COM

A 2019 SYMPOSIUM at the American Orthotic and Prosthetic Association National Assembly highlighted the leading multiarticulating hands available in the US marketplace. Össur's i-Limb hand, TASKA's Gen2 hand, and Ottobock's bebionic hand were featured as the leading players. Other hands mentioned but not reviewed, either because there was no formal US distribution or they were recently launched and there was not enough information available to fairly compare them, were the Vincent Hand, Hy5's hydraulic MyHand, COVVI's Nexus hand, Psyonic's Ability Hand, Mobius Bionics' LUKE hand, and Open Bionics' Hero Arm.

Photograph courtesy of Open Bionics

PARING

Multiarticulating Hands Available in the United States

By Karl Lindborg, CPO/LP; Linda Calabria, MBA; and Susi Ebersbach, MT (ASCP), MBA

Fast forward to 2024 and new multiarticulating hand players are entering the US market, such as COVVI's Hand, Aether Medical's Zeus Hand, and BionIT Labs' Adams Hand. Manufacturers such as BrainRobotics, Esper, Rebel Bionics, and Prensilia are knocking at the door, while a few other upstart companies have vanished from the market.

In this article, we offer a current multiarticulating hand comparison for the US market with perspectives on coding, marketing, and clinical choice.

CODING PERSPECTIVE

The current Healthcare Common Procedure Coding System (HCPCS) code for upper-limb prostheses is insufficient for describing the significant differences among externally powered prosthetic hands, which are crucial for aligning a prosthesis with a patient's specific functional needs, capabilities, and goals.

The Centers for Medicare & Medicaid Services (CMS) guidelines outlined in Pricing, Data Analysis and Coding (PDAC) advisory articles only allow for a single code for all multiarticulating hands—L-6880 (electric hand, switch or myoelectric controlled, independently articulating digits, any grasp pattern or combination of grasp patterns, including motor(s)). This code does not allow for additions that would detail the unique features influencing device selection. The only coding differences in a service will pertain to the socket, additional control strategies, and differences in technology at the wrist or above.

This coding structure does not distinguish between technological differences in areas such as thumb functionality (passive or powered, rotatable, varying degrees of freedom), hand sizes, articulation mechanisms, grip options (including number, customizability, switching), hand speed, load capacity, waterproof capability, serviceability, and durability factors like grip strength and antislip capabilities. Other relevant aspects include battery type and life, user interfaces, safety features (such as off switches and safety releases), manufacturer support, and compatibility with other potentially necessary technologies (control strategies, and wrist and elbow components).

Some multiarticulating hand manufacturers believe their products offer technological advancements that go beyond the capacity of the predicate L-6880 code in several key areas: powered thumb rotation, high-speed thumb rotation, app control, gesture control, proximity control, pattern recognition control, customizable grips, preset grips, breakaway/resettable clutches, lateral compliant fingers, waterproof seal ring, and haptic feedback. Because the compensation for their added features is not provided for in that code, manufacturers who seek compensation for these advanced features have to justify their classification under not otherwise specified codes like L-7499.

The manufacturers contend that these features did not exist at the time of creation of L-6880, they surpass the capacity of L-6880, and it's impossible for the features to have been part of the predicate product. This creates a challenging billing process that requires justification and appeals that can affect the choice of a hand.

The code set and fee schedule lags behind the technology, but the mechanism is in place to assign codes for new features. The CMS HCPCS decision tree notes that "when an item operates in a significantly different manner, or provides a significant therapeutic distinction compared to existing coded treatments or products, a new or revised code shall be created." The O&P Alliance is actively discussing code creation and revision with CMS.

Given the popularity of these products among wearers, the manufacturers' claims of enhanced functionality, adaptability, and safety brought about by the new technology appear validated, but until the CMS HCPCS code set for upper-limb prosthetics is revised to accommodate the technology and associated costs for additional features, the code set will remain a barrier to access for end users.

MULTIARTICULATING HAND FEATURE COMPARISON

Eight multiarticulating hands are available in the US market. Two additional similar devices not included in our comparison are the Michaelangelo hand, which is a multifunctioning hand rather than a multiarticulating hand, and the LUKE arm, which includes a multiarticulating hand as part of its unit but the hand is not sold separately. See the comparison chart on pages 18-19. An in-depth comparison chart is available at opedge.com.

PRODUCT MARKETING PERSPECTIVE

"Why is this device better than that device?" This is one of the most difficult questions for someone in product marketing. No matter the differences, or how great the device, it simply may not be the right one for a user.

