

Cover Story

Mending **Shattered** **Youth**

Plastic Surgery

Team of Dalin

Tzu Chi Hospital

A traffic accident almost took the life of a 16-year-old teenager. After a narrow escape from death due to cerebral contusion, his shattered legs which had been run over by a car tested the repair and reconstruction capabilities of the Dalin Tzu Chi Hospital. The Division of Plastic Surgery cooperated with the Cardiovascular Surgery Division in eight surgeries over a period of 50 days. After performing a fasciotomy to treat compartment syndrome, debridement to deal with muscle necrosis, and repair of a severe degloving injury, they were finally able to stabilize his condition and save his life and his legs. The cross-divisional team also assisted in the rehabilitation process with the ultimate goal of calming his mind and soul, stabilizing the family finances, and guiding him on the path to gradual recovery.



From left to right: Dalin Tzu Chi Hospital Operating Room RNs Lin I-Jung, Chen Yu-Fen, Yang Yen-Ling, and Hsieh Meng-Hung, Dr. Huang Chieh-Chi, Director of the Division of Plastic Surgery, Operating Room RNs Huang Kuo-Shu, Tsai Mei-Hua, and Luo Hui-Yu.

By Chiang Pei-Ju

“Thank you all for your devoted care. I’m so glad that I’m slowly getting better and that I can walk again” exclaimed 16-year-old Lin Kai-Hsiang while having a group photo taken with the medical team of Ward 7B. He made a V-sign and thumbs-up gesture as his Dad was standing nearby, his eyes brimming with tears.

Emergency Treatment in the Dalin Tzu Chi Emergency Department After the Victim Is Catapulted from the Backseat of a Scooter

In the evening of that ominous day, Mr. Lin felt restless and uneasy, which seems like a premonition in hindsight. After his



After a narrow escape from death, the 16-year-old Kai-Hsiang is able to have a group photo taken with the medical team of Ward 7B while making a V-sign in his wheelchair, which moves his Dad (right) to tears.

divorce, he had to raise his two kids alone. He worked hard day after day to give his kids a worry-free life. However, he was not prepared for the string of misfortune that hit the family. Six months ago, his scooter skidded in the rain and he fell, breaking his right hand, on his way home from work. Since his hand was seriously fractured, he was unable to continue his work and the whole family had to rely on social relief as their sole revenue source. Family life was still harmonious although they were just scraping by.

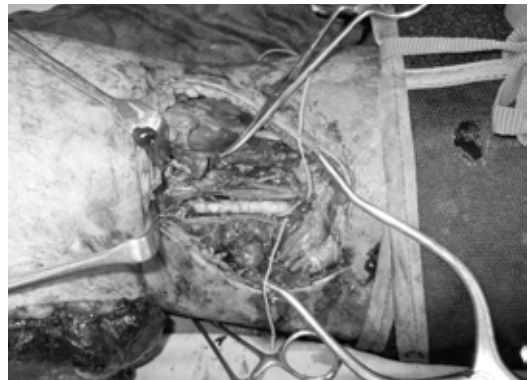
Then, out of the blue, he received a phone call from a hospital: "Is this Lin Kai-Hsiang's Dad? Your son had an accident. He is currently in the Emergency Department of Dalin Tzu Chi Hospital." His dreaded premonition turned out to be true. He rushed out of his home to hail a taxi. On his way to the hospital, he kept praying to the gods for his son's safety. He was willing to take on all the pain his son was suffering.

As he arrived at the hospital, the doctor gave him the bad news: "When your son got here, he was in shock and in a coma. He had a head injury, a cerebral hemorrhage, and otorrhea (the brain injury caused cerebrospinal fluid to be discharged from the patient's ear), his left leg was swollen, and his right leg was bleeding severely. The bleeding has been stopped, but your son's life is in danger, and he is currently in the ICU ward." His

mind suddenly went blank, and he kept thinking to himself "how could this happen to my son?"



Right after his admission to the Emergency Department, the patient developed severe avulsion in his crushed legs. Tissue and muscle necrosis was caused by bacterial infection of issue that lacked protection by the skin barrier.



Right after the patient's hospitalization, it was detected that he had compartment syndrome in his popliteal (hollow at the back of the knee). Dr. Huang Chieh-Chi, Director of the Division of Plastic Surgery, immediately contacted Dr. Hill Ing-Heng of the Division of Cardiovascular Surgery, and Dr. Hsieh Min-Hong, Director of the Division of Orthopedic Surgery, to perform fasciotomy, debridement, and rejoin the severed blood vessels. This surgery lasted almost 10 hours and involved infusion of 6,000cc of blood.

