Humanizing the Robot: Medicaroid's Vision for the Future of Robotic Surgery

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16.1 Introduction

Joseph Hashimoto dreamed to have robots support humans in a collaborative fashion. This view may appear in contrast to what one might observe in the mainstream media, where images similar to those in Terminator and Westworld depict a world overpowered by artificial intelligence and robots at odds with the human well-being. Hashimoto, the Managing Executive Officer of Kawasaki™ Heavy Industries which includes Kawasaki Robotics, envisioned the human-robot collaboration for betterment of human health and took the first step to realize his dream with support of his old friend and business partner, Kaoru Asano, now Senior Executive Officer of Sysmex™ Corporation, and President of Medicaroid, Corporation when they established Medicaroid Corporation, a joint venture between Kawasaki and Sysmex, in 2013 in Kobe, Japan.

Medicaroid™ aspires to provide healthcare professionals worldwide with viable surgical robotic solutions that surgeons and surgical teams can trust, even rely on, to further improve patient care. Medicaroid's vision is to use surgical robotic solutions in supporting everyone, from surgeons to surgical teams to patients and their families, enhancing life and quality of healthcare (Fig. 16.1).

Medicaroid is committed to advancing surgery by improving outcome and efficacy through robotic solutions that help reduce cost and increase versatility in the operating room and providing economy of space through accurate and coordinated motion and placement plus customizable and programmable devices that collaborate with each other to meet specific needs in different situations. Medicaroid also envisions enhancing safety and reliability through customized ergonomics and reduced strenuous tasks by healthcare providers, eliminating error through real-time guidance and feedback via data connectivity, plus providing comprehensive training that enables implementation of such advanced technologies in a safe and dependable fashion. Medicaroid believes in enabling clinical innovations through abovementioned initiatives in robotic surgery (Fig. 16.2).

In keeping with their commitment to provide choices, the Medicaroid products are being designed and developed on an open platform philosophy, allowing healthcare providers to continue using the tools they trust while sharing its strengths with the global medical device community.

16.2 History of Medicaroid

Medicaroid Corporation was established in Kobe, Japan, in August 2013. Soon after, an office was established in San Jose, California, with the mission to explore business viability and implement headquarters' plans in the United States and beyond, which later was named Medicaroid, Inc. Medicaroid is a joint venture start-up in the sense that it began with a vision of transforming available enabling technologies into a viable business of surgical robotic solutions. Yet this young start-up has more than 50 years of global medical and robotic experience through its parent companies (Fig. 16.3).

Sysmex Corporation is a Japanese company based in Kobe with a legacy of innovation and automation in medical diagnostics and pathology. They started in Japan in the 1960s and later came direct to Europe and then to the United States in the late 1970s. At that point, the automated diagnostic systems were an established market conquered by giants such as Coulter. Through quality and innovation in design and sincerity and reliability of service, which are what Japanese enterprises are well known for, Sysmex demonstrated to healthcare providers that they were providing a solution they could trust. Sysmex went on to become the market leader in the United States. This commitment to product quality and sincerity in service is a value shared at Medicaroid (Fig. 16.4).

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Fig. 16.1 Medicaroid's mission statement

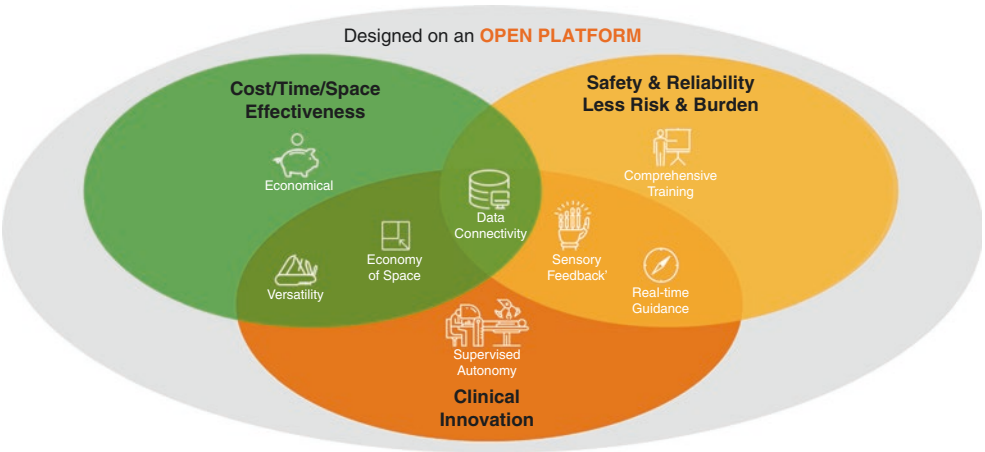

Fig. 16.2 Medicaroid's solution designed on an open platform

Fig. 16.3 Medicaroid's name from medical and Android as the result of joint venture between Sysmex and Kawasaki

Kawasaki Heavy Industries started in Tokyo in the late 1800s in ship design. They are a multifaceted heavy industry company who entered into robotics in the 1960s when they acquired the patent to the American robotic company, Unimation.

