

# Rise of the Medical Machines

By [Global Research News](#)

Theme: [Science and Medicine](#)

Global Research, October 02, 2013

[healthcare-administration-degree.net](http://healthcare-administration-degree.net)



Source: [Rise of the Medical Machines](#)

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## Rise of the Medical Machines

Pier Cristoforo Giulianotti, University of Illinois department of surgery cannot foresee a time when robots replace surgeons, but he has no doubts over the importance of robotics. "Robot surgery is the future of medicine."

### A little background

- 1921: The term "robot" was coined by the Czech playwright Karel Capek in. The word "robot" is from the czech word robota which means forced labor.
- 1985: PUMA 560 assisted in neurosurgical biopsies.
- A variety of commercial companies have been developed to create surgical robotic systems for the general community.
- 1. 1993: Computer Motion, Inc. developed the AESOP Endoscope Positioner: a voice-activated robotic system for endoscopic surgery. It is the first robot approved by the FDA for surgery.
- 2. 2001: SOCRATES Robotic Telecollaboration System was created by Computer Motion, Inc.. System was used for the first-ever transatlantic telesurgery performed.
- 3. 1998: ZEUS Surgical System in 1998. This system consists of a surgeon control center and three table-mounted robotic arms used to perform the first fully endoscopic robotic surgery and the initial beating-heart, totally endoscopic coronary bypass procedure. Many more robots and robot instruments and programs are being researched and developed in the United States and around the world. Here are five of the coolest 'bots in medicine:

### The da Vinci System

- Who invented it: Intuitive Surgical, Inc.
- Why it's useful: Enables surgeons to perform delicate and complex operations through a few tiny incisions with increased vision, precision, dexterity and control.
- Why it's cool: Although it increases surgery time by 20-30%, it cuts recovery time in half. A

robotic surgical platform specializing in minimally invasive procedures, allows traditional surgeries to be performed with only 1-2 cm incisions, lowering impact on the patient.

- Cost of equipment: Around \$2 million. There are over 210 da Vinci Systems in use throughout the United States, Europe and Japan.
- Patient benefits include:
  - less pain
  - less risk of infection
  - less blood loss
  - fewer transfusions
  - less scarring
  - faster recovery time
- Number of times procedure used so far: 1.5 million. More than 450,000 soft tissue procedures in 2012.

## CyberKnife

- Who invented it: In 1994, John R. Adler, a Stanford University Professor of Neurosurgery and Radiation Oncology, and Peter and Russell Schonberg of Schonberg Research Corporation
- Why it's useful: It is a non-invasive alternative to radiation therapy, the highly focused nature of the beams cuts down on excess radiation entering the body and damage to healthy tissue.
- Why it's cool: CyberKnife can automatically track, detect, and correct tumor and patient movement in real time, using 100 focused beams of radiation.
- Cost of equipment: Around \$3 million
- Number of times procedure used so far: hundreds of thousands
- Patient benefits include:
  - No incision
  - No pain
  - No anesthesia
  - No hospitalization
  - Little or no recovery time
  - Immediate return to daily activities

## NeuroArm

- What it does: NeuroArm is an engineering research surgical robot specifically designed for neurosurgery
- Who invented it: Dr. Garnette Sutherland, in collaboration with Macdonald Dettwiler and Associates
- Why it's useful: NeuroArm provides unparalleled accuracy and control when operating on the human brain.
- Why it's cool: It's the world's first MRI-compatible surgical robot. It was built to possess the dexterity and precision of the human hand without compromising surgical technique.
- Cost of equipment: Unknown
- Number of times procedure used so far: The prototype system was built, tested and used for the first time in neurosurgery on December 4, 1997. Since then, hundreds of patients have had Neuroarm surgery.
- Patient benefits include:
  - Less pain
  - Less blood loss

- Faster recovery time

## RP-VITA

- What it does: RP-VITA is a remote presence robot, allowing physicians to interact with patients without being in the same room, hospital, or country.
- Who invented it: iRobot and InTouch Health
- Why it's useful: Improves the remote consult process; specialists from other hospitals or countries can consult on difficult cases far more easily.
- Why it's cool: It was designed to move from point to point autonomously, freeing up valuable time for both doctors and hospital staff.
- Cost of equipment: InTouch is planning to sell RP-VITA as part of an integrated cloud-based service, with a per-unit price of somewhere between \$4,000 and \$6,000 per month.
- Number of times procedure used so far (or is it still experimental): In May, 2013, InTouch revealed that 7 hospitals were already integrating the RP-VITA.
- Patient benefits include:
  - Any doctor, anywhere in the world, can help you
  - system can spot things that may otherwise be missed because the doctor can record the video feed and play it back at a later time

## Paro

- What it does: Pet Therapy...performed by a robot. We know that pet therapy helps physically, psychologically and socially, and Paro does the same thing for people who are unable to care for a live pet. Modeled to look like a baby harp seal, it's an interactive robot serving as a therapeutic tool for the elderly and those with degenerative diseases such as Alzheimer's and other forms of dementia.
- Who invented it: Dr. Takanori Shibata
- Why it's useful: "It allows the documented benefits of animal therapy to be administered to patients in environments such as hospitals and extended care facilities where live animals present treatment or logistical difficulties."
- Why it's cool: In order to be treated as a real animal, Paro has to appear to be one. To do this it has five kinds of sensors: tactile, light, audition, temperature, and posture sensors, with which it can perceive people and its environment. Through these sensors, it can feel the world around it, and respond to external stimuli. Paro can tell whether it is light or dark, the direction from which it is spoken to, whether it is being held, petted, stroked, or struck, and can respond to positive gestures with trills and flapping, and negative gestures with yelps. How cool is that?
- Cost of equipment: Around \$6,000
- Number of times procedure used so far: Thousands have been sold worldwide, many to hospitals and assisted living facilities.
- Closing Factoid: 4 in 10 hospitals promoted robotic surgery on their websites in 2011.

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