

Mapping the use of computer modelling and simulation in clinics

Report of the 1st VPHi
Clinical Community survey
2021

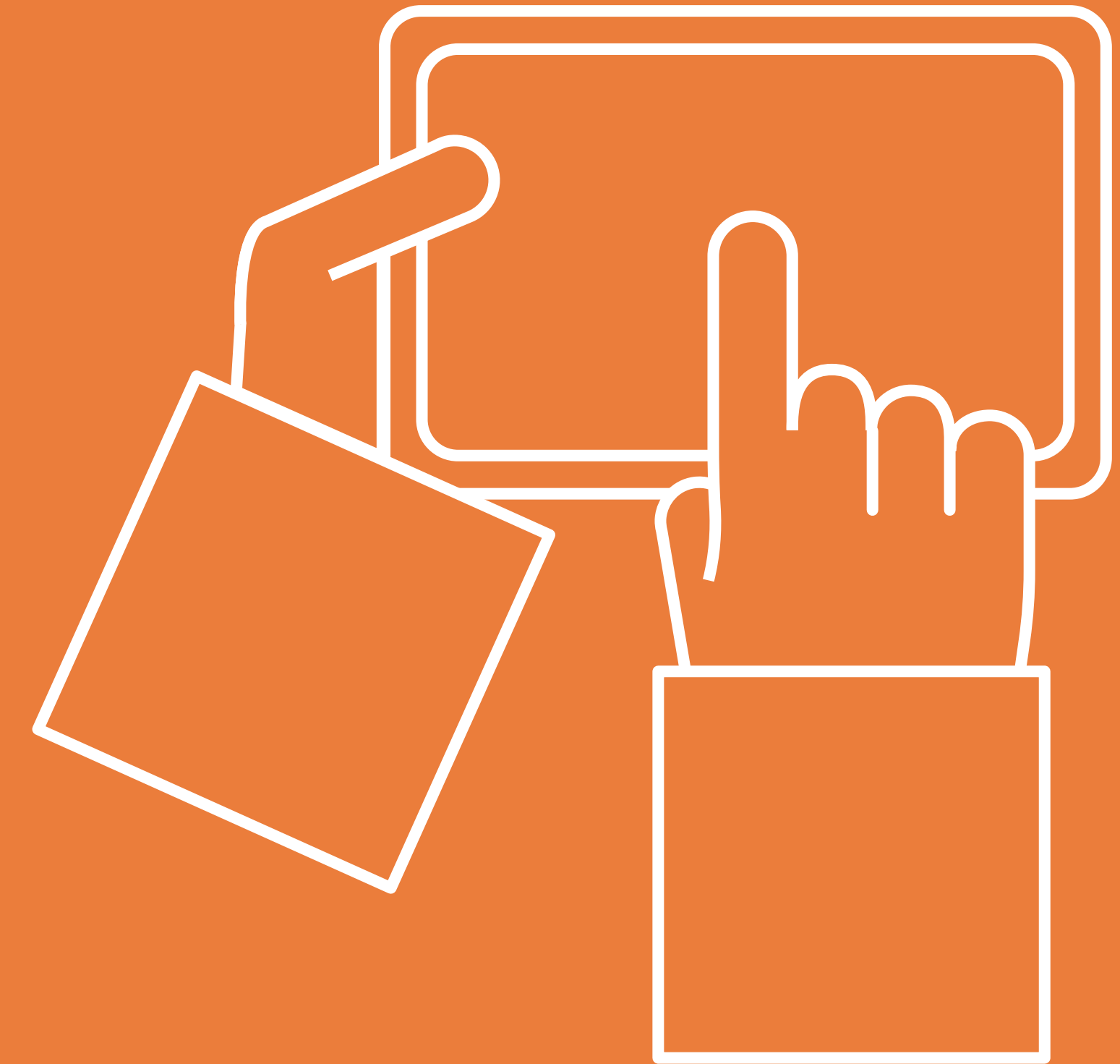


Table of contents



01

About VPHi

02

Survey objectives

03

Participants

04

Findings

05

Conclusions - SWOT Analysis

06

Acknowledgements

01. About VPHi



Formed in 2011, the Virtual Physiological Human Institute for Integrative Biomedical Research, in short VPH Institute, is an international not for profit, whose mission is to ensure that the Virtual Physiological Human (VPH) is fully realised, universally adopted, and **effectively used both in research and clinic**.

