JG|U UNIVERSITÄTSmedizin. MAINZ
Department of Pharmacology

Delivering pharmacology education to resource-limited countries:

# PharmaFrog: a pharmacology app for Africa

EB2017

Chicago, April 23, 2017

Leszek Wojnowski, MD

Professor of Clinical Pharmacology and Pharmacogenetics

# who are we?

***experts:***

- Prof. Stefan Aufenanger (Mainz) – digital learning, former Dean of Media Faculty
- Prof. Thomas Herdegen (Kiel) – the editor of the currently most popular German textbook on pharmacology
- Prof. Irene Krämer (Mainz) – director of University pharmacy, expert on drug safety
- Prof. Reiner Nobiling (Heidelberg) – lecturer of physiology and pathophysiology
- Dr. Bettina Stollhof (Mainz) - pharmacist
- Prof. Leszek Wojnowski (Mainz) – project coordinator

***students (medicine, pharmacy, media sciences, anthropology):***

- Katherina Brüll – adverse drug reactions
- Chelsey Collins - indications
- Maximilian Frensch – general design and scope
- Thomas Gaul – drug mechanisms
- Anna-Lena Großgarten – drug interactions
- Sebastian Hahn – drug mechanisms
- Katerina Okeke - indications
- Daniel Schütz – architecture
- Dativa Tibyampansha – architecture, decision support functionality
- Natalia Westervelt – adverse drug reactions, social networking

***testers of design and functionalities from the following medical schools:***

- University Medical Center Mainz, Germany
- TCMC, Stranton, PA, United States
- KCMUCo, Moshi, Tanzania
- University of Pune, India

***DB programming***

opoloo

***app programming***

coobers

lern refresh consult update network help

## Pharmacology course at KCMUCo since 2012

### 6 topic-oriented blocks commprizing:

**12 weeks of direct teaching**

**80 h of podcasts**

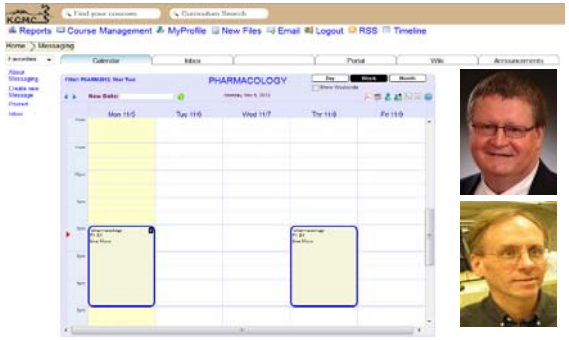
**handouts, drug matrices, 100s of Q&E each,**

**6 self–assessment tests of 10 Q&E each**

**Learning groups**

**Forum**

**4 Academic Examinations of 45 Q each**



# how to reach other African medical students & professionals?

***accessible:***

- smartphone-based

***essential:***

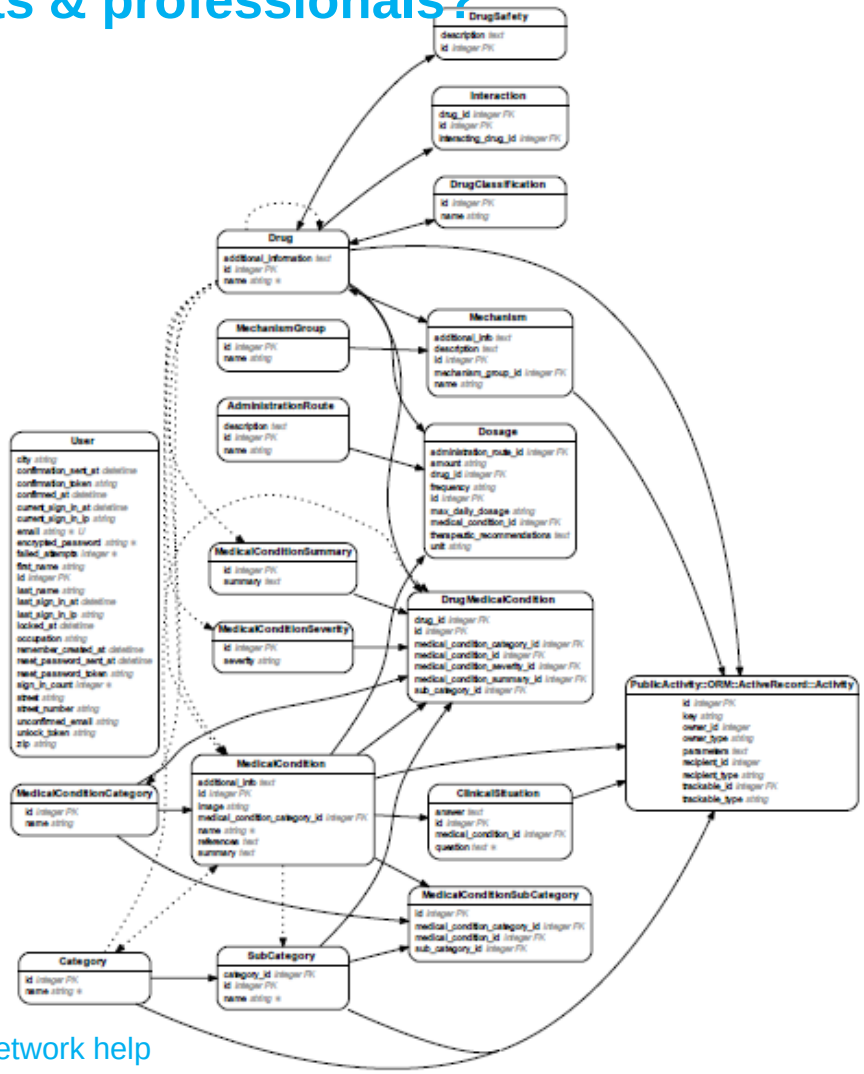
- only common and serious diseases (ca. 70, accounting for ~60% of global life and health loss)
- only key drugs and treatments
- only the indispensable knowledge elements
- guidelines-based

***understandable:***

- concise but plain language
- chunking

***integrated:***

- minimally redundant
- causal, semantics-based connections among knowledge base elements