After regaining his composure, he brought himself back to reality and after wiping off the tears, he was getting ready to gain a clear understanding of what had actually happened. It turned out that the child of a neighbor had given his son a ride to make some purchases in the evening of the same day. As bad luck would have it, they had an accident. The rider of the scooter suffered a fractured right hand and multiple contusions. His son was catapulted from the backseat of the scooter and smashed to the ground. The vehicle behind them was unable to

Compartment Syndrome

The term “Compartment” refers to muscle groups encapsulated and divided by fascia within a limited space. When the compartment muscle tissue is damaged, excessive stress is generated in the compartment, which results in abnormal blood circulation and ultimately causes Compartment Syndrome. When the unreleased pressure reaches a critical value, muscle cell necrosis is gradually progressing. This causes severe tissue complications if detected too late. Fasciotomy performed at an early date is the best way to prevent worsening of patient’s condition.

dodge in time and ran over his lower limbs.

In the ambulance on the way to the hospital, Lin Kai-Hsiang was in a coma and his blood pressure was very low. He was in shock and had suffered a skull base fracture. His injuries were life-threatening. After his arrival at the hospital, he was examined by Dr. Chen Jin-Cherng, Deputy Superintendent and Neurosurgeon at Dalin Tzu Chi Hospital. Dr. Chen determined that his cerebral hemorrhage could be absorbed by itself, and surgery was currently not necessary. He was therefore admitted to the ICU ward for observation.

The Crisis Is Defused Through Fasciotomy Performed by a Cross-divisional Team to Relieve Compartment Syndrome

No one could have foreseen that a storm was brewing beneath the seemingly calm surface. On the next day, he developed compartment syndrome in his right leg. Deputy Superintendent Chen therefore decided to conduct a joint emergency consultation with the Plastic Surgery Division. An angiography proved that his blood vessels were obstructed. Dr. Huang Chieh-Chi, Director of the Department of Surgery and Division of Plastic Surgery, therefore decided to take over and perform emergency surgery in the hybrid operating room.

On that day, November 27, 2021, the medical team conducted the first emergency surgery. After opening the wound, Director Huang realized that the popliteal artery, vein, and nerves in his left leg had been severed and there was blood everywhere. This had caused muscle stress and a serious swelling. He therefore immediately asked Dr. Hill Ing-Heng of the Division of Cardiovascular Surgery, and Dr. Hsieh Min-Hong, Deputy Director of the Division of Orthopedic Surgery, for assistance. The team acted in concert to remove the blood clots and perform decompression surgery. Subsequently, they rejoined the blood

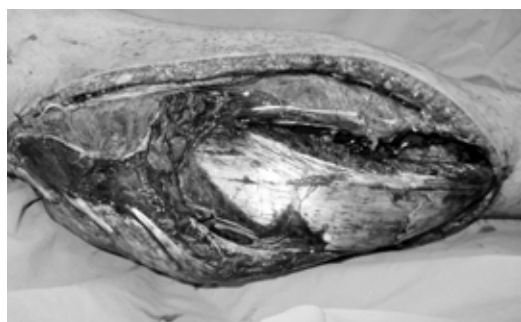
vessels and treated the fractured left femoral and right ankle and the avulsion over an extensive area of the right foot (the skin was completely detached from the flesh) in a painstaking effort to save the patient's legs.

Eight Surgeries Performed over a Period of 50 Days to Avoid Amputation

Since his admission to the hospital after an accident on November 24, 2021, Kai-Hsiang had suffered repeated infections as a direct result of his wounds covering a large surface area.



The medical team was able to save the patient's legs and stabilize his condition a bit through a time-consuming and laborious surgery.



The debridement surgery performed on December 1 aimed to remove necrotic (dead) muscle and other tissue in his right foot and left leg.

Eight surgeries had been conducted successively. On November 27, Director Huang Chieh-Chi and Dr. Hill Ing-Heng rejoined the patient's severed blood vessels in a concerted effort. This surgery lasted almost 10 hours from morning to night and involved infusion of 6,000cc of blood.

The debridement surgery performed on December 1 aimed to remove necrotic (dead) muscle and other tissue in his right foot and left leg. Further debridement and Split Thickness Skin Graft (STSG) surgery was conducted on December 8. A week later, the patient underwent another debridement surgery. On the 21st, skin graft and debridement surgery was performed on the right foot and left lower limb, respectively. The sixth and seventh debridement surgeries were carried out on December 28th, 2021 and January 5, 2022. The eighth and final surgery which lasted almost six hours and involved a muscle flap transplant and skin grafting was performed on January 12.