While marketers try to focus on the differentiators, there are many similarities because all myoelectric multiarticulating prosthetic devices are intended for light- to medium-duty activities, offer some kind of access to grips, and are ideal for finer activities. But the devices are not identical, and manufacturers' marketing can provide some information on specifics to aid clinicians in making the most appropriate choice for the individual. Additionally, as users have become more savvy consumers, they are more likely to ask their prosthetists for specific devices. Thus it is incumbent for manufacturers to ensure their marketing provides education about their products for users as well as clinicians and payers.

One of the ways manufacturers can assist clinicians is through courses and demos. This helps practitioners ensure they understand the device, how it works differently, and who it is for. With this knowledge they can work with users to understand their needs and set realistic expectations about the unique benefits each device can offer. Realistic imagery and videos of other users with similar amputations utilizing the devices in activities of daily living can also help patients in making an informed decision about their prostheses, as well as providing a visual representation for payers that these devices are medically necessary—not a luxury.

HOW WE CHOOSE

With the influx of viable and available multiarticulating hands, there is more information than ever to help evaluate and recommend the most appropriate prosthesis for an end user. The end user's clinical evaluation and factors outside the evaluation play a part. Starting with my own selection criteria, I (Lindborg) informally collected 15 other US-based upper-limb specialists' criteria to see how we choose the devices we recommend. These results from experienced upper-limb prosthetists give the clinician with limited upper-limb experience a glimpse of the approach commonly taken when choosing a multiarticulating hand.

I asked the group to rank 23 influencing criteria into three categories in order of influence. Multiple criteria could be chosen for each category. The group was also encouraged to add criterion they felt was important to the list; one write-in—durability—made its way to the top five considerations. Many of the criteria influence weight and size choices of a hand, which is why they were not included as criteria unto themselves.

Photograph courtesy of Össur.

1 FIRST PRIORITY CRITERIA

The following criteria were chosen as the first priority when selecting a multiarticulating hand (by the noted percentage):

94 PERCENT

Activity (waterproof, work, home, activity-specific)

Specific activities may require a particular terminal device such as a hook (electric or body-powered) or an activity-specific attachment. A multiarticulating hand is not appropriate for all activities. High-impact activities, heavy vibration and lifting, and excessively wet or dirty environments increase the risk for damage, failure, and wear. Multiarticulating hands have historically been considered appropriate for light- to medium-duty activities, but technological improvements such as waterproofing and breakaway digits are making some multiarticulating hands more durable.

75 PERCENT

Bilateral or unilateral

Bilateral users may not have the ability to push a button to access grips, making muscle triggers a better option. Wrist flexion units may also be difficult to lock/unlock. The hand dominance for a bilateral user can switch depending on which residual limb is longer. A multiarticulating hand is often not appropriate for both limbs. Powered thumb rotation versus manual thumb positioning can be important for a bilateral user, and hands with haptic feedback with sensors in the fingers, new on the market, may provide benefit for the bilateral user who has no sense of feeling in either hand.

69 PERCENT

User wants and expectations (aesthetics/functionality)

A multiarticulating hand provides aesthetic function, but users often find functionality disappointing because the digits don't all articulate independently on command, and the hand provides no sense of touch. The muscles utilized for myoelectric control are often different muscles than would be used intuitively. Noise caused by a device can be undesirable, but a covering can muffle the sound. There are less bulky thumbs and more slender fingers that may be more aesthetically appealing. The user may want a robotic-looking hand or a realistic-looking cover. Some hands require a cover and some don't, some covers are more aesthetically pleasing than others, and some covers might interfere with the hand's responsiveness.

63 PERCENT

Insurance coverage (copay, billing, appeals required to obtain technology)

Multiarticulating hand choice can depend upon whether the patient is covered by private insurance, workers' compensation, Veterans Affairs, or self-pay. Insurance companies' policies sometimes restrict multiarticulating hands. The amount of the copay can make a difference and depends on the insurance coverage and price set. The billing and appeals time and money required to get different technology approved for payment can also influence the choice.

Durability

This broad category includes normal wear and tear, grip strength, digit strength, lift capacity, impact resilience, grip pad longevity, switch and charging port viability, cover condition, and battery longevity/efficiency.

Emotional stability/cognitive ability

Not all users have the cognitive ability to efficiently and consistently operate a multiarticulating hand. Sometimes simpler is better. A user may not be emotionally ready for a multiarticulating hand, while sometimes it can enhance emotional stability. Some manufacturers offer in-clinic trials that can help stabilize emotions and help with the selection process. Trialing hands within a structured occupational therapy setting can be of great benefit.

