COVID-19 & Vaccines
Merle Carter, MD, FACEP

February 17, 2021
Urban Affairs Coalition
Philadelphia, PA
Roadmap for Today

- Coronavirus-19
- COVID-related Healthcare Disparities
- Vaccines
- Myths & Misconceptions
- Where to Find Information
Coronaviruses have been around for decades
- Human coronaviruses were first identified in the 1960’s
- Coronaviruses cause diseases in mammals and birds.

In humans:
- Many types of coronavirus
- Typically use respiratory infections, including the common cold
- Usually mild, though rare forms such as SARS (including COVID-19) and MERS can be lethal
- Severe Acute Respiratory Syndrome coronavirus (SARS-CoV) first emerged in 2002 in China
  - Recent examples of coronavirus outbreaks:
    - SARS-CoV in 2003
    - MERS-CoV in 2012

COVID-19 is a novel (or new) variant of coronavirus not previously been seen in humans
Coronavirus-19 Transmission

- Close contact (within 6 ft) of someone carrying the virus
- Droplets carrying virus from respiratory tract (nose, mouth) can travel
  - Cough, sneeze, singing, talking, breathing, laughing, exercising, speaking loudly/shouting
- Droplets can linger in the air (“airborne”) or surfaces for minutes to hours
  - Larger droplets travel withing seconds to minutes
  - Smaller ones can linger in the air minutes to hours and travel far from source on air currents
- Viruses gain entry through your mouth, nose, or eyes
- Increasing transmission
  - Poorly ventilated spaces (e.g. airplanes, crowded spaces)
  - Enclosed spaces (e.g. cruise ships, nursing homes)
  - Touching surfaces with COVID-19 droplets, then touching your face, nose, mouth, eyes
Time course of infection: COVID-19

- Infection
- Onset of infectiousness
- Symptom onset
- End of infectiousness
- Symptom resolution

- Latent period (3-5 days)
- Infectious period (6-7 days)
- Incubation period (5-7 days)
- Clinical illness (7-9 days)
Time course of infection: COVID-19

Infection
- Onset of infectiousness
  - Latent period (3-5 days)
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- Symptom onset
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  - Clinical illness (7-9 days)
- End of infectiousness
- Symptom resolution

Transmission (spread) of Virus

“Contagious” Period
Transmission (spread) of Virus

Target Period of Vaccine
What we don’t know

Time course of infection: COVID-19

- Infection
- Onset of infectiousness
- Symptom onset
- End of infectiousness
- Symptom resolution

- Latent period (3-5 days)
- Infectious period (6-7 days)
- Incubation period (5-7 days)
- Clinical illness (7-8 days)

Transmission (spread) of Virus

Target Period of Vaccine
Symptoms & Disease

- **Clinical Symptoms (2 – 14 days after exposure)**
  - Fever (83-99%)
  - Cough (59-82%)
  - Fatigue or weakness (44-70%)
  - No appetite (40-84%)
  - Shortness of breath (31-40%)
  - Body aches (11-35%)

- **Other common symptoms reported:**
  - Sore throat
  - Nasal or head congestion
  - Headache
  - Diarrhea
  - Nausea/vomiting
  - Loss of smell and/or taste (often precedes onset of respiratory symptoms)
Symptoms & Disease

Look for emergency warning signs for COVID-19. If someone is showing any of these signs, seek emergency medical care immediately:

- Trouble breathing
- Persistent pain or pressure in the chest
- New confusion
- Inability to wake or stay awake
- Bluish lips or face
Symptoms & Disease

COVID-19

HOW DOES IT AFFECT YOU?

Coronavirus Disease 2019 (COVID-19) is a pandemic caused by Severe Acute Respiratory Syndrome Coronavirus 2, also called SARS-CoV-2. Despite the widespread awareness regarding COVID-19, many are still unaware about how it affects the human body.

SARS-CoV-2 starts its journey in the nose, mouth, or eyes and travels down to the alveoli in the lungs. Alveoli are tiny sacs of air where gas exchange occurs.