Kai-Hsiang had suffered Compartment Syndrome mainly due to the ruptured popliteal artery in his lower limb and peripheral vessel occlusion (blockage). Due to his young age, his blocked peripheral vessels miraculously proliferated and the collateral circulation opened up the blood vessels. Director Huang Chieh-Chi recalls that "the patient's muscles and blood vessels were blocked. Under these most adverse conditions,

there was very little hope. In the very beginning, we found a remote embolism which we tried to extract. However, we were only able to remove part of it, and the remaining part was floating to a remote location and caused blockage there. This caused dead tissue which became infected and had to be removed through another debridement."

Director Huang Chieh-Chi further points out that massive muscle cell necrosis is most difficult to treat due to presence of so many rotten cells and multidrug-resistant bacteria. Serious infections represent another concern, which often necessitates amputation. However, in consideration of the patient's young age, it was determined that the loss of a leg would have an immense impact on his future life and mental well-being.

Free Flap Limb Reconstruction Surgery

A flap is a tissue structure composed of skin and subcutaneous tissue which can be relocated from its original site to another part of the body. Free flap is a flap graft that relies on microvascular anastomosis and allows limb reconstruction such as reattachment of severed fingers.

Close to 900 Cases of Free Flap Limb Reconstruction Surgery over the Past 20 Years

Under the leadership of Director Huang, the plastic surgery team of the hospital has been firmly committed to preserving limbs to minimize the physical and mental impacts on the patients and their families and enabling the patient to regain his confidence and restore his quality of life at an early date. Over the past 20 years, Dalin Tzu Chi Hospital has successfully performed free flap limb reconstruction surgery close to 900 times. This case number is among the highest



Under the leadership of Director Huang Chieh-Chi, the plastic surgery team of Dalin Tzu Chi Hospital has been firmly committed to preserving limbs. Over the past 20 years, the team has successfully performed free flap limb reconstruction surgery close to 900 times.

in Taiwan. By performing this surgery, the team not only saved the patients' limbs and thereby changed their lives but also relieved the care burden of their families.

Director Huang states that “looking back on these difficult and complex cases, what’s most important other than the cooperation and coordination between teams from different departments, unwavering efforts, fulfillment of duties, and passing on of experiences, is to treat the patient as a “teacher” and maintain a humble attitude characterized by lifelong learning and empathy for the patient. I firmly believe that this is the demeanor fitting for a physician who embraces healing as his calling.”

Trauma Score (Injury Severity Score)

The Injury Severity Score (ISS) is a calculation method which has been developed based on the Abbreviated Injury Scale (AIS). It is utilized for injury severity assessment and prognosis.

An ISS of 1–8 is considered minor, 9–15 moderate, 16–24 severe, and 25 and higher very severe. Patients with scores above 16 are eligible to apply for an IC card for severe illness.

Patient Regains Consciousness After Around a Month Due to the Perseverance of the Medical Team

After around a month in the ICU ward, Kai-Hsiang slowly woke up from his coma due to the meticulous care of the medical team. The nurses of the ICU ward, in particular, made immense efforts in the care process. They had to pay constant attention to ensure that the comatose patient wouldn't bite or pull out the tubes. This process was extremely taxing and tiring, but as they observed how the patient gradually got better, they felt it was all worthwhile. However, they also knew that they still had a long road ahead of them...

As he recalls how the patient was still lying unconsciously in the ICU, Dr. Huang Chieh-Chi, Director of the Department of Surgery and Division of Plastic Surgery, has a lingering sense of anxiety. He still remembers that “the patient was in very critical condition when we checked on his wounds after being notified by Deputy Superintendent Chen. His trauma score was off the charts at 38. He needed constant blood transfusions and vasopressor injections. Due to extensive muscle necrosis in his lower limbs, his bones were visible and a putrid smell filled the room. Compartment syndrome represented another serious issue. Despite uninterrupted treatment, the patient



As a result of the affectionate care provided by caregiver Lin Mei-Chin, the patient Lin Kai-Hsiang trusted and relied on her like a close family member.

just wouldn't regain consciousness. We therefore anxiously asked Deputy Superintendent Chen the same question every day: "Is Kai-Hsiang going to wake up?" Each time, he would reassure us that he would."