Kawasaki has a legacy of multi-industry robotic applications. They have been market leaders in large-scale factory automation including automotive, semiconductor, and food sectors. Interestingly, even as the leader, they continued to innovate and customize their product offering based on voice of customer, empowering their customers' potential through reliable robotic technologies. This commitment to empowering customers through trusted robotic choices is a value Medicaroid shares (Fig. 16.5).

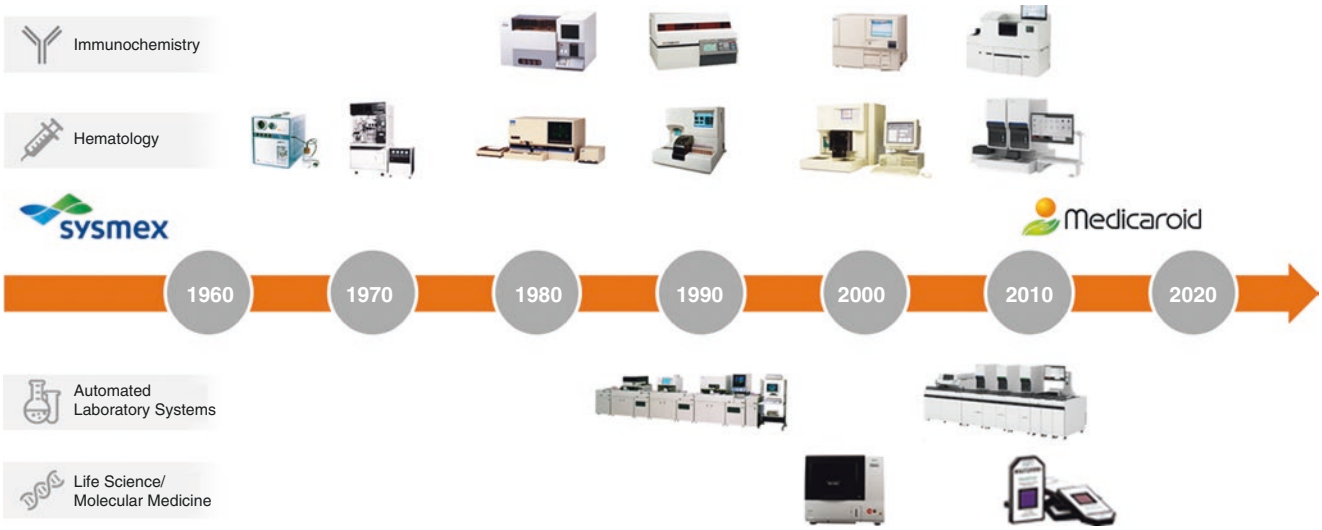

Fig. 16.4 Sysmex's history of innovation

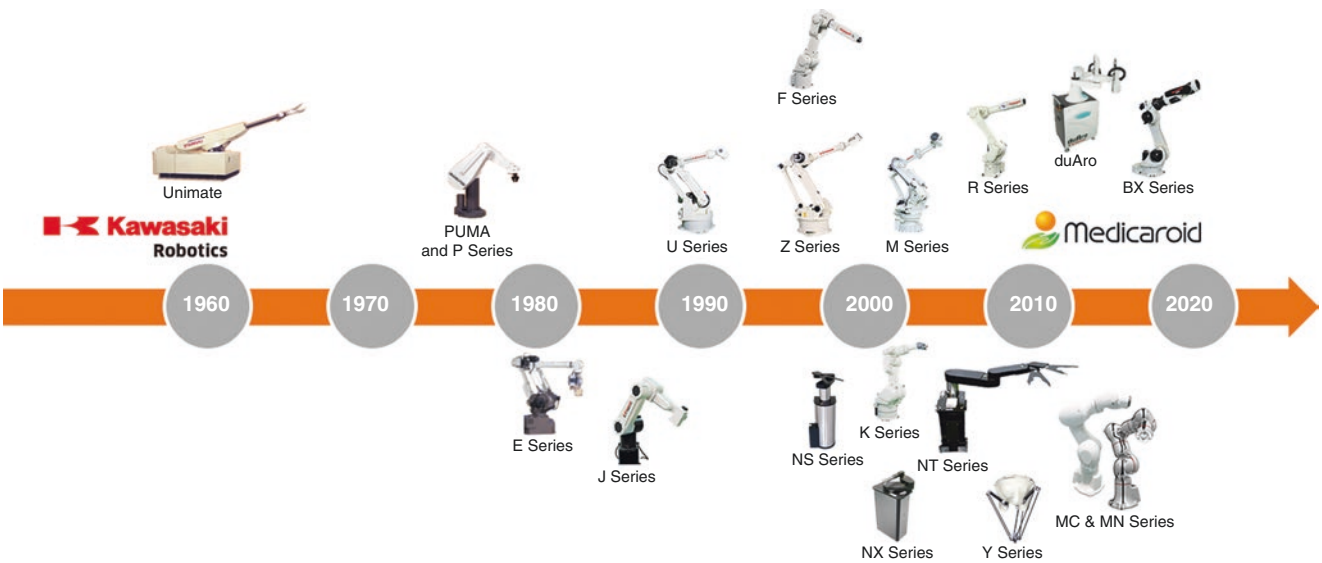

Fig. 16.5 Kawasaki robotics' history of customization

16.3 Medicaroid's Robotic Operating Table

Medicaroid developed a robotic operating table, SOT-100 Vercia™ Robotic Operating Table, that was cleared through Japan PMDA in 2017. The table is robotized and programmable for patient positioning in operating rooms. Medicaroid envisions integrating the table with robotic-assisted surgical devices to improve patient placement during surgery.

16.4 Medicaroid's Robotic-Assisted Surgical System

Medicaroid developed a new robotic-assisted surgical (RAS) system, hinotori™ Surgical Robot System based on the global customer needs, which was cleared through Japan PMDA in August 2020. They committed to design and evaluate their concepts soliciting input from masters in the field of surgery and finalized the design accordingly with an obsession to satisfy validated unmet needs that would attain societal trust (Fig. 16.6).

In developing a new RAS device, Medicaroid leveraged its parent companies' expertise. Sysmex's global medical expertise has been the beacon of guidance to the Medicaroid start-up. Along with their novel approach in customer training, their online on-time quality control for smart and preemptive services, plus their global regulatory expertise to maximize product value to healthcare providers, Sysmex facilitates Medicaroid's ambitions to enter the highly regulated field of medical devices (Fig. 16.7).

Fig. 16.6 Hinotori Surgical Robot System

Through unsurpassed attention to unmet needs of the market, Medicaroid recognized the challenges in robotic-assisted surgery and envisioned how collaborative and effective robotic technologies can improve procedural efficacy and safety in surgery. Kawasaki's robotic experience depth and breadth provides Medicaroid with a head start in developing surgical robotic solutions, from technical design to telemanipulation, allowing advanced development opportunities (Fig. 16.8).

Many of Kawasaki Robotics' applications in heavy industry has inspired Medicaroid to envision human-level dexterity and form factor portraying robots work safely and effectively side by side humans. Medicaroid recognized that industrial robots, where Kawasaki Robotics shines as a leader, were mainly intended and developed for autonomous mass productions; however, in the field of surgery, dexterity