Healthy

Normal Chest Xray

Infected

SARS-CoV-2

COVID Chest Xray

Moderate

Impaired Gas Exchange

Greatly hindered gas exchange

Severe

Reduced gas exchange

Protein-rich fluid

Loss of surfactant

Neutrophil

Protein and cellular debris

Formation of scar tissue

1. Alveolar collapse due to loss of surfactant
2. Less oxygen enters the bloodstream due to lack of Type II cells
3. More fluid enters the alveoli

When the immune system affects the area of infection it also kills healthy alveolar cells. This results in three things that hinder gas exchange:
Current State

United States: 27.6 million cases  484,000 deaths

Cases

Philadelphia County

Cases: New  Total

Deaths

Philadelphia County

Deaths: New  Total

Second Peak *

Second Peak *
COVID-related Disparities

“The most pervasive disparities are observed among African American and Latino individuals, and where data exist, American Indian, Alaska Native, and Pacific Islander populations.”

Percent COVID-19 Cases and Population by Race in the United States

Age-Adjusted COVID-19-Associated Hospitalization Rates by Race and Ethnicity, United States, March 1 – January 16, 2021

Source: CDC COVID-19 Data from 16 States
COVID-related Disparities


Covid-19 mortality rates for males in England & Wales
(for deaths registered up to April 20 2020)

- All males: 9.9
- Health care workers: 10.2
- Social care workers: 23.4
- Vehicle technicians & mechanics: 19.2
- Sales & retail assistants: 19.8
- Bus & coach drivers: 26.4
- Care workers & home carers: 32.0
- Chefs: 35.9
- Taxi drivers & chauffeurs: 36.4
- Security guards: 45.7

Source: ONS. Figures are age-adjusted estimates.
COVID in PA & Philadelphia

Gross, Essien, et al 2020

28 states and NYC reported race and ethnicity-stratified Covid-19 mortality

CDC COVID-19 data are missing race and ethnicity on 65% of patients

Missing data
< 5%
5-10%
11-19%
20-39%
> 40%

Black population
22 states (+NYC) significantly higher risk of COVID-related death than white population
3.57x relative risk of death compared to white population

Latinx population
12 states (+NYC) significantly higher risk of COVID-related death than white population
1.88x relative risk of death compared to white population

Journal of General Internal Medicine
DOI: 10.1007/s11606-020-06081-w
COVID Death Rates by Race

COVID-19 Cases, Hospitalizations, and Deaths by Race/Ethnicity

<table>
<thead>
<tr>
<th></th>
<th>American Indian or Alaska Native, Non-Hispanic persons</th>
<th>Asian, Non-Hispanic persons</th>
<th>Black or African American, Non-Hispanic persons</th>
<th>Hispanic or Latino persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases¹</td>
<td>1.9x</td>
<td>0.7x</td>
<td>1.1x</td>
<td>1.3x</td>
</tr>
<tr>
<td>Hospitalization²</td>
<td>3.7x</td>
<td>1.1x</td>
<td>2.9x</td>
<td>3.2x</td>
</tr>
<tr>
<td>Death²</td>
<td>2.4x</td>
<td>1.0x</td>
<td>1.9x</td>
<td>2.3x</td>
</tr>
</tbody>
</table>

Race and ethnicity are risk markers for other underlying conditions that affect health, including socioeconomic status, access to healthcare, and exposure to the virus related to occupation, e.g., among frontline, essential, and critical infrastructure workers.

Stark COVID-19 Disparities
Nationally, Black people have died at 2.5 times the rate of white people.

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Deaths per 100,000 people by race or ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black or African American</td>
<td>77</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>42</td>
</tr>
<tr>
<td>American Indian or Alaska Native</td>
<td>41</td>
</tr>
<tr>
<td>Asian</td>
<td>33</td>
</tr>
<tr>
<td>White</td>
<td>31</td>
</tr>
<tr>
<td>Native Hawaiian and Pacific Islander</td>
<td>30</td>
</tr>
<tr>
<td>Other</td>
<td>30</td>
</tr>
<tr>
<td>Two or more races</td>
<td>3</td>
</tr>
</tbody>
</table>

Sources: The COVID Racial Data Tracker and the U.S. Census Bureau.

