JPPT | 2023 Richard A. Helms Award Lecture

A Life Less Ordinary

Shannon F. Manzi, PharmD

ABBREVIATIONS BCH, Boston Children's Hospital; DMAT, Disaster Medical Assistance Team; ED, Emergency Department, EMS, Emergency Medical Services; NDMS, National Disaster Medical System; PGx, Pharmacogenomics; SNP, Single Nucleotide Polymorphism

KEYWORDS disaster response; emergency medicine; medication safety; pharmacogenomics; resilience

J Pediatr Pharmacol Ther 2023;28(6):480–489

DOI: 10.5863/1551-6776-28.6.480

I certainly did not expect to be standing here in front of you accepting the 2023 Richard A. Helms Award of Excellence in Pediatric Pharmacy Practice, in the company of so many people who I have admired, looked up to, and envied for their dedication to their careers, to the advancement of the profession each in their own way. Thank you to Rich Helms and to the Board of Directors for voting to give me this award. In some ways, I have always viewed the Helms Award as a symbol of lifetime achievements, and I don't feel like I have done enough to measure up to those who have come before me. And then I realized, my path has been very different from traditional careers and I cannot compare it to the journeys of others. Twists and turns of events led to a very unusual list of accomplishments. A life less ordinary.

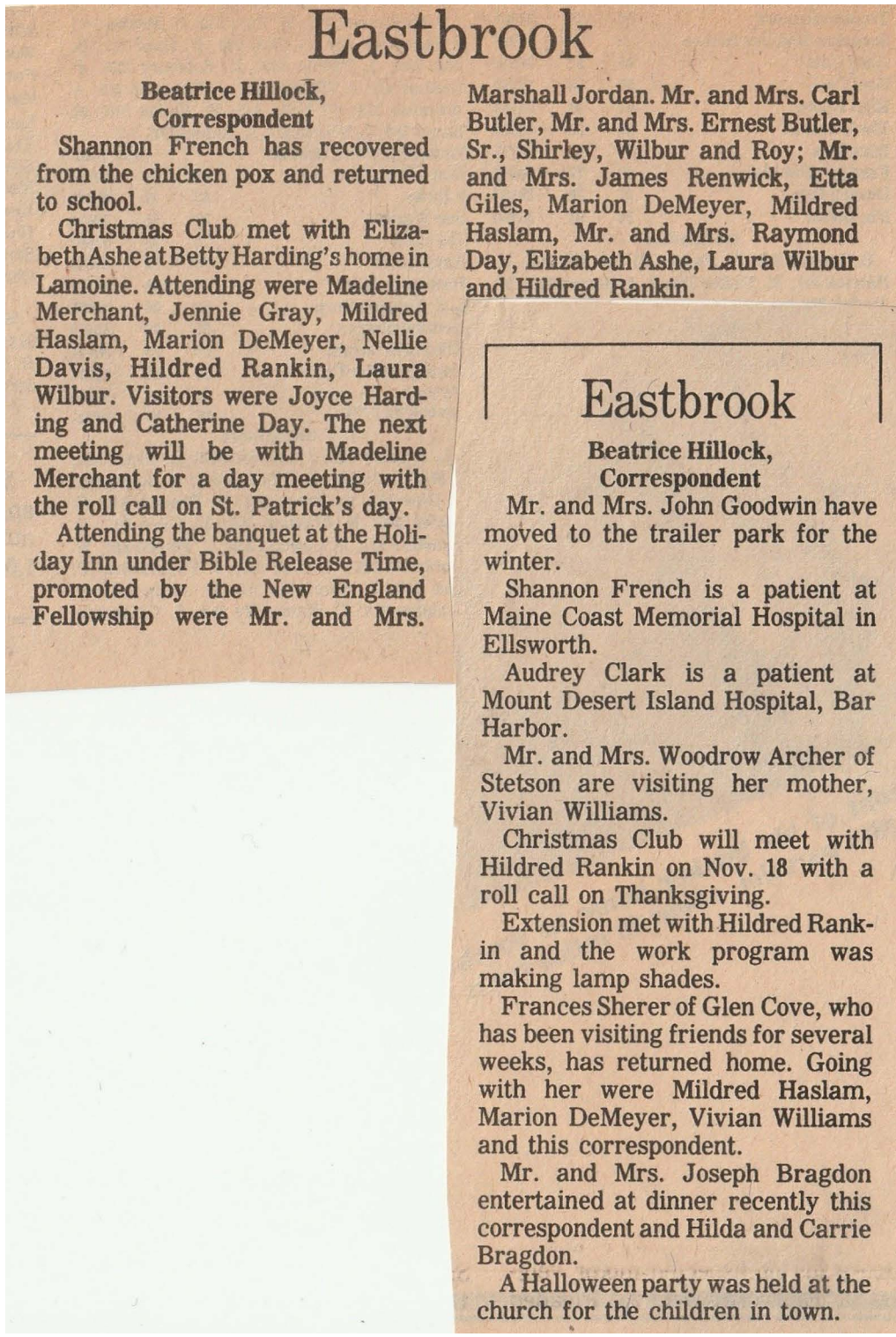
So where did this crazy story start? Growing up in Maine in a small town of 330 people, no one else in my family had ever gone to college. My mom attended a Certified Nursing Assistant course when I was in high school—she was so determined to complete that course and would spend hours studying in front of the wood stove with her feet on the oven door (yep!), telling us random health facts as she found them interesting. She has always embodied pure determination—a single mom with three girls. She gave up so much just to make sure we had food and heat. But growing up in such a small town meant that everyone knew everyone and there was no privacy. I literally made the newspaper for having dinner with my grandmother who lived 3 houses away! As one can imagine from the newspaper clippings I kept, no secret was safe from Bea Hillock, the town columnist! (Figure 1).

