Connected sciences : a piece of translational research

Jonathan van Eyll

24.11.2017

Inspired by patients.
Driven by science.

BIO.BE Belgian life sciences industry association Part of essenscia

The old model : from research to patients

System- & Symptom-based classification of diseases

Development of models that mimick disease's symptoms Identify a modality in the model that will prevent/decrease symptoms

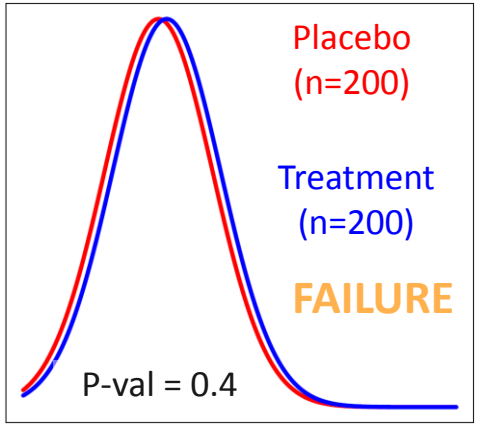
Develop a safe solution that can be administered to patients

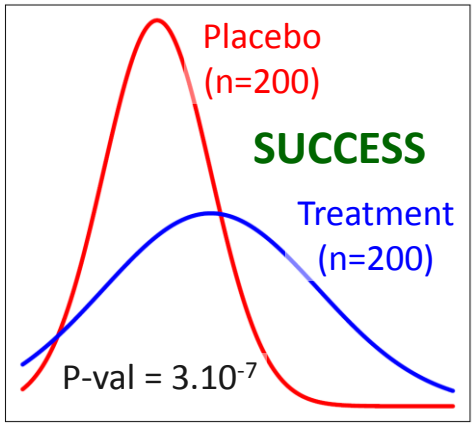
Test efficacy of the solution in large cohorts of patients experiencing those symptoms

~10 years

Investment

Clinical trial outcome analysis : more than an average

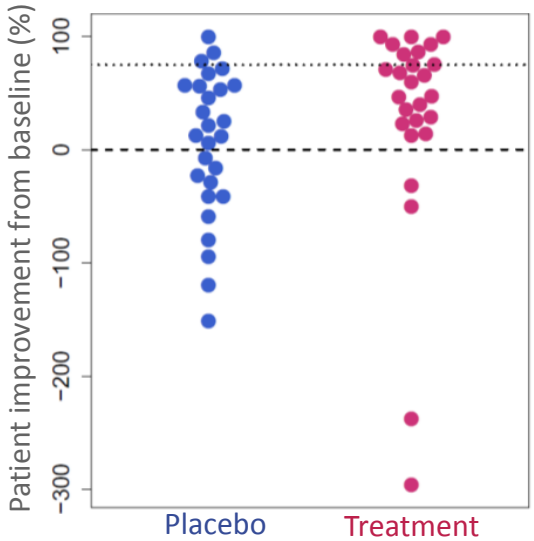




Limitations of this model :

- In case of failure:
  no understanding why the pre-clinical efficacy does not translate in patients - value of pre-clinical model/research ?

- Partial efficacy or side effects :
  different patient trajectories despite similar clinical presentation of the disease
  - Different disease etiologies ?
  - Different biochemical response to a drug ?
  - Interaction with environmental parameters ?
  - …



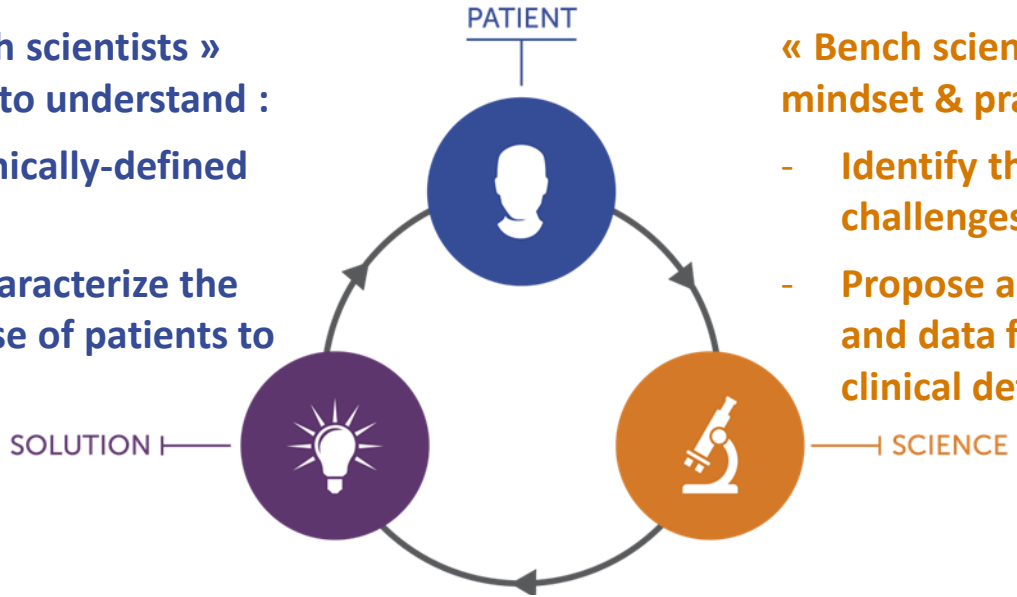
Consequences of the « research to patient » model

