Future of Robotics in the Cathlab

Current practices and future perspectives of robotic use in the cathlab:
an exclusive worldwide survey

Robocath

This survey was conducted by Suazio for Robocath in February 2024. The objective was to evaluate current and future perspectives of robotic use in the cathlab, as well as collect information on user needs to maximize clinical adoption in the near future. It was also a great opportunity to assess radiation concerns and PCI practices in the community 10 years after the SCAI study[1] and to evaluate these concerns on a global scale. All interviews were conducted by telephone. The survey will be repeated over the next few years to monitor perspectives based on future robotic developments in interventional medicine.

About Suazio

SUAZIO part of NAMSA, is a research and consultancy agency that provides far-reaching customer insights for products and services in Medtech markets. SAUZIO with NAMSA provides global end-to-end partnership from concept to commercialization.

About Robocath

Founded in 2009 by Philippe Bencteux, MD, Robocath designs, develops and commercializes smart robotic solutions to treat cardiovascular and neurovascular diseases. As an active player in the digital evolution of the medical industry, its smart connected solutions aim to enhance hand gestures and make medical procedures safer.

Robocath develops robotic solutions which integrate a unique bionic technology that optimizes the safety of robotic-assisted coronary angioplasty. This medical procedure consists of revascularizing the cardiac muscle by inserting one or more implants (stents) into the arteries that supply it with blood. Every 30 seconds, somewhere in the world, this type of procedure is performed. Robocath's robotic solutions are designed to operate with precision and perform accurate movements, creating better interventional conditions. Thanks to their open architecture, they are all compatible with market-leading devices and cathlabs.

In 2019 the company received the CE marking for R-One™, its first robotic solution. In a prospective, multicenter, non-randomized, single-arm clinical trial, R-One demonstrated safety and efficacy as it achieved more than 95% technical procedure success with no MACE (major adverse cardiovascular events). Currently R-One is used in Europe, Africa and China.

By pursuing the development of smart digital solutions, Robocath aims to become a world leader in vascular robotics. Its vision is to guarantee the same access to vascular emergencies treatment through the development of remote interventions, providing the best care option to everyone everywhere at safe. Based in Rouen, France, Robocath has more than 70 employees.

[1] Klein LW, Tra Y, Garratt KN, Powell W, Lopez-Cruz G, Chambers C, Goldstein JA; Society for Cardiovascular Angiography and Interventions. Occupational health hazards of interventional cardiologists in the current decade: Results of the 2014 SCAI membership survey.Catheter Cardiovasc Interv. 2015 Nov;86(5):913-24

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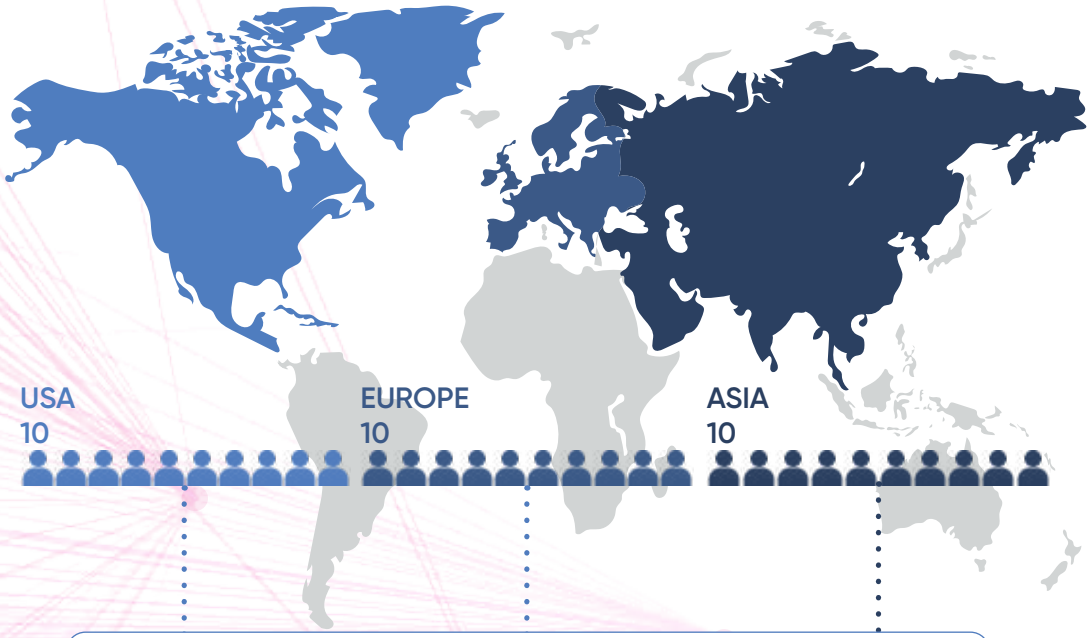
Interventional cardiologists profile