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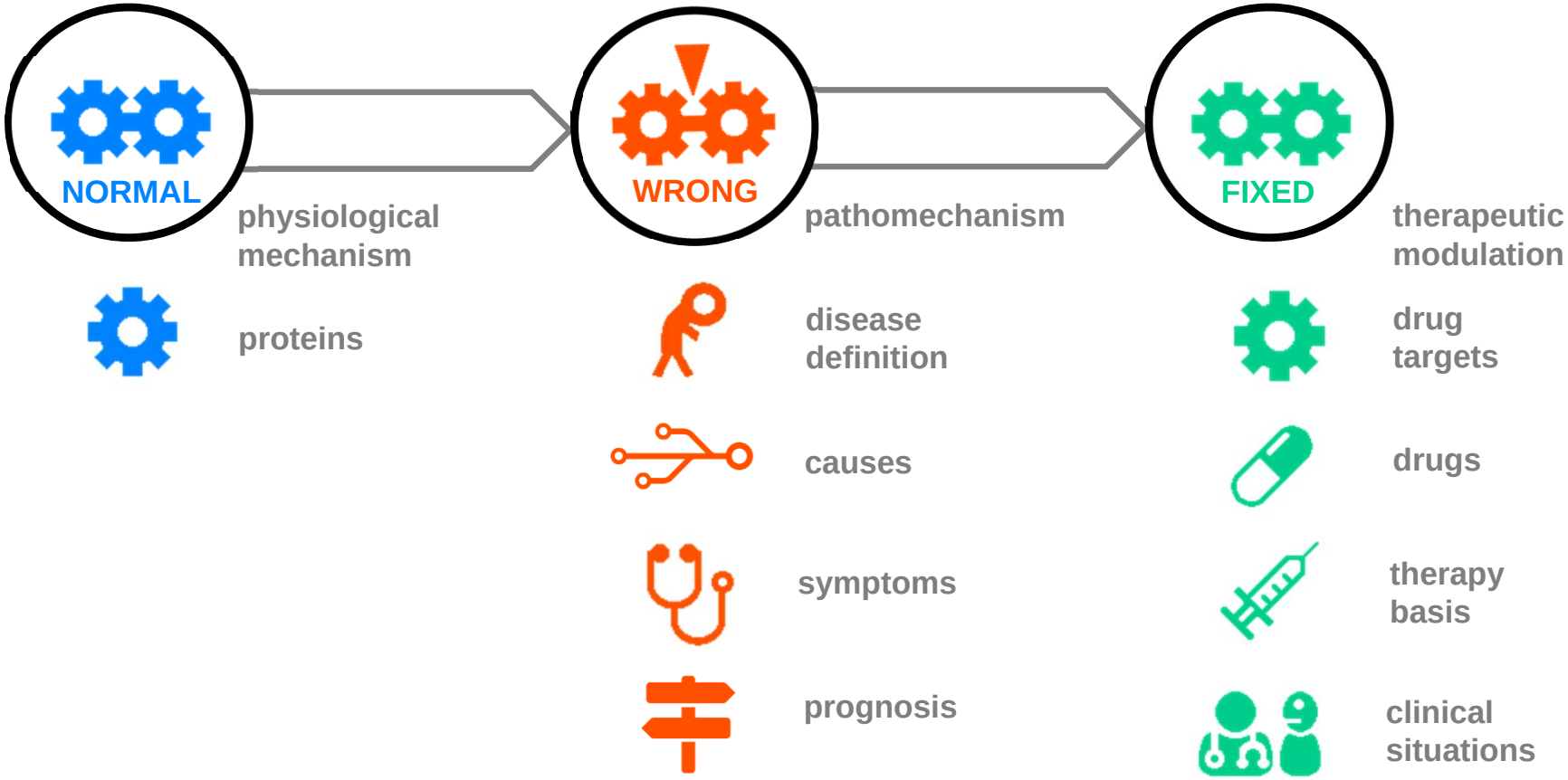
# rational prescribing is multidisciplinary but based on physiology