The VPH, also identified with the word "in silico medicine", is the field that uses individualised physiology-based computer models and simulations to assist and improve all aspects of healthcare, ranging from prevention, over diagnosis and prognostic assessment to treatment, including the design and development of biomedical products. The VPHi membership and participation are open to any scientists, clinicians and healthcare professionals focused on the development and uptake of computer modeling & simulation in healthcare and currently we represents many of the largest in silico medicine research groups worldwide.

The VPHi acts as a catalyst to bring together a variety of different stakeholders (policy makers, science funding bodies, regulatory agencies, clinical organisations and industry) in order to maximise the benefit of in silico medicine approaches for the healthcare industry and for the public good.

About VPHi

To achieve this goal, the VPHi will:

- Provide a single voice for all its members
- Ensure that in silico medicine related research receives all over the world an adequate level of funding
- Act as a think-tank to advise and support governmental and non-governmental institutions on research & technology development programmes and initiatives on in silico medicine research and related topics
- Provide a platform for the exchange of ideas, challenges, solutions and experience among the various stakeholders
- Sustain the dissemination of in silico medicine research, through the organisation of a number of activities, such the bi-annual VPH Conference, the VPH Summer School and online webinars.

www.vph-institute.org

In 2021 we partnered with UCL-GOSH to assess clinicians through a survey to answer the following question:


Where are we now?

02. Survey objectives



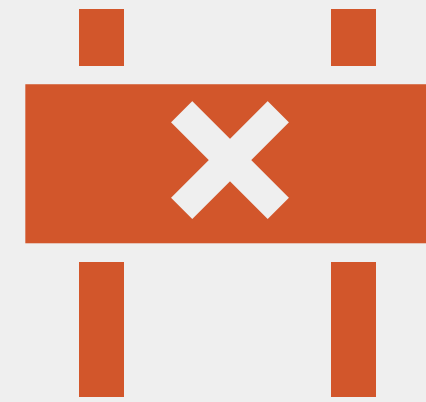
Objective 1

Mapping the use of computer modeling & simulations (CM&S).



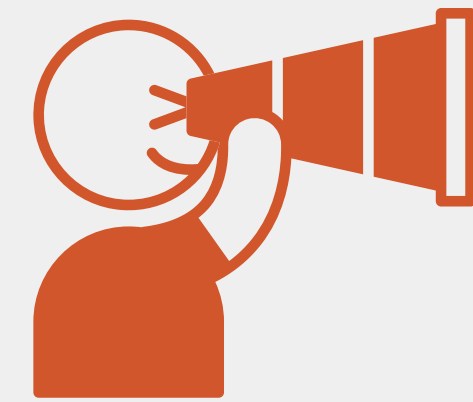
Objective 2

Assessing the current level of acceptance.



Objective 3

Identifying the barriers.



Objective 4

Highlighting future opportunities.

Survey timeline

Assessing clinicians

An **exploratory approach** was used to gain a better view on the current status of the clinical uptake of in silico medicine technologies and gathers insights on applications, level of acceptance and potential barriers for clinicians.

An online **survey** of **25 questions**, including demography, was disseminated in **2021** through a **communication campaign** towards **medical practitioners**.

Survey launched
(via Survey Monkey)