Fig. 16.7 Medicaroid leverages Sysmex's expertise

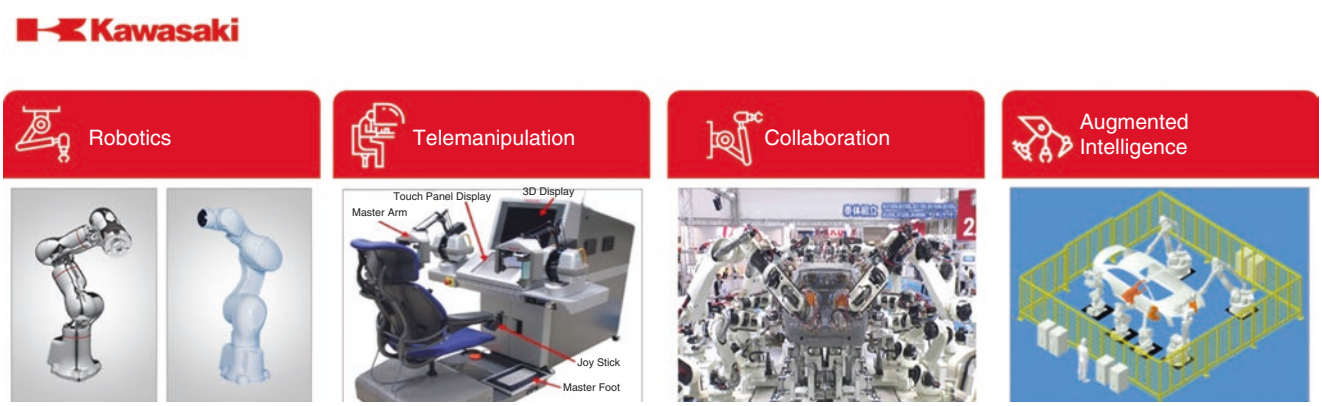

Fig. 16.8 Medicaroid leverages Kawasaki Robotics' expertise

and human compatibility are paramount. Therefore, Medicaroid has been eyeing more compatible robots from Kawasaki such as the teachable duAro robot which allegedly devises the same dexterity and area of motion as human. Such applications from Kawasaki Robotics are more relevant to Medicaroid's vision into the future of surgery and collaboration between human and robots and, therefore, have been considered in developing their surgical solutions. Furthermore, Medicaroid envisions expanding on existing artificial intelligence technologies validated through Kawasaki, allowing Medicaroid to conceptualize supervised automation to optimize surgical operation through machine learning (Fig. 16.9).

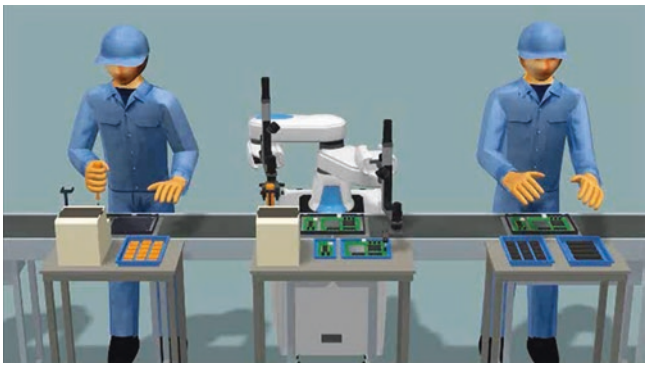

Fig. 16.9 Rendering of Kawasaki Robotics' duAroTM dual-arm SCARA robot on production line side by side human

In order to enable a global business, complete with products plus required service and support, Medicaroid has an exceptional advantage of access to already established support infrastructure through Sysmex and Kawasaki's global business network.

16.5 Summary

Medicaroid was established in Japan in 2013 followed by a US subsidiary in 2014 with the plan to extend human and robot collaboration into the field of surgery. Medicaroid is planning to compete in the field of robotic-assisted surgery, providing advanced instrument choices in different robotic configurations, robotic and smart operating table integration, and, when regulatory support allows, with supervised autonomy in surgery enabled by robotic technologies (Fig. 16.10).

Medicaroid's unique history and vision into the future will further revolutionize the field of surgery where healthcare providers worldwide will be empowered with viable surgical robotic choices they can trust through Japanese craftsmanship and obsession on quality and reliability.

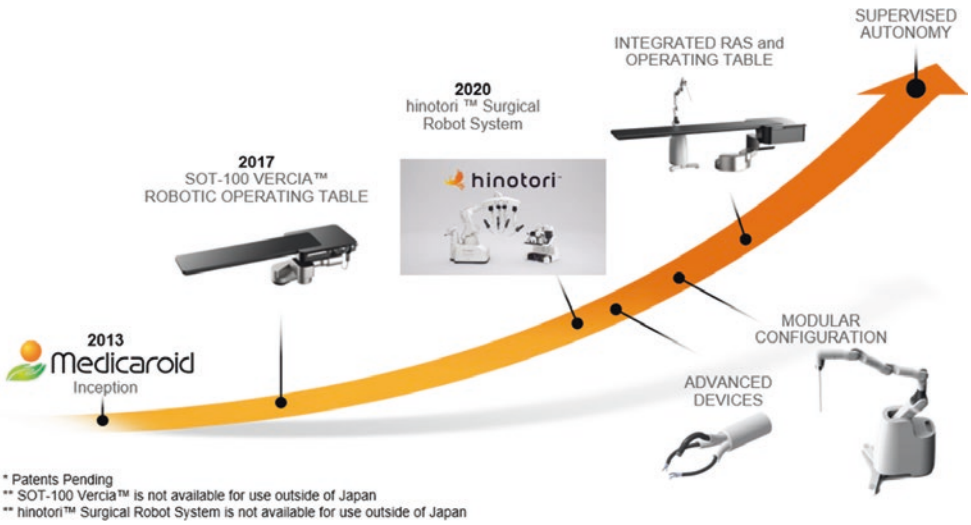

Fig. 16.10 Medicaroid's vision into the future