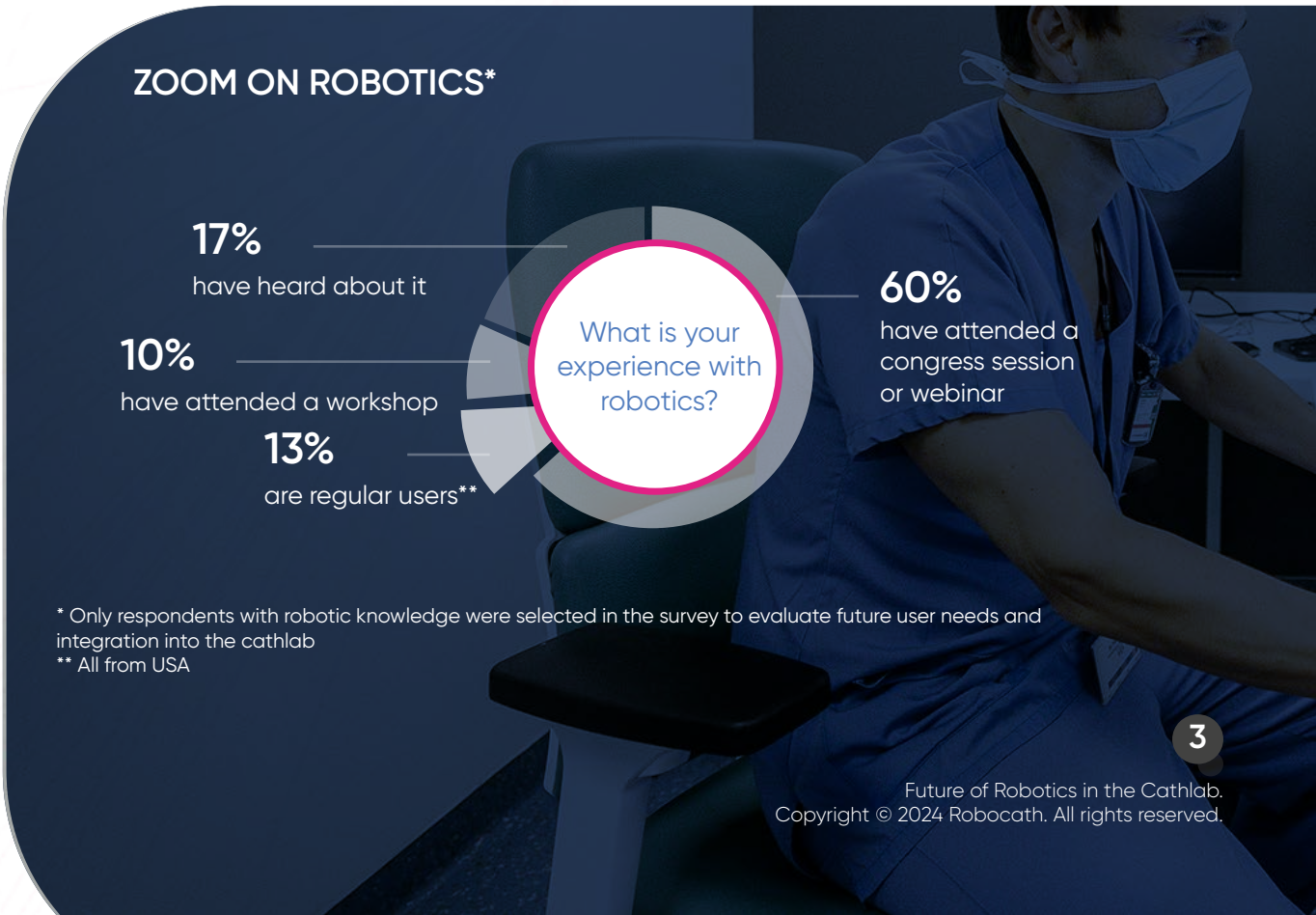
Average number of PCIs per year per operator