Coronavirus deaths and race
COVID-19 is disproportionately killing black Americans, according to data released by several states.

<table>
<thead>
<tr>
<th>State</th>
<th>Deaths per 100,000</th>
<th>Total deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louisiana</td>
<td>blacks: 5.8</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>whites: 167</td>
<td>407</td>
</tr>
<tr>
<td>Michigan</td>
<td>blacks: 2.6</td>
<td>21.6</td>
</tr>
<tr>
<td></td>
<td>whites: 203</td>
<td>298</td>
</tr>
<tr>
<td>Illinois</td>
<td>blacks: 7.2</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>whites: 114</td>
<td>183</td>
</tr>
<tr>
<td>North Carolina</td>
<td>blacks: 0.6</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>whites: 0.4</td>
<td>28</td>
</tr>
</tbody>
</table>

Death totals as of Tuesday afternoon. State governments, U.S. Census Bureau.

Lorena Elebee / Los Angeles Times
Current State

**Daily New COVID-19 Cases Reported in the United States – Slopes of 3 Surges**

**Number of Confirmed Deaths by Day From COVID-19, United States**

**Pa. coronavirus deaths by month**

This graphic tracks fatalities by when the death was reported by the Pa. Dept. of Health.

- March: 62
- April: 2,229
- May: 3,263
- June: 1,094
- July: 540
- August: 484
- September: 469
- October: 670
- November: 1,571
- December: 5,595
- January: 5,683

**Pa. daily COVID-19 hospitalizations**

The number of coronavirus patients reported by the Pa. Department of Health who are currently hospitalized, in the ICU or on a ventilator.

- Hospitalizations
- ICU
- Ventilator

Note: historic ICU data not available before Nov. 3.
"Flattening the Curve"

LOWER AND DELAY THE EPIDEMIC PEAK

- Uncontrolled transmission
- Proactive measures:
  - slow the spread of disease & reduce burden on hospitals

With controls, healthcare system capacity (ICU beds, ER visits, etc.)

*Social distancing such as teleworking, limiting large gatherings, reducing travel or more assertive approaches.

Einstein
COVID-19 Vaccines

- How do they work?
- Effectiveness
- Which vaccines are available and the differences?
- Frequent concerns & frequently asked questions
- Side effects and how to manage
- What to do after you’ve been vaccinated
COVID Molecule

Patient

Viral RNA

Spike protein

Viral membrane

ACE2

Host cell

HOW VACCINES WORK

A weak or dead form of the germ is introduced

This sparks your immune response to develop antibodies that remember the germ

The antibodies fight off the germ if it invades again

If the patient encounters coronavirus again, the antibodies and T-cells are triggered to fight the virus
Average length of process: 8 – 17 years

Phases of Vaccine Development under IND

- Preclinical
  - Safety study
  - Immunogenicity
  - Dose Ranging
  - 20-80 subjects

- Phase 1
  - Safety
  - Immunogenicity
  - Several hundred subjects

- Phase 2
  - Immunogenicity
  - Safety
  - Effectiveness
  - Several thousand subjects

- Phase 3
  - Immunogenicity
  - Safety
  - Effectiveness
  - Several thousand subjects

We Are Here!

That's me!
A Strategic Approach to COVID-19 Vaccine R&D
L Corey, JR Mascola, AS Fauci & FS Collins

Unprecedented collaboration and resources will be required to research and develop safe and effective vaccines for COVID-19 that can be manufactured and delivered in the scale of billions of doses to people globally.

Efficacy and Safety of the mRNA-1273 SARS-CoV-2 Vaccine
LR Baden et al. for the COVE Study Group

2-dose regimen of mRNA-1273 conferred 94.1% protection against COVID-19 in persons aged 18 years or older
N=30,420
No cases of severe Covid-19 in vaccine group; 30 in placebo group
Incidence of serious adverse events was low and similar in vaccine and placebo groups

Vaccine Safety
Learn more about how CDC is ensuring the safety of COVID-19 vaccines in the United States.