56 PERCENT

Unique features

Every multiarticulating hand has unique features that differentiate them from competitors' hands. One feature can change the course of a prosthetist/user decision. There are unique grips, grip access methods, safety features, durability features, programming options, data collection, and more. Manufacturer marketing will spotlight these.

Top to bottom: Courtesy Aether Biomedical; Össur; © Ottobock; TASKA Prosthetics; Psyonic.

Multiarticulating Hand Comparison

US Market - June 2024*

Information listed has been confirmed by manufacturers. Readers should do their own due diligence on all listed information.

Multiarticulating Hands/ Features	BionIT Labs - Adam's Hand	ottobock - bebionic	COVVI Hand	Össur - i-Limb**
Sizes	MEDIUM	S, M	S, M, L	XS, S, M, L
Field Serviceability***	✓	✓	✗	✓
Req. Covering	✓	✗	✓	✓
Accessibility to grips via***	THUMB POSITION (0, 45, 90°) HAND POSITION IN SPACE	MYOSIGNALS THUMB POSITION BUTTON	MYOSIGNALS APP BUTTON THUMB TAP SENSORS IN FINGERTIPS	MYOSIGNALS APP GRIP CHIPS GESTURE CONTROL
IP Rating	IP-67	IP-22****	IP-44	IP-22
Years of Warranty	2 YEARS	3 YEARS	2 YEARS	2 YEARS
PDAC Approval	✓	✓	✓	I-LIMB ACCESS/ULTRA ONLY

SECOND PRIORITY CRITERIA

The following criteria were chosen as the second priority when selecting a multiarticulating hand (by the noted percentage):

63 PERCENT

App features (shared, user-only, clinician-only, remote access)

Manufacturers allow shared, user-only, or clinician-only access to apps. This can make a difference in choice depending on who you want to have adjustment capability. Apps may be either IOS- or Android-specific or both and may have phone or laptop versions.

56 PERCENT

Field serviceability

Some manufacturers allow repair of a device in your clinic. Others require the device to be sent in for repairs. Some provide loaners.

Manufacturer support (occupational therapy, prosthetist training, reimbursement, loaners, trial devices, repair)

Manufacturers offer various levels of support that can influence the final cost of a hand. The hand choice will determine the level of support and service you receive.

Compatibility with other manufacturer components/pattern recognition

Hand build height and battery demand can influence choice when combining with other components. Mixing components from various manufacturers may cause some hand features to become inaccessible.

50 PERCENT

Gadget tolerance (ability to use app or button)

Some apps are not user friendly, and some users don't like to use apps. Apps can be phone specific. Users may not be able to consistently access grips through muscle trigger and will prefer cycling through grip options via a button on the hand. Some may only want to have one compliant grip and fewer programmed grips.

User compliance

If compliance is an issue, the user may need emotional or psychological support. They may have unrealistic expectations or have cognitive/emotional issues that would fit better with a different device. Partnership with an occupational therapist (OT) can help manage noncompliance. Trialing other hands,

open bionics - Hero Arm	Psyonic - Ability Hand	TASKA - Gen2 & CX Hands	Aether Biomedical - Zeus Hand
S, M, L	S, L	CX HAND, M, L	MEDIUM
✗	✓	✓	✓
✗	✗	✗	✗
MYOSIGNALS BUTTON	MYOSIGNALS APP BUTTON	MYOSIGNALS APP BUTTON	MYOSIGNALS APP
IP-20	IP-64	IP-67	●
1 YEAR	2 YEARS	2-3 YEARS	2 YEARS
✓	✓	✗	✓

LEGEND:

✓ Present

✗ Not available

● Unkown

- *Based on information that is publicly available. Confirmed by mfgs.**
- *Össur has the i-limb access, i-limb ultra, i-limb quantum***
- *Check with manufacturer on the specifics****
- *While a glove is not required with the bebionic hand, IP-22 rating is achieved with a glove*****

Honorable mentions:

Not in the US market:
- *Esper Bionics (PDAC approved), Vincent Hand*

Don't fit into same criteria:
- *Michelangelo, Luke Arm*

Data collected by Linda Calabria, Calibration Marketing LLC, and Karl Lindborg, Intersect OPS.

switching to a simpler device, breaking down the training into smaller steps, and sometimes just listening to what the user is telling you can make a difference.

Level of amputation

The higher the level of limb loss, the more components may need to be paired up. The multiarticulating hand needs to be compatible, and limb length must be considered when choosing the hand's weight. The addition of a flexion wrist might enhance midline activity to the transhumeral. For a wrist disarticulation, a hand with a specific wrist disarticulation adapter may need to be utilized, which will limit the a hand's interchangeability with another terminal device.

