Science & Technology
FORESIGHT
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Executive Summary

"Theranistic for P4 Medicine"

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WG HEALTH

National Research
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www.foresight.cnr.it

Working Group HEALTH
Coordinator: Caterina CINTI

Scientific Committee
Francesco BALDINI
Daniela BANTI
Alek DEDIU
Giorgio EINAUDI
Gabriella LEO
Luisa TONDELLI
Maria Giovanna TRIVELLA

Organising committee:
Caterina CINTI   *caterina.cinti@cnr.it*
Ilaria SANTONI   *ilaria.santoni@ic.cnr.it*
Luisa TONDELLI   *luisa.tondelli@cnr.it*

EXECUTIVE SUMMARY

The main aim of the F2F meeting "Theranostics for P4-Medicine" was to collect opinions from international experts in order to identify **long term future needs and bottlenecks in the exploitation of Theranostics for a Predictive, Preventive, Personalized and Participatory Medicine** (**P4-Medicine)**.

The interdisciplinary character of the meeting led to the elaboration of scenarios related to health societal challenges and the definition of a strategic roadmap for innovative medicine based on individual needs.

After a specific analysis of four major disease areas (cardiovascular, metabolic, oncological, neurological and neurodegenerative diseases) a wide-ranging interdisciplinary brainstorming session took place. An effort was made to highlight the most intriguing elements, the most interesting needs, the most promising current technologies useful for scientific research and innovation within the framework of P4-Medicine.
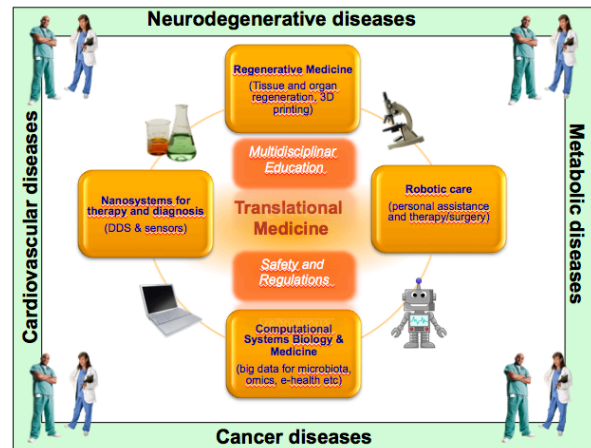
MAIN OUTPUTS

To overcome the current bottlenecks, specific actions are necessary as reported below.

From reactive to personalised/precision medicine
- ✓ Adopt a holistic approach to medicine where the human body is seen as a complex system and disease as a transition from equilibrium to disequilibrium states.
- ✓ Consider similarities, cross-talk and overlapping features as well as common elements/factors within different pathologies to approach the diseases with holistic view rather than treating them separately.

Towards predictive and preventive medicine
- ✓ Develop models of personalised risk stratification profiles for individual predictions.
- ✓ Manage open data while taking into account regulations, guidelines, ethical and privacy issues.
- ✓ Use and implement big data to verify predictive models.
- ✓ Focus research on the development of personal digital biomarkers based on combinations of omics data, diagnostic digital information, physiological variables and personal data (such as family data, lifestyle, behavioural and environmental aspects).
- ✓ Find theranostic tools able to detect real-time changes in multi-marker predictors of transitions from health to disease and to deliver factors, which restore healthy physiological conditions. Although too visionary at present, this will be mandatory for future preventive medicine.

Towards participatory medicine
- ✓ Share awareness to increase motivation and active involvement.
- ✓ Encourage partnerships between scientists with different backgrounds and technological expertise, and MDs with different specialisations, as well as those between MDs and patients .
- ✓ Reduce communication gaps between the scientific community and the public, which impair the empowerment of people in maintaining their status of health and wellbeing.
- ✓ Improve the correct use of social media and digital technologies to orient and influence individual health behavioural changes
- ✓ Change education strategies at various levels in order to motivate people to follow a healthy lifestyle (preventive medicine) and to promote individuals' active participation in their own wellbeing.

✓ Use the interventional approach to correct the mistakes of self-education and to enhance the impact expected from cognitive computing.
✓ Create a new generation of MDs able to work within an interdisciplinary and multidisciplinary context and with a holistic view towards the patient .
✓ Improve communication skills of MDs, as well as their ability to understand and handle different discipline languages in order to increase their appreciation of new technological developments.

ROADMAP FOR THE FUTURE

To achieve the goal of Theranostics for P4-Medicine, we need to:

➢ **Acquire deeper basic knowledge of health and disease, with a novel and disruptive holistic approach**.
- Create an inter/multidisciplinary network of MDs with different specializations
- Assess data related to the recovery of homeostasis for a specific person
- Set up a longitudinal study of a healthy population for a correct stratification of people
- Improve/support basic research on pathophysiology of diseases
- Look for common features in the major complex diseases
- Apply a multi-scale approach with a new holistic vision of the human body as a complex system.

➢ **Develop a valid model of risk stratification profiles in order to quickly predict and prevent the disease or, at least, to personalize the therapy for the individual patient.**
- Define the risk and protective factors
- Identify new biomarkers and better precursors of disease
- Create reliable models, based on big data
- Develop new sophisticated diagnostic tools/technologies
- Develop platforms for integration of all data and intelligent "electronic records"
- Assess the influence of nutrition on individual health through a multi-genomics approach
- Map over time the individual response to therapies, the escalation risk of illnesses and comorbidities and human plasticity in response to environmental factors.
- Monitor individuals in terms of environmental factors, lifestyle and behavioral changes.

➢ **Promote individual and social actions.**
- Shift from public health recommendations toward individual ones
- Adopt a socially-oriented digital medicine
- Adapt ethical and regulatory issues to move from individual privileges to the wider community societal needs.

The full report and list of participants can be downloaded here:
http://www.foresight.cnr.it/working-groups/wg-health