

DIAGNOSTIC WEARABLES: THE FUTURE OF MEDICAL MONITORING

A Survey of Design Engineering Stakeholders

SEPTEMBER 2022

molex | **AVNET**



INTRODUCTION

Diagnostic wearable devices enable individuals and medical providers alike to track and understand health status by providing real-time data. The keys to success for diagnostic wearables include ease of use, affordability and wide market availability – plus, increasing data collection capabilities thanks to advances in sensor electronics integration.

Wearables that track heart rate, sleep, and physical activity levels are already widely used for sports and fitness purposes, and now diagnostic wearables are primed to deliver innovation for more challenging wellness and medical applications. From diet tracking to cancer detection – diagnostic wearables represent a world of opportunity.

However, the path to bringing these products to market is not without its challenges. In this survey, we explore the market drivers and issues impacting a new generation of diagnostic wearables, including the tradeoffs design engineers in this game-changing field must face – from form factors and battery considerations to data collection and management.



METHODOLOGY AND PARTICIPANTS



Research Goal

The primary research goal was to understand the experiences and attitudes of design engineering stakeholders responsible for wearable diagnostics.



Methodology

This report is based on an online survey consisting of 21 multiple choice and rating scale questions. Design engineering stakeholders from a variety of sources were invited to participate. For the purposes of this survey, design engineering stakeholders are defined as engineers focused on the design process or managing a design engineering team responsible for the development of wearable diagnostic products. Respondents were asked a variety of questions related to wearable diagnostic experiences, challenges, and future expectations. Responses were captured between July 27 and August 12, 2022.



Participants

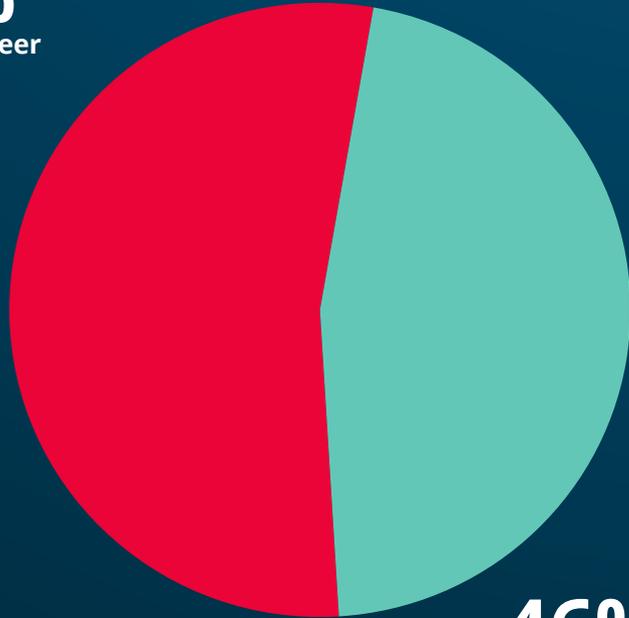
A total of **603 qualified individuals** completed the survey. All worked in design engineering or design engineering management roles for organizations developing wearable diagnostic solutions.

Percentages may not add up to 100% due to rounding.

INDIVIDUALS REPRESENTED

Role

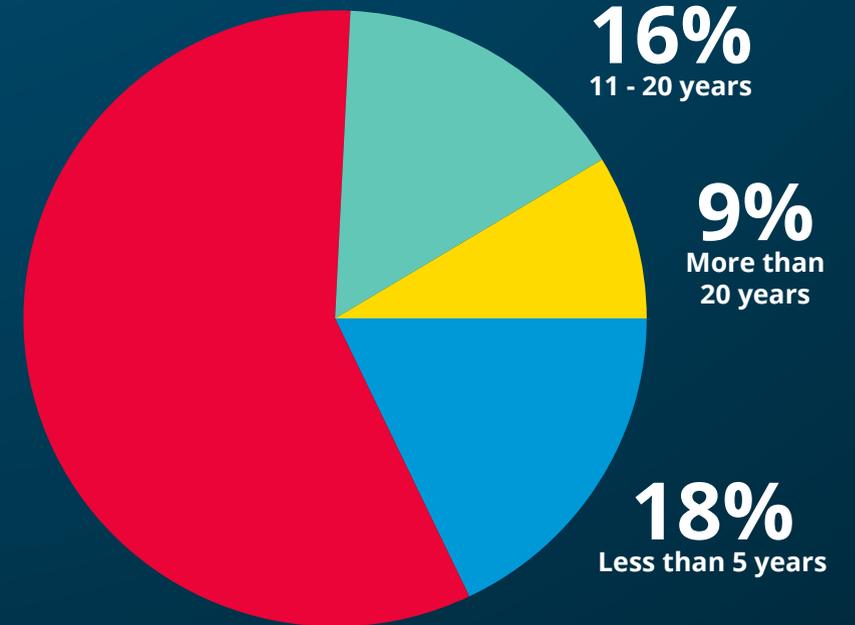
54%
Design engineer



46%
Design engineering
manager

Years of Experience

58%
5 - 10 years



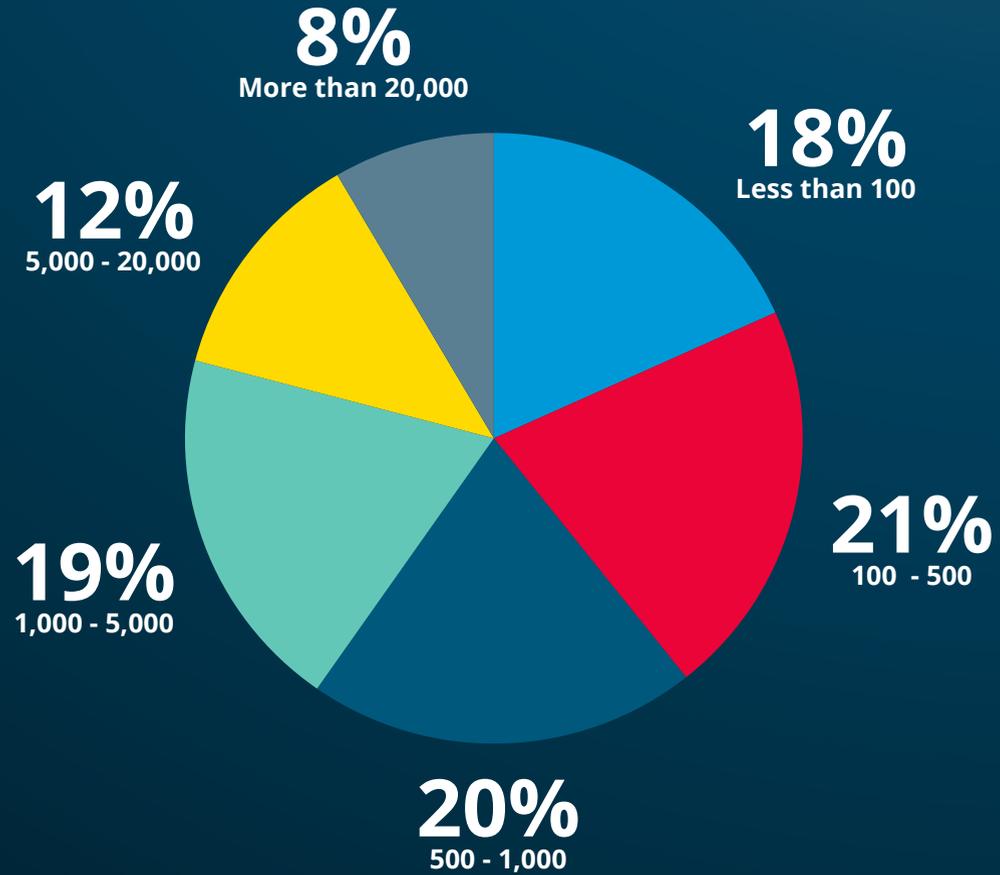
16%
11 - 20 years

9%
More than
20 years

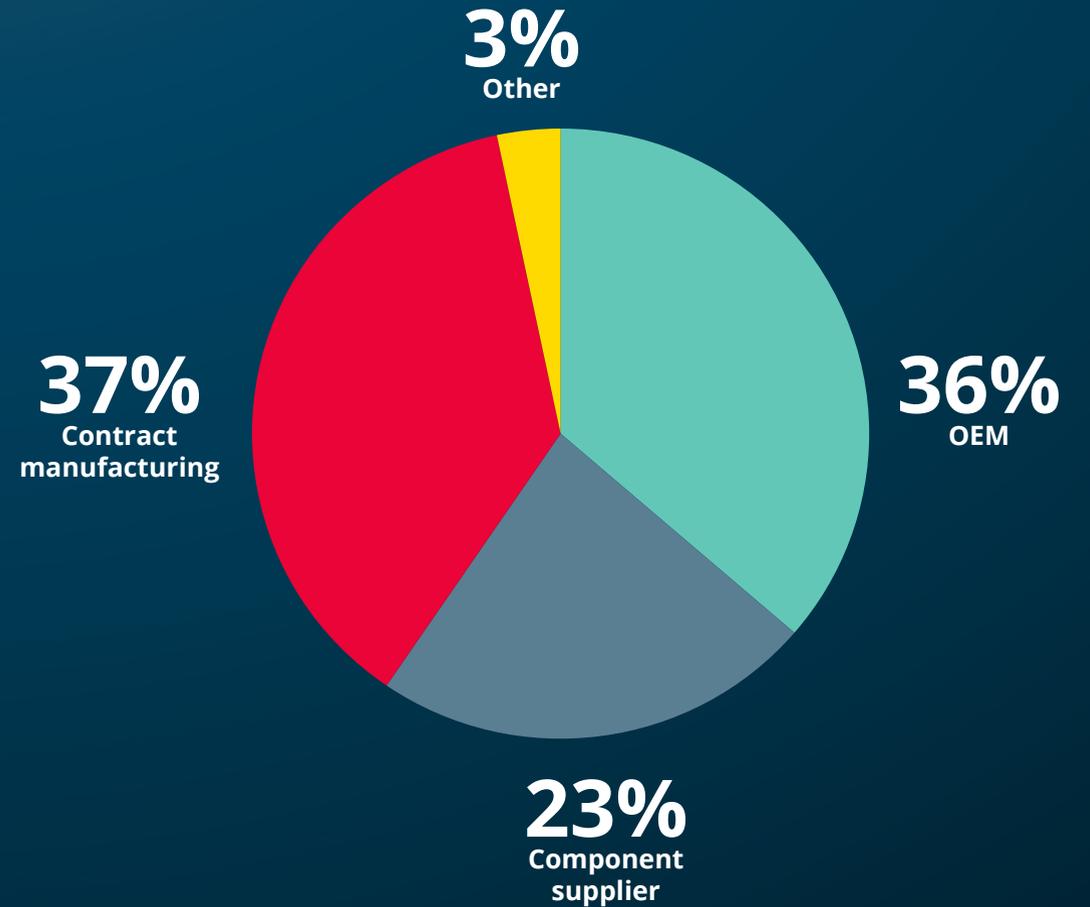
18%
Less than 5 years

COMPANIES REPRESENTED

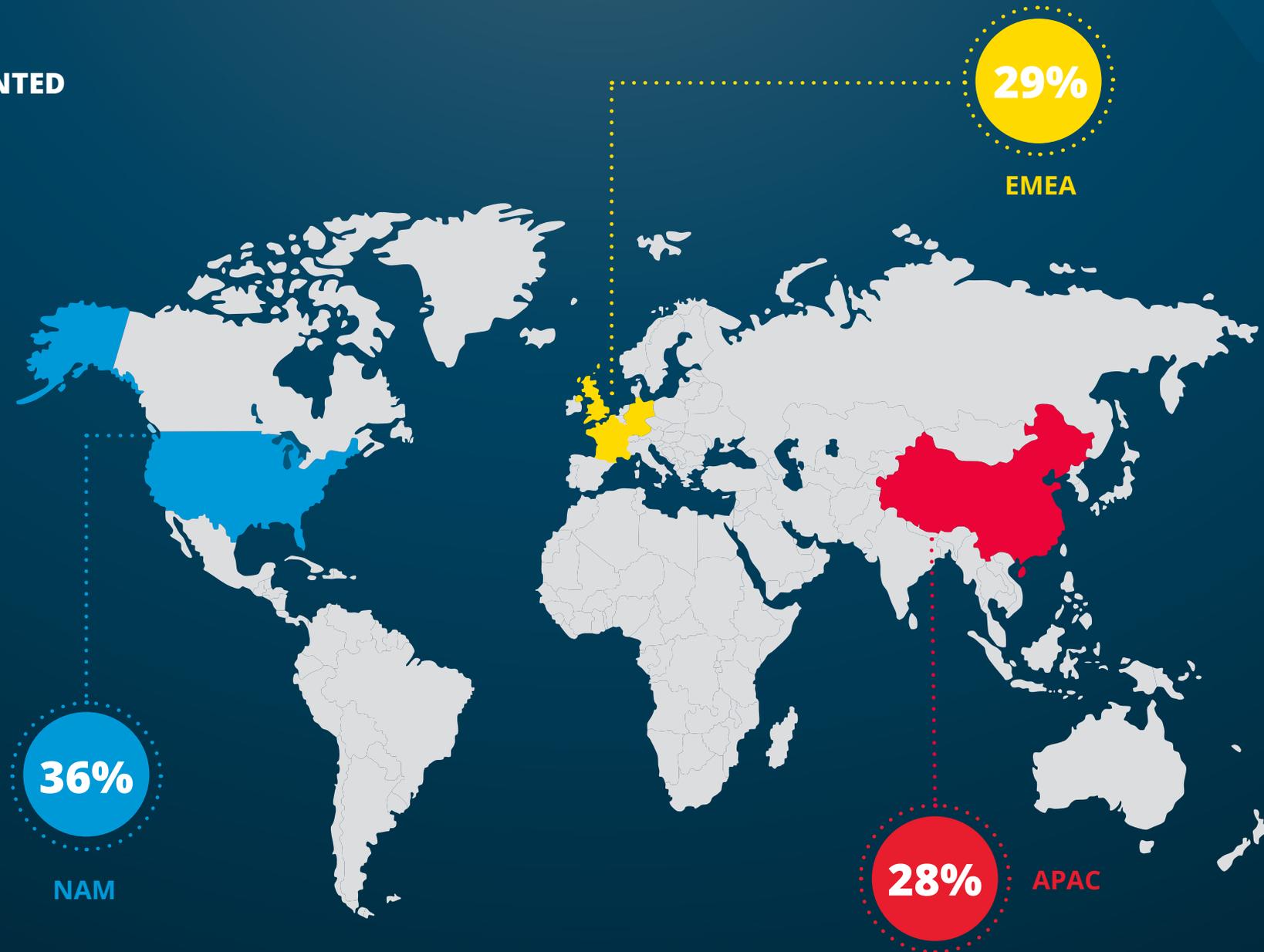
Company Size (# Of Employees)