**DECEMBER
2020**

Survey closed

**FEBRUARY
2021**

Preliminary findings
shared at the VPHi
General Assembly

**NOVEMBER
2021**

VPH2022:
Communication of results

**SEPTEMBER
2022**

Peer review publication
accepted in *Frontier in
Medical Technology*

**MARCH
2023**

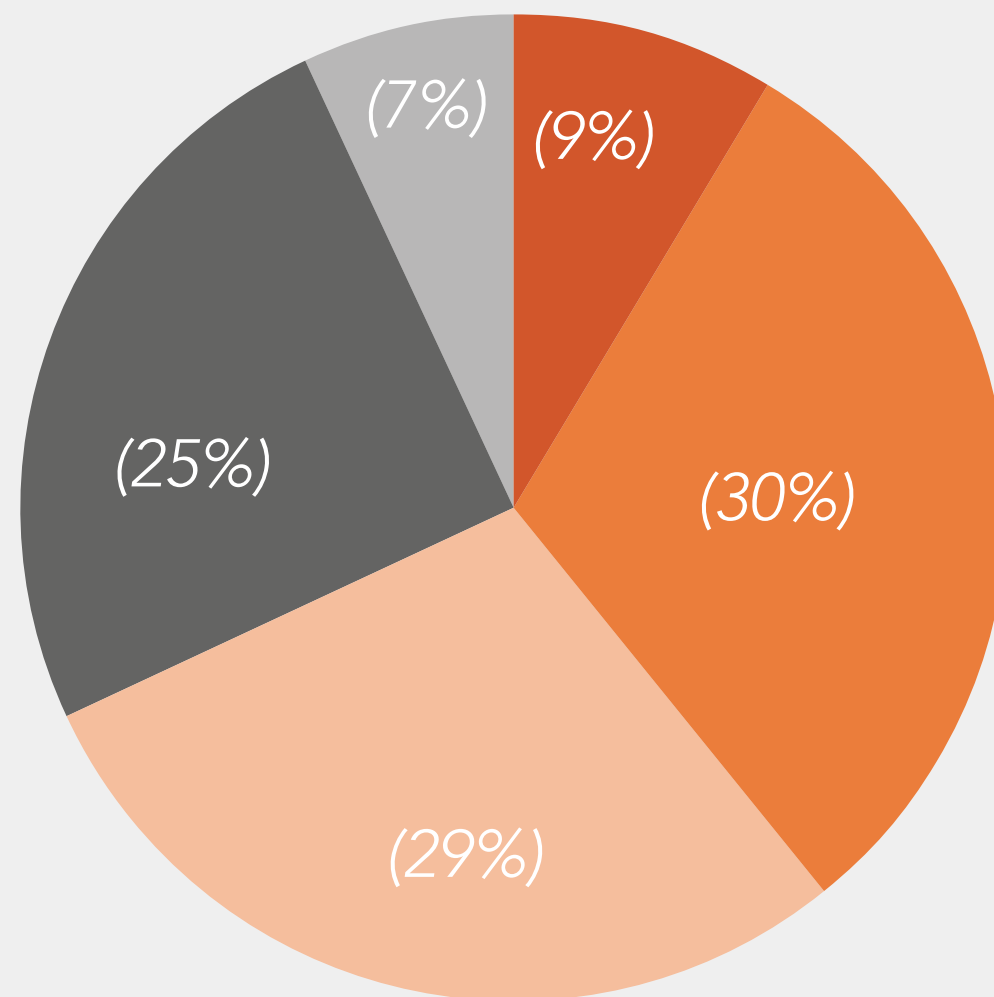
03. Participants



163 clinicians
have been surveyed.

Age groups

- 25 - 34 y.o.
- 35 - 44 y.o.
- 45 - 54 y.o.
- 55 - 64 y.o.
- Over 65 y.o.



Medical specialties

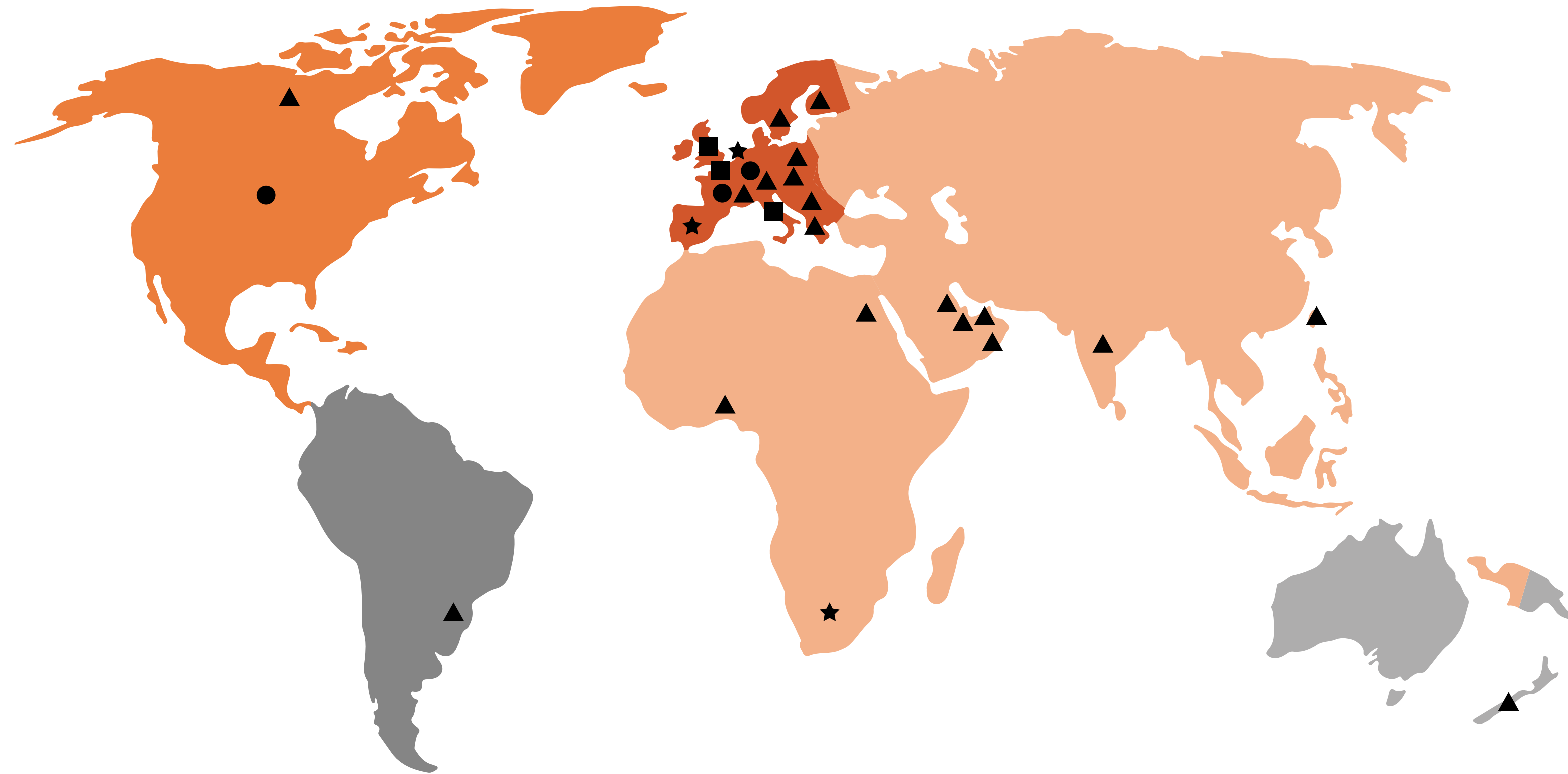
- Cardiac field (48.1%)
- Paediatrics (22.2%)
- Muscoloskeletal (12.6%)
- General Surgery (8.1%)
- Rheumatology (5.2%)
- Imaging (4.4%)
- Oncology (3.7%)
- Anaesthetics (3.0%)
- Other fields (9.6%)