43 PERCENT

Cost (facility's price and payment terms), additional costs (fabrication, nonwarranty repairs), phone compatibility (IOS or Android or both)

3 THIRD PRIORITY CRITERIA

The following criteria were chosen as the third priority when selecting a multiarticulating hand (by the noted percentage):

63 PERCENT

How the hand is marketed (end-user demonstration, sensationalized advertising, sales rep demonstrations, end-user ambassadors)

How the hand is marketed influences product choice, by successful exposure to the prosthetist and the user, and through the marketing message delivered. Marketing by patient ambassadors or honest sales teams communicating realistic expectations is often better received by a prosthetist than sensational ads, whereas those ads may appeal to the end user. A prosthetist may be influenced to choose a hand by a manufacturer whose marketing helps them set realistic expectations.

Limb loss cause (congenital/traumatic)

Etiology affects what muscle activity is available to operate the hand. Congenital-loss candidates often do not have the muscle and residual limb needed to operate a multiarticulating hand. Choices made for a prosthesis due to traumatic loss can vary greatly depending on the nature of the injury (i.e., electrical, guillotine, degloving, traction).

56 PERCENT

Gender, age

These criteria may dictate the size, weight, and durability of the hand.

50 PERCENT

Familiarity

Sometimes a clinician and/or an OT is trained in and has success with a particular hand, or they have established a working relationship with the manufacturer's sales, services, and marketing

teams. This can influence choice and may benefit all involved or not. The risk is there may be a device out there that is better suited for the particular user.

Hardware bundle (electrodes, battery, lamination ring, car charger, gloves)

Some manufacturers include these essential items with the hand. Others provide the bundle separately.

43 PERCENT

Amount of training required, age.

ADDITIONAL CONSIDERATIONS

The respondents wrote in considerations not clearly incorporated elsewhere. They were: previous prosthetic history, culture, functionality, contralateral condition, maintenance required, anecdotal experience from self and colleagues, sound, no glove required, product quality, overall strength (pinch/grasp), wrist flexion, dominant side, and water resilience. While all of these are worthy of consideration, space permits comment on only a few:

Functionality

In my mind this covers the total capability of a multiarticulating hand as opposed to a unique feature of a hand.

Previous prosthetic experience

Users with some prosthetic experience may adapt more quickly to the limitations and benefits of a multiarticulating hand. That experience can push them toward a more complex hand or a simpler solution. They usually contribute more to the decision-making process.

Wrist flexion

In some cases, if there is not enough build space for a wrist flexion unit due to a long residual limb, or if the limb is too short to support the weight of a hand with wrist flexion, the prosthetist may need to choose a hand without the unit.

Culture

Sometimes cultural factors can influence multiarticulating hand choice, most notably hand aesthetics.

Contralateral condition

Multiarticulating hand choice may be influenced by the condition of, and the ability to use, the contralateral extremity. Choices may include electronic rotating thumb, electric wrist rotator, and grip access through triggers or gesture control versus manual operation of these options.

Photograph courtesy of TASKA.

Maintenance required

Some manufacturers offer an annual service check and maintenance agreement as part of their warranty.

Sound

Noise can be a factor in hand selection depending on the number of motors, the speed of operation, and the materials used to build the hand. Sometimes a cover helps with sound control.

Overall strength, grip/grasp

There is no current standard for measuring grip or grasp strength, so it is difficult to compare this quality in each hand. This is why it is not included on the comparison chart.

Water resilience

A waterproof multiarticulating hand for water activities may or may not be paired with waterproof components; compatible waterproof components are not always available. Sometimes water resistance, splash resistance, or a waterproof cover is sufficient.

While technology will continue to progress and new features will be introduced, the fundamentals of choosing a multiarticulating hand will likely remain the same for some time to come. The individual user, his or her activities, physical presentation, and needs and wants will always be primary. Hopefully with O&P industry assistance, the reimbursement matrix will be able to step up and keep pace with the user story, prosthetist requirements, and technological advancement. O&P EDGE

The authors would like to thank the participants for their contributions. The comparison chart is available at intersectops.com and calibration.marketing for reference.

Karl Lindborg, CPO/LP, is an upper-limb specialist and consultant, Intersect OPS. Linda Calabria, MBA, is owner and chief marketing officer of Calibration Marketing. Susi Ebersbach, MT (ASCP), MBA, provides independent consulting and has over 20 years of experience in O&P reimbursement topics.