Type of Company



REGIONS REPRESENTED



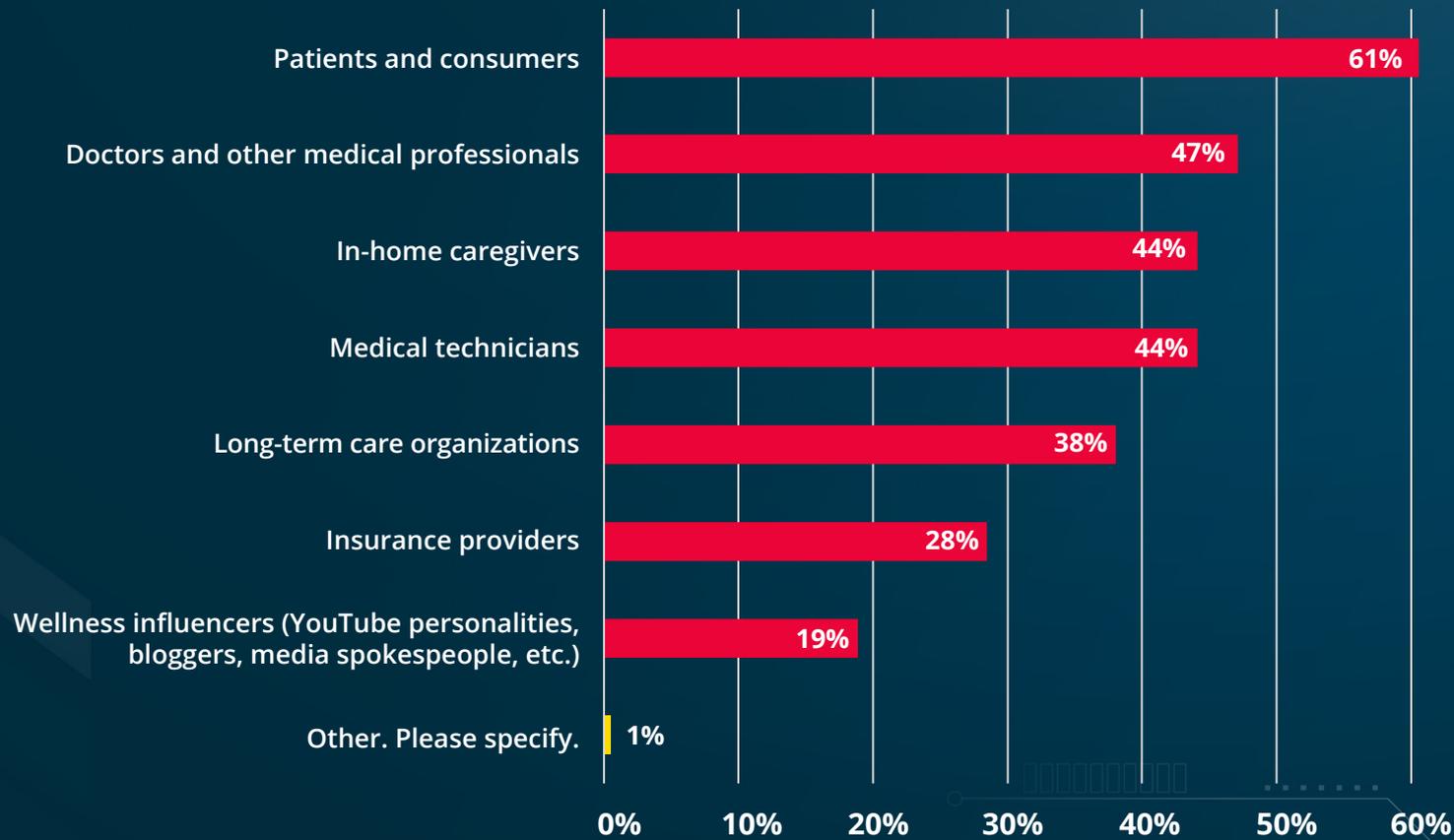
DETAILED FINDINGS

The Next Five Years of Wearable Diagnostics: Barriers, Driving Factors and Opportunities



QUESTION:

In your experience, what types of stakeholders are advocating for increased use of wearable diagnostics? Choose all that apply.

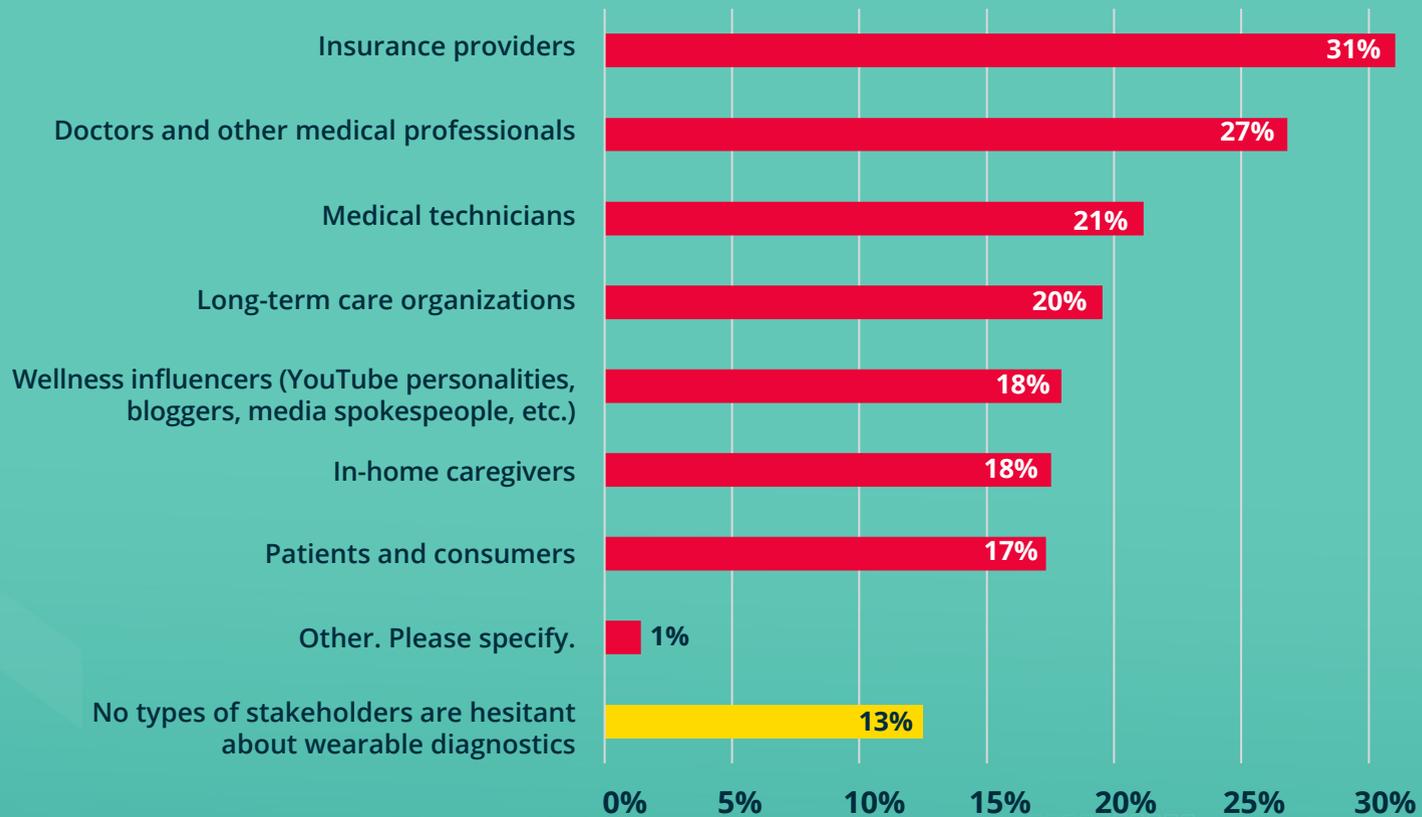


KEY TAKEAWAY:

There are a range of advocates for wearable diagnostics, but patients predominately drive demand.

QUESTION:

In your experience, what types of stakeholders are hesitant or object to increased use of wearable diagnostics? Choose all that apply.



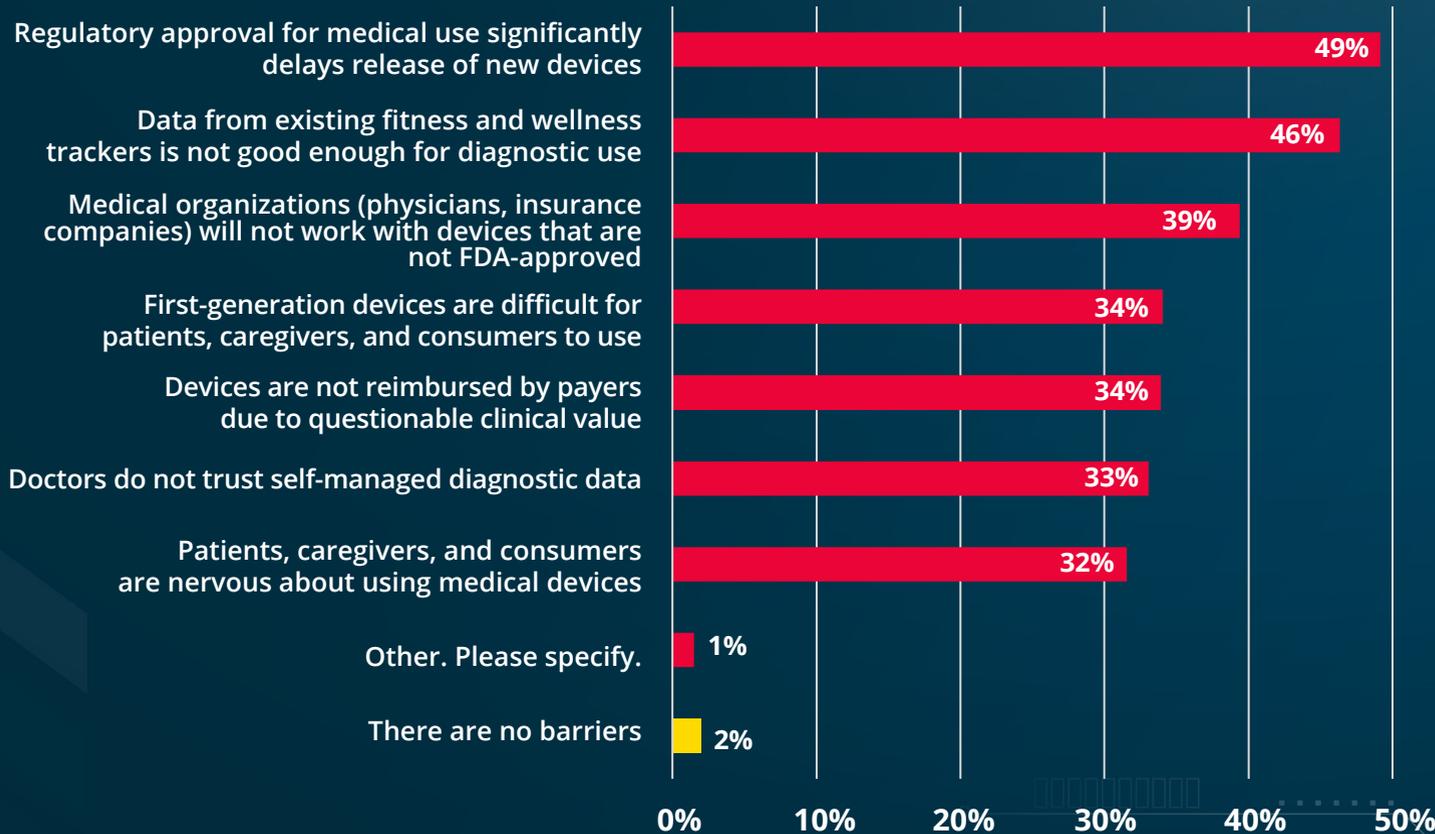
KEY TAKEAWAY:

Some stakeholders are creating drag on the adoption of wearable diagnostics; insurance providers top the list and were also the least likely to advocate for wearables.

QUESTION:

What barriers prevent or delay adoption of wearable diagnostics?

Choose all that apply.

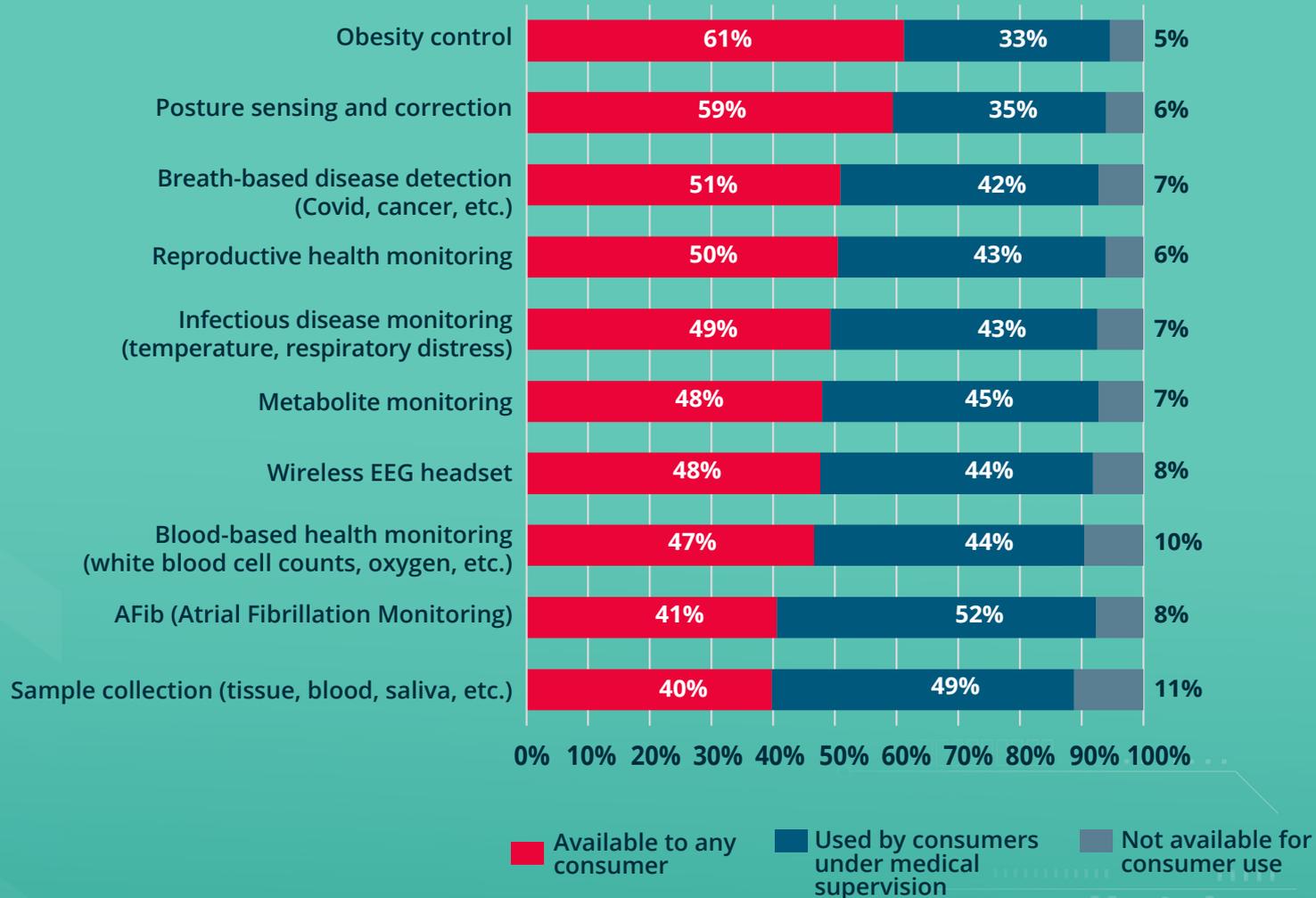


KEY TAKEAWAY:

98% predict barriers to the adoption of wearable diagnostics, mainly citing issues around approval and questions about utility of the data.