Clinical positions

- Head of units (33 respondents)
- Consultants (28 respondents)
- Registrar/MD (19 respondents)
- Fellow/Junior Doctors (8 respondents)
- Research positions (46 respondents)
- Not specified (8 respondents)

Participants

Location of respondents



Working country of respondents

- More than 25
- 11 to 15
- ▲ 6 to 10
- ★ 1 to 5

Collaborations

Respondents declared having ongoing collaborations within the field of CM&S in the following parts of the world:

- Europe (86%)
- North America (21%)
- Africa and Asia (7%)
- South America (3%)
- Oceania (1%)

04. Findings

Do clinicians have team members dedicated to CM&S?



CM&S-related technical profiles in clinicians' teams:



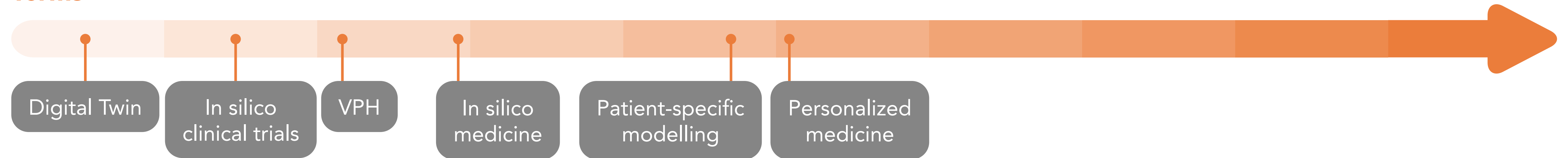
Medical practitioners and technical experts do collaborate in clinical premises. Biomedical engineers and Statisticians are the technical profiles the most represented in clinicians' teams.

Findings

Awareness and familiarity with CM&S terms and methods

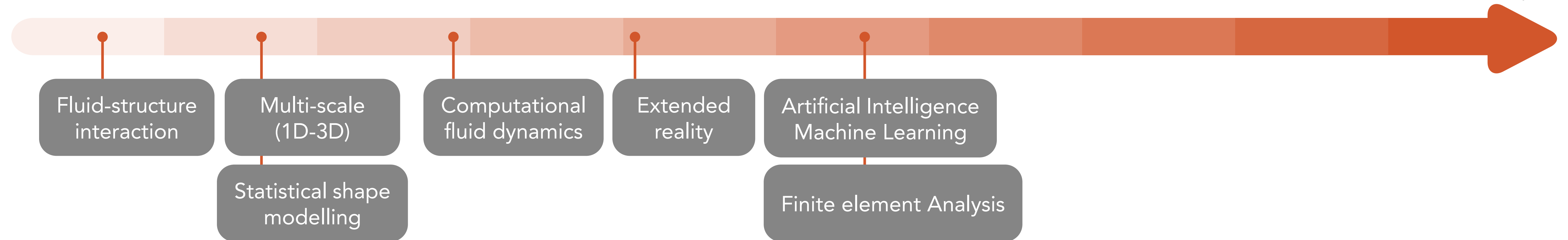
Terms

Awareness



Methods

Familiarity



Clinicians are **moderately aware** about in silico terms & concepts.

