



Illustration by Claire Gilmore

# **Orthopaedics** **in the time of COVID-19:** *Use of remote verbally-controlled robot-like hands*

## James G. Gamble, MD, PhD

Dr. Gamble (ΑΩΑ, University of Maryland School of Medicine, 1974) is Professor, Department of Orthopaedic Surgery, Stanford University School of Medicine, Packard Children's Health at Stanford, Stanford, CA.

**O** orthopaedics, is a hands-on specialty. When a patient has pain after an injury, or when a patient presents with chronic diffuse aches about the hip, we need to put our hands on the body to find out what's going on. Much of the information needed to make an orthopaedic diagnosis comes through our hands during the physical examination. Of course, obtaining a verbal description of the situation is very important, but we need to touch to be able to perform the physical maneuvers necessary to evaluate for tenderness, to discover instability, and to decide if it is an anterior cruciate ligament (ACL) tear or simply a knee contusion.

However, since the COVID-19 pandemic my only contact with patients not in the hospital has been through telehealth visits—looking at, and talking to, an image on the screen of my laptop computer. Obtaining the patient's history of the current problem, past medical history, family history, social history, and review of systems is easy during a telehealth visit, but not so with the physical examination. By definition a physical examination is physical; it is a hands-on experience.

It is impossible to do a hands-on examination via a telehealth visit. We can listen, we can look, but we cannot touch. As a surrogate for the hands-on examination a new telehealth skill is the use of remote verbally-controlled robot-like hands (RVRH.) The robot-like hands are those of the patient or someone with the patient, who are instructed to perform the physical examination under the doctor's visual and verbal control. This skill requires precise communication so the robot-like hands perform the physical examination as closely as possible to what would be done at an in-person visit. Using this skill, the patient or the patient's assistant does all the touching and pushing and twisting necessary, and the doctor observes the consequences on the screen and gives verbal feed-back as necessary.

Robots as we know them have been around since the 1950s, and robotics has transformed many industries from the manufacture of integrated circuits to the assembly of automobiles. Even surgery has been performed with robotics such as the da Vinci systems. A recent PubMed search for "robotic surgery" turned up 20,029 citations, and a Google search of the same terms turned up 44,200,000 results in 0.52 seconds. Use of robotic surgery is not new; use of RVRH is new for most orthopaedists.

Using RVRH, a telehealth visit might go something like, doctor looking at the screen and talking to a person in the room with the patient, "Please adjust your camera so it is pointing to the right knee...that's it, down a little...to the left a little...perfect. Now, bend the knee...maybe just a little bit more to about 15 degrees...that's it. Now with your left hand firmly hold on to the outside of the thigh above the knee cap. A little higher please...that's it. Now with your right hand grab the shin bone below the knee and from the inside. Excellent, now quickly and at the same time pull up with your right hand and push down with your left hand...good...repeat that a couple of times."

The RVRH just performed the Lachman test to evaluate the integrity of the ACL. Likewise, RVRH can be used to evaluate an ankle sprain, a shoulder injury, or a jammed finger.

RVRH is a learned activity in which practice improves performance. Some of the keys to the successful use of RVRH are patience and constant, gentle verbal instructions from the doctor using simple, clear language.

Telehealth visits have been crucial to providing care to many patients during the time of the COVID-19 with clinics and offices closed, and with hospitals available only for emergency visits. Many wonder if doctors and patients will want to continue with telehealth visits after the shelter in place orders are lifted? By many accounts, it is going to be a changed world, and life as we knew it will be different until a safe and effective vaccine against COVID-19 becomes universally available. Until that time, some patients may prefer a telehealth visit to a clinic or an office visit simply as a health precaution. It may be that patients and doctors will find telehealth and RVRH convenient for routine postoperative visits, or for monitoring stable conditions where the patient would have to travel long distances for a clinic visit. Most likely the digital platforms will improve for both audio and video performance, making the telehealth visit a better experience for both doctors and patients. However, it seems unlikely that Telehealth will ever completely replace the hands-on experience of the physical examination.

### Acknowledgments

Thanks to Lawrence A Rinsky, MD, and Steven L. Frick, MD for helpful suggestions.

The author's E-mail address is [jgamblemd@aol.com](mailto:jgamblemd@aol.com).