339

274

338

ZOOM ON ROBOTICS*



17%
have heard about it

10%
have attended a workshop

13%
are regular users**

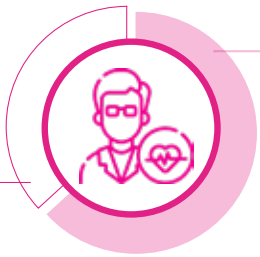
60%
have attended a congress session or webinar

* Only respondents with robotic knowledge were selected in the survey to evaluate future user needs and integration into the cathlab
** All from USA

Interventional cardiologists profile

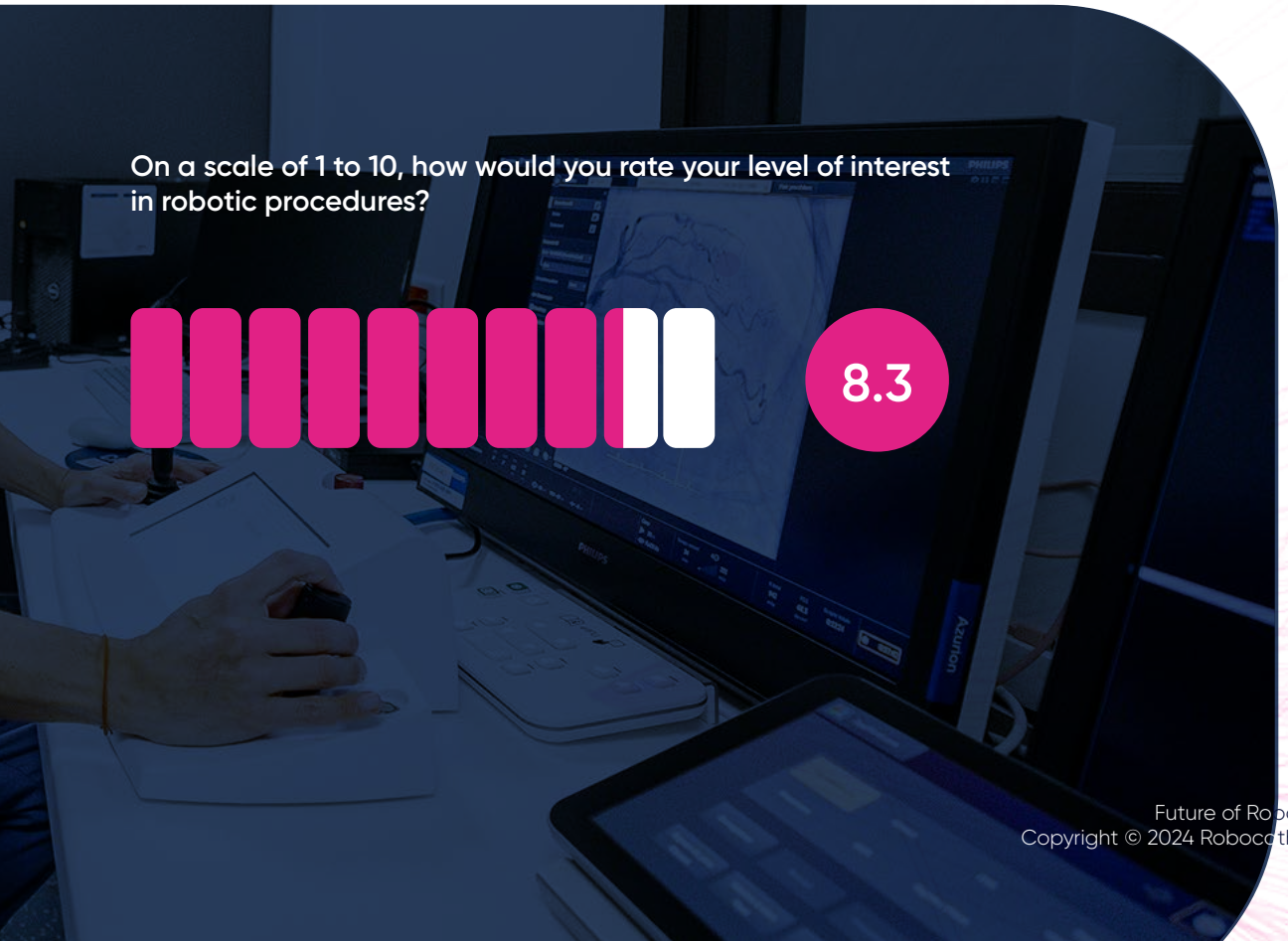
40% of all procedures treated are complex