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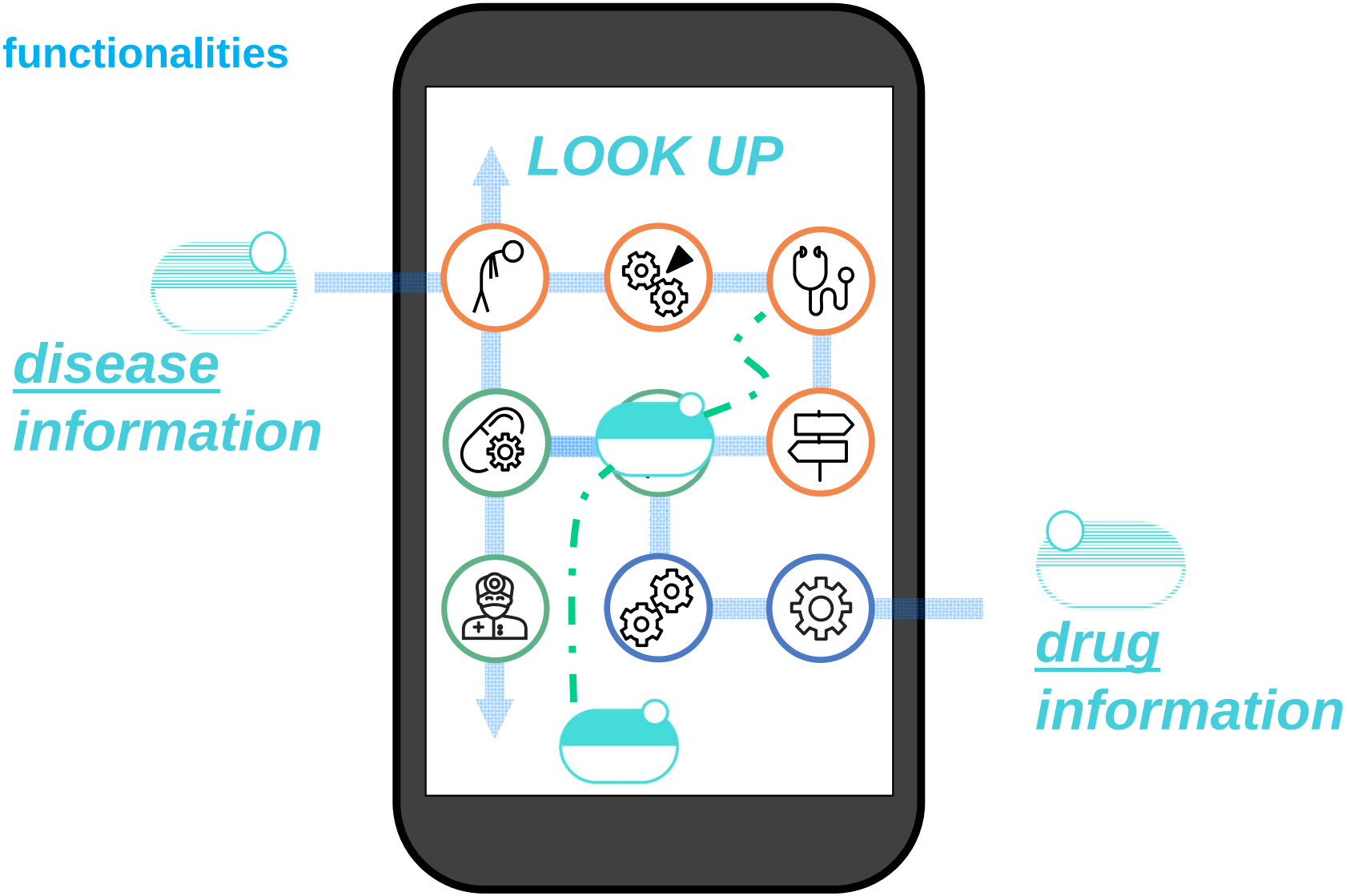
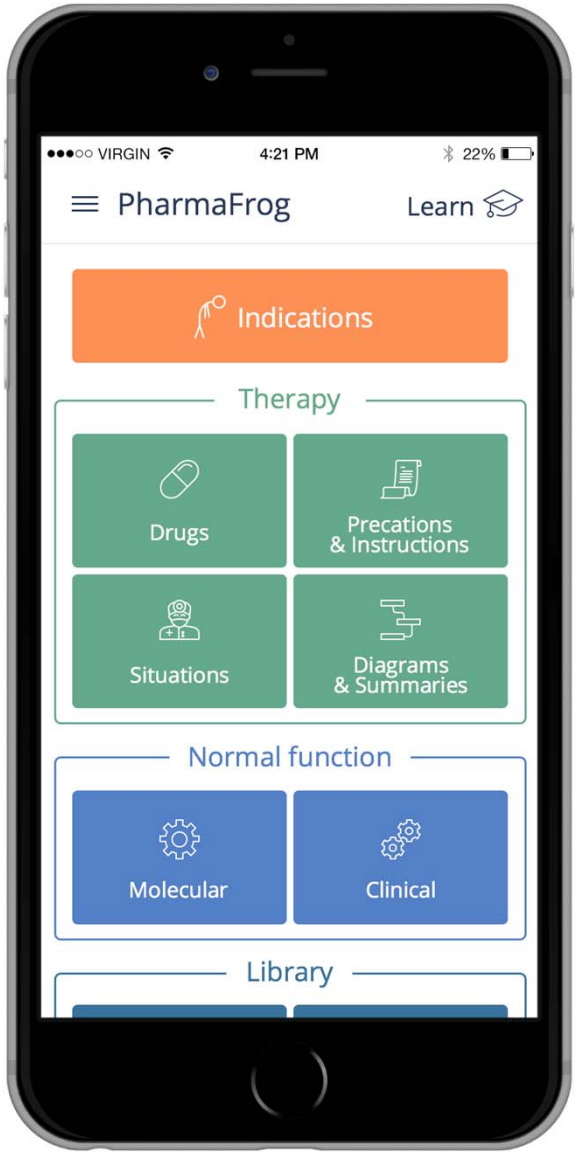
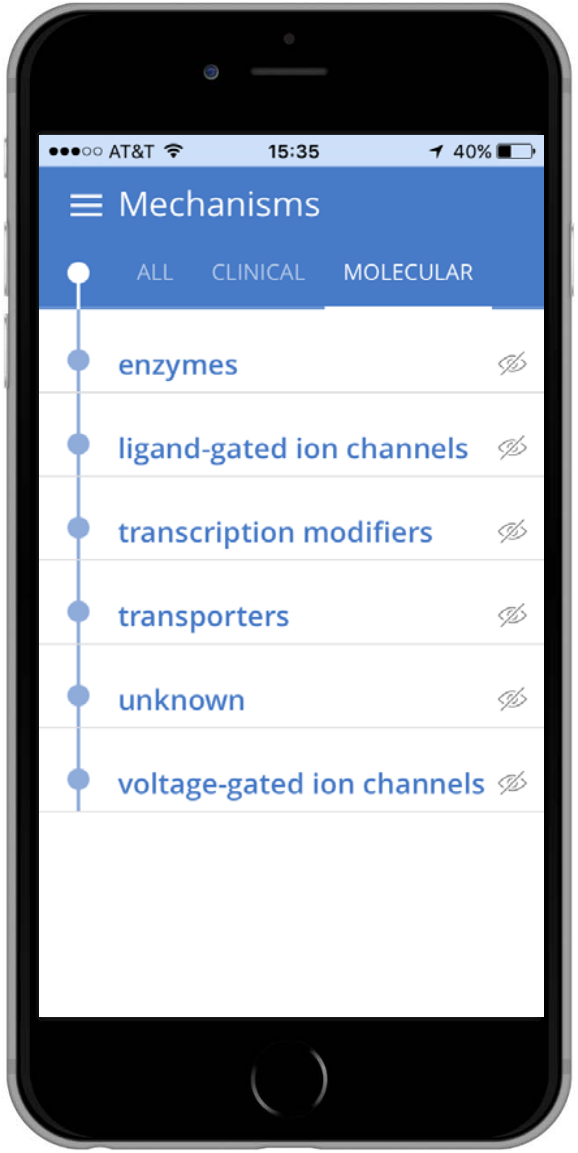
## key functionalities




●●●○○ VIRGIN
4:21 PM
22%
PharmaFrog
Learn
Indications
Therapy
Drugs
Precations & Instructions
Situations
Diagrams & Summaries
Normal function
Molecular
Clinical
Library