Are COVID-19 vaccines safe?
All the COVID-19 vaccines being used have gone through rigorous studies to ensure they are as safe as possible. Systematic reviews of vaccine safety issues are in place across the entire country.

The U.S. Food and Drug Administration (FDA) has granted Emergency Use Authorizations for COVID-19 vaccines that have been shown to meet rigorous safety criteria and be effective as determined by data from the manufacturers and findings from large clinical trials. Watch a video describing the emergency use authorization. Clinical trials for all vaccines must first show they meet rigorous criteria for safety and effectiveness before any vaccine, including COVID-19 vaccines, can be authorized or approved for use. The known and potential benefits of a COVID-19 vaccine must outweigh the known and potential risks of the vaccine. Learn more about how federal partners are ensuring the safety of COVID-19 vaccines in the United States.
## COVID-19 Vaccine Availability & Effectiveness

**Most Widely Used:** Pfizer & Moderna

### Comparing the COVID-19 Vaccines

<table>
<thead>
<tr>
<th></th>
<th>Pfizer-BioNTech</th>
<th>Both</th>
<th>Moderna</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granted EUA</td>
<td>Granted Emergency Use Authorization (EUA) on DEC. 12</td>
<td>Are mRNA vaccines</td>
<td>Granted Emergency Use Authorization (EUA) on DEC. 18</td>
</tr>
<tr>
<td></td>
<td>Needs to be stored in ultra-cold freezers (94 degrees below zero)</td>
<td>Will help prevent 9.5 out of 10 COVID-19 infections</td>
<td>Can be stored in regular freezers (four degrees below zero)</td>
</tr>
<tr>
<td></td>
<td>Two shots given 21 DAYS APART</td>
<td>Two-shot series</td>
<td>Two shots given 28 DAYS APART</td>
</tr>
<tr>
<td></td>
<td>For people 16 AND OLDER</td>
<td>Cause minor side effects, most likely after the second dose</td>
<td>For people 18 AND OLDER</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Were tested on thousands of people in clinical trials</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Are proven to be safe and effective</td>
<td></td>
</tr>
</tbody>
</table>

95% Effective  

94.1% Effective  

**Next up for authorization in US:** Johnson & Johnson*, AstraZeneca (UK), Janssen*
Trends in Number of COVID-19 Vaccinations in the US

Find the latest data on CDC's COVID Data Tracker.
Vaccination Roll-Out

Total adults - 288 million

**Phase 1a (~24M)**
- Health care personnel
- Long-term care facility residents

**Phase 1b (~49M)**
- Frontline essential workers
- Persons aged 75 years and older

**Phase 1c (~129M)**
- Persons aged 65-74 years
- Persons aged 16-64 years with high-risk conditions
- Essential workers not recommended in Phase 1b

**Phase 2 (~86M)**
- All people aged 16 years or older not in Phase 1, who are recommended for vaccination
Vaccine Side Effects

Most say, I would rather have a few side effects for less than 1-2 days, than COVID.”

**COVID Warning Signs:**
- Trouble breathing
- Persistent pain or pressure in the chest
- New confusion
- Inability to wake or stay awake
- Bluish lips or face

**COVID-19 SYMPTOMS**

**COMMON SYMPTOMS**
- fever or chills
- cough
- shortness of breath or difficulty breathing
- fatigue
- body aches
- headache
- new loss of smell or taste
- sore throat
- runny nose or congestion
- nausea of vomiting
- diarrhea

**SYMPTOMS IN CHILDREN**
- fever
- abdominal pain
- vomiting
- diarrhea
- neck pain
- rash
- bloodshot eyes
- feeling extra tired
Figure 13: Cumulative Incidence Curves for the First COVID-19 Occurrence After Dose 1 – Dose 1 All-Available Efficacy Population

COVID INFECTIONS

Placebo

Vaccine
Vaccine Hesitancy

Figure 3
Among Hispanics Larger Shares Of Younger Adults And Essential Workers Express Vaccine Hesitancy

When a vaccine for COVID-19 is approved and widely available to anyone who wants it, do you think you will...?

