

4th March, 2023

School of Science and
Engineering, LUMS

ADVISORS

Dr. Basmaa Ali (Harvard)
Dr. Agha Ali Raza (LUMS)

STUDENT

Sheza Munir

MIGRAINE PREDICTION ENGINE



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I MUCH MORE THAN JUST A 'HEADACHE'

5th

most
common
disease

7th

most
debilitating
disease

affects
22%

Pakistanis =
52 million
people

2/3

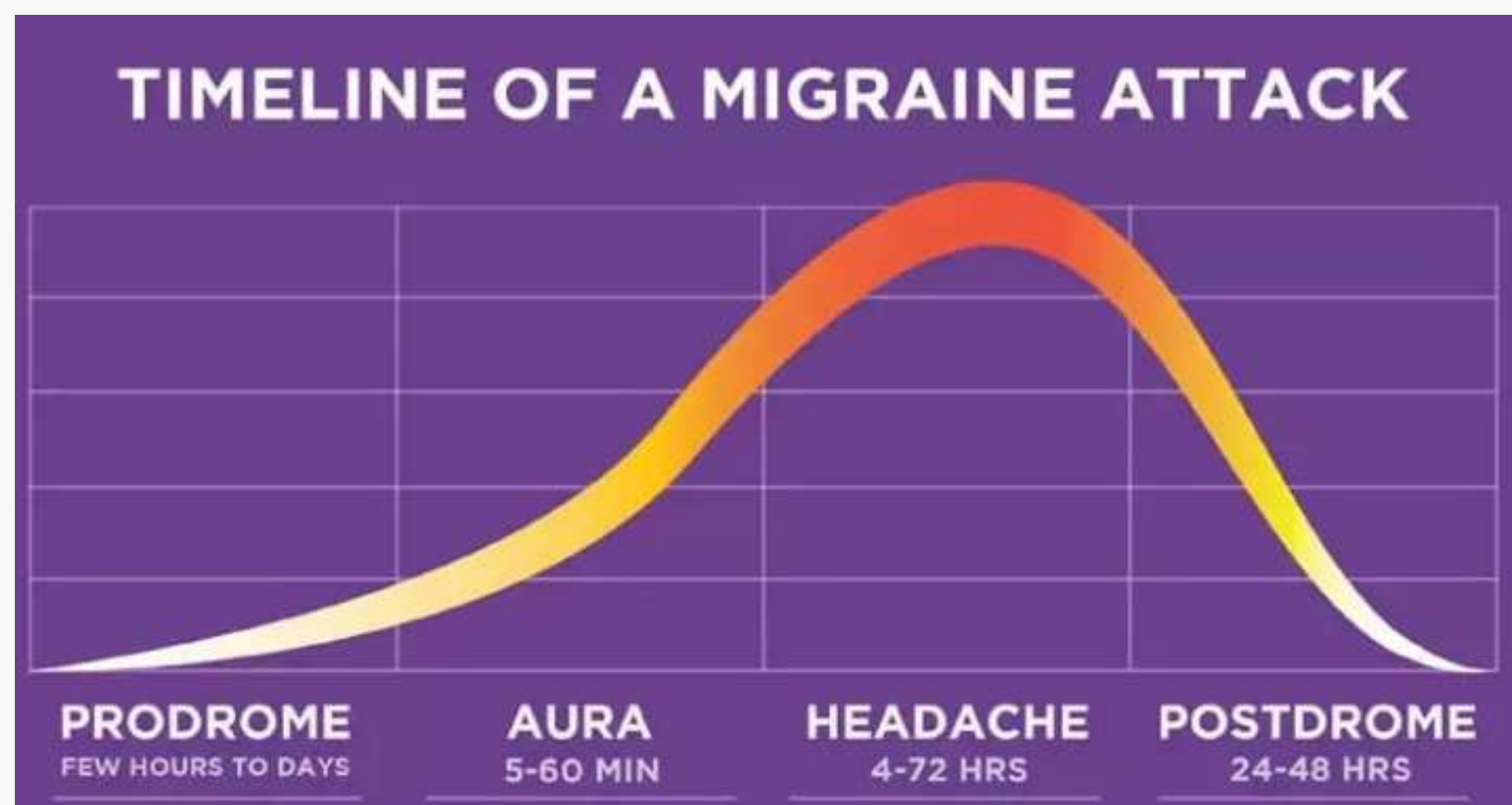
women in the
peak productive
time of their
lives

90%

are unable
to function
during an
episode.