Personalized medicine is the concept they are the most aware of.

The majority of clinicians are **not familiar** with computational & modelling methods.

Findings

Applications of CM&S recorded in clinics

Clinicians have used computer modelling and simulation to:



In this cloud, the largest words highlight the **most frequent answers** by clinicians.

Most frequent answers

Percentage of votes

- 1 Plan interventions (49%)
- 2 Teach/Training (41%)
- 3 Study Pathophysiology (30%)
- 4 Enrich diagnosis (29%)









Findings

Frequency of CM&S use to plan intervention & medical field of application

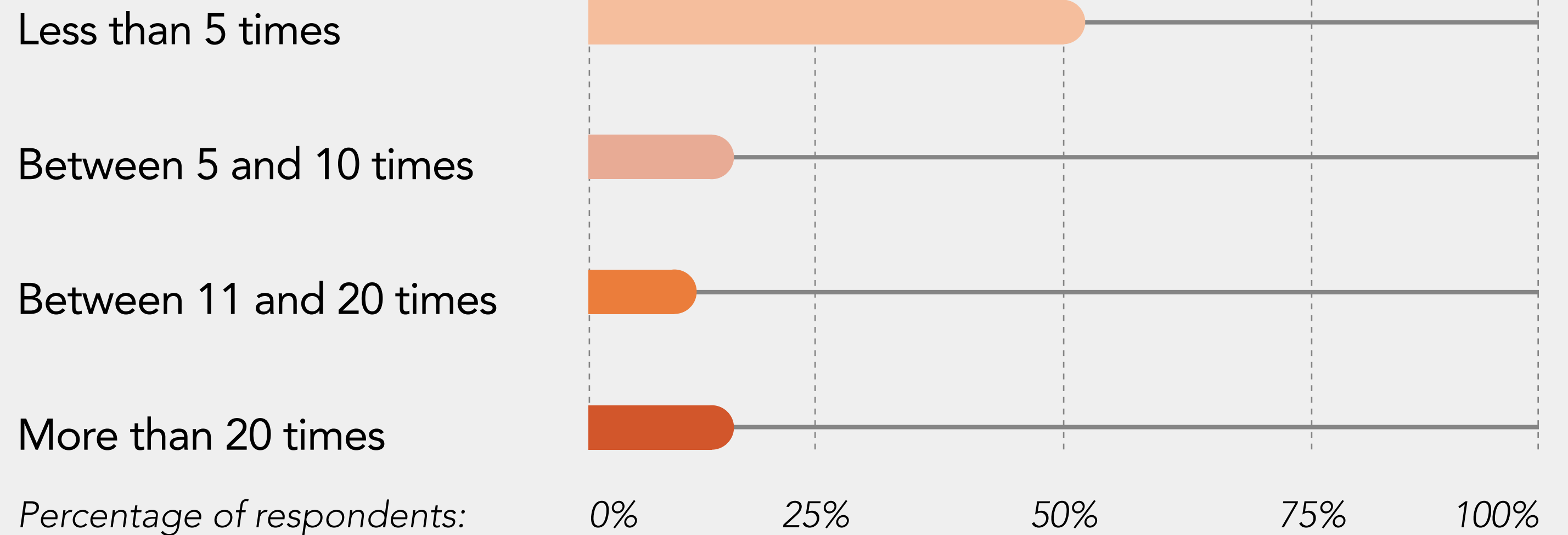
Medical applications

Clinicians have used CM&S to plan intervention in the following fields:

-  Cardiac (58%)
-  Musculoskeletal (21%)
-  Neuro-degenerative (7%)
-  Cancer (6%)
-  Craniofacial (4%)
-  Other categories (6%)
Metabolism, diabetes, infectious diseases, pelvic floor, foetal medicine, critical care, space medicine, etc.

Frequency of use

Respondents were asked the **number of times** they had used CM&S to plan intervention in the previous year.