QUESTION:

For each of the following types of wearable diagnostic applications, please indicate your expectations of their availability for use by patients, caregivers, and consumers within the next five years.



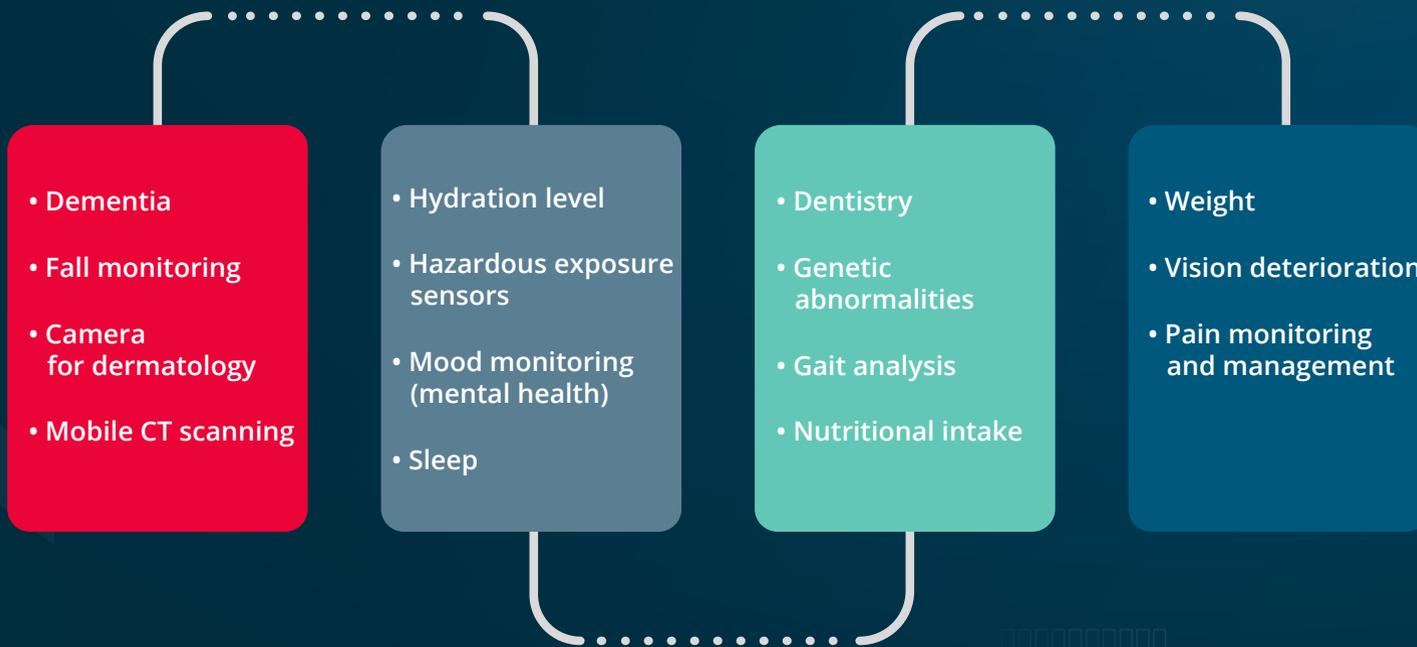
KEY TAKEAWAY:

Design engineers expect consumer use to increase in the next five years, but the perceived need for medical supervision is significant. Less than half of most categories are expected to be available to all consumers without medical supervision.

QUESTION:

Not including the examples above, are there other types of new and innovative wearable diagnostics for medical use that you expect to be available for use by patients, caregivers, and consumers within the next five years? If nothing comes to mind, please move to the next question without answering.

Most frequent: Diabetes



**Responses filled in by survey participants.*

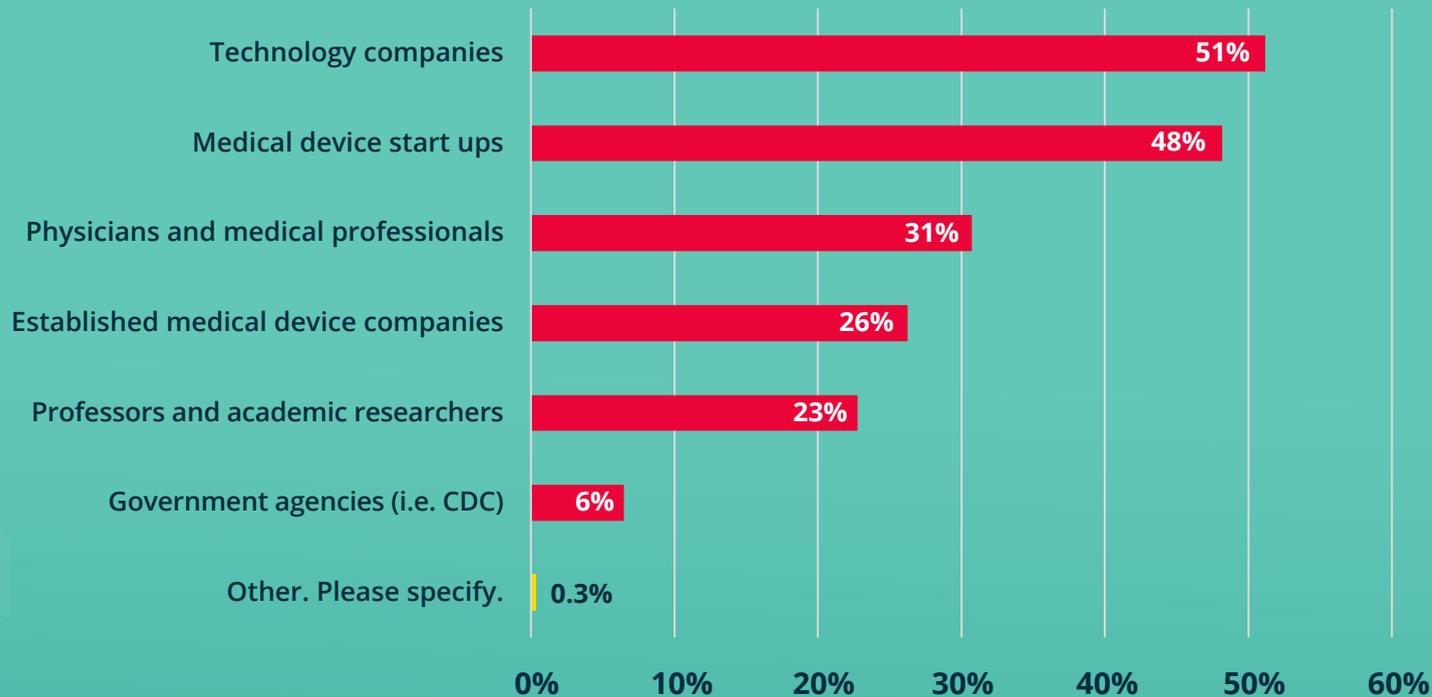
KEY TAKEAWAY:

The potential applications for medical wearables are extensive. Design engineers expect to see a wide range of new types available for consumer use in the next five years.

QUESTION:

What industry players do you expect to lead in driving innovation in wearable diagnostics in the next five years?

Choose up to 2 of the following.

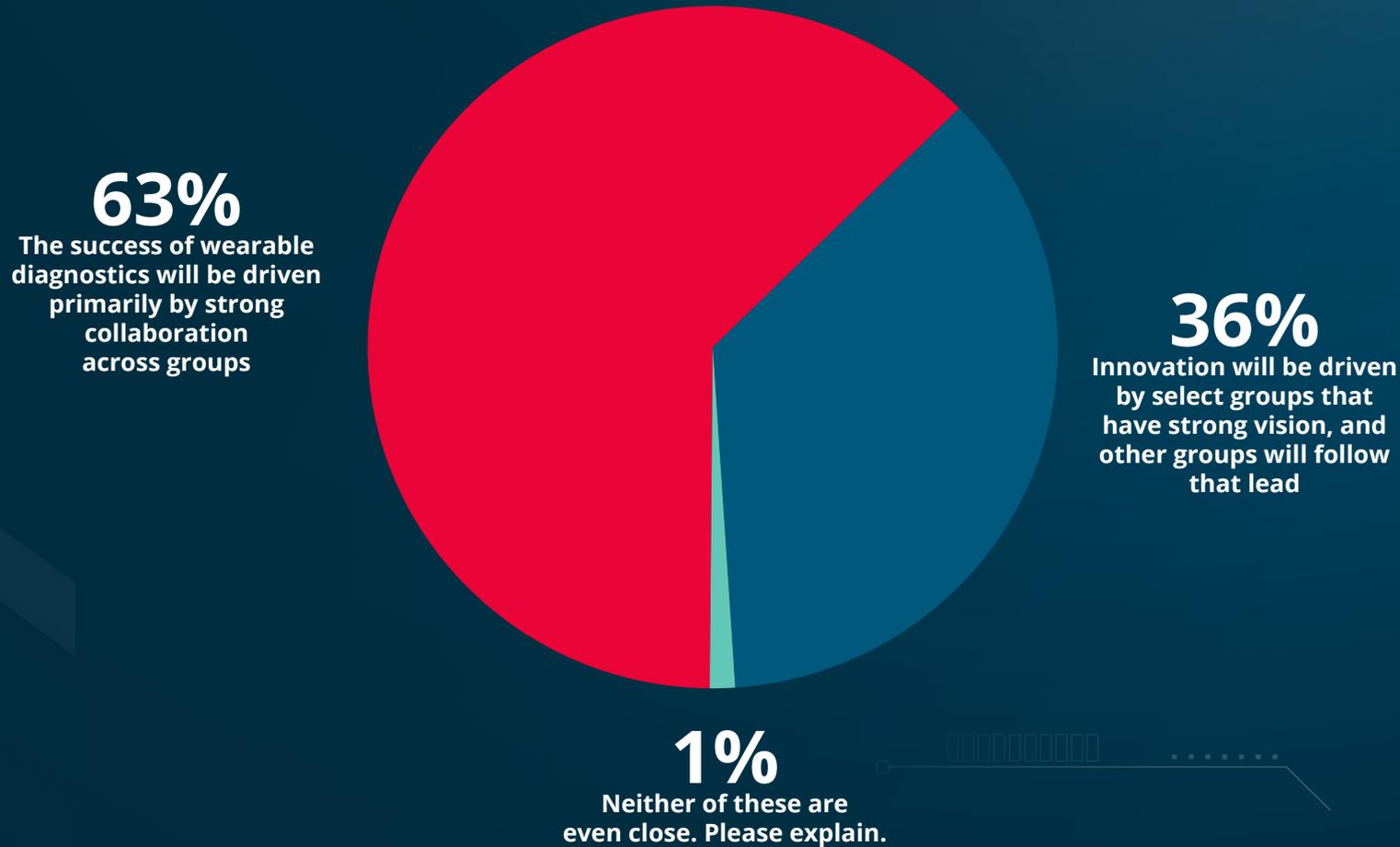


KEY TAKEAWAY:

Tech companies and medical device startups are expected to lead wearable diagnostic innovation in the next five years.

QUESTION:

Which of the following statements best describes your opinion about the importance of collaboration across industry, government, and academia to drive innovation in wearable diagnostics?



KEY TAKEAWAY:

Most engineers believe collaboration across groups will drive innovation in wearable diagnostics.

QUESTION:

Which of the following statements best describes your opinion about the importance of collaboration across industry, government, and academia to drive innovation in wearable diagnostics?

By Region



KEY TAKEAWAY:

The emphasis on collaboration as a driver for innovation varies considerably by region, but APAC (China) was most likely to say collaboration is needed for innovation.

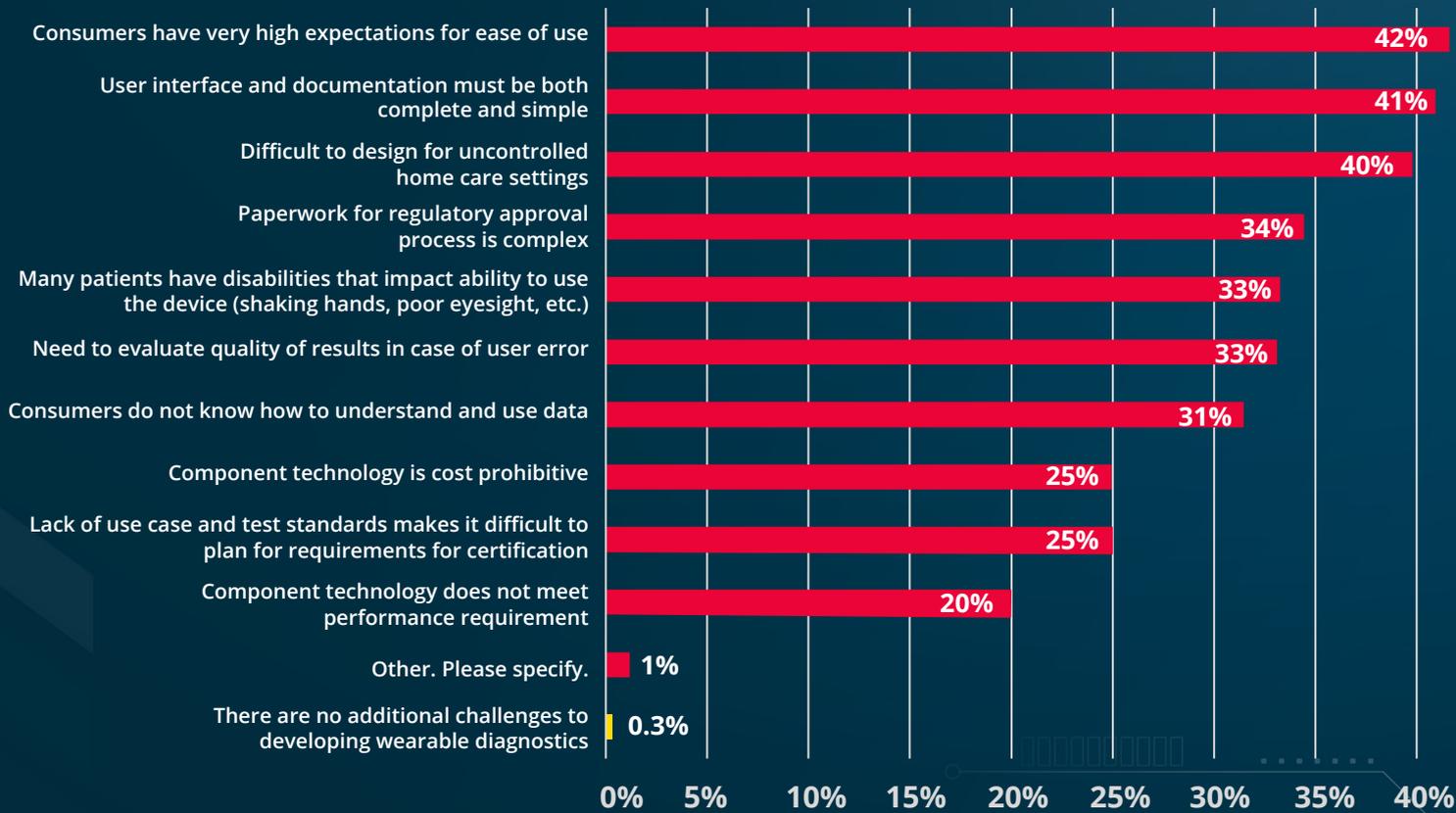
DETAILED FINDINGS

Designing Wearable Diagnostics: Challenges & Tradeoffs



QUESTION:

What additional challenges are faced in designing and delivering wearable diagnostics used by a patient, caregiver, or consumer for medical use as compared to devices to be used by trained professionals in medical or clinical settings? Choose all that apply.