More than a normal headache:

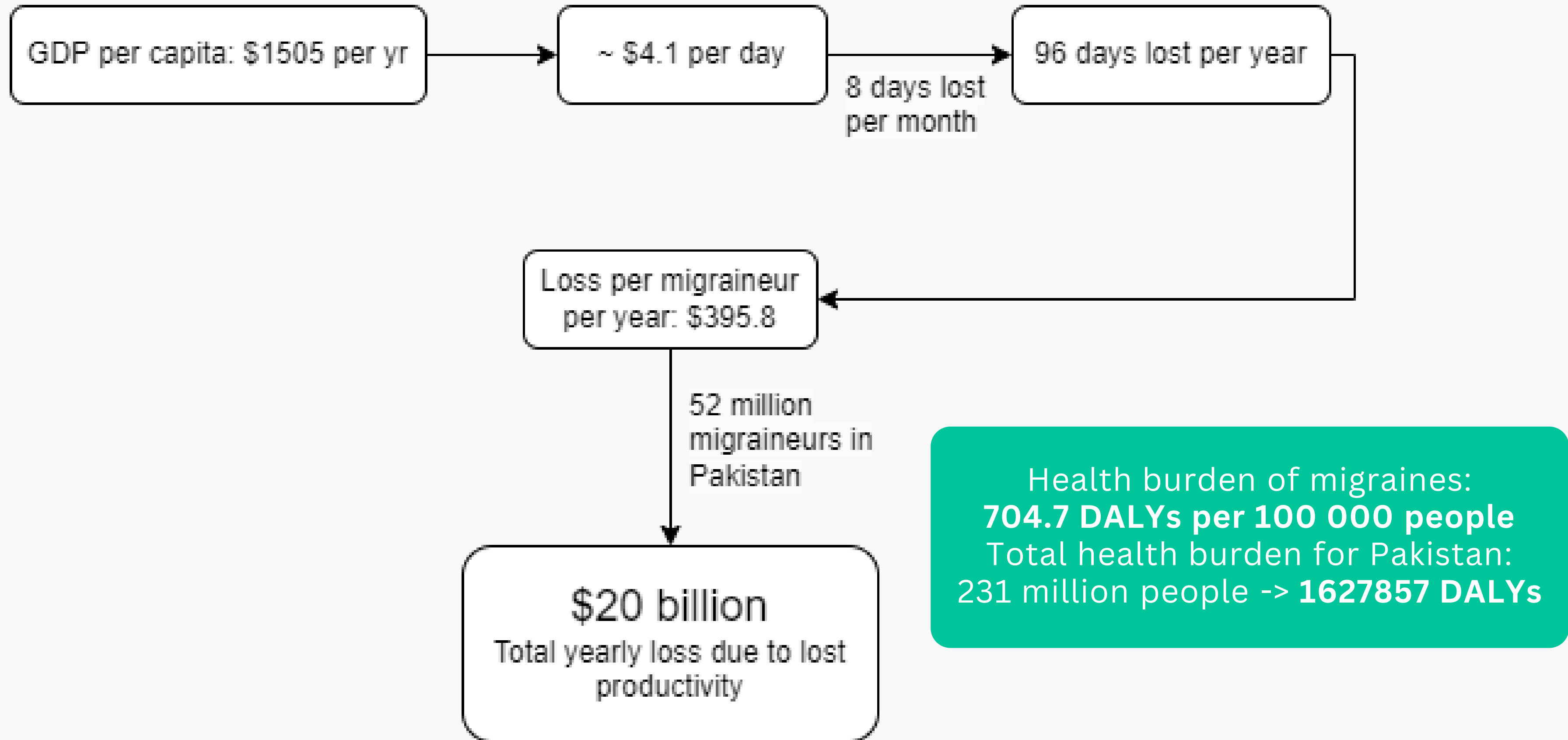
Phases:



Each episode lasts ~48 hours
4.2 episodes per month
~8 days lost every month

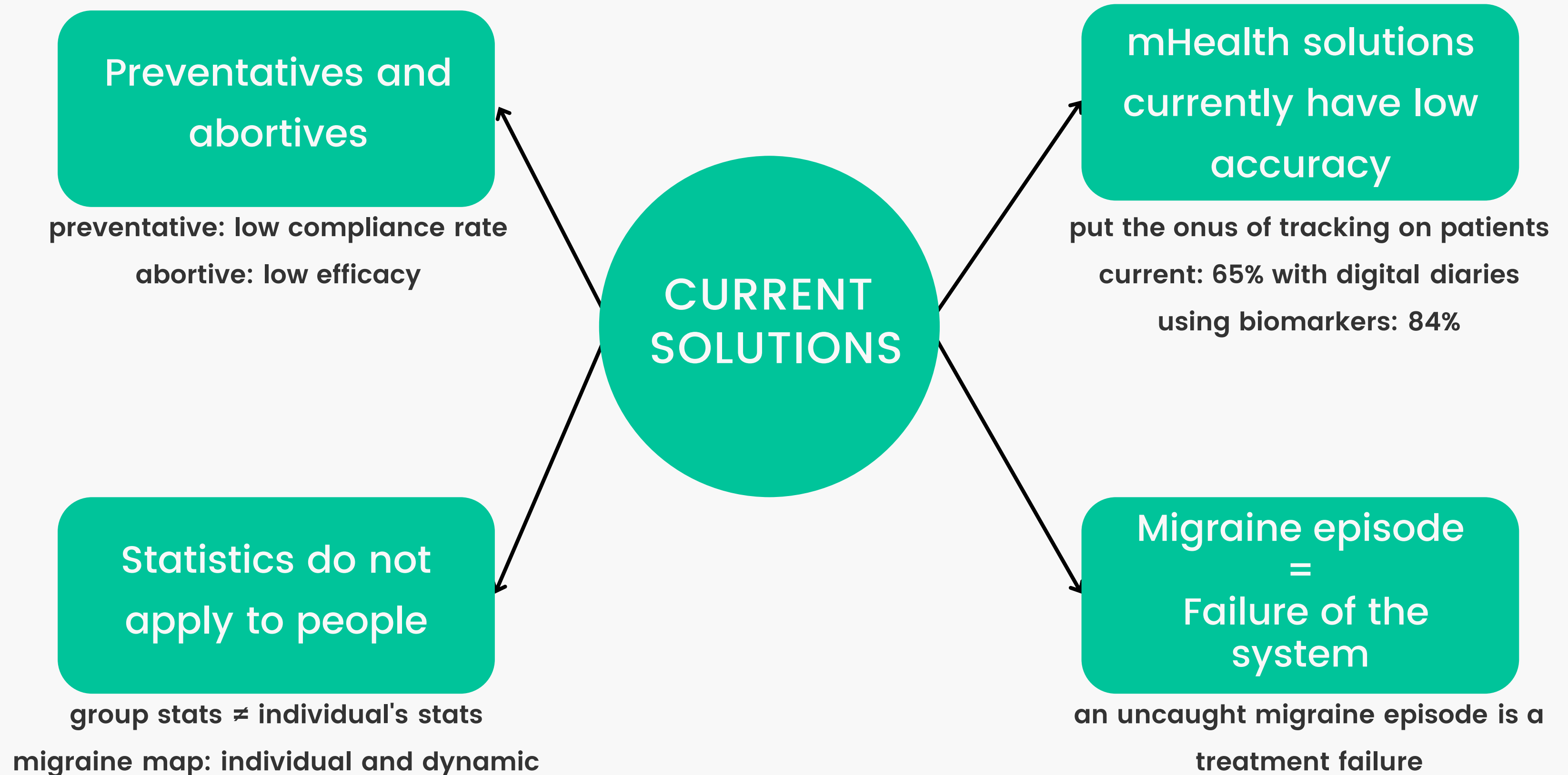
Our survey of 106 migraineurs shows that the inability to plan their life is as distressing as the pain and disability of the actual attacks.

II IMPACT ON PAKISTAN



Accounting for healthcare expenditure, the cost is much higher in reality!

III CURRENT SOLUTIONS



IV OUR GOAL

"Develop a personalized migraine prediction and prevention tool."

V OUR SOLUTION

- Combines digital diary data with physiological biomarkers from wearables, and collects weather data from NOAA.
- Takes the onus of tracking off patients
- Each migraineur has an individual migraine map, our solution creates personalized migraine predictions.

3 STREAMS OF DATA:

Biomarkers

- Heart rate
- Galvanic skin response (EDA)
- Body temperature
- Movement (behavioral)