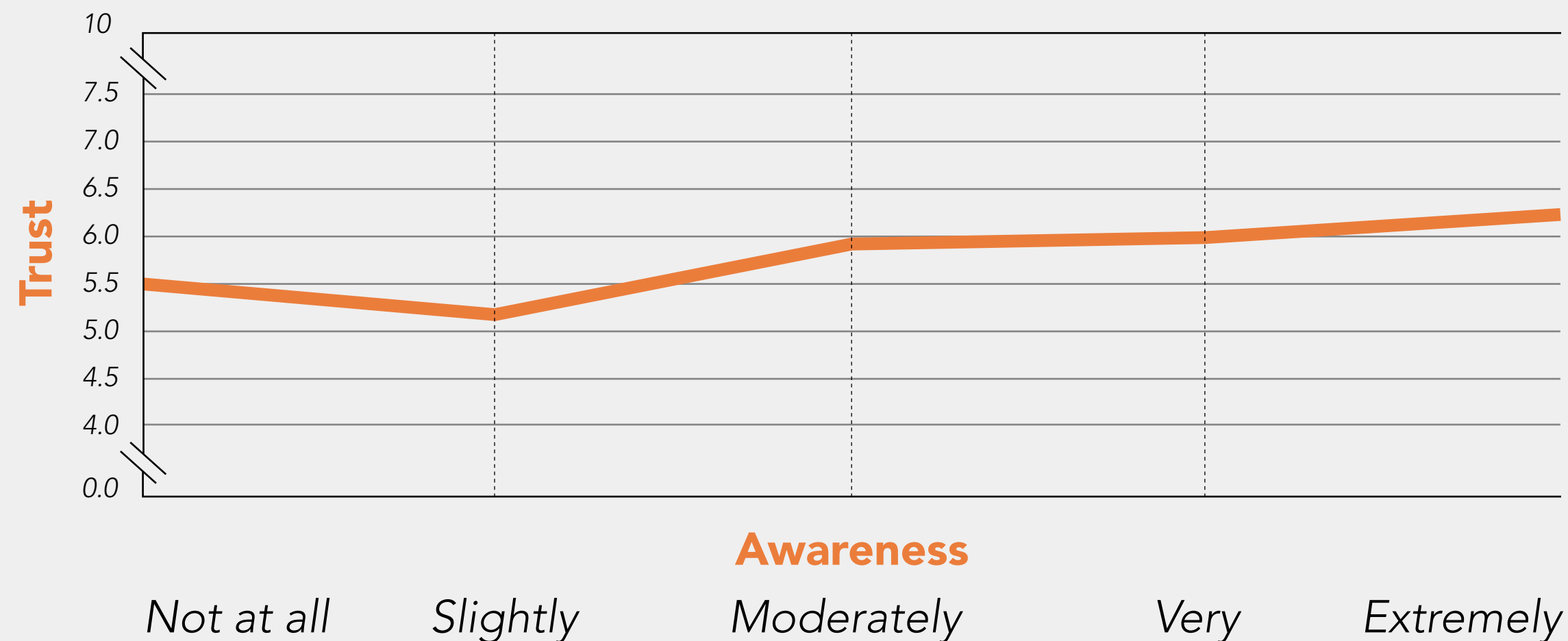


Most clinicians have used CM&S to plan intervention **less than 5 times**, so the overall use is still scarce.

Findings

Level of trust in the technology

Evolution of trust level according to awareness level in different in silico concepts



Awareness level is evaluated for the following in silico terms:

In silico medicine, Patient specific modelling, In silico clinical trials, Digital Twin, Virtual Physiological Human, Personalized medicine.

Trust

Medical doctors' **trust** level in CM&S results is **independent** of their experience with actually **using** it.



Ranking of type of evidence required to trust CM&S outcomes

Percentage of votes

- 1 Personal experience (28%)
- 2 Successful post-hoc in silico clinical trials (26%)
- 3 Successful a priori in silico clinical trials (24%)
- 4 Regulatory approval (18%)

Other: Easy to understand user interface, random clinical trial, etc.