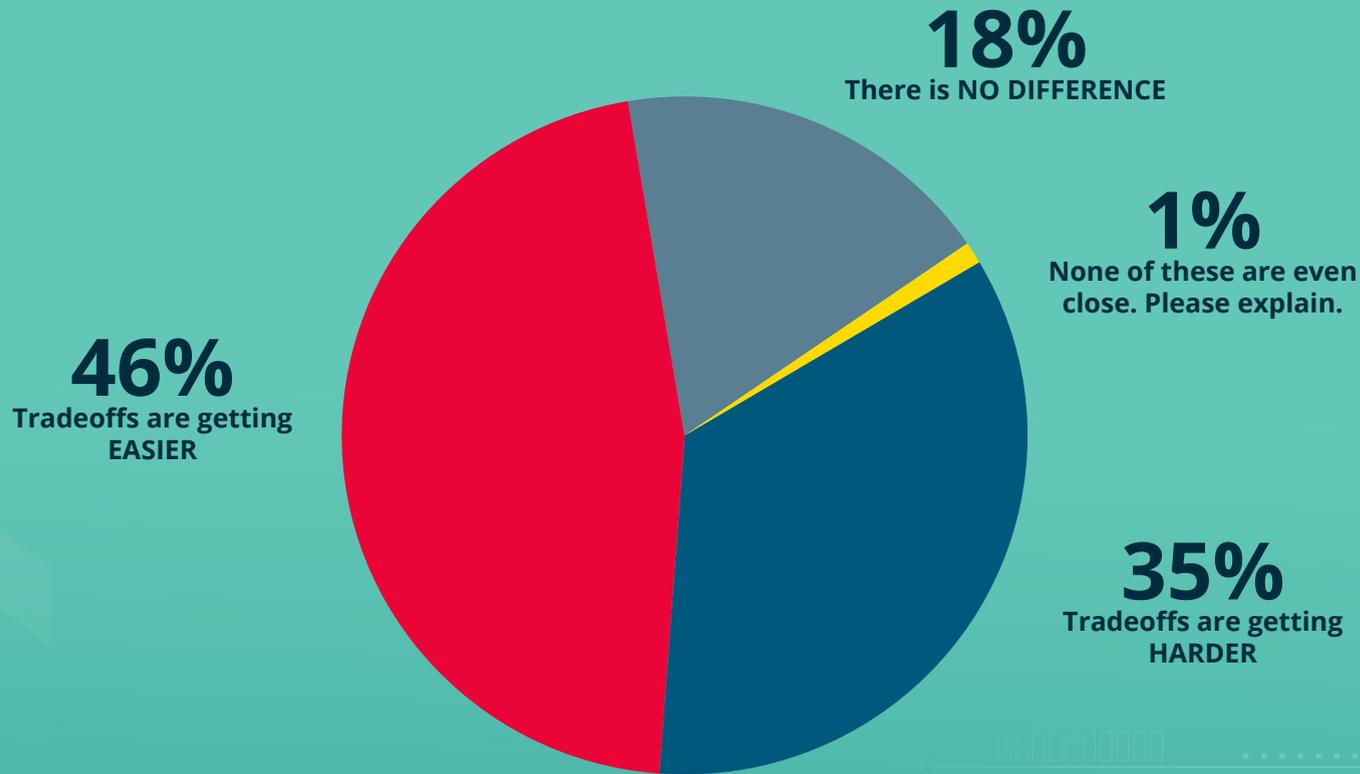


KEY TAKEAWAY:

99.7% of respondents report that wearable diagnostics have additional design challenges, with issues related to ease of use and user interface cited most often.

QUESTION:

Understanding and choosing acceptable design tradeoffs is key to delivering quality solutions that meet customer and business needs. In your experience, how is the job of making design tradeoffs changing for wearable diagnostics devices? Choose the one answer that most closely applies.

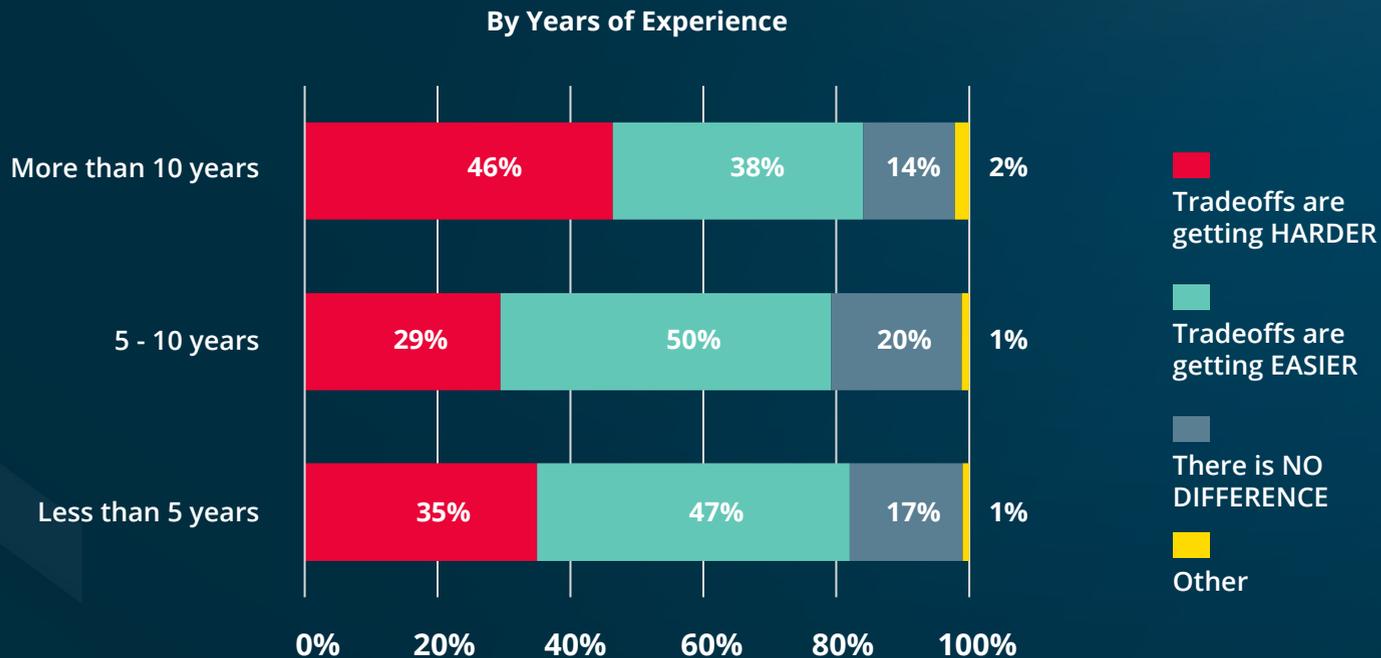


KEY TAKEAWAY:

Only **35%** of engineers see design tradeoffs as getting harder; the majority see a positive or neutral trend.

QUESTION:

Understanding and choosing acceptable design tradeoffs is key to delivering quality solutions that meet customer and business needs. In your experience, how is the job of making design tradeoffs changing for wearable diagnostics devices? Choose the one answer that most closely applies.



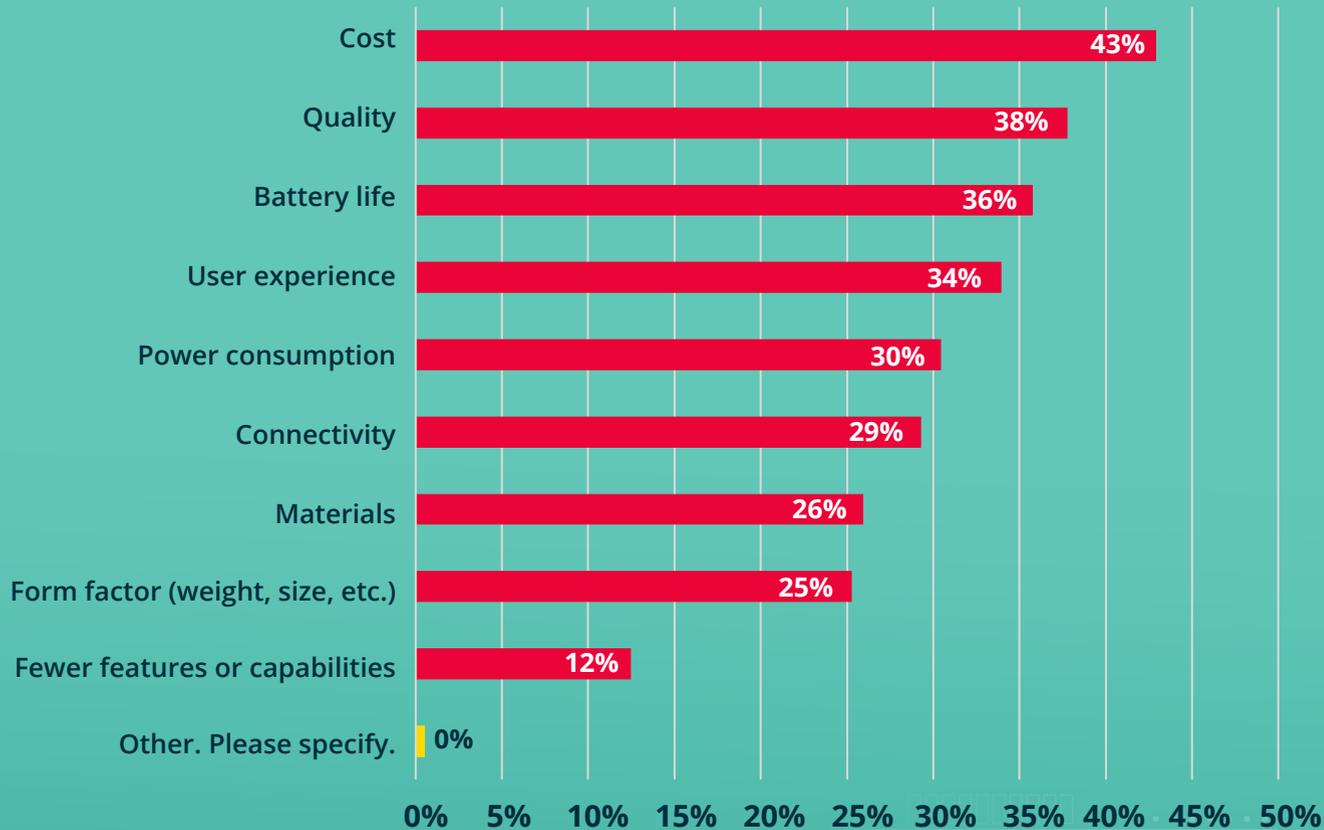
KEY TAKEAWAY:

More experienced engineers are more likely to say design tradeoffs are getting harder, while younger engineers are more likely to say they're getting easier.

QUESTION:

In your experience, what are the most effective areas to focus on when looking for design tradeoffs for wearable diagnostics?

Choose up to 3 of the following.



KEY TAKEAWAY:

When it comes to tradeoffs, the classic battle of cost vs. quality remains king, but issues around power consumption and battery life follow closely behind.

DETAILED FINDINGS

Improving Wearable Diagnostics:

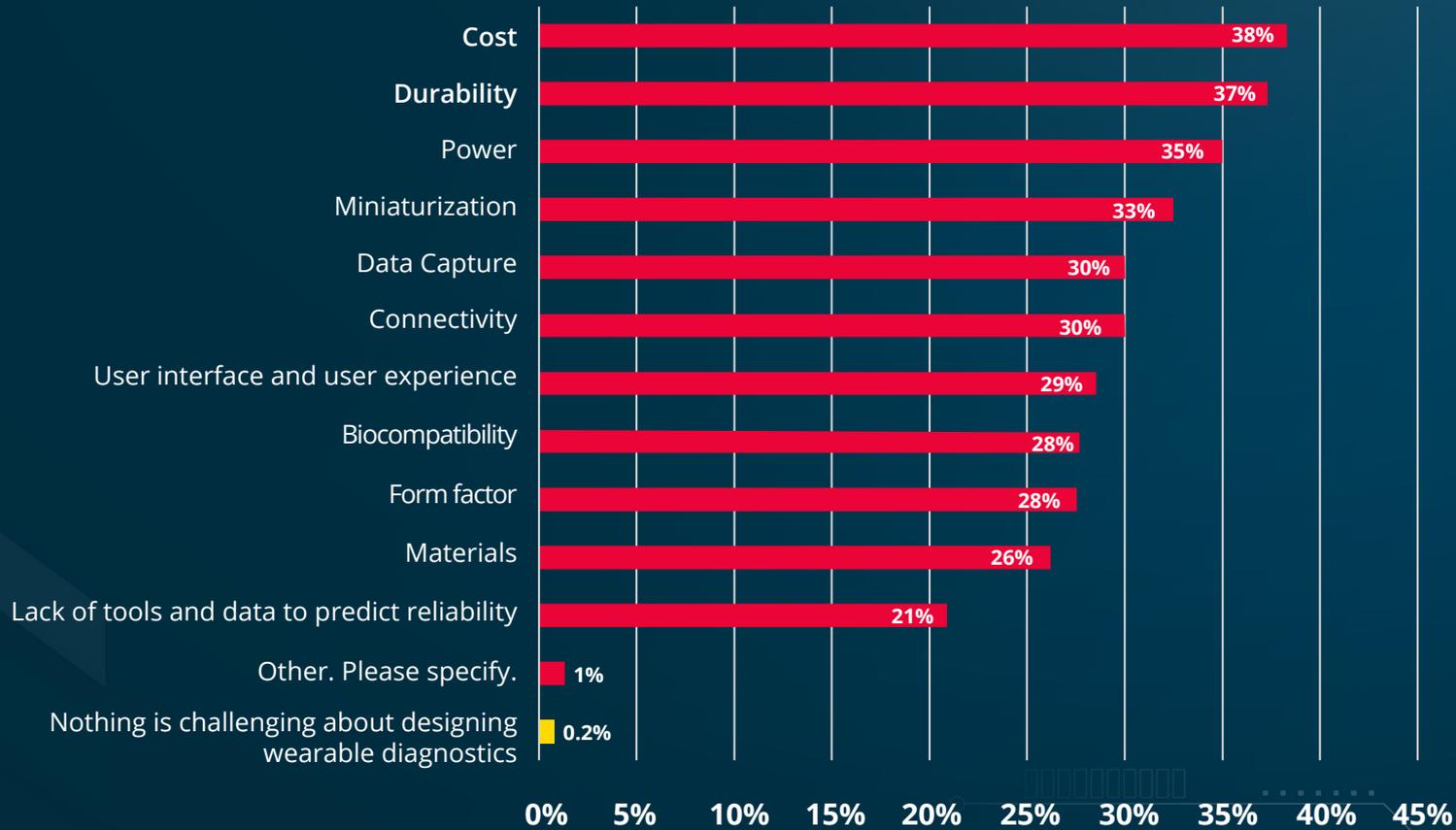
The Need for Innovation
in Materials, Energy,
Sensing and More



QUESTION:

What areas are the most challenging when designing wearable diagnostics?