Director Huang states with a chuckle that "the Deputy Superintendent has divine foresight just like the legendary strategist Chu-Ko Liang." Kai-Hsiang did indeed wake up less than one month later. Despite the fact that the patient was still drowsy, the specter of persistent vegetative state (PVS) had already passed. His family members, caregivers, and



After eight successful surgeries, the team was finally able to save his legs and initiate rehabilitation therapy. The image shows a physical therapist examining the patient's splint.

all members of the medical team were overjoyed and full of confidence in the face of upcoming challenges.

Deputy Superintendent Chen Jin-Cherng reveals that "when Kai-Hsiang was transferred from the Emergency Department, it was determined through a computer tomography that his dura mater was bleeding, but it was decided not to perform surgery since the bleeding was not serious. Due to the swelling in his legs, he was emergency admitted to the ICU ward for observation. He had another cerebral hemorrhage coupled with otorrhea caused by a skull base fracture.

These severe injuries did not only affect the brain.”

The following morning, Deputy Superintendent Chen was alarmed by the condition of the patient’s left foot. He therefore immediately arranged angiography which showed that the blood vessels in his foot were ruptured and were spurting blood. The Plastic and Cardiovascular Surgery were therefore notified immediately to perform surgery in the hybrid operating room.

Subsequently, he not only received critical care but also treatment by a cross-departmental team due to his numerous



Despite the fact that Kai-Hsiang is in a lot of pain, the team still encourages him to grit his teeth and complete his rehab routine to ensure his speedy recovery.

wounds. This team was composed of members of the Neurosurgery, Cardiovascular Surgery, Orthopedic Surgery, Infectious Disease, Neurology, Nutrition, and Rehabilitation Divisions. Social workers and volunteers were enlisted to provide assistance in the application for subsidies and assistive devices to alleviate the financial burden of the patient's family. The medical team successfully saved the patient's life and his legs and ultimately enabled him to return to his normal life and reintegrate into society, thereby generating a true fusion of charity and humanities.

Surrounded by Human Warmth, the Patient Grits His Teeth to Gain a New Lease of Life

The daily two-hour rehab regimen five days a week was extremely strenuous for the patient, but he was gritting his teeth because he was determined to get better. Ms. Lin Mei-Chin, the hospital hired caregiver, was filled with pity, but she knew that all his efforts would be worthwhile to ensure a fast recovery and early return to his normal life.

In consideration of the strained finances of the patient's family, the social worker of the hospital therefore provided assistance in the application for subsidies covering the caregiver costs.

Ms. Lin recalls that “when the boy was transferred to the general ward after

almost one month in the ICU ward, he was unable to speak normally, probably because he was too scared. He was only able to reply with “Ah, Ah”. One month later, he gradually regained his ability to communicate and could answer some simple questions.” Since Ms. Lin had been his primary caregiver after his transfer to the general ward, they developed a special bond resembling a mother-son relationship. Naturally, she treated this 16-year-old patient as her own child.

“Auntie, will I get well again?” asked the slowly recuperating Kai-Hsiang. After being hospitalized for two months, he had no memory at all of the accident. In the beginning, he didn't even realize he was in a hospital and would always giggle since he was unable to talk normally.

He has been devoid of motherly love since his early childhood. Due to the motherly care he received from Ms. Lin, he viewed her as a loved one and started calling her “Auntie” or “Mum”. Ms. Lin was always there for him when he had his meals, did his rehab routine, or video chatted with his Dad and Grandma in the evenings.

“One evening, he and his Dad both broke into tears during a video chat because his Dad was deeply worried he would never walk again. He was still undergoing rehabilitation therapy for his hand and had just been reinstated to his former job. Before the accident, his Dad was forced to make the decision to have



his son move to Huwei to stay with his sister and be closer to his school, while he himself lived alone in Taixi Township. He was worried that his son wouldn't be able to take care of himself after his discharge from the hospital and couldn't think of a solution."Ms. Lin was fully aware of the state of the family's finances. After all, his sister who was two years older was also still a student. No wonder his Dad was so distressed.

Mr. Lin always points out that Kai-Hsiang is a very good son. After his accident, he was unable to take care of himself because of surgery to his right hand and his son would bathe, feed, and dress him. Now that his son had also had



During a ward round on February 21, Director Huang examines the skin grafts on Kai-Hsiang's legs and assesses his ability to walk independently.

an accident his heart was bleeding. His whole life revolves around his children. If he lost one of them, all his efforts and hard work would be meaningless.