Findings

Perception, added value to the practice and resources

Perception and opinion

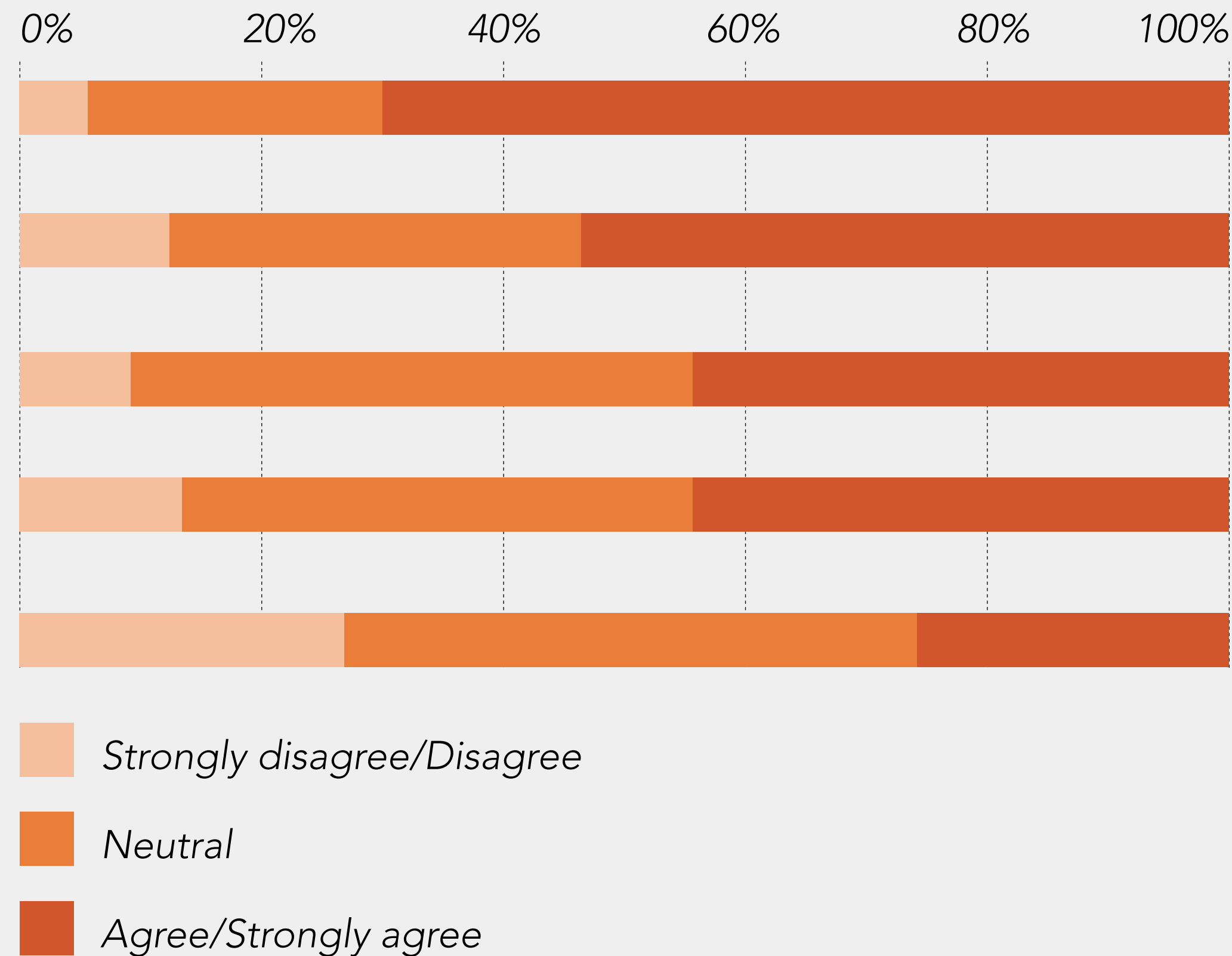
CM&S provides me with more confidence in planning procedures.

Patient-specific CM&S is accurate enough for clinical application.

CM&S allows me to perform procedure faster.

Patient-specific CM&S is slow.

Results of CM&S are easy to understand.



Overall, CM&S has a positive impact on clinicians **confidence** for **intervention planning**, it presents an added value for the **speed of procedures** and patient-specific CM&S is considered quite **accurate** but CM&S is still perceived as **slow** and **difficult to understand**.