- Patients experiencing moderate to negative benefit/risk outcome lose trust in medicine and pharmaceutical product(s)
- Utility of pre-clinical/fundamental research to support human health challenged
- Opportunities to learn more than the clinical outcome from a trial is missed

Precision medicine and translational research as a way forward

Clinicians need « bench scientists » mindset & techniques to understand :

- **Etiology(-ies) of clinically-defined diseases**
- **Understand and characterize the differential response of patients to treatments**



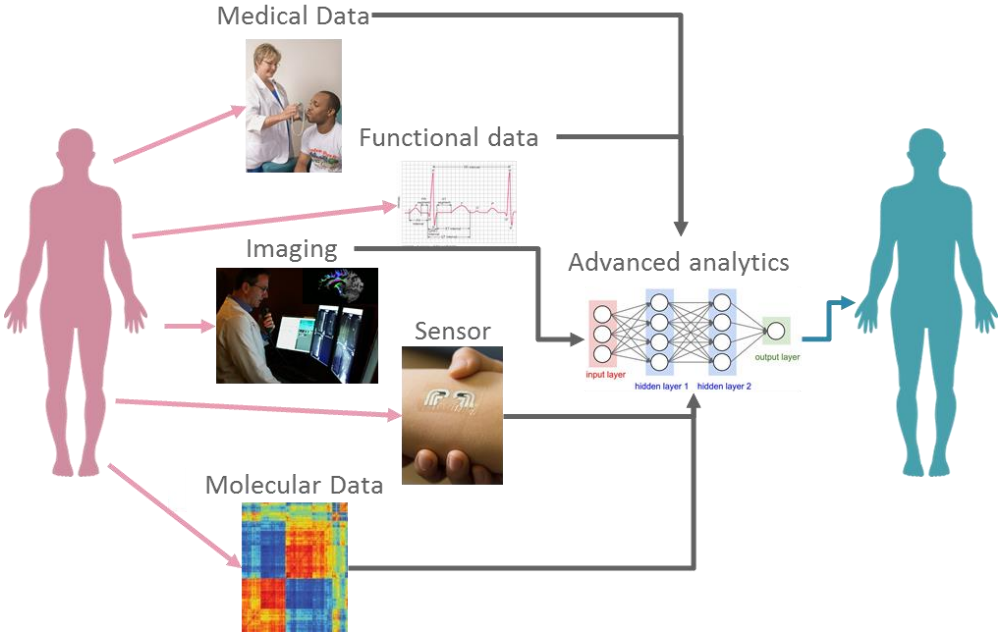
« Bench scientists » need clinicians mindset & practice to :

- **Identify the right human health challenges**
- **Propose and access relevant samples and data for characterization beyond clinical definitions**

Precision medicine : Identify the right drug-patient pairing for optimal efficacy and low risks of side effects

Translational research : combine disciplines, resources, expertise, and techniques within pre-clinical research, clinical research and patient organizations to promote enhancements in prevention, diagnosis, and therapies.

Connected sciences to support the translational research



Real-life challenges :

- Existence of a signal and useful modalities are unknown – need for discovery screening approaches
- Not all modalities are practically or ethically applicable – indirect access to biology
- Gain in precision may be null to moderate
- Findings are often hard to mechanistically understand and deconvolute
- Each health challenge must be clearly identified and approaches must be tailored

A few concrete examples of translational approaches

« Bench to Bedside » : Assess translational value of pre-clinical models :

- Pathway disregulation in human disease is modelled from transcriptional expression pattern
- Pre-clinical models are compared with same methodology to human to assess which mechanisms of the disease they reproduce
- Succesfully led to identification of new treatment paradigm[1]

« Bedside to Bench » : Understand mode of action of new drug candidate :

- A drug candidate has shown superior efficacy than other compounds targeting the same protein
- No hypothesis came from the pre-clinical research
- Drug induces a specific signature in the blood of patients that may lead to understanding its superior efficacy

1. https://doi.org/10.1101/140087

Conclusions

- Connected sciences and multidisciplinary approaches are enablers for Precision medicine and translational research
- Need to break silos : engage physicians, scientists and patients to initiate the translational research cycle
- Deep and focused expertise in the disease, science, methodologies, technologies, and data analysis are key success factors of translational approaches

Thanks!