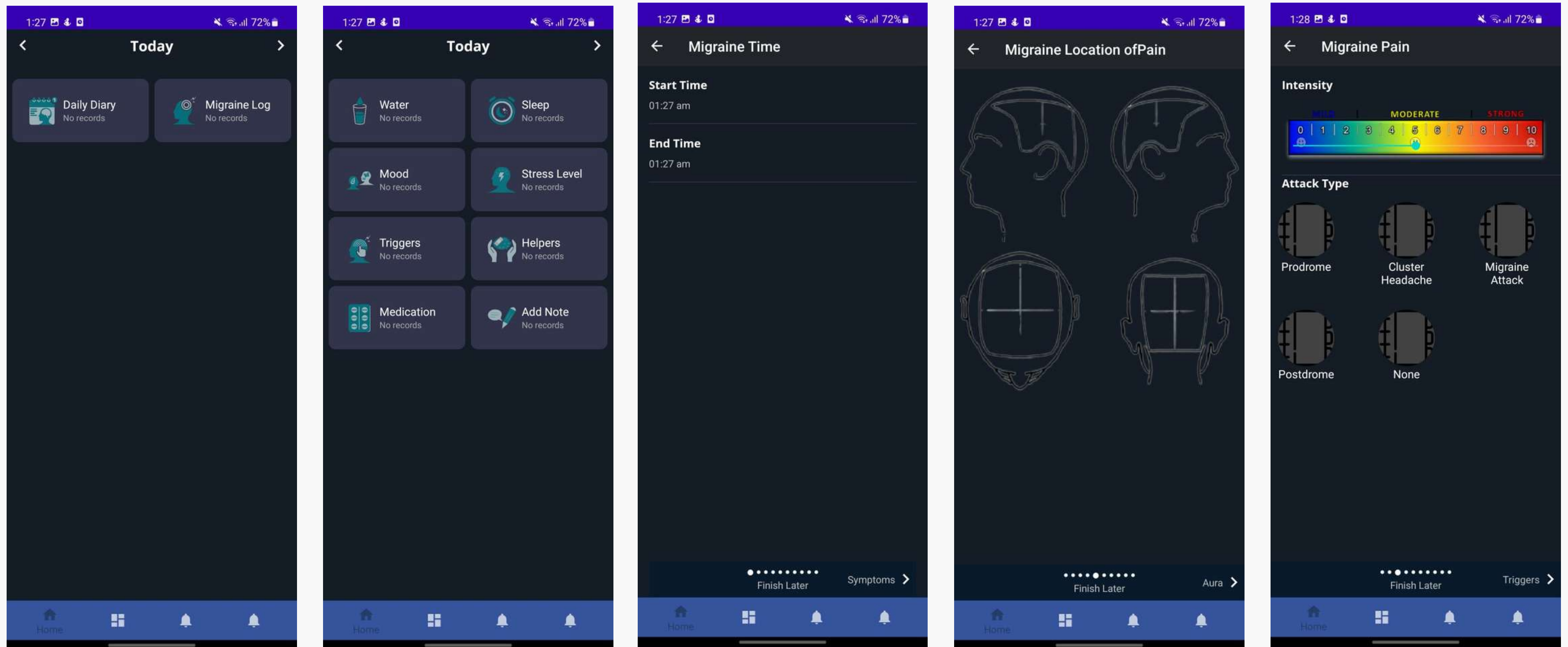
Digital Diary

- Sleep
- Stress score
- Migraine events
- Stressors, helpers
- Location

Weather

- Temperature
- Atmospheric pressure
- Humidity
- Storms
- UV index
- Cloud cover
- Lightning

VI TRACKING BY THE DIGITAL DIARY



Features of the application: dark color palletete, no sounds, low contrast.

WHAT WE'RE WORKING WITH

Longitudinal data of
4
patients

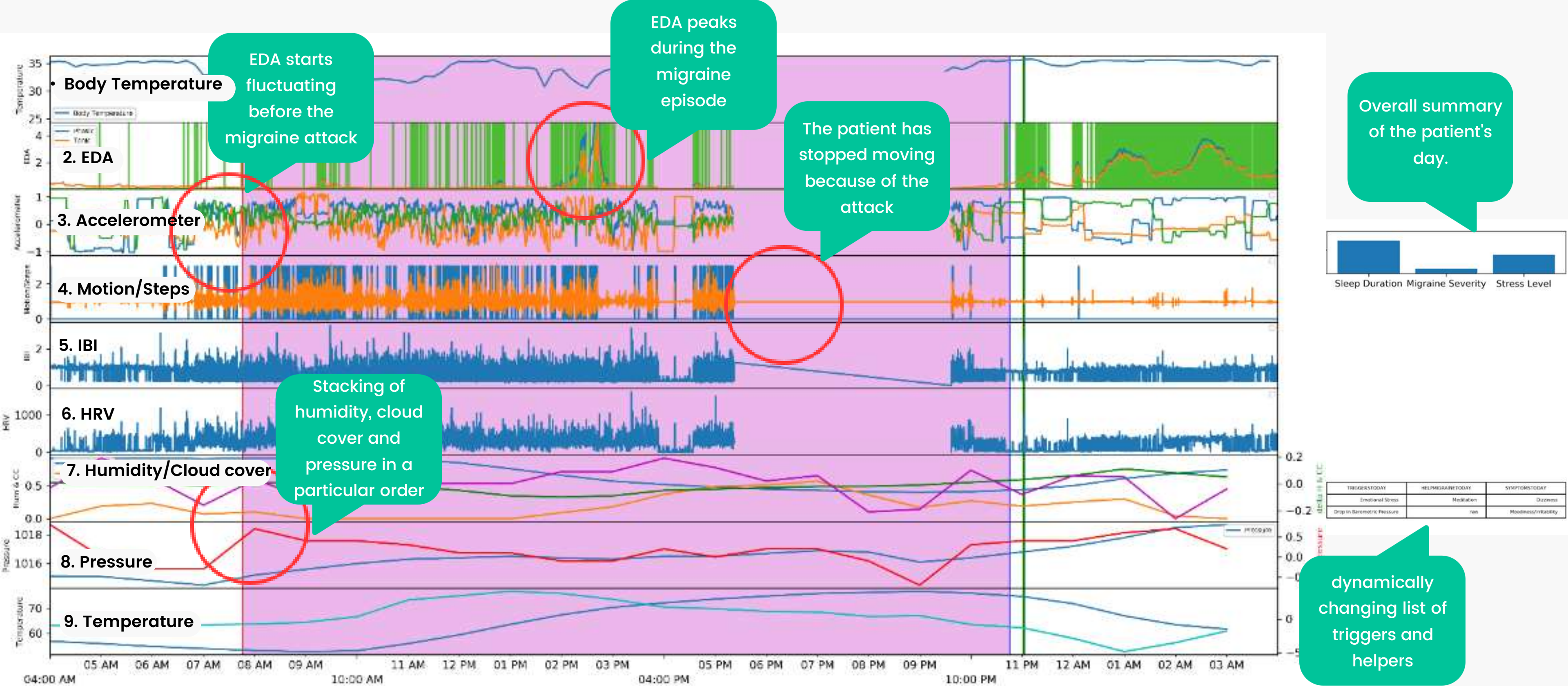
564 days of data
with
197 events
for one patient
several months for others