AT&T
15:35
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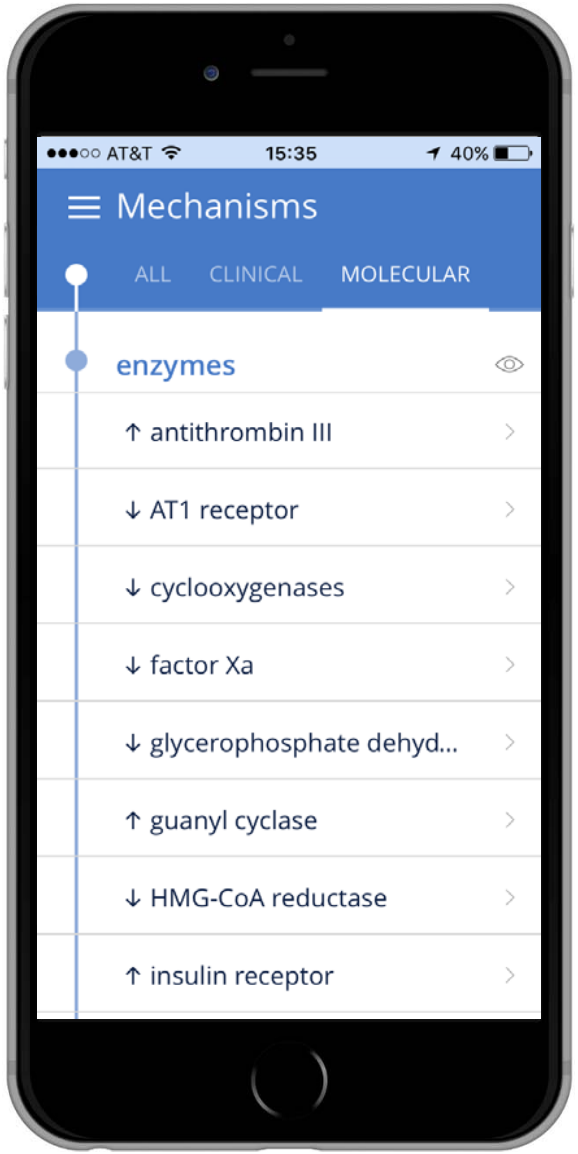
Mechanisms
ALL
CLINICAL
MOLECULAR
enzymes
ligand-gated ion channels
transcription modifiers
transporters
unknown
voltage-gated ion channels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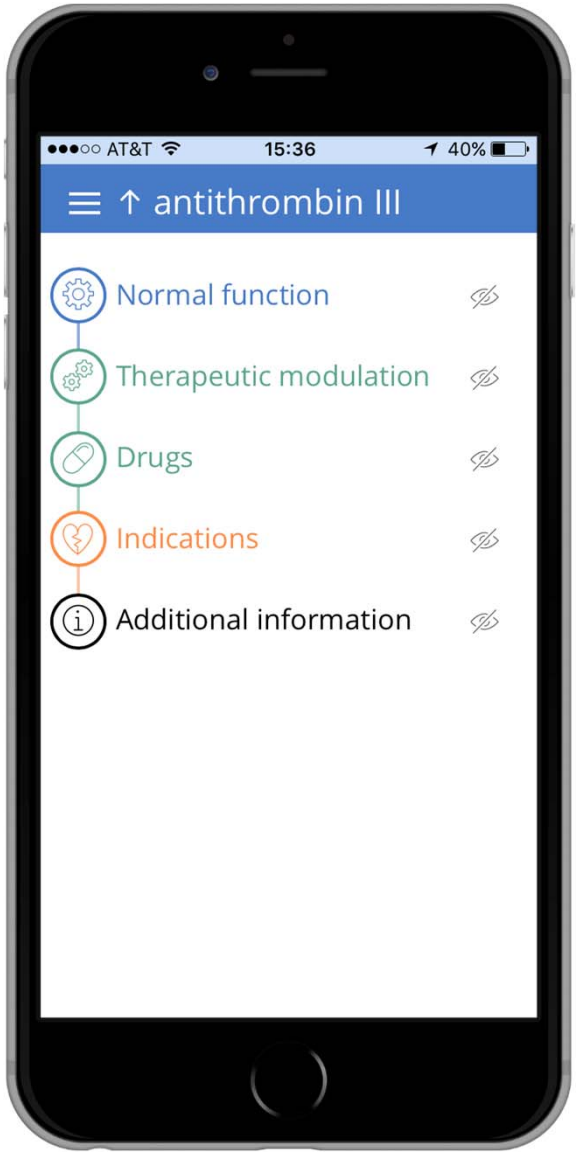
Mechanisms
ALL
CLINICAL
MOLECULAR
enzymes
↑ antithrombin III
↓ AT1 receptor
↓ cyclooxygenases
↓ factor Xa
↓ glycerophosphate dehyd...
↑ guanyl cyclase
↓ HMG-CoA reductase
↑ insulin receptor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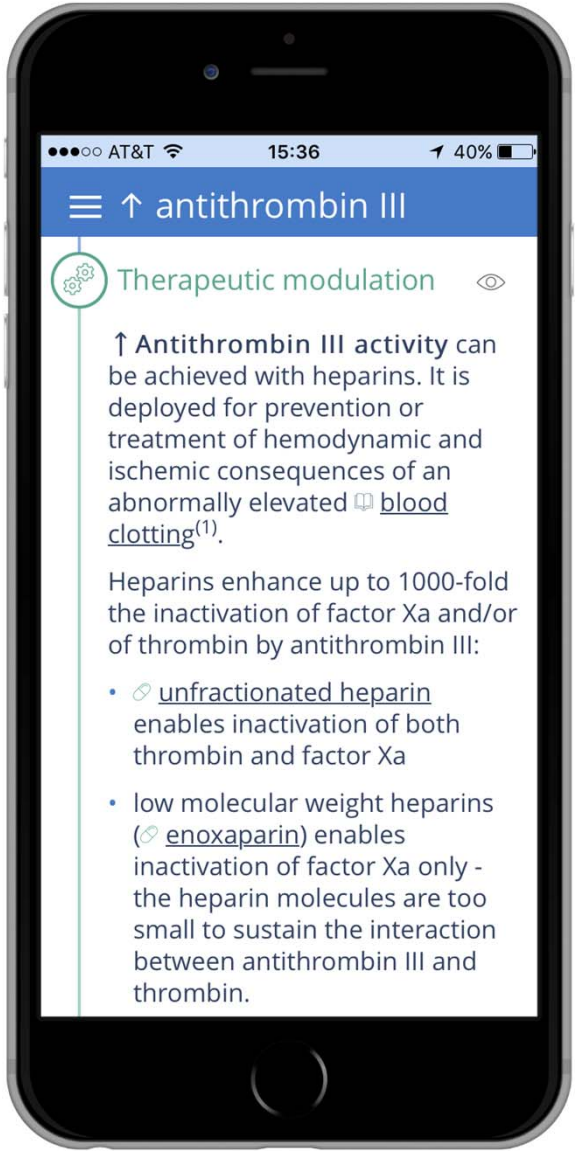
↑ antithrombin III
Normal function
Therapeutic modulation
Drugs
Indications
Additional information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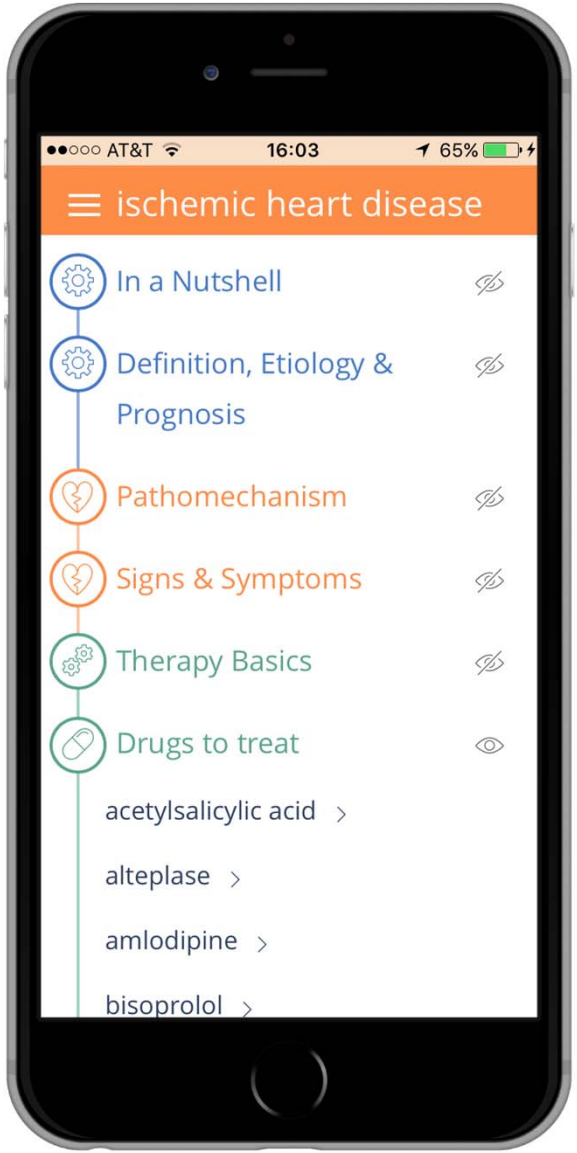
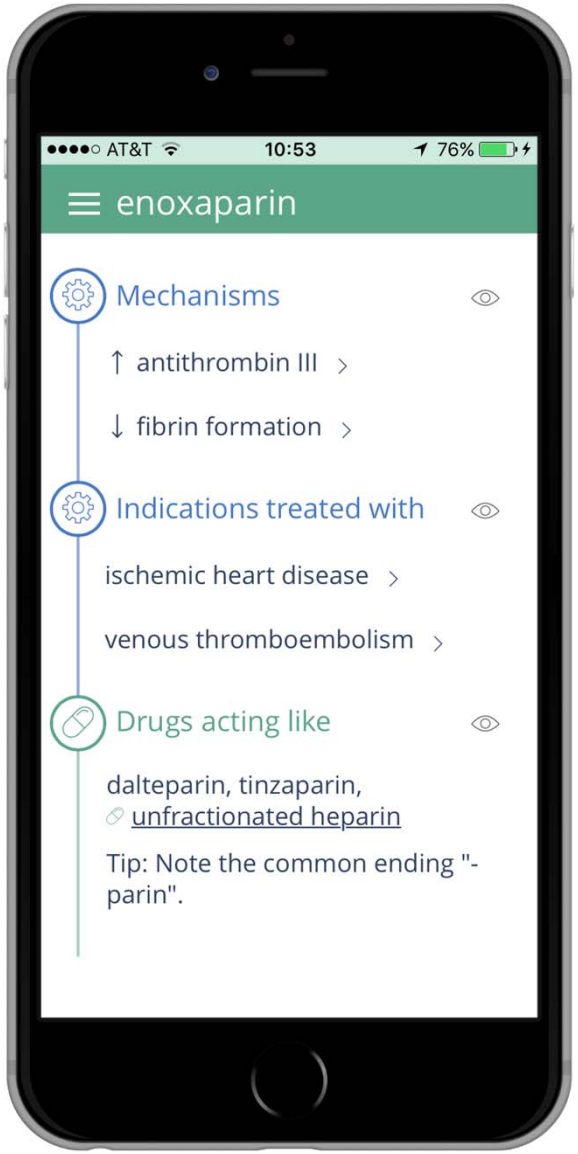
↑ antithrombin III
Therapeutic modulation
↑ Antithrombin III activity can be achieved with heparins. It is deployed for prevention or treatment of hemodynamic and ischemic consequences of an abnormally elevated blood clotting(1).
Heparins enhance up to 1000-fold the inactivation of factor Xa and/or of thrombin by antithrombin III:
• unfractionated heparin enables inactivation of both thrombin and factor Xa
• low molecular weight heparins (enoxaparin) enables inactivation of factor Xa only - the heparin molecules are too small to sustain the interaction between antithrombin III and thrombin.