“When I was admitted I only weighed 44 kg. Now I have already gained 5 kg,” said Kai-Hsiang beamingly. He had never weighed so much before. Ms. Lin Mei-Chin jokingly referred to him as a polite glutton. In the course of his three-month hospital stay, he got acquainted with almost all the nurses and patients in Ward 7B. Everyone really cared about him. For instance, the patient in the bed next to him shared his food with him and someone else gave him an inspirational book as a gift. The nurses were also very fond of him and always shared their drinks, cookies, and pastry with him.

Every morning from Monday to Friday at 9:00 am, Ms. Lin Mei-Chin pushed Kai-Hsiang in a wheelchair toward the Rehabilitation Division. She recalls that “his tight leg muscles and tense hamstrings had to be loosened so he could walk better.” Mr. Yeh Hsing-Tung, the physical therapist taught Kai-Hsiang patiently how to massage his acupoints. Based on an assessment of his current condition, he suggested to Ms. Lin that the plank that secured his foot should be replaced with a slipper-like device to protect the skin in that area.

Another physical therapist Tsai Pei-I, who was also very caring about him, constantly motivated him: “You have

made good progress over the past two to three weeks! Keep up the great work!” Whenever she saw him diligently do his rehab exercises drenched in sweat during the daily two-hour sessions, she never forgot to encourage him. The loving care shown by all these people helped him gradually recover from a state of incontinence and astasis and regain the ability to walk stably with the aid of a quad cane.

Joyful Birthday Party and Well Wishes at the Time of Discharge

“Happy birthday to you! Happy birthday to you!” Lin Kai-Hsiang walked slowly toward them with his quad cane from a distance with his signature smile on his face. His sister who was lighting the candles announced that “March 26 is Kai-Hsiang’s birthday! We have decided to celebrate his birthday early!”

His Dad and his sister both took a day off to attend Kai-Hsiang’s Farewell Party in the hospital shortly before his discharge. The people who were instrumental in saving his life including Dr. Hill Ing-Heng of the Division of Cardiovascular Surgery, Dr. Hsieh Min-Hong, Director of the Division of Orthopedic Surgery, Ms. Hsu Yu-Chen, Head Nurse of Ward 7B, Ms. Chen I-Wen, surgery NP, Ms. Chen Ying-Ying, a volunteer, and his primary caregiver Lin Mei-Chin were also present. They all formed a circle around this medical

miracle. Director Huang Chieh-Chi, who had meticulously planned this Farewell Party was overjoyed but deep inside he was reluctant to say goodbye.

“I am deeply thankful to all members of the medical team and Uncle Huang, Deputy Superintendent Chen Jin-Cherng, Dr. Hill Ing-Heng, and Dr. Hsieh Min-Hong in particular” exclaimed Kai-Hsiang, expressing his heartfelt gratitude in a leisurely manner. He also presented the team with a self-made thank you card. Ms. Chen Ying-Ying gave him the previously prepared farewell gift and encouraged him to keep up his efforts so he could go back to school as soon as possible. The team also reassured them that regular home visits by community volunteers would be arranged after Kai-Hsiang’s discharge.

“This high-protein powders will regenerate Kai-Hsiang’s muscles. This book *Jing Si Aphorisms – Fundamentals of Virtue* will turn Kai-Hsiang into a more filial son and this one titled *Bodhisattva Path* will help him unleash his innate abilities when he is grown up.” Director Huang Chieh-Chi described each gift prepared by the team and offered his blessings in the sincere hope that Lin Kai-Hsiang will practice filial piety and do good deeds after gaining a new lease of life.

When receiving the gifts that Director Huang had so carefully prepared, Kai-Hsiang said, visibly moved: “Thanks so much Uncle (Director) Huang. When I’m fully recovered, I’ll come back to serve as

a volunteer to extend a helping hand to people in need of help.”

When the Patient Returns to His ward during a Return Appointment, the Team Clusters Around Him to Show Concern and Cheer Him Up

“Have you been doing alright after your discharge?” asked Director Huang during Kai-Hsiang’s first return appointment on March 16, almost four months after he had sustained severe, life-threatening injuries in a traffic accident. His Dad rolled his son into the outpatient room in his wheelchair. Director Huang greeted him warmly, making him feel like a close relative.

“Have you been diligent about your rehab routine?” The doctor earnestly inquired. “This is really important! You have to keep up your efforts to ensure a speedy recovery so you can walk normally again and go back to school.” He was worried that his young patient would slack off at home if no adult kept an eye on him.