<table>
<thead>
<tr>
<th></th>
<th>Get the vaccine as soon as possible</th>
<th>Wait and see</th>
<th>Only get the vaccine if required</th>
<th>Definitely not get the vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Hispanic adults</strong></td>
<td>26%</td>
<td>43%</td>
<td>11%</td>
<td>18%</td>
</tr>
<tr>
<td>Hispanic adults 18-49</td>
<td>20%</td>
<td>45%</td>
<td>11%</td>
<td>22%</td>
</tr>
<tr>
<td>Hispanic adults 50+</td>
<td>38%</td>
<td>39%</td>
<td>10%</td>
<td>11%</td>
</tr>
<tr>
<td>Hispanic essential workers</td>
<td>23%</td>
<td>39%</td>
<td>18%</td>
<td>18%</td>
</tr>
</tbody>
</table>


Among black adults, if a coronavirus vaccine was determined to be safe by scientists and available for free to everyone who wanted it, would you get it?

777 Black U.S. adults surveyed Aug. 20 to Sept. 14, 2020

- Definitely: 1.7%
- Probably: 33%
- Probably not: 22%
- Definitely not: 27%
# Reasons for Vaccine Hesitancy

<table>
<thead>
<tr>
<th>Reason</th>
<th>Total</th>
<th>Party ID</th>
<th>Age</th>
<th>Race/Ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Independent</td>
<td>Republican</td>
<td>18-49</td>
</tr>
<tr>
<td>Worried about possible side effects</td>
<td>59%</td>
<td>59%</td>
<td>54%</td>
<td>58%</td>
</tr>
<tr>
<td>Do not trust the government to make sure the vaccine is safe and effective</td>
<td>55%</td>
<td>52%</td>
<td>56%</td>
<td>55%</td>
</tr>
<tr>
<td>Vaccine is too new and want to wait and see how it works for other people</td>
<td>53%</td>
<td>54%</td>
<td>41%</td>
<td>57%</td>
</tr>
<tr>
<td>Politics has played too much of a role in the vaccine development process</td>
<td>51%</td>
<td>46%</td>
<td>53%</td>
<td>47%</td>
</tr>
<tr>
<td>The risks of COVID-19 are being exaggerated</td>
<td>43%</td>
<td>40%</td>
<td>57%</td>
<td>40%</td>
</tr>
<tr>
<td>Don’t trust vaccines in general</td>
<td>37%</td>
<td>43%</td>
<td>31%</td>
<td>37%</td>
</tr>
<tr>
<td>Do not trust the health care system</td>
<td>35%</td>
<td>34%</td>
<td>36%</td>
<td>32%</td>
</tr>
<tr>
<td>Worried that they may get COVID-19 from the vaccine</td>
<td>27%</td>
<td>30%</td>
<td>18%</td>
<td>26%</td>
</tr>
<tr>
<td>Don’t think they are at risk of getting sick from COVID-19</td>
<td>20%</td>
<td>18%</td>
<td>23%</td>
<td>18%</td>
</tr>
</tbody>
</table>

NOTE: Sample size too small to report separately among Democrats and Hispanics who say they definitely or probably won’t get vaccinated. See Appendix A for tables based on total.
True or False? You can get COVID from the COVID-19 vaccine.

**FALSE:** NONE of the vaccines in development or currently available in the US contain the live virus. The vaccine CANNOT make you sick with COVID. It takes a few weeks for the body to build full immunity, so it is possible for people to become infected before or just after the vaccine before it’s had a chance to work.

True or False? If I already had COVID-19 and recovered I do not need to get the vaccine.

**FALSE:** Because of severe health risks and that re-infection is possible after several months because the virus may have mutated from the variant you had, it is important to get a vaccine for continued protection.
True or False? COVID is no worse than the flu

**FALSE:** It is more dangerous and attacks more parts of the body than the virus that causes the flu (influenza).

True or False? The vaccine will alter my DNA.