AT&T
16:03
65%
ischemic heart disease
In a Nutshell
Definition, Etiology & Prognosis
Pathomechanism
Signs & Symptoms
Therapy Basics
Drugs to treat
acetylsalicylic acid
alteplase
amlodipine
bisoprolol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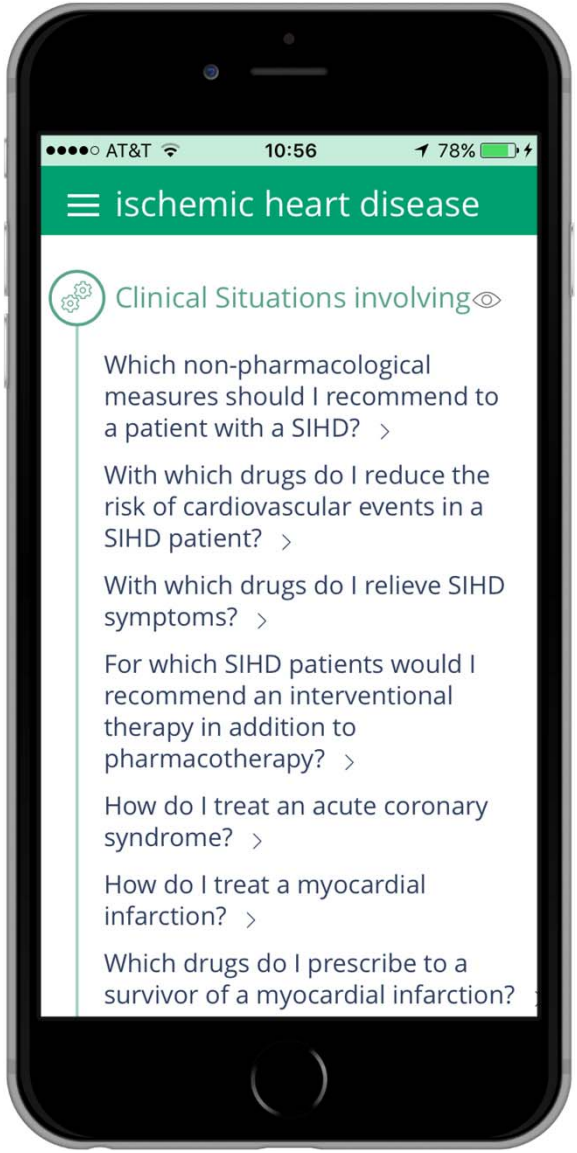
10:53
76%
enoxaparin
Mechanisms
↑ antithrombin III
↓ fibrin formation
Indications treated with
ischemic heart disease
venous thromboembolism
Drugs acting like
dalteparin, tinzaparin,
unfractionated heparin
Tip: Note the common ending "-parin".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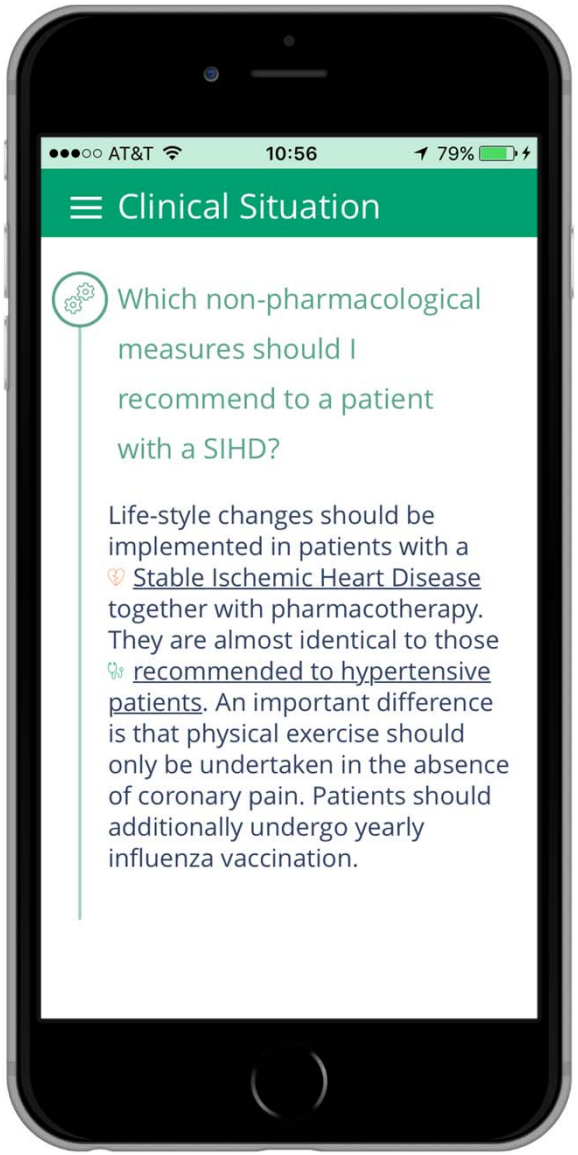
10:56
78%
ischemic heart disease
Clinical Situations involving
Which non-pharmacological measures should I recommend to a patient with a SIHD?
With which drugs do I reduce the risk of cardiovascular events in a SIHD patient?
With which drugs do I relieve SIHD symptoms?
For which SIHD patients would I recommend an interventional therapy in addition to pharmacotherapy?
How do I treat an acute coronary syndrome?
How do I treat a myocardial infarction?
Which drugs do I prescribe to a survivor of a myocardial infarction?


