of need

Fiduciary duties

Professionals have an ethical obligation to serve the best interests of their clients