18 years of experience in the cathlab on average



57%
are heads of interventional cardiology departments

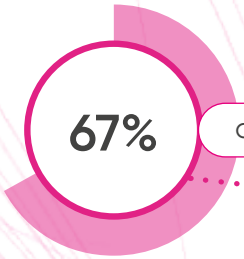
43%
are senior phyisicians



On a scale of 1 to 10, how would you rate your level of interest in robotic procedures?

8.3

Radiation concern



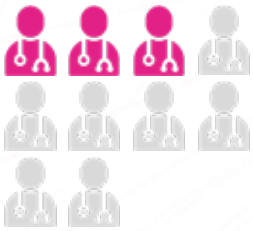
are concerned about **radiation**

Most frequent responses

- Accepted / aknowledged risks (17)
- Know others with Injury (6)
- Currently not protected enough (5)
- Risks relatively unknown (4)
- Injuries isolated to right / left side of body (3)
- Personally have / haf an injury (3)

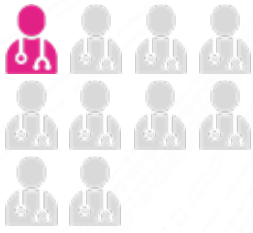
> As an interventionalist, I'm very concerned about radiation damage. **From 1977 until 2017, PCI radiation exposure damage had always been an issue, but a system to protect cardiologists has never been effectively developed**. In 2017, I heard that 18 cardiologists in our field had died from right-sided brain cancer. That was very upsetting. Some of my senior colleagues also died of cancer. Radiation exposure damage should never be underestimated.

Effects on health



3 in 10

are suffering from
musculoskeletal disorders



1 in 10

have taken a **health-related period of absence**
from the lab attributed to an occupational hazard