Migraine events
recorded:
601

Data coverage:
80 %

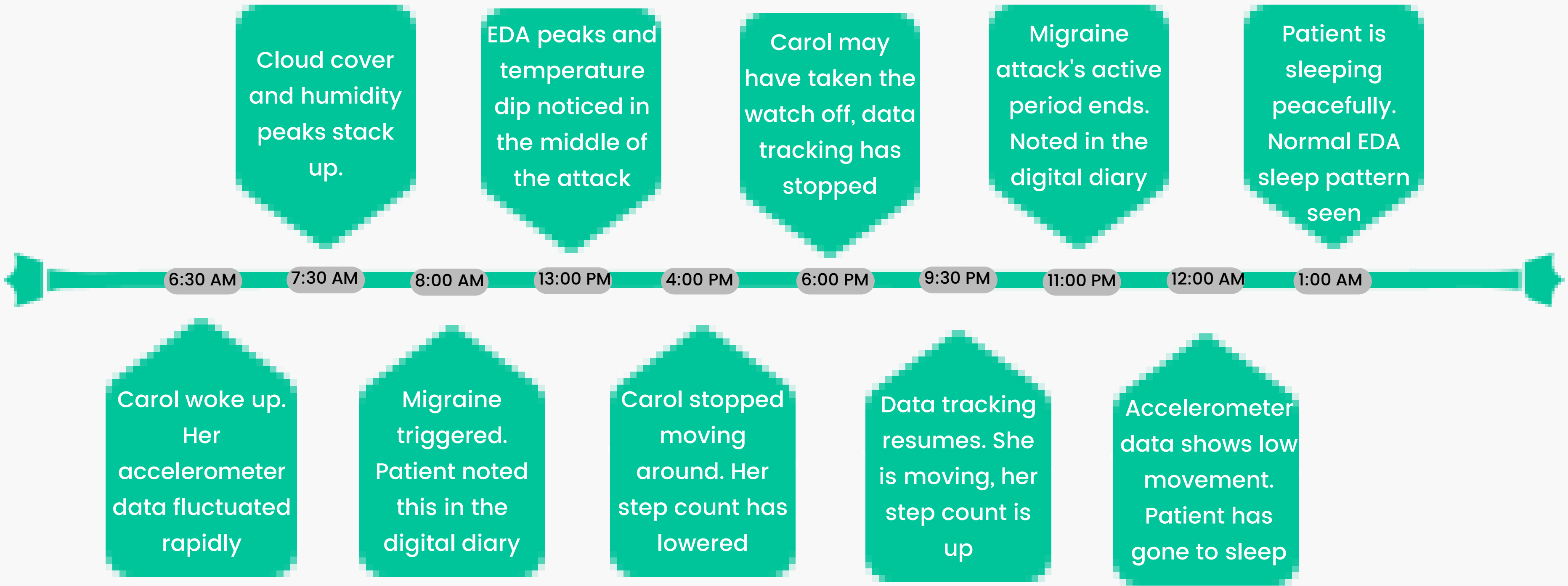
- Continuous tracking of heart rate, EDA, temperature, and movement
- Data covers migraine attacks as well as inter-migraine days, which are just as important as the days of the migraine episode.