AT&T
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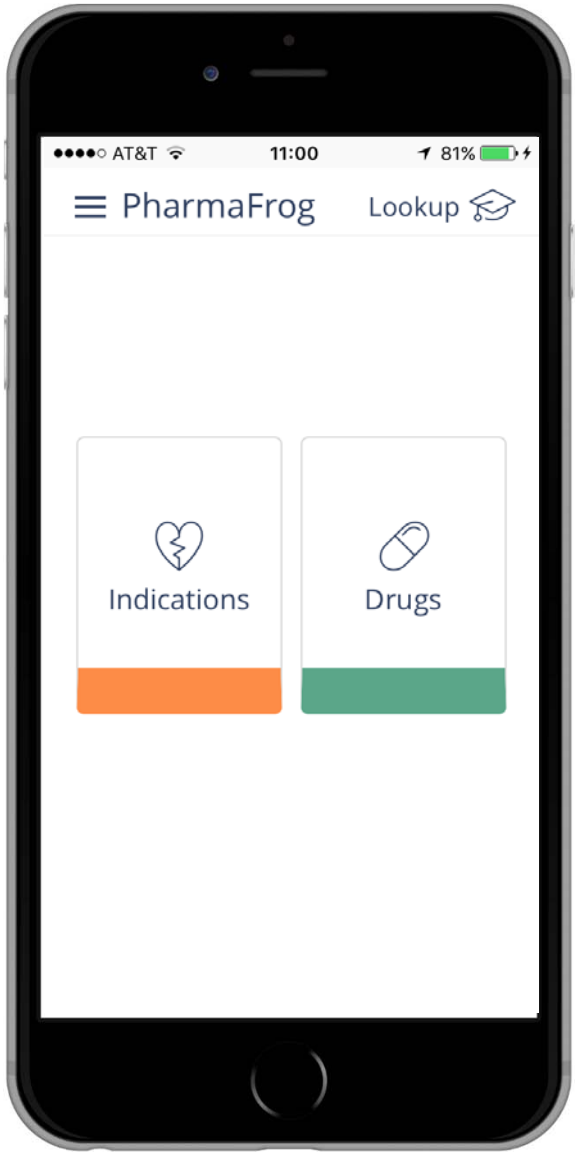
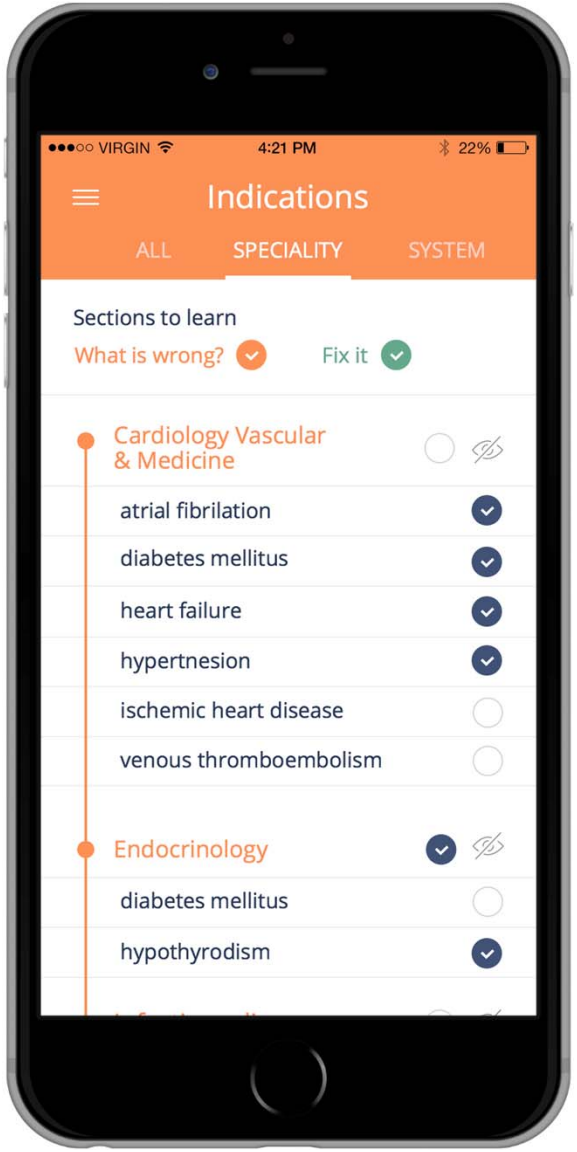
79%
Clinical Situation
Which non-pharmacological measures should I recommend to a patient with a SIHD?
Life-style changes should be implemented in patients with a Stable Ischemic Heart Disease together with pharmacotherapy. They are almost identical to those recommended to hypertensive patients. An important difference is that physical exercise should only be undertaken in the absence of coronary pain. Patients should additionally undergo yearly influenza vaccination.