Radiation dose

23%

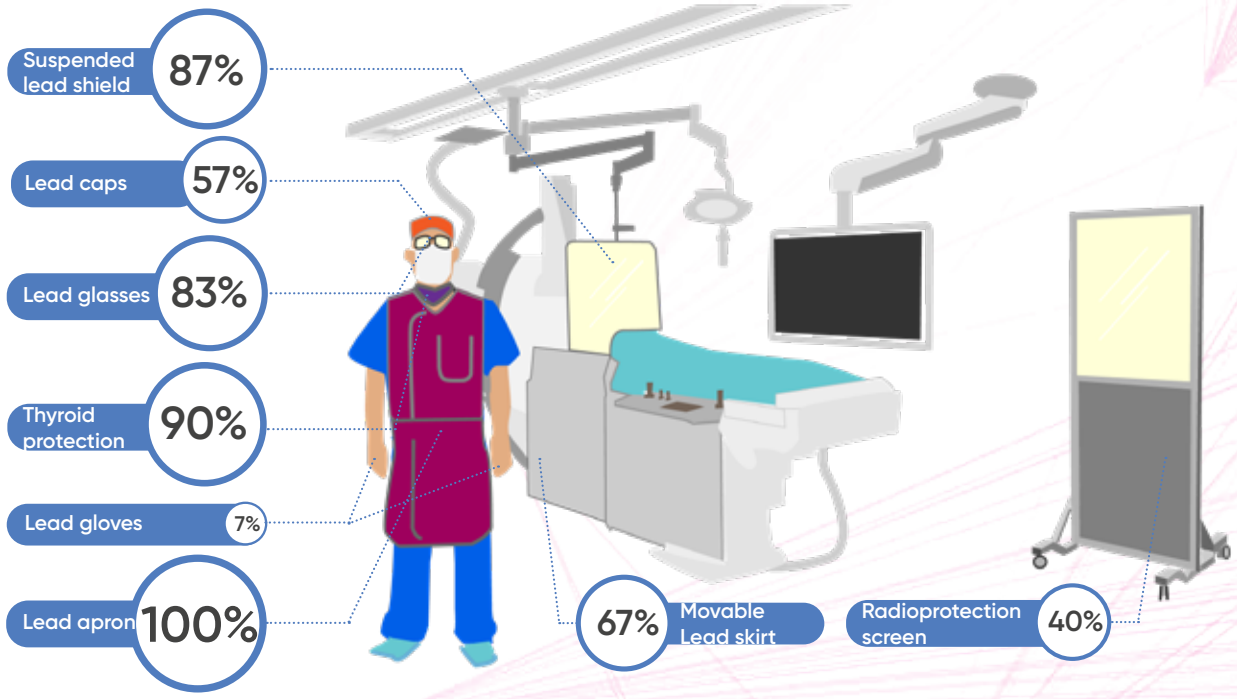
of respondents know their annual radiation dose

Others don't know the exact amount but **50% mention receiving periodic reports**

Radioprotection program

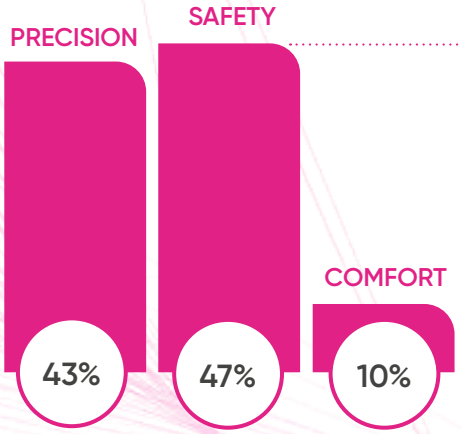
40% don't have a radioprotection program at their centers

Which kind of radioprotection equipment do you systematically wear/use in your current practice?



Robotic benefits

Safety and precision are both perceived as crucial.



43% of respondents consider robotics as the most relevant radioprotection among other solutions, operator operating from the control room

> Mobile shields are small and not handy to use as we have to move them around. Suspended lead apron is too heavy and lacks flexibility .It's also not easy and comfortable to move around. We bought one but now one wants to use it. The Control unit is the best option because it's remote, shielded, and lead-free. It delivers the highest comfort.

Precision

The majority of respondents believe that robotics bring precision to the procedure.