His Dad who was standing next to him reassured the doctor that “his sister always takes time out of her busy schedule to take him to St. Joseph’s Hospital in Huwei to do his rehab routine as scheduled.” He added that he calls his son every day to show concern and ask how he’s doing no matter how busy he is at work since they can’t live together.



On March 1, the team holds a Farewell and early birthday party for Kai-Hsiang. All attending physicians (Deputy Superintendent Chen Jin-Cherng: 3rd to the right) participate in this event to offer their blessings.

After that, the doctor took a pen light out of his pocket to carefully examine Kai-Hsiang's legs and determine their current condition. As the wounds were healing, the transplanted flap made the skin appear a bit dry. He grabbed a bottle of lotion on his desk, while he was explaining to Kai-Hsiang how to care for his skin to prevent wounds caused by dry cracking. As he squeezed some lotion on his hand, he showed Kai-Hsiang how to apply it evenly on his legs and instructed his Dad to buy a similar lotion for his son at a local pharmacy or convenience store.

Due to the otorrhea caused by the skull base fracture that he was still recovering from, Kai-Hsiang appeared a little dull and slow-witted. He wasn't

as cheerful and talkative as during his stay in the hospital. Although he was aware of the long recovery period of severe trauma victims, Director Huang was still concerned about Kai-Hsiang since patients in that age group tend to be tempted by consumer electronics products and neglect their rehabilitation routine.

Director Huang therefore earnestly exhorted him to train his brain. "Did you carefully read those two Jing Si aphorism books that I gave you when you were discharged after you got back home? You must read more books to stimulate your brain and get back to normal."

Kai-Hsiang looked at Director Huang whom he fondly calls "Uncle Huang" with

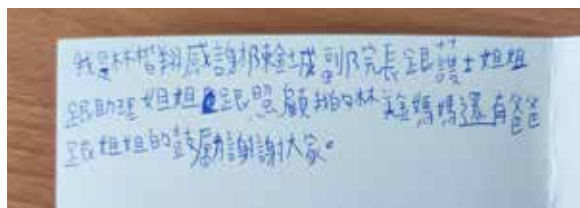
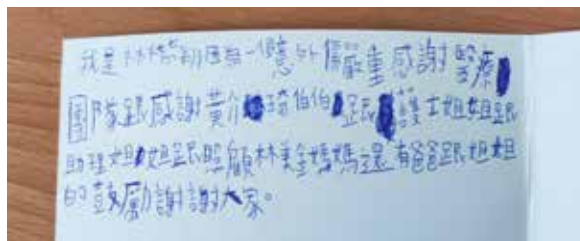
a grin. After pausing for a few seconds, he quickly replied “I will do my best to pass the test you give me in our next appointment.”

Despite the fragmented memory loss caused by the brain trauma, Kai-Hsiang had not forgotten the devoted care he had received from NPs and RNs over the past three months. He therefore decided to take this opportunity to visit the medical team of his former ward. Ms. Yu-Chen Hsu, Head Nurse of Ward 7B, who had already been notified by Director Huang, quickly told the other team members to prepare a gift for Kai-Hsiang. They hastily grabbed a package of Kuai Kuai cookies symbolizing “stabilized condition and smooth recovery” and started writing their well-wish message in a conscientious manner.

Head Nurse Hsu Yu-Chen greeted him affectionately, “Kai-Hsiang! It’s so good to see you again!” A moment later, the whole team of plastic surgery NPs assembled to welcome their visitor.

”Look! Here’s a special gift we have prepared for you!” The nurses handed him the Kuai Kuai Cookies (meaning being good) with the following message written on the pink package: “We wish you a speedy recovery so you can run faster and faster! You got this!” Kai-Hsiang raised his head and thanked them with a smile.

“Why are you so withdrawn today? You weren’t like that while you were here! Did you study at home? Writing essays



Despite the fact that his brain functions are not yet fully restored, Kai-Hsiang is still able to personally write a greeting card to express his gratitude to every team member.

is an excellent way to train your brain! Next time you visit us you have to hand in essay!"The loving care of this team of NPs and RNs and their blessings and hopes give Kai-Hsiang the strength to forge ahead on the path to full recovery.

During a return appointment after his discharge on March 10, Director Huang teaches Kai-Hsiang and his Dad how to care for the wounds and apply lotion.



All RNs and NPs of the ward cheer for Kai-Hsiang and give him a homework assignment to train his brain.