## key functionalities


AT&T
11:00
81%
PharmaFrog
Lookup
Indications
Drugs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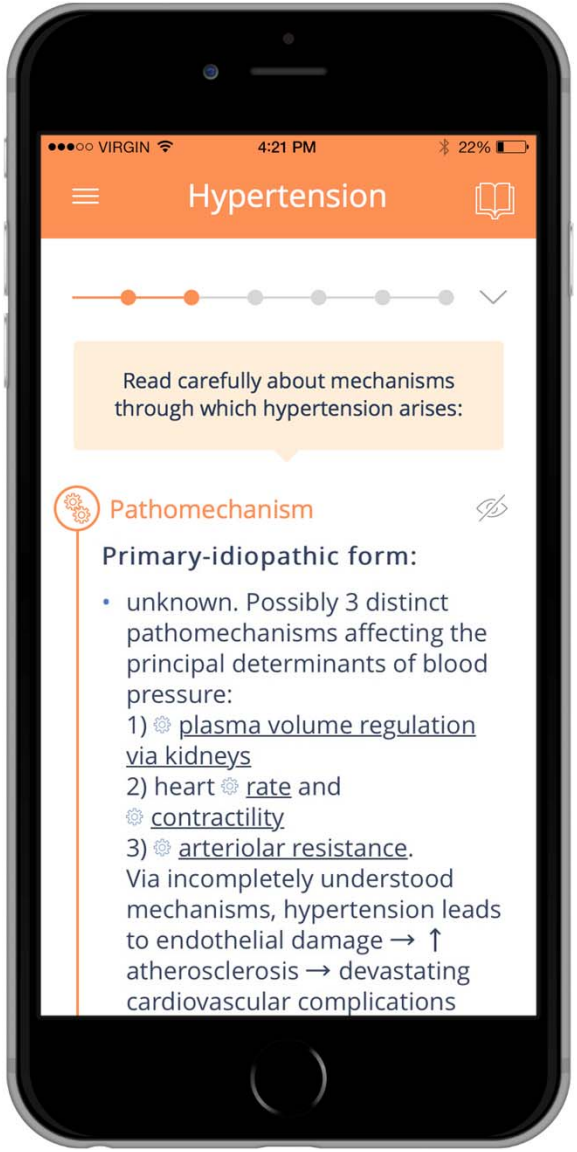
4:21 PM
22%
Indications
ALL
SPECIALITY
SYSTEM
Sections to learn
What is wrong?
Fix it
Cardiology Vascular & Medicine
atrial fibrilation
diabetes mellitus
heart failure
hypertnesion
ischemic heart disease
venous thromboembolism
Endocrinology
diabetes mellitus
hypothyrodism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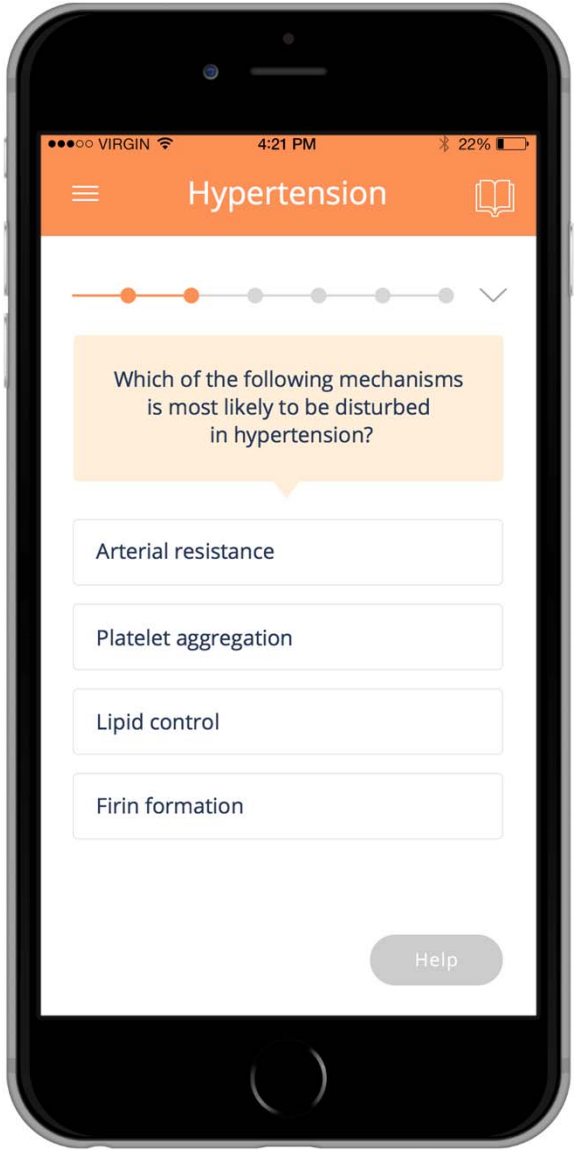
Hypertension
Read carefully about mechanisms through which hypertension arises:
Pathomechanism
Primary-idiopathic form:
• unknown. Possibly 3 distinct pathomechanisms affecting the principal determinants of blood pressure:
1) plasma volume regulation via kidneys
2) heart rate and contractility
3) arteriolar resistance.
Via incompletely understood mechanisms, hypertension leads to endothelial damage → ↑ atherosclerosis → devastating cardiovascular complications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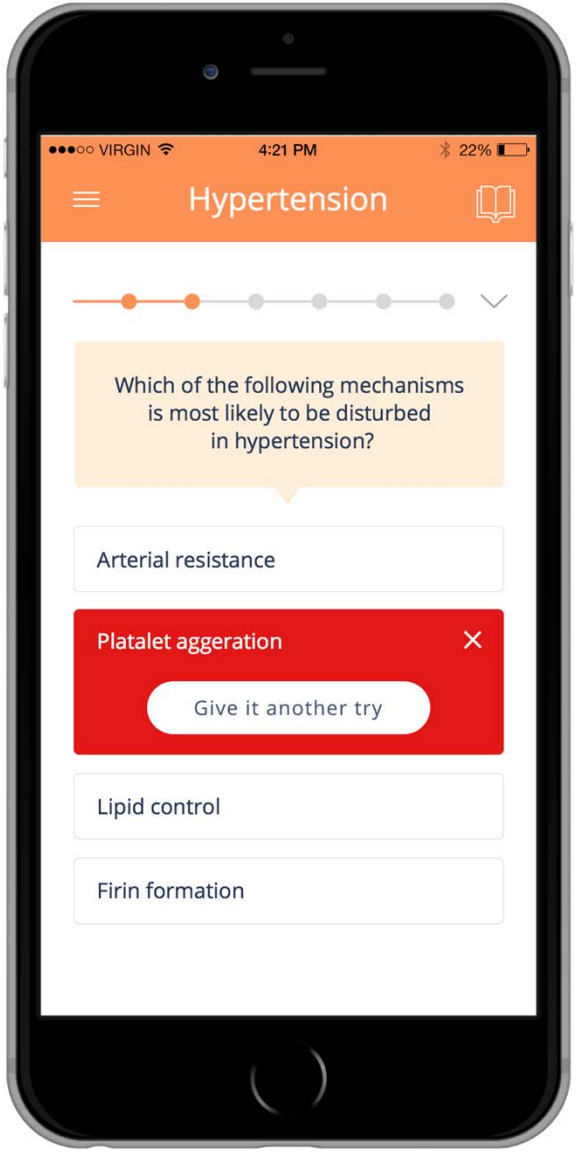
Hypertension
Which of the following mechanisms is most likely to be disturbed in hypertension?
Arterial resistance