0 = totally disagree
10 = totally agree

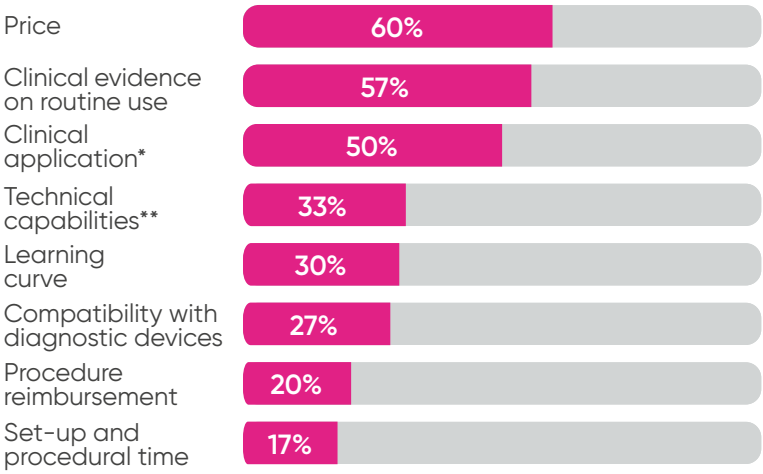
> Based on personal experience and the debates that we had at the time we were offered robotics. That's true, it is very precise. I have seen very complex cases performed with robotics.

Clinical application

47% need more information and clinical data on robotics

> I believe a robotic system delivers higher accuracy than conventional PCI and is the future for medical healthcare. Innovation and rapid development of robotic technology will facilitate the treatment of complex lesions. We just need more clinical data to support and prove this reliability.

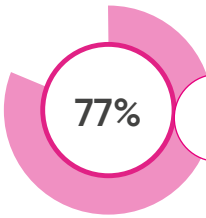
Actual limitations to global adoption



* address all kind of lesions
** number of devices manipulated robotically

Those considering using robotics today

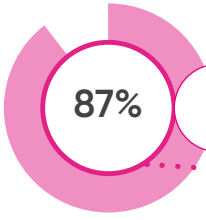
Despite actual limitations reported by the panel, due to the health and safety advantages, most respondents would consider robotics. Of the seven respondents who said they have not considered using robotics, four explained that it was due to lack of exposure or access to the technology.



considered using a robotic PCI solution

> "I have been trained with these robotics on animals and attended webinars. We do a lot of selected PCIs and staged PCIs where robotics would be great, but the biggest issue was mainly the cost as well as the integration of other technology with it."

Impact of robotics



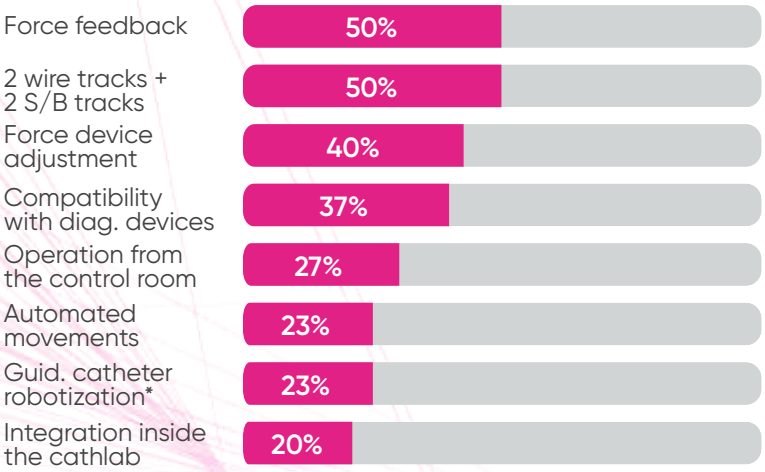
consider that robotics would **improve the quality of the intervention** and/or consistency of results

Vs. in 2019

Most frequent responses

- Yes but in the future (8)
- removes variability among physicians (5)
- More accurate than humans (3)
- Only for simple lesions (3)

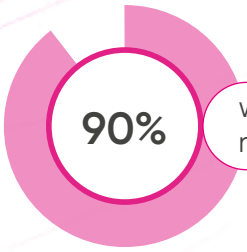
Features needed for mass adoption



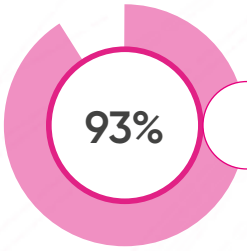
* for repositioning during the procedure

Robotic adoption perspectives

Integration of Robotics with imaging is crucial for most respondents, especially in Asia. The greatest motivation would be if robotics could treat a broad scope of lesions, ranging from simple to complex.

