

**A**N ESTIMATED 300,000 PROSTHETIC LIMBS A year are discarded in America. No secondary market exists for them because of regulation and risk of liability. They gather dust in closets and basements. They pile up in warehouse “boneyards,” stick out of landfills, get pushed by the cartload into incinerators. Around the world, meanwhile, millions of amputees endure limited mobility and unemployment for lack of prosthetic limbs.

“I can’t think of any higher-value waste—waste that could have such a tremendous impact on somebody’s life—than prosthetic limbs,” says Henry Iseman, President of a nonprofit bringing used prosthetics to those desperate for them. “To treat them as medical waste is a shame, all the more so because these devices don’t rot. They’re not biodegradable.”

Mr. Iseman was a student at Yale University when he and fellow students Victor Wang of Yale and Trang Duong of Brown discussed ideas for a nonprofit

In a story sure to bolster your belief in the problem-solving abilities and heart of humanity, these young entrepreneurs created a way to bring discarded prosthetics to amputees around the world. By **BEATRIZ GARCIA & KEVIN HELLIKER.**

# WASTE

## that Costs an ARM and LEG

venture. Ms. Duong talked about the large number of amputees without prosthetics in her native Vietnam, an idea that excited Mr. Iseman because he had seen the enormous value of prosthetics while interning in high school at an agency for wounded veterans. On researching the issue, they learned that used prosthetic devices in America are treated as waste—even though most often nothing is wrong with them.

The nonprofit they started, Penta Medical Recycling, began seeking discarded prosthetic devices through amputee networks and clinics that handle the products. After searching for qualified medical personnel to fit the devices on amputees in Vietnam, Penta signed a partnership with the Vietnamese Ministry of Health’s Young Physicians Association who had no shortage of potential beneficiaries. Traffic accidents and unexploded ordnance from last-century’s wars have made amputation too common in Vietnam, where 90 percent of victims can’t afford the \$2,000 to \$10,000 cost of a prosthetic limb.



Regulation and risk of liability have prevented the rise of a secondary market for limbs in America. But these perfectly fine devices are prized by amputees in emerging markets.

The Penta story highlights a sweet spot between the gravest Third World medical needs and the greatest sources of First World non-biodegradable waste. Amputation doesn't top the list of emerging economies' medical problems and prosthetics aren't a leading threat to the environment. But Penta has found something like the perfect match between medical waste and medical need—having supplied over 1,300 devices to amputees in Central America and South Asia.

Tran Manh Cuong, 22, lost his leg above the knee following a traffic accident at the age of 12. He never had a prosthetic until receiving one this year via Penta. “With my new leg, I go to school and perform daily tasks just like a normal person,” said Tran.

Prosthetics not only provide mobility, but also help combat the perception in many developing countries that the disabled can bring misfortune or are even cursed.

Since its start in 2016, Penta has supplied more than 260 limb sets to Vietnamese amputees, including Nguyen Thang. A studious teenager with dreams of entrepreneurial success, Thang envisioned a prosperous future for himself in economically vibrant Vietnam. But on his 17th birthday, he was hit from behind by a motorbike that swerved onto the sidewalk. By the time he reached a hospital, the window to save his leg had closed, and he underwent a below-the-knee amputation.

Unable to afford a prosthetic limb, Thang dropped out of school and depended on friends, family and crutches for even minimal movement. In pursuit of a prosthesis that he knew he couldn't afford, he came to the attention of doctors at Bệnh Viện Chinh Hinh hospital in Ho Chi Minh City, one of Penta's first partners and the largest private orthopedic hospital in Vietnam.

Soon afterward, Thang was fitted with a lightweight below-the-knee device that restored his mobility. Enrolled in college and hairdressing school now, he gets around by foot and motorbike. “The leg helps me move around easily,” he says. “I can have a job and take care of myself.”

Mr. Iseman is determined to expand geographically providing prosthetic components to ever-larger numbers of amputees. In that he faces financial and logistical barriers. Collecting and shipping prosthetic devices is expensive, and late in 2019 Penta expected to post expenses for the year of \$110,000 on revenue from grants, donations and awards of \$150,000. Of the founders, only Mr. Iseman works full-time at Penta, though he recently hired a Chief Operating Officer and Chief Strategy Officer,

bringing to three the number of full-time employees at the organization.

Penta has received support from a luminous list of benefactors including Yale and Brown universities, McKinsey, JPMorgan, Ford Foundation, Bloomberg Philanthropies and the Clinton Global Initiative. The white-shoe law firm of Paul, Weiss, Rifkind, Wharton & Garrison provides pro-bono legal services. And Penta receives discounted shipping from UPS in the US. Forbes placed Penta's three founders on its 2019 30 Under 30 Healthcare list.

Penta is also collaborating with companies that make and distribute prosthetic devices, as well as clinics that perform prosthetic services. An estimated two million Americans are amputees, and in developed countries prosthetics are typically replaced every three to five years. About 185,000 lower-extremity amputations are performed in the US every year, and first-time users tend to switch out their prosthesis within the first year. Nearly all discarded devices are reusable or have reusable components.

“Penta is a great cause, and it's the right thing to do for our environment and people who are underserved,” says John J. Voll, a clinical manager for Hanger Clinic, America's largest chain of clinics providing prosthetic services. “Penta has provided me with a cost free way of recycling my prosthetic limbs, sockets and components. My patients and I love to hear that their devices are going to be donated to people who are in need of prosthetics.”

Penta operates out of donated office space in New York City. It rents space in a nearby self-storage facility for the prosthetics it receives. It's a complicated process. A prosthetic leg can be composed of attaching knees, pylons, adapters and other components. “When donations come in, we sort through everything and mark every piece,” says Mr. Iseman. “Right now we have about 450 components in our storage space” along with hundreds of prosthetic liners, socks, sleeves and other necessary materials that amputees need to feel comfortable.

A couple of medical groups in the US journey to places like Guatemala and Ecuador to fit amputees with used prosthetics, and Penta has supplied devices to them. But mostly it seeks out on-the-ground medical providers in countries like Vietnam, Thailand, Sri Lanka and Pakistan. Mr. Iseman has developed relationships with a government hospital in Pakistan, as well as with that nation's Institute of Prosthetic and Orthotics.

Certainly, Penta shows that the trend toward social projects among undergraduates in America can amount to much more than résumé building. ♦

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