Findings

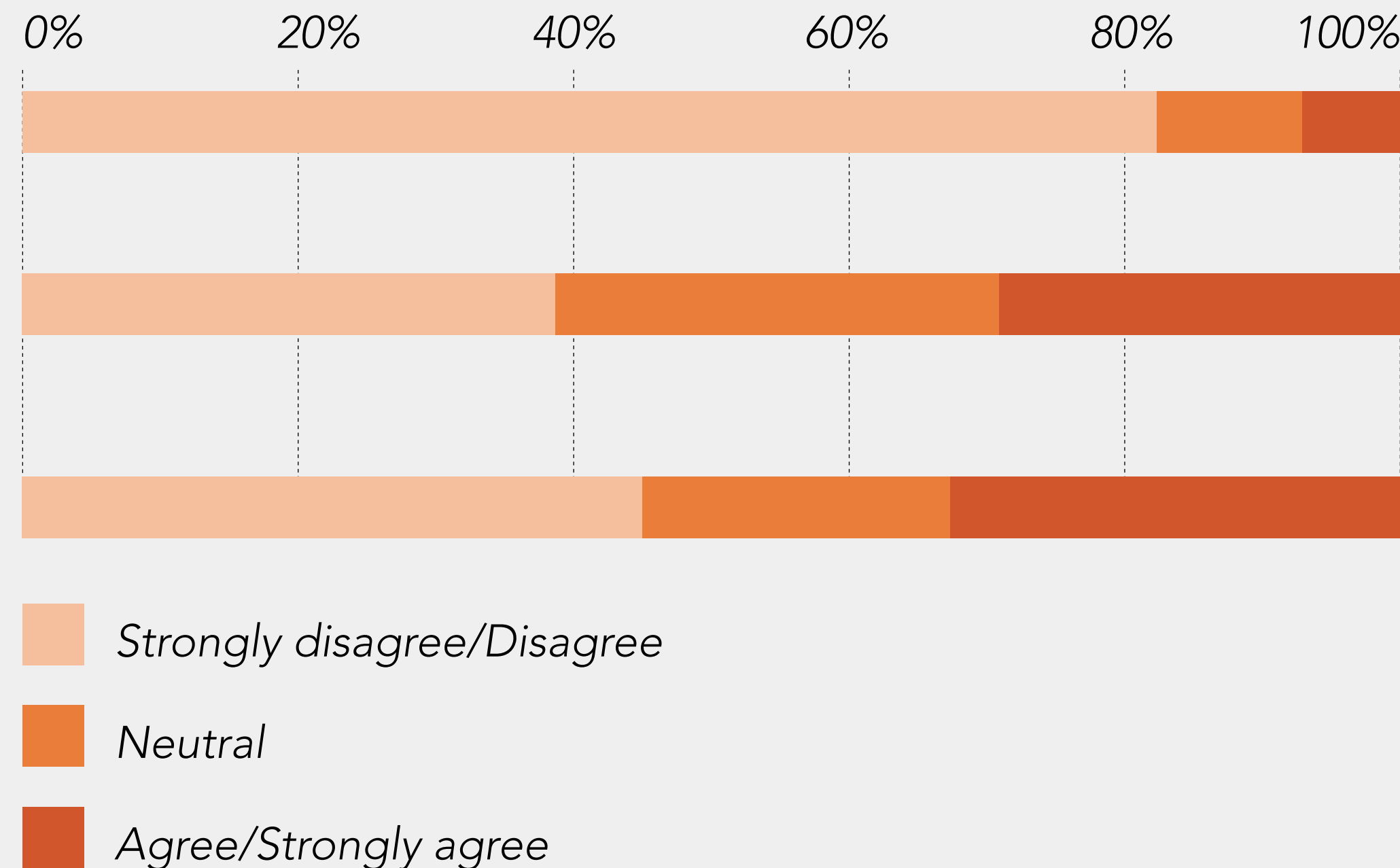
Perception, added value to the practice and resources

Resources

There is no need for expertise on CM&S in my team.

It would be impossible to finance a position for an expert in CM&S in my group.

I have access to high performance computing.



In terms of resources, clinicians do **see a role for CM&S expertise** in their team but **fundings** to finance such a position are **inequal** and access to **HPC facility** is **scarce**.

05. Conclusions

SWOT Analysis



Strengths:

- Awareness in concepts
- Perception of positive role played by CM&S in planning procedures
- Positive impact on confidence
- Accuracy to provide patient-specific results
- Trust



Weaknesses:

- Required technical expertise
- Low access to computing resources
- Perceived slow turnaround time of simulations
- Limitation to a few medical area
- Familiarity with CM&S technologies



Opportunities:

- Trust
- Role for CM&S profiles & expertise considered
- Existence of interdisciplinary collaborations
- Applications in teaching, planning



Threats:

- Recognition of regulatory approval by clinicians
- Level of awareness in certain terms
- Mistrust/over expectations
- Lack of funding for CM&S expertise

Conclusions

Future



Inform policy makers

Improve CM&S **value proposition** for **clinicians**

Build a stronger **ecosystem**

Better understand **trust**

Disseminate results

**New survey coming soon
(Stay tuned!)**

06. Bibliography and Acknowledgements

For more data, see linked peer-reviewed publication in Frontiers:

R. Lesage et al.

Mapping the use of computational modelling and simulation in clinics: a survey

Front. Med. Technol. Sec. Cardiovascular Medtech. vol. 5 - 2023

<https://doi.org/10.3389/fmedt.2023.1125524>

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For any question or comment, or if you would like to help us disseminate our next survey, please contact:

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