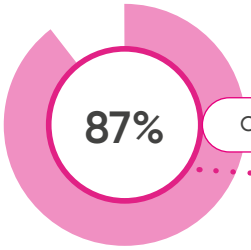


would **adopt robotics in their daily practice** if it was able to manipulate 2 wires, 2 S/B and the guiding catheter



would **adopt robotics in their daily practice** if it was able to treat all kind of lesions (including CTOs)

Robotics integration in the cathlab over the coming years

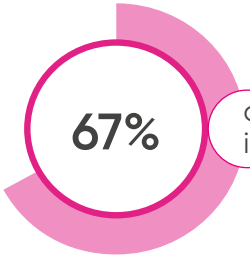


87% consider **integration with imaging system** crucial

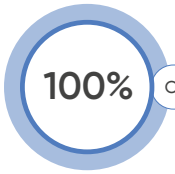
Most frequent responses

- Accuracy/precision (9)
- Efficiency/workflow (8)

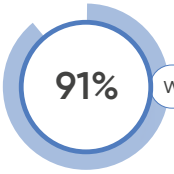
> Integration with imaging devices and compatibility with IVUS/OCT/FFR are critical to achieving outcome accuracy and optimizing workflow efficiency.



67% consider that **robotics opens up new possibilities** in terms of treatment approaches and device selection



100% of **regular users** agree



91% with **high PCI volume** agree

> Yes, in being more consistent it does open up the precision aspect compared to by hand, which has more of a variance. Robotics will deliver better quality control. I also think automated wire movement can be developed with robotics as, again, this currently varies greatly across operators.
>
> It will help with recruitment especially when young doctors are completing their fellowships, I truly believe radiation is the cause of doctors not entering our field.

Future of PCI

1 in 2

mention robotics
when talking about the future of PCI

> It depends how you define PCI? A simple PCI will be done robotically and perhaps remotely. With complex PCI, I am optimistic that robotics will eventually get there as well. But I really see PCI being done regionally with robotics involved and satellite hospitals helping with cost savings, so you don't have to transfer the patient to a different center.

40% believe **robotics will be part of their daily practice** in the near future

17% believe robotics **could be part of their daily practice** in the near future even if it's too soon to say

20% consider that it's too soon to say

23% don't believe in robotics

While most acknowledge the risks, 2/3 of the respondents are very concerned about radiation

- Only 23% of respondents know their annual radiation dose, others don't know the exact amount, but 50% mention receiving periodic reports
- 30% of respondents suffer from MSK disorders (mostly back pain) and 7% reported that they have had a related period of absence
- The radioprotection uniform for an interventional cardiologist is the lead apron (100%), thyroid protection (90%) and lead glasses (87%)

Despite actual technical limitations, 77% of respondents considered using a robotic PCI solution

- Most respondents would consider robotics due its benefits, safety being the first for 47% and precision second at 43%
- 87% consider that robotics would improve the quality of the intervention and/or consistency of results (vs. 61% in 2019)
- Clinical demonstration to treat all kind of lesions and price optimization appear as the most important improvements to make to democratize robotics in the cathlab

87% would adopt robotics in their daily practice if it was able to manipulate 2 wires, 2 S/B and the guiding catheter

- 87% consider integration with the imaging system as crucial
- 67% consider that robotics opens up new possibilities in terms of treatment approach and device selection (100% of regular users)
- 1 in 2 mentions robotics as being part of the future of PCI

Future of Robotics in the Cathlab

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