Platelet aggregation
Lipid control
Firin formation
Help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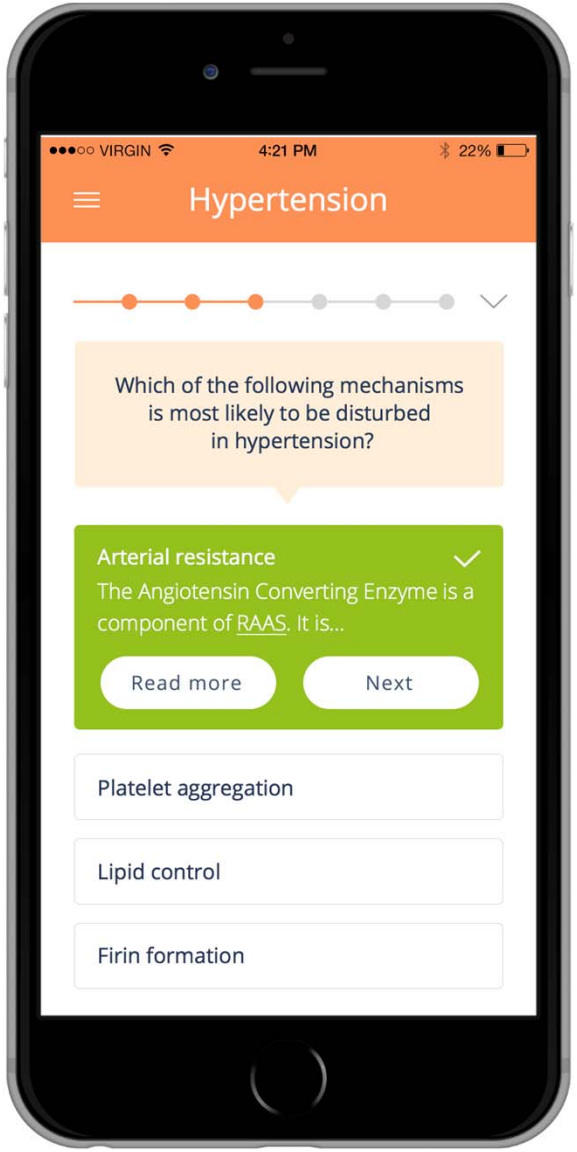
Hypertension
Which of the following mechanisms is most likely to be disturbed in hypertension?
Arterial resistance
Platalet aggeration
Give it another try
Lipid control
Firin formation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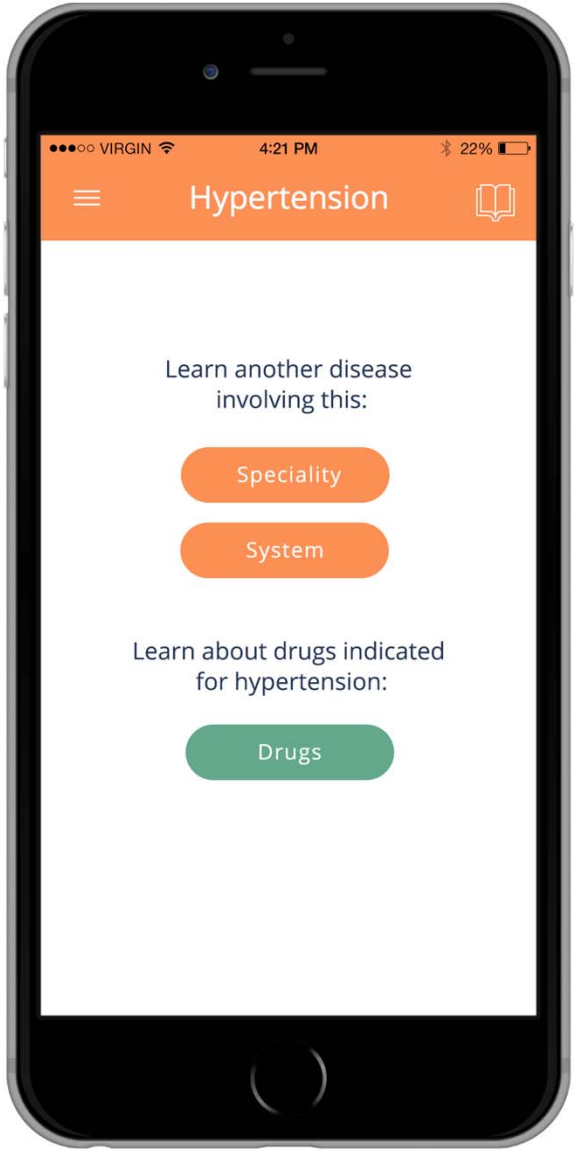
22%
Hypertension
Which of the following mechanisms is most likely to be disturbed in hypertension?
Arterial resistance
The Angiotensin Converting Enzyme is a component of RAAS. It is...
Read more
Next
Platelet aggregation
Lipid control
Firin formation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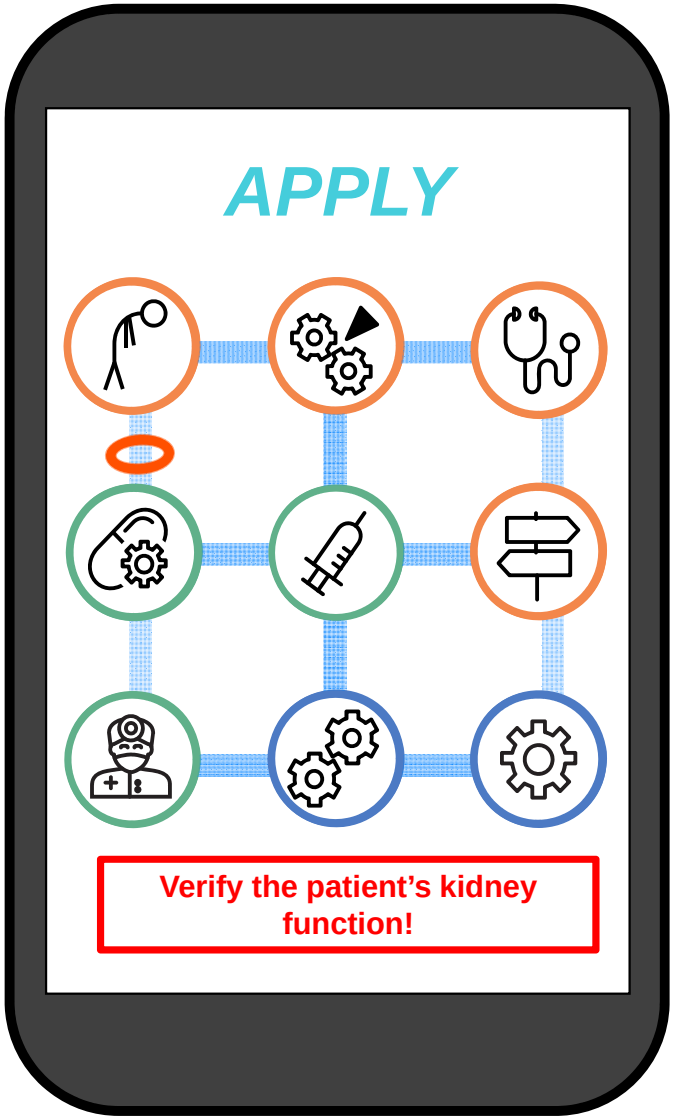
Hypertension
Learn another disease involving this:
Speciality
System
Learn about drugs indicated for hypertension:
Drugs

## key functionalities



## Next steps

- publish a demo version with several cardiovascular diseases
- start a crowd funding campaign

- identify a partner (publisher, insurance, health authority, charity)
- identify additional editors (-> Wojnowski@uni-mainz.de)

- add contraindications, ADRs -> interactions