VII VISUALIZATION OF DATA

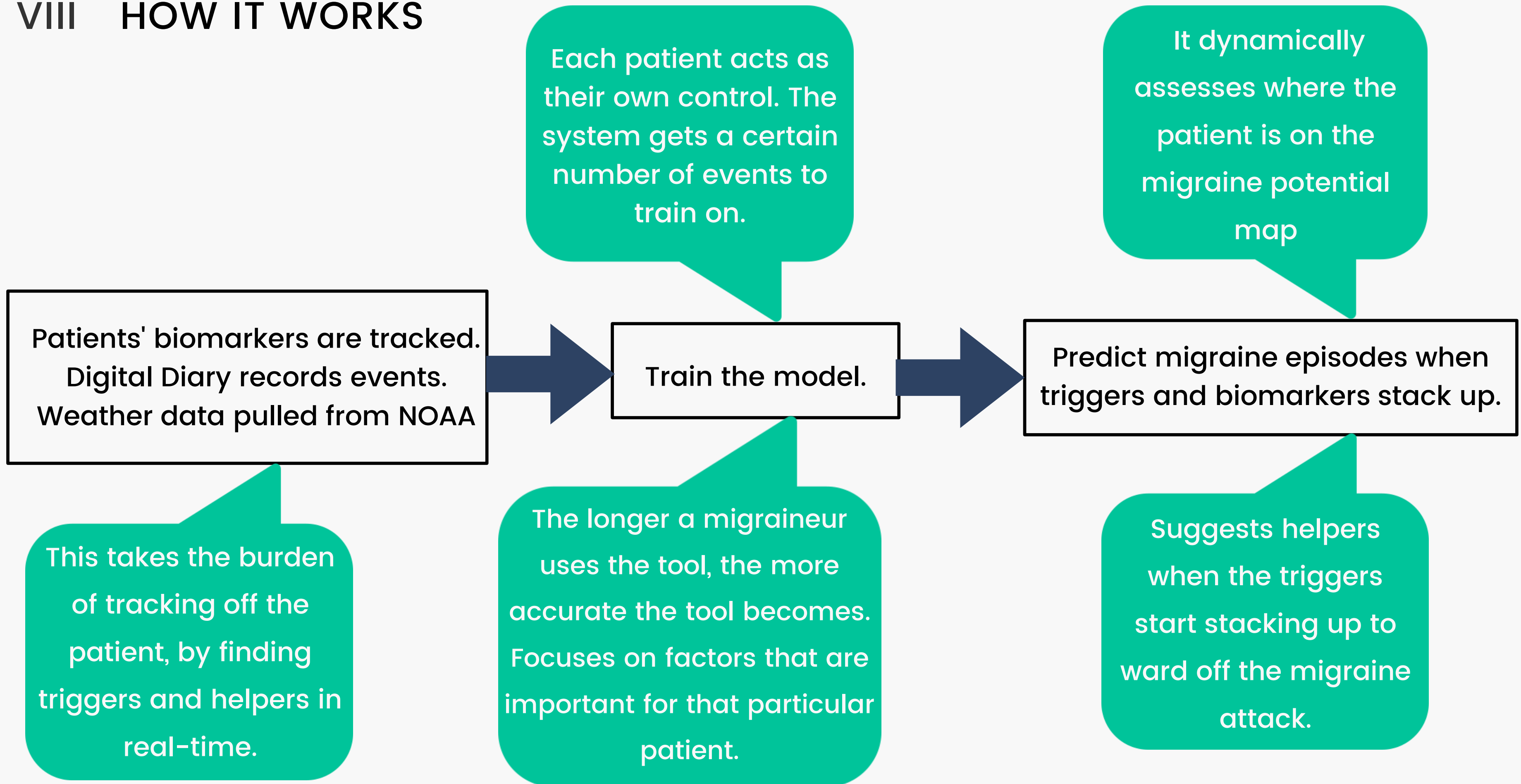


CAROL'S STORY

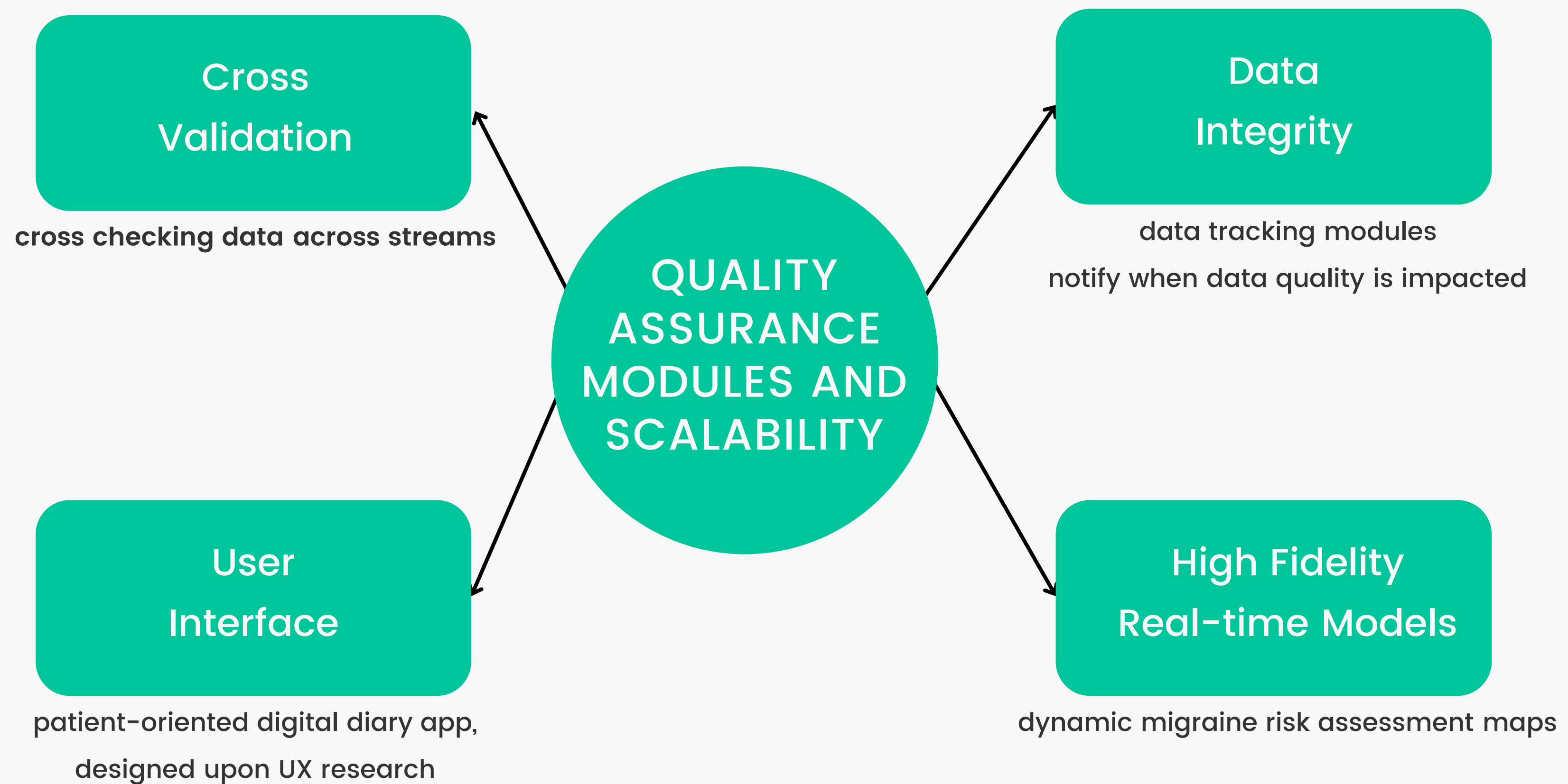
By noting how her biomarkers are changing, we can monitor Carol's migraine attack.