Choose up to 4 of the following.



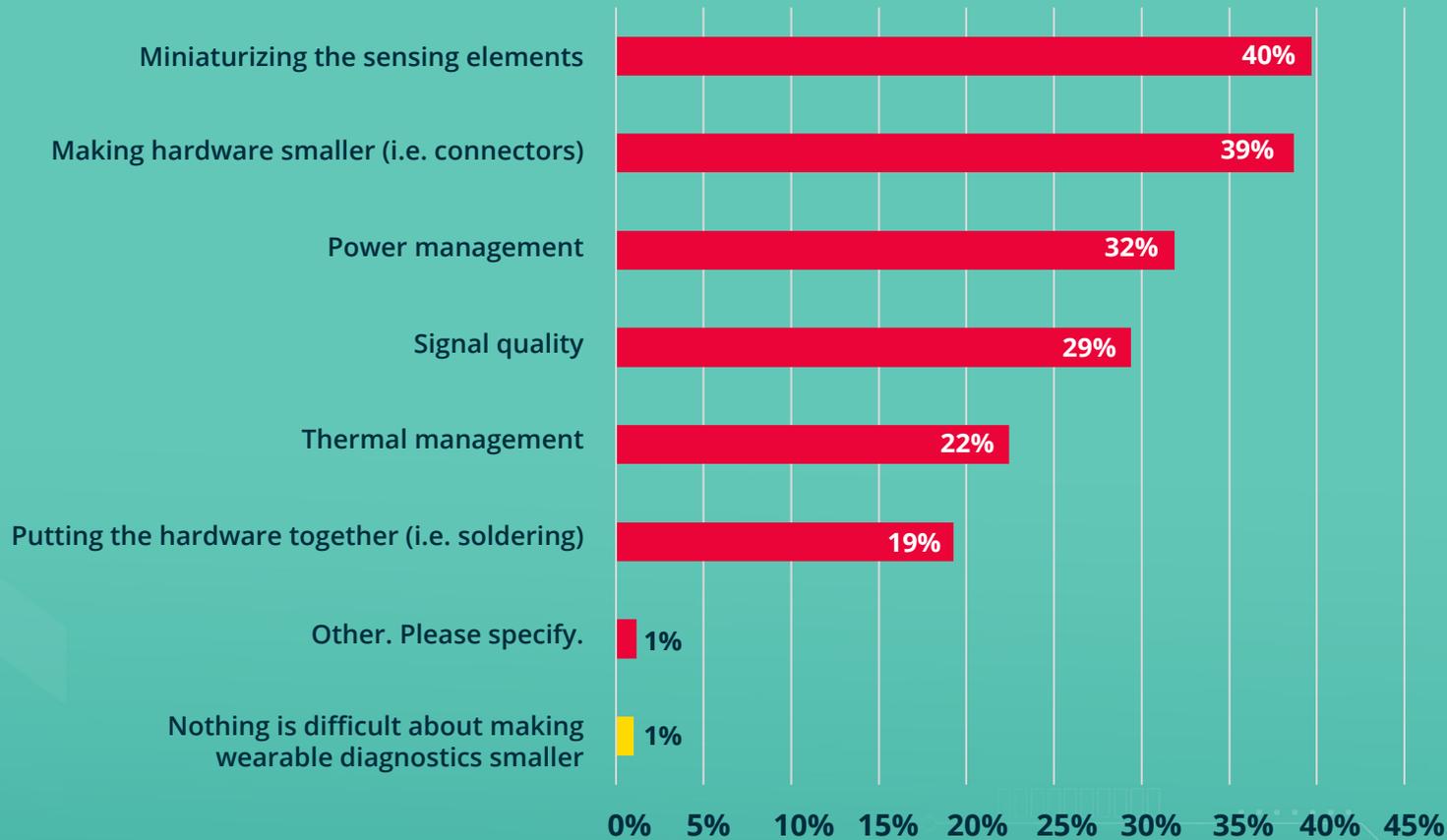
KEY TAKEAWAY:

Cost tops the charts again as the biggest design challenge, but a host of other issues cited are not far behind.

QUESTION:

What is the most difficult part of making wearable diagnostics smaller?

Choose up to 2 of the following.

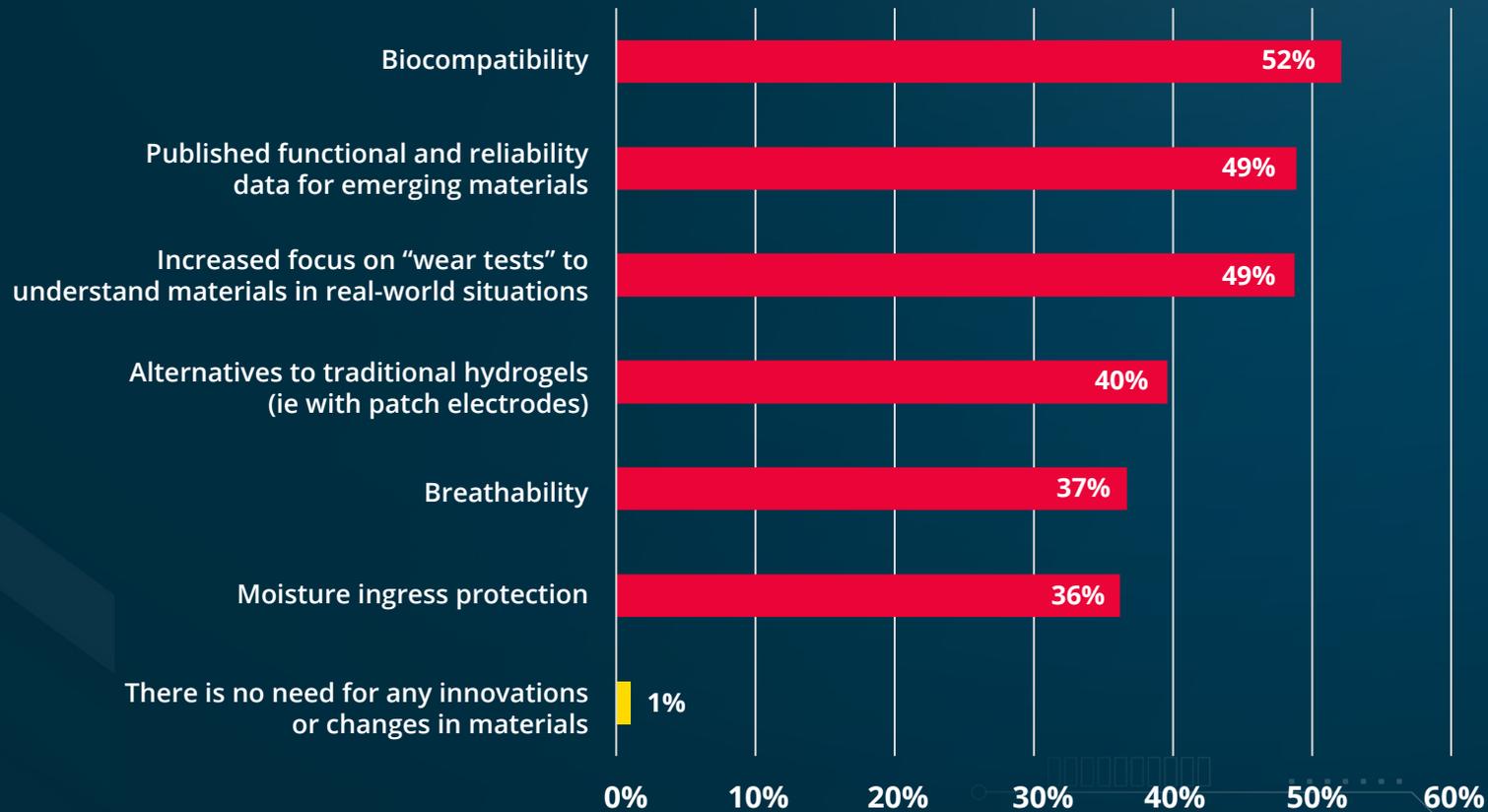


KEY TAKEAWAY:

Sensors and connectors top the list as the most challenging aspects of miniaturization.

QUESTION:

What innovations or changes in materials would improve the ability to design and deliver wearable diagnostics? Choose all that apply.

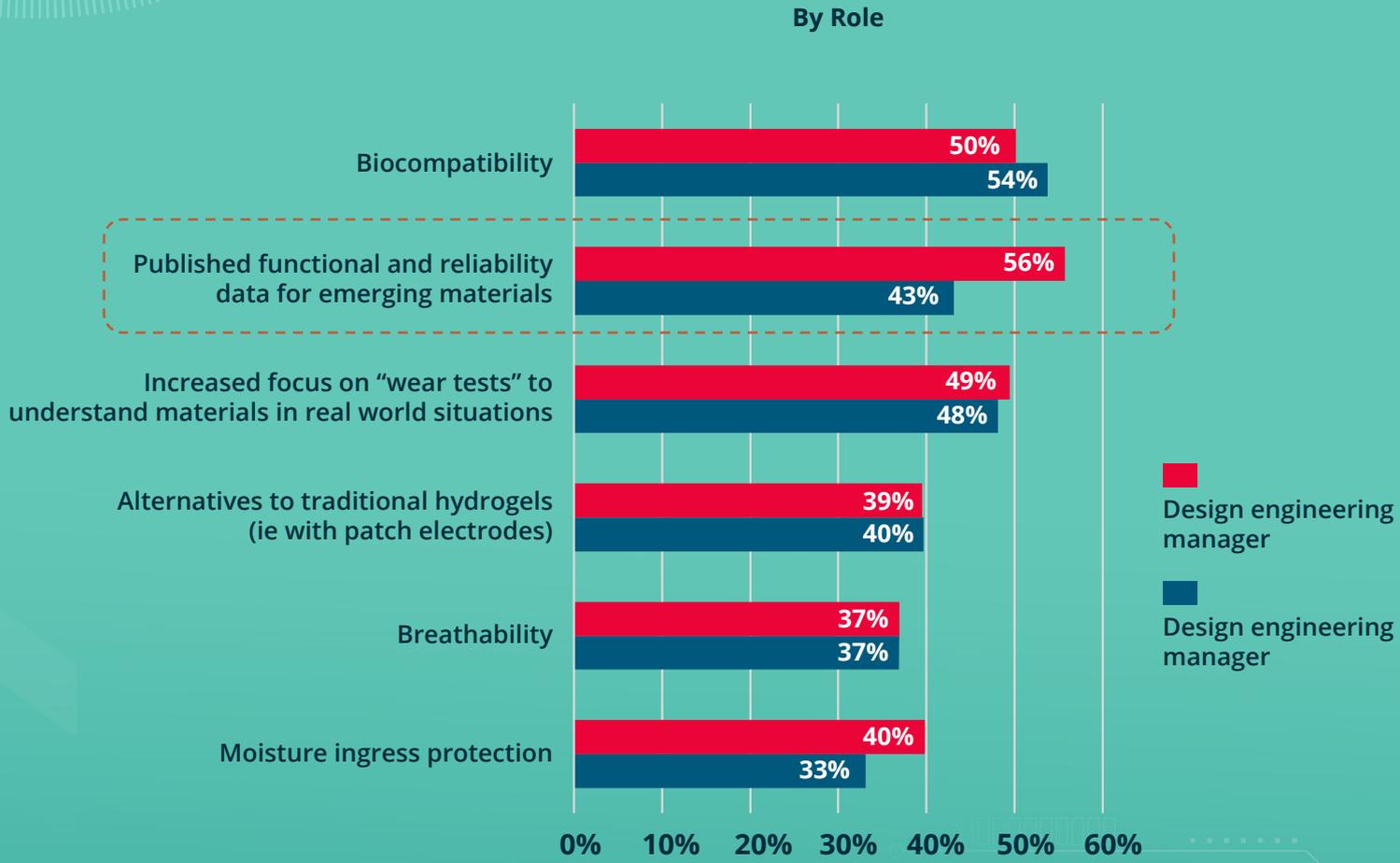


KEY TAKEAWAY:

Design engineers largely see a need for improvement in materials for wearable diagnostics.

QUESTION:

What innovations or changes in materials would improve the ability to design and deliver wearable diagnostics? Choose all that apply.