**FALSE:** The current vaccines in use & in development are mRNA vaccines. mRNA vaccines teach our cells how to make the proteins that trigger an immune response. The mRNA never enters cells (where DNA is kept) and cannot interact with our DNA in any way.
True or False? If I am pregnant, I should definitely not have the vaccine.

- **FALSE:** No data exist that this vaccine causes problems with pregnancy or other fertility-related side effects. But studies are ongoing. On the other hand, the COVID ILLNESS increases risk of preterm labor, other adverse pregnancy outcomes. Bottom line: infection risks, etc should be discussed with PCP or Obstetrician.

True or False? After I get vaccinated, I do not have to wear a mask or socially distance.

- **FALSE:** You still may come in contact with it, become a carrier without symptoms and spread it to someone else for whom it might be lethal. Also, you are not fully protected until a few weeks AFTER the 2nd dose.
True or False? We cannot trust the COVID-19 vaccines because they were rushed into use.

FALSE

True or False? If I get sick with COVID, I should ask for an antibiotic.

FALSE: Antibiotics ONLY work for bacterial infections (e.g. strep, staph, etc) and DO NOT WORK on viruses like COVID or the viruses that cause the flu or common cold.
COMMON COVID-19 & COVID VACCINE MYTHS

True or False? Since the COVID-19’s survival rate is so high, I do not need the vaccine.
FALSE

True or False? You have to be with someone for at least 10 minutes to catch the virus.
FALSE

True or False? Children cannot get COVID
FALSE
Summary

- Coronavirus-19
- COVID-related Healthcare Disparities
- Vaccines
- Myths & Misconceptions
- Where to Find Information
Getting ‘Back to Normal’ is Going to Take All of Our Tools

If we use all the tools we have, we stand the best chance of getting our families, communities, schools, and workplaces “back to normal” sooner:

- Get vaccinated.
- Wear a mask.
- Stay 6 feet from others, and avoid crowds.
- Wash hands often.

www.cdc.gov/coronavirus/vaccines
<table>
<thead>
<tr>
<th><strong>PA COVID Hotline:</strong></th>
<th><strong>Philadelphia COVID Helpline:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1-877-PA Health</td>
<td>1-800-722-7112</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Blackdoctorsconsortium.com</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>484-270-6200</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Centers for Disease Control</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>cdc.gov/coronavirus</td>
</tr>
<tr>
<td>cdc.gov/vaccines/covid-19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Mental Health Help During COVID-19</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crisis Text Line</strong></td>
</tr>
<tr>
<td>Text ‘PA’ to 741741</td>
</tr>
<tr>
<td><strong>National Suicide Prevention Lifeline</strong></td>
</tr>
<tr>
<td>1-800-273-8255</td>
</tr>
<tr>
<td><strong>Preventing suicide in PA</strong></td>
</tr>
<tr>
<td>preventsuicide.pa.org/</td>
</tr>
<tr>
<td><strong>Disaster Distress Helpline</strong></td>
</tr>
<tr>
<td>800-985-5990</td>
</tr>
<tr>
<td><strong>Get Help Now for substance use disorder</strong></td>
</tr>
<tr>
<td>1-800-662-4357</td>
</tr>
<tr>
<td><strong>Veterans in crisis</strong></td>
</tr>
<tr>
<td>veteranscrisisline.net</td>
</tr>
<tr>
<td><strong>PA’s support helpline</strong></td>
</tr>
<tr>
<td>855-284-2494</td>
</tr>
<tr>
<td><strong>Coping with COVID-19 stress</strong></td>
</tr>
<tr>
<td>bit.ly/covid-coping</td>
</tr>
<tr>
<td><strong>COVID-19 resources</strong></td>
</tr>
<tr>
<td>mhanational.org/covid19</td>
</tr>
</tbody>
</table>
Einstein HEALTHCARE NETWORK

More than Medicine

Merle Carter, MD, FACEP
carterm@einstein.edu