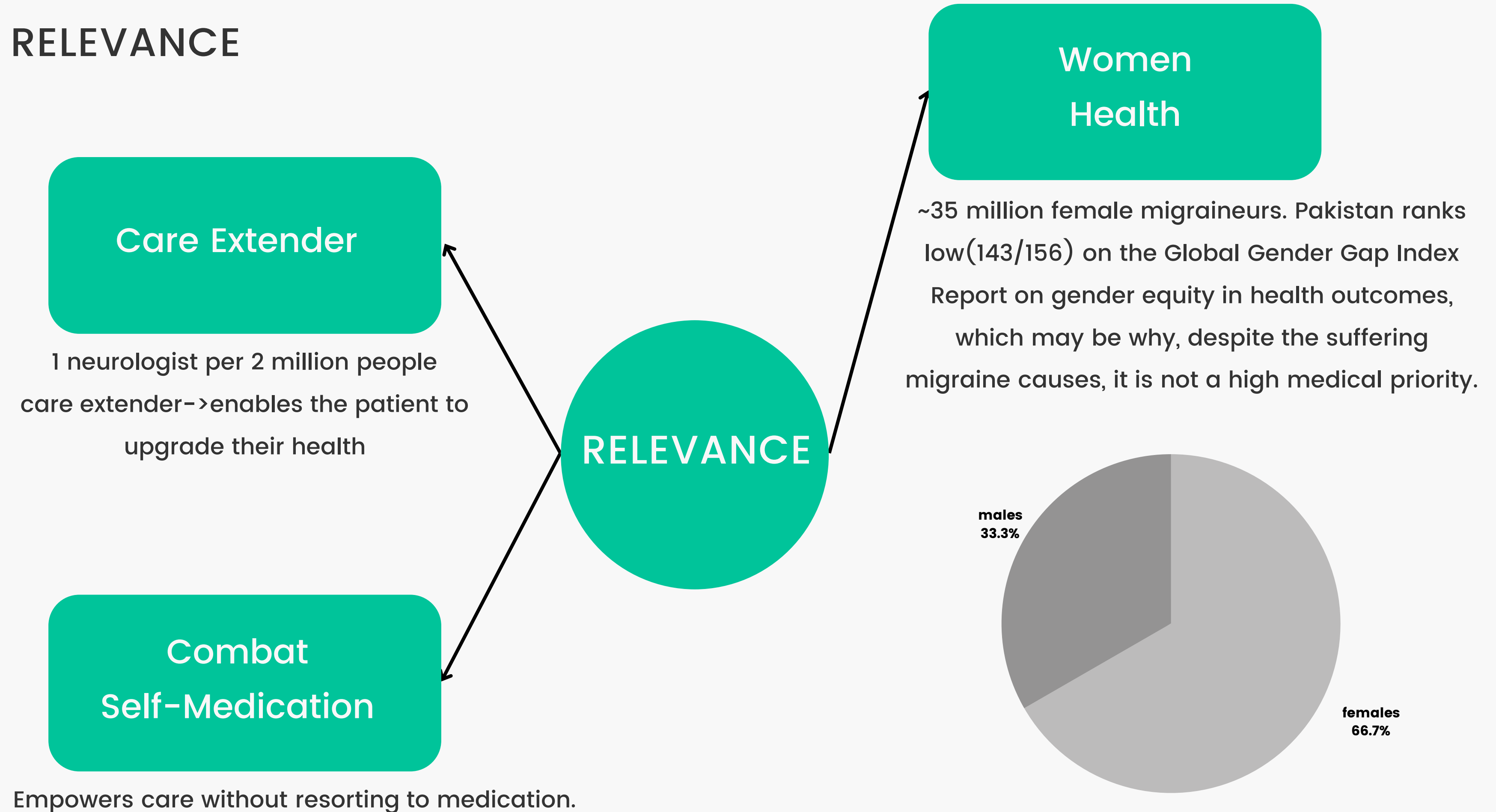
VIII HOW IT WORKS



IX QUALITY ASSURANCE MODULES AND SCALABILITY



X RELEVANCE



XI ACCESSIBILITY

High penetration of
smartphones

Wearables usage on
the rise

Weather data is readily
available

Workarounds with less
data streams

3 streams of data: wearables, digital diaries, and weather.