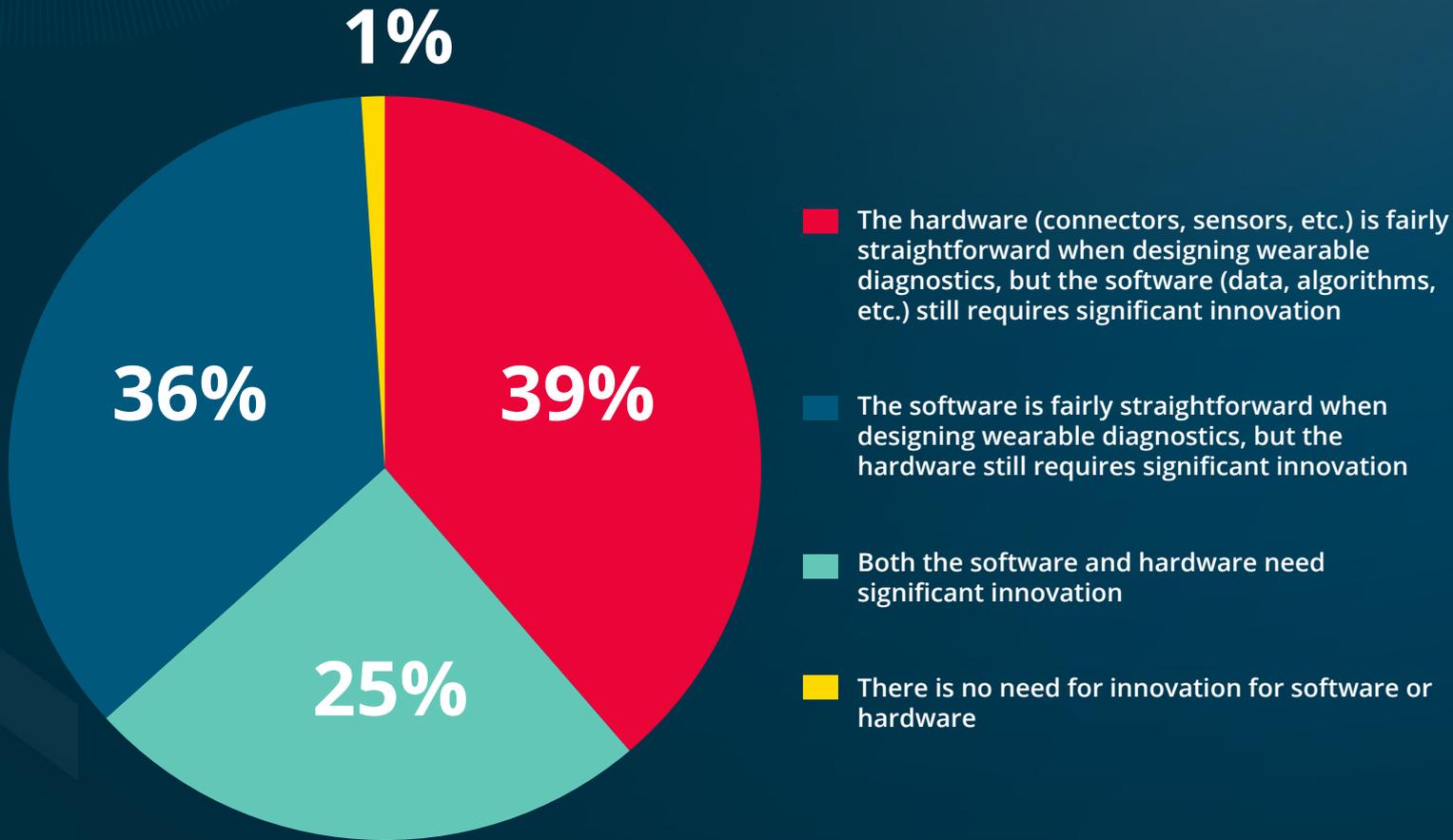


KEY TAKEAWAY:

Design engineering managers are more likely than design engineers to identify a need for published data on emerging materials.

QUESTION:

Which of these statements most closely reflects your opinion?

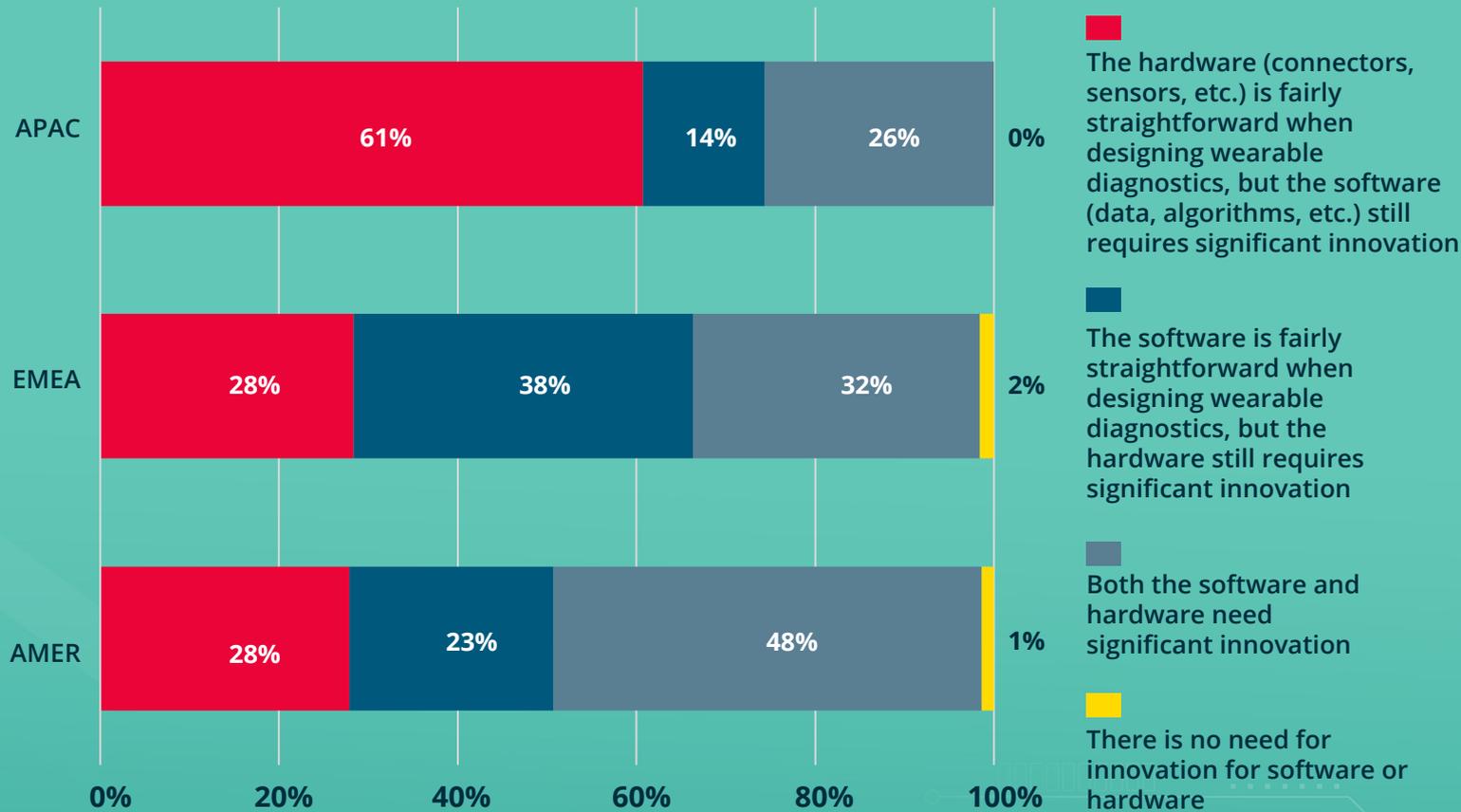


KEY TAKEAWAY:

There is broad agreement that innovation is needed, with over **60%** of engineers highlighting the need for hardware innovation.

QUESTION:

Which of these statements most closely reflects your opinion?

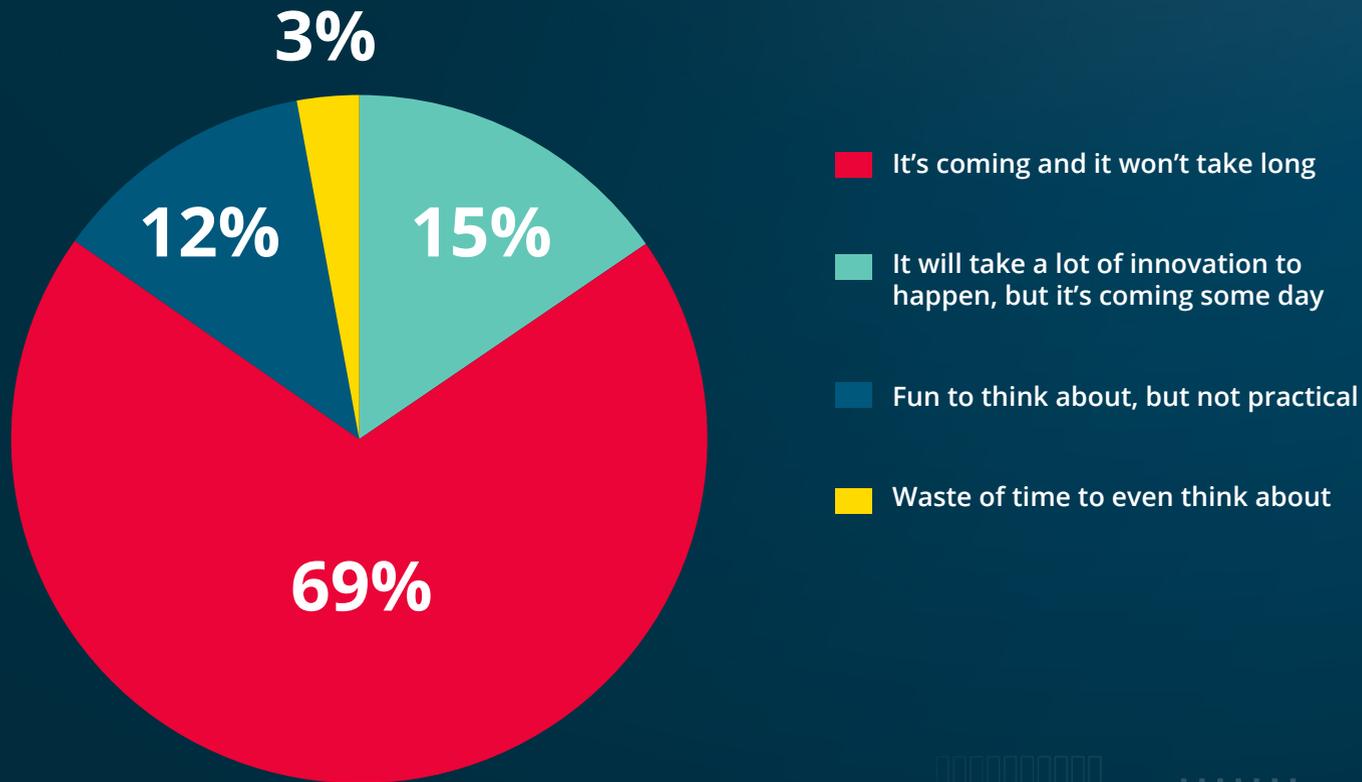


KEY TAKEAWAY:

APAC (China) is more than **2x** as likely as EMEA or NAM to point to software as needing innovation.

QUESTION:

What is your personal opinion about harvesting patient energy (i.e. body heat, sweat, heart beat) to power wearable diagnostics? Choose the one answer that most closely applies.



KEY TAKEAWAY:

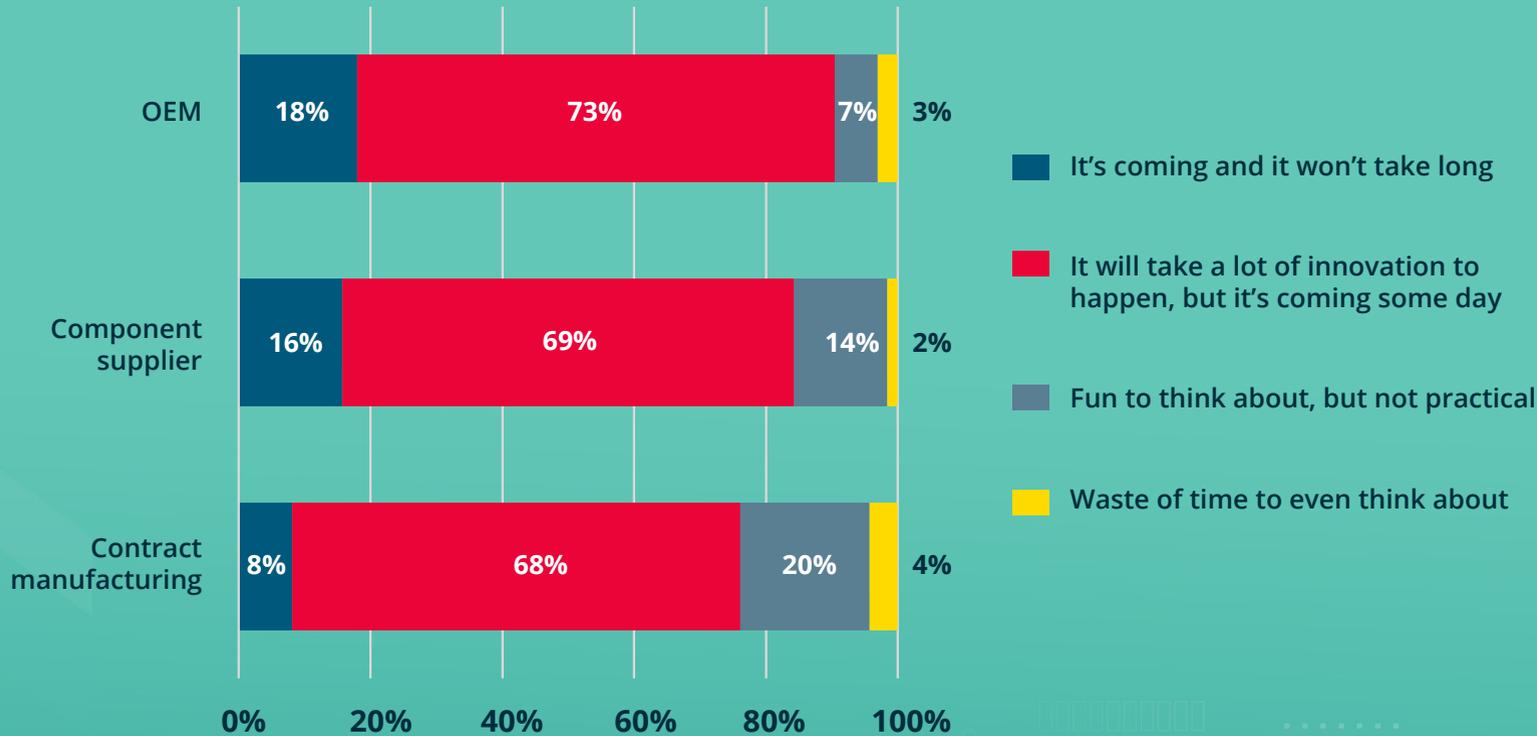
Design engineers believe in energy harvesting, but overwhelmingly predict it will take time.

QUESTION:

What is your personal opinion about harvesting patient energy (i.e. body heat, sweat, heart beat) to power wearable diagnostics?

Choose the one answer that most closely applies.

By Company Type

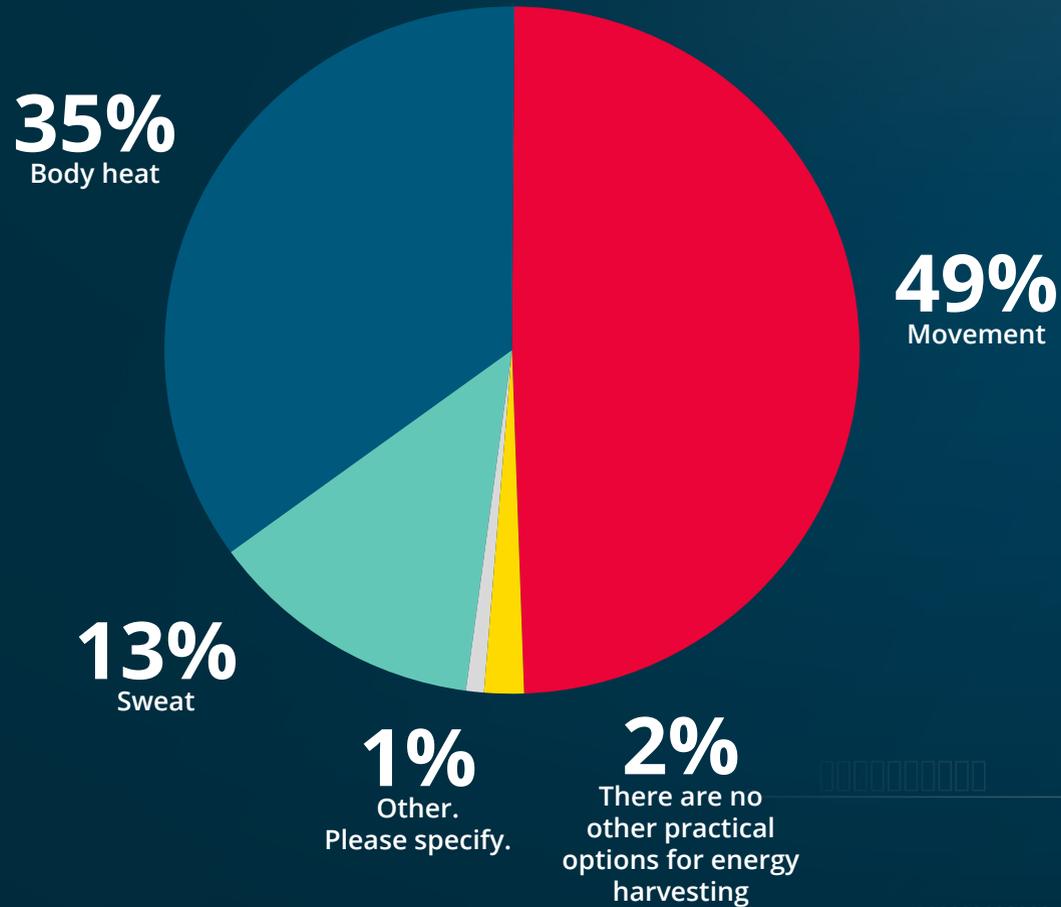


KEY TAKEAWAY:

OEMs are a bit more optimistic about the potential for energy harvesting – about **20%** see it happening very soon.

QUESTION:

Solar is an established source of energy harvesting for wearable devices. In your opinion, what other type of energy harvesting is the most likely to have practical applications for wearable diagnostics? Choose the one answer that most closely applies.

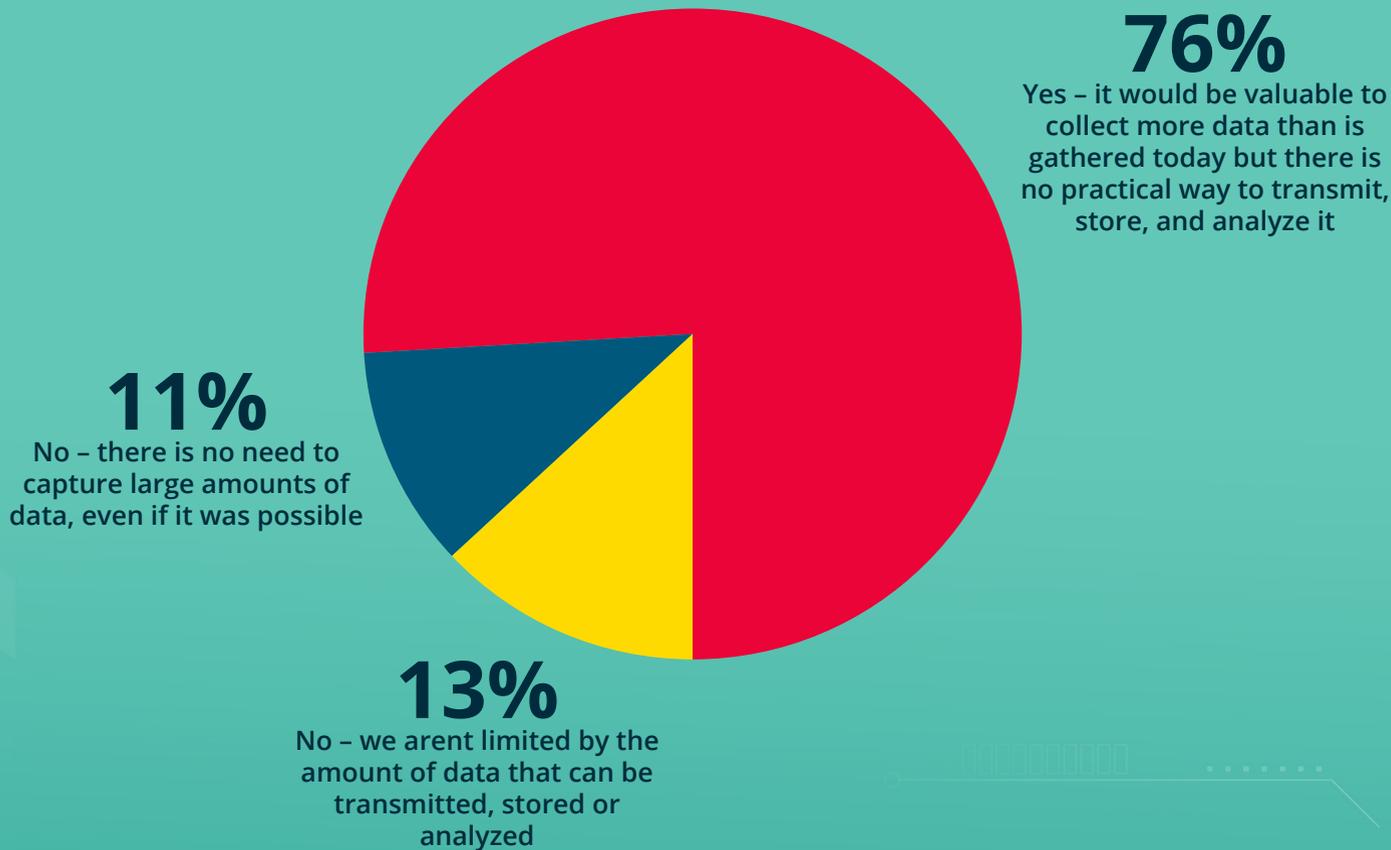


KEY TAKEAWAY:

Movement is considered the most likely source of energy harvesting by a wide margin.

QUESTION:

Are connectivity constraints currently impacting data collection for wearable diagnostics?

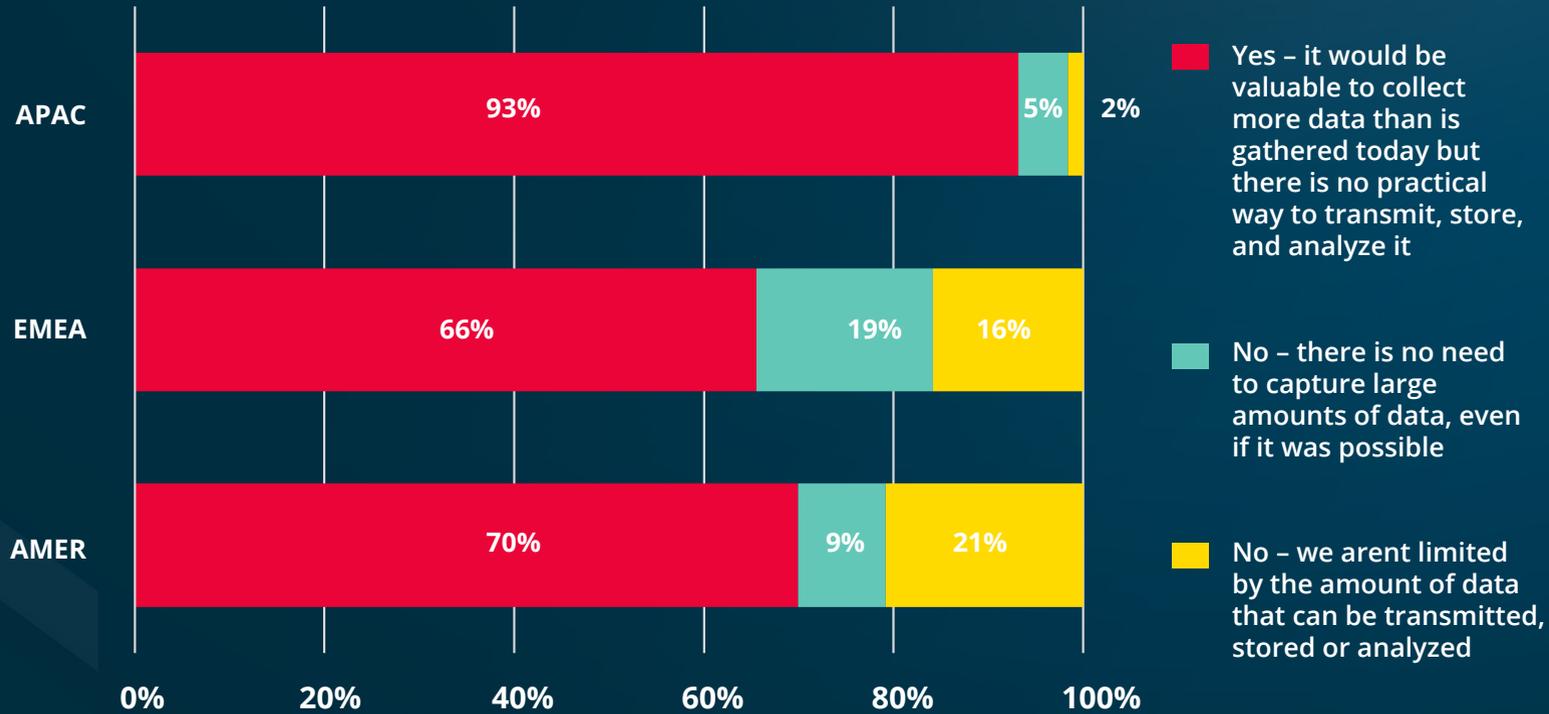


KEY TAKEAWAY:

76% of engineers report that they are impacted by connectivity constraints when collecting data.

QUESTION:

Are connectivity constraints currently impacting data collection for wearable diagnostics?

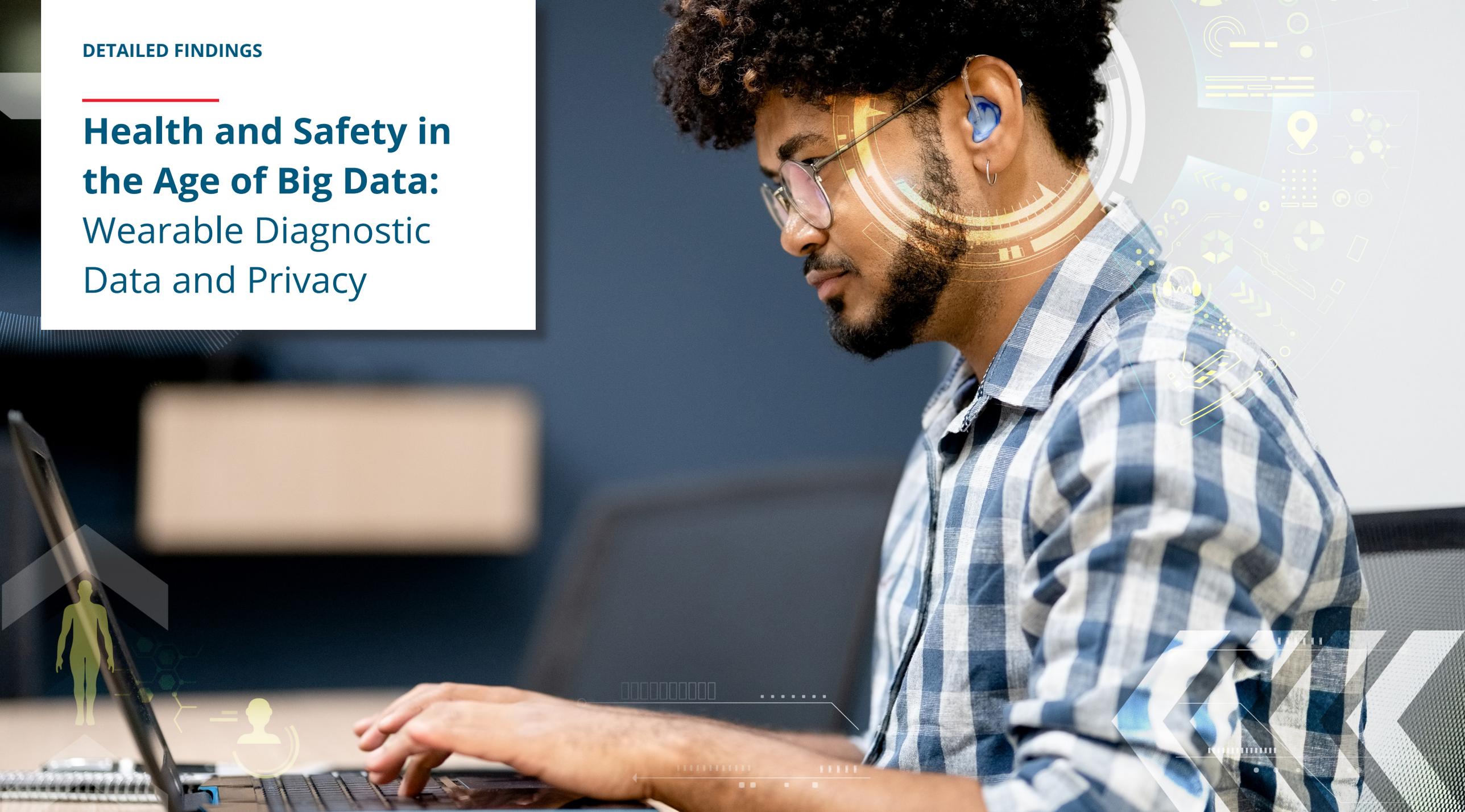


KEY TAKEAWAY:

APAC (China) was much more likely to report struggles with connectivity constraints.