Even without a wearable data stream, we can use self-reported stress, accelerometer data, ambient noise, and light from smartphone sensors to make sound predictions.

XII VALUE CREATED

Builds a platform for
all chronic diseases
with episodic
exacerbations

Identify archetypes of
migraine within the
population

Less pain and suffering
for migraineurs, more
productivity for the
country

Reducing uncertainty in
migraineurs' life, the
self-reported cause of
great distress.

Perfect timing!

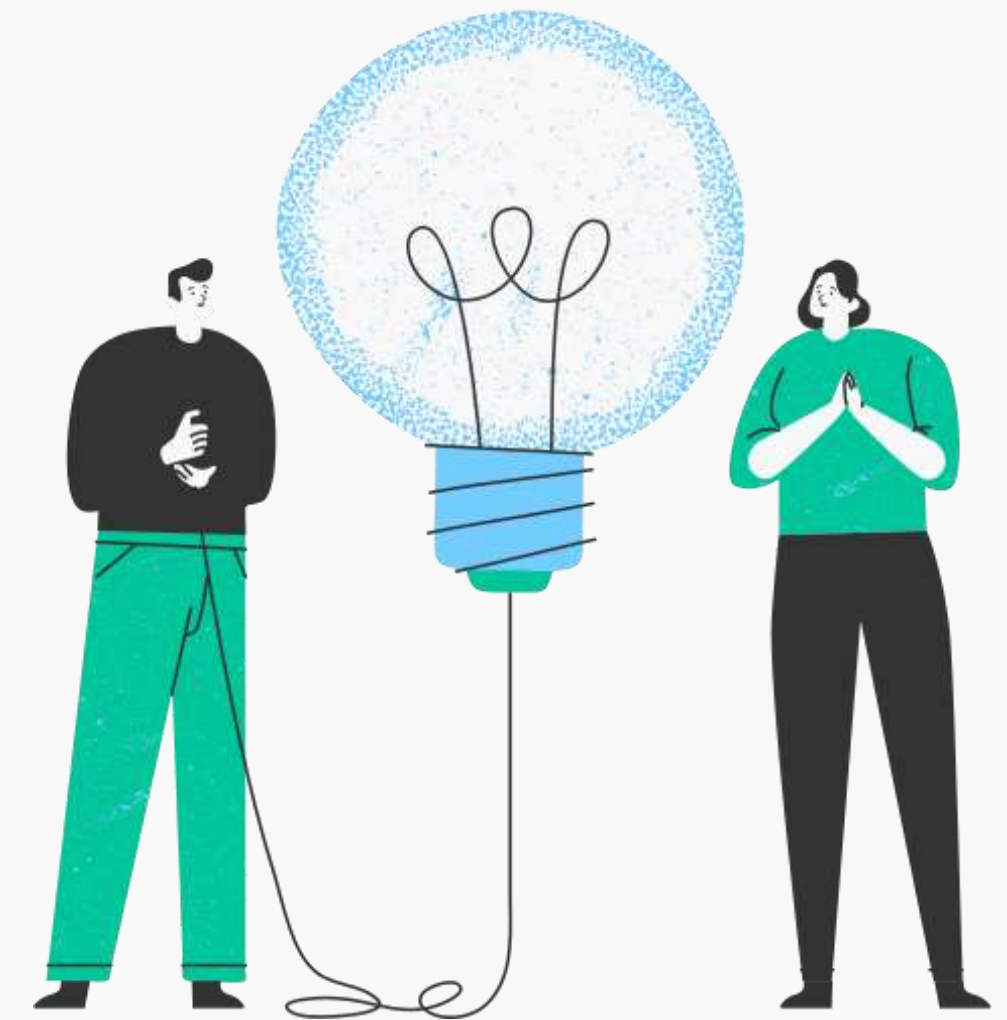
Before smartphones and current tech, it was hard to collect this data

Before big data, it was hard to process and analyze this data

This is work that could not have been done 10 years ago.

XIII THE TEAM

- **Dr. Basmaa Ali:**
Clinical Instructor at Harvard
Visiting Fellow at LUMS
- **Dr. Agha Ali Raza:**
Asst. Prof. CS Dept, Director CSALT LUMS,
Machine Learning expert
- **Students (CS, Psych, Bio):**
 - Sheza Munir – health tech pro (Project Lead)
 - Danyal Maqbool – master of data
 - Saad Hasan Iqbal – deduction doyen
 - Syeda Mah Noor – writing pundit



11th February, 2023

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Engineering, LUMS

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Dr. Agha Ali Raza (LUMS)

STUDENT

Sheza Munir

Thank you!

SOURCES

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