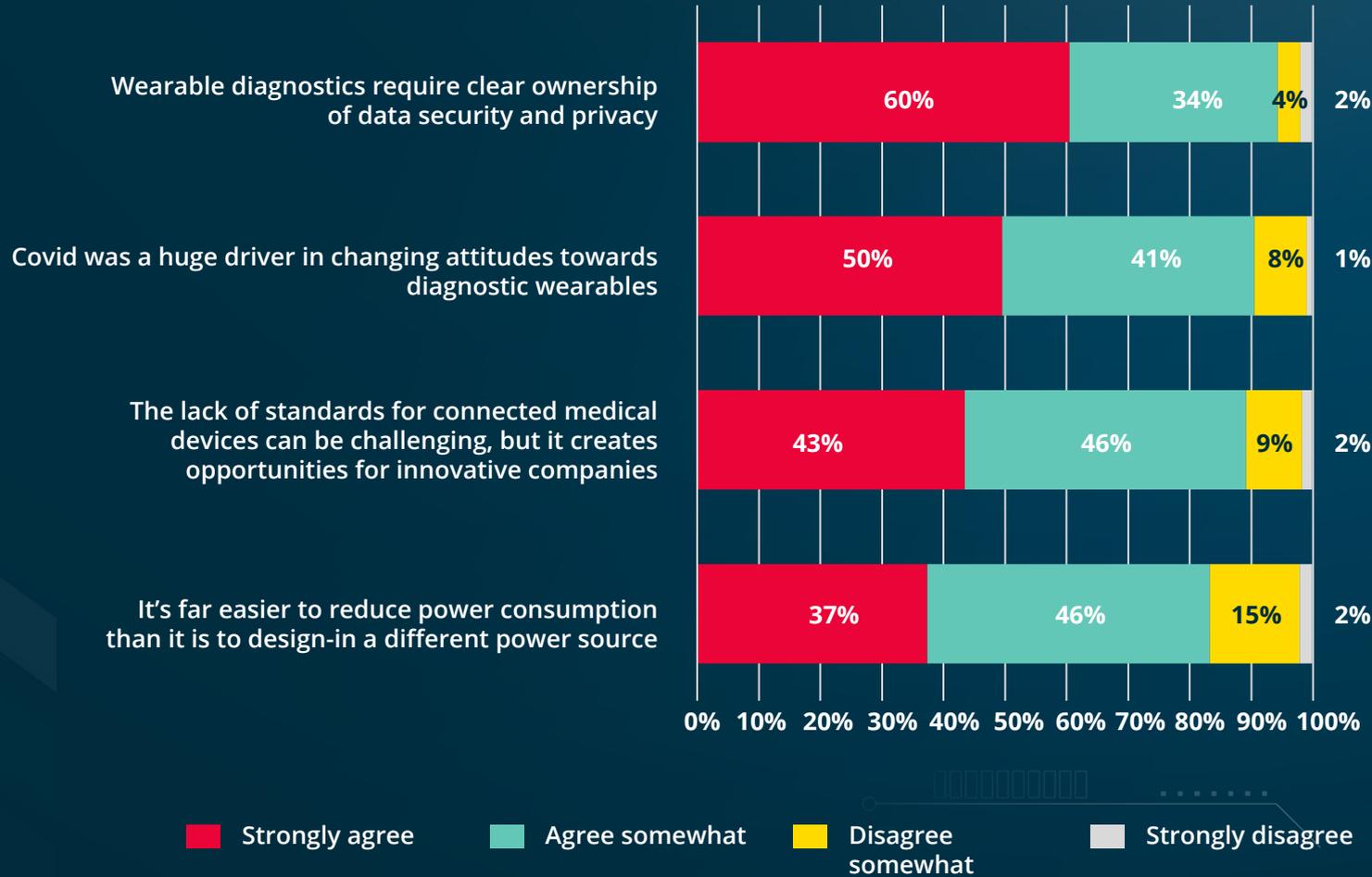
DETAILED FINDINGS

Health and Safety in the Age of Big Data: Wearable Diagnostic Data and Privacy



QUESTION:

Please rate your agreement with each of the following statements.

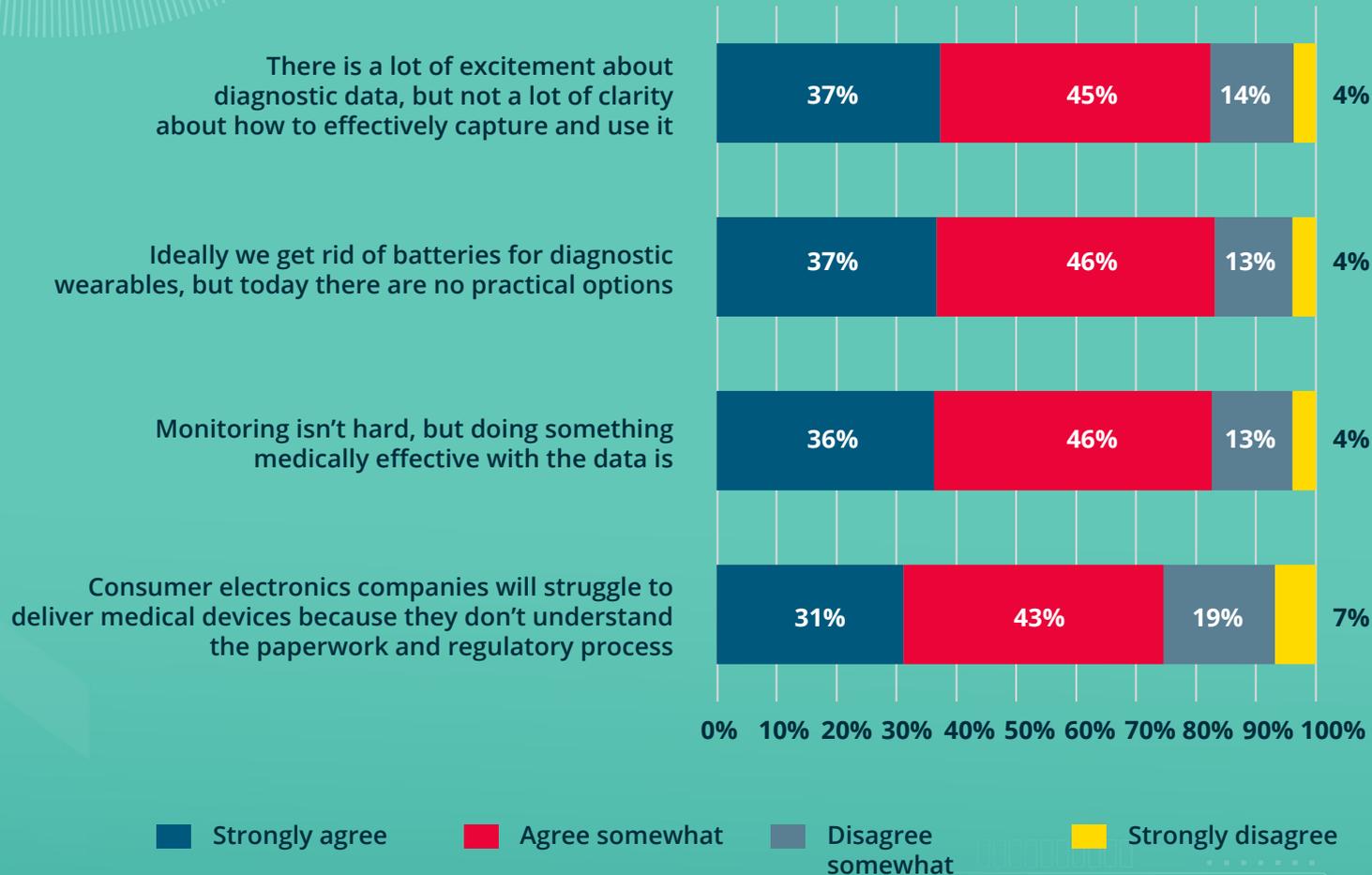


KEY TAKEAWAY:

94% agree that wearable diagnostics requires clear ownership of data security and privacy.

QUESTION:

Please rate your agreement with each of the following statements.



KEY TAKEAWAY:

82% agree there is a lack of clarity on how to capture and use diagnostic data.

DETAILED FINDINGS

General Medical Device Trends:

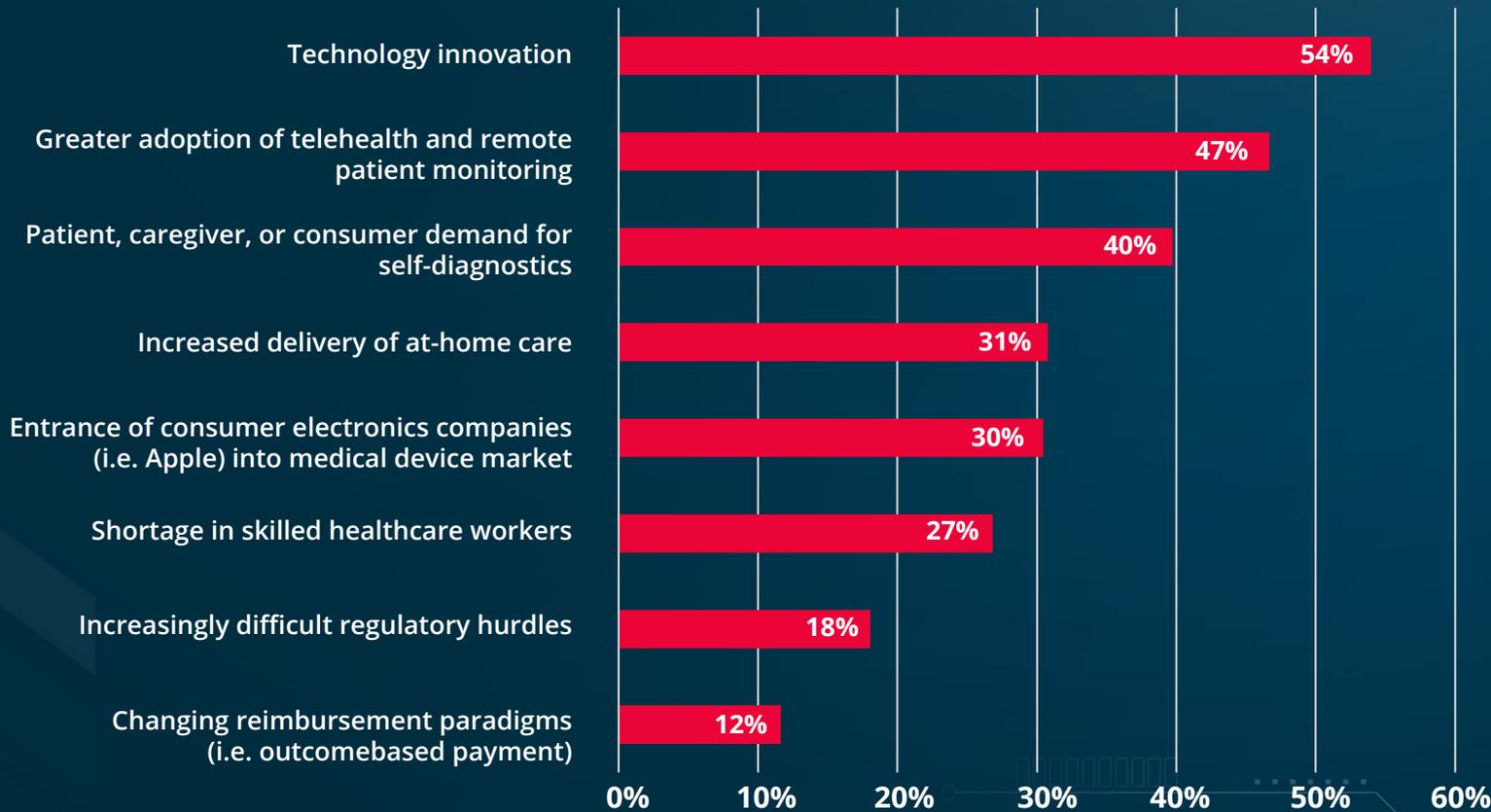
The Impact of Telehealth and COVID



QUESTION:

What market trends do you expect will have the greatest impact on innovation and design requirements of medical devices?

Choose up to 3 of the following.

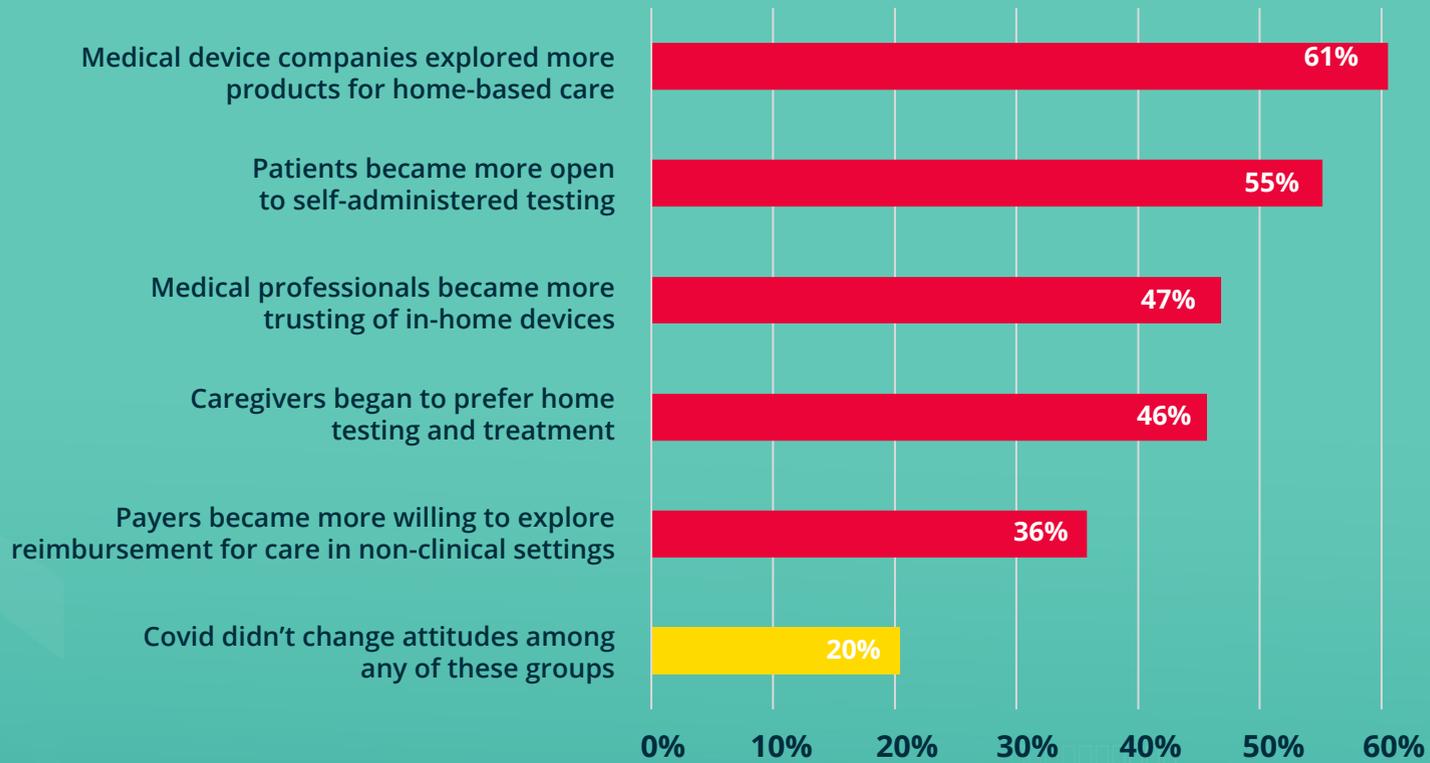


KEY TAKEAWAY:

Technology innovation and adoption of telehealth top the list of medical device trends.

QUESTION:

In your experience, did the Covid pandemic result in a change in attitudes towards the use of medical devices in a non-clinical setting (telehealth, remote monitoring, home use, etc.) among any of the following groups? Choose all that apply.



KEY TAKEAWAY:

80% reported that COVID resulted in changing attitudes towards medical devices in non-clinical settings.

FOR MORE INFORMATION

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