When I was 10 years old, I spent the day after Halloween until the day before Christmas in a small hospital in Maine, diagnosed with *H influenzae* osteomyelitis. I did not respond to the antibiotics they tried, so the team decided to try a new second generation cephalosporin called Mefoxin (cefoxitin) that had been FDA approved 3 years prior (1978!)—it worked! Of course, the treatment of osteomyelitis in the early 1980s required 6–8 weeks in the hospital—there was no home visiting nurses or home IV therapies back then, especially not in rural Maine! As you can see from the note my sisters wrote to me, admitting to breaking the "rools," their future as criminal masterminds was in doubt early on! (Figure 2) I had a tutor every day to try to keep up with my classwork and continued physical therapy because being bed-ridden for so long left me quite deconditioned. I have never recommended Z-track intramuscular iron injections in my entire career because of how traumatic that experience was. As my primary nurse finally bundled me up with a humongous number of stuffed animals and cards from my classmates to take home, she handed me a stuffed whale Christmas ornament. It has hung on my tree every year since, a reminder not only of the staff that cared for me but also how much I feel compelled to pay back the system that saved my life.

Fifteen years later as I rounded on the pediatric respiratory wing at Yale New Haven Hospital, I turned the corner to find my pediatrician Dr Kipperman, charting at the nurses station. This was amazing because I had not seen him since my last day in the hospital all those years prior, since he was "moving on." Turns out, he moved to Connecticut and had established a practice with admitting privileges at Yale New Haven Hospital. After introducing myself, since he clearly did not recognize me, the first thing he said was "I never thought you would step foot in a hospital ever again after your ordeal!". To be honest, I think that experience settled in my subconscious and drove my early decision to be a pharmacist—and not only a pharmacist—but a pharmacist who worked in a hospital.

I was 12 or 13 years old when I saw an advertisement on the back of one of my mother's magazines that proclaimed pharmacists were the most respected profession. I was sold! I interviewed at Wellby Super Drug in Ellsworth just as soon as I got my work permit at 15 years old; there was nowhere else I wanted to work. Luckily I impressed them with my passion if not my age! I spent all of high school and a few vacations during

Figure 1. Ellsworth American, circa 1978 and 1981.



Eastbrook

Beatrice Hillock, Correspondent

Shannon French has recovered from the chicken pox and returned to school.

Christmas Club met with Elizabeth Ashe at Betty Harding's home in Lamoine. Attending were Madeline Merchant, Jennie Gray, Mildred Haslam, Marion DeMeyer, Nellie Davis, Hildred Rankin, Laura Wilbur. Visitors were Joyce Harding and Catherine Day. The next meeting will be with Madeline Merchant for a day meeting with the roll call on St. Patrick's day.

Attending the banquet at the Holiday Inn under Bible Release Time, promoted by the New England Fellowship were Mr. and Mrs. Marshall Jordan. Mr. and Mrs. Carl Butler, Mr. and Mrs. Ernest Butler, Sr., Shirley, Wilbur and Roy; Mr. and Mrs. James Renwick, Etta Giles, Marion DeMeyer, Mildred Haslam, Mr. and Mrs. Raymond Day, Elizabeth Ashe, Laura Wilbur and Hildred Rankin.

Eastbrook

Beatrice Hillock, Correspondent

Mr. and Mrs. John Goodwin have moved to the trailer park for the winter.

Shannon French is a patient at Maine Coast Memorial Hospital in Ellsworth.

Audrey Clark is a patient at Mount Desert Island Hospital, Bar Harbor.

Mr. and Mrs. Woodrow Archer of Stetson are visiting her mother, Vivian Williams.

Christmas Club will meet with Hildred Rankin on Nov. 18 with a roll call on Thanksgiving.

Extension met with Hildred Rankin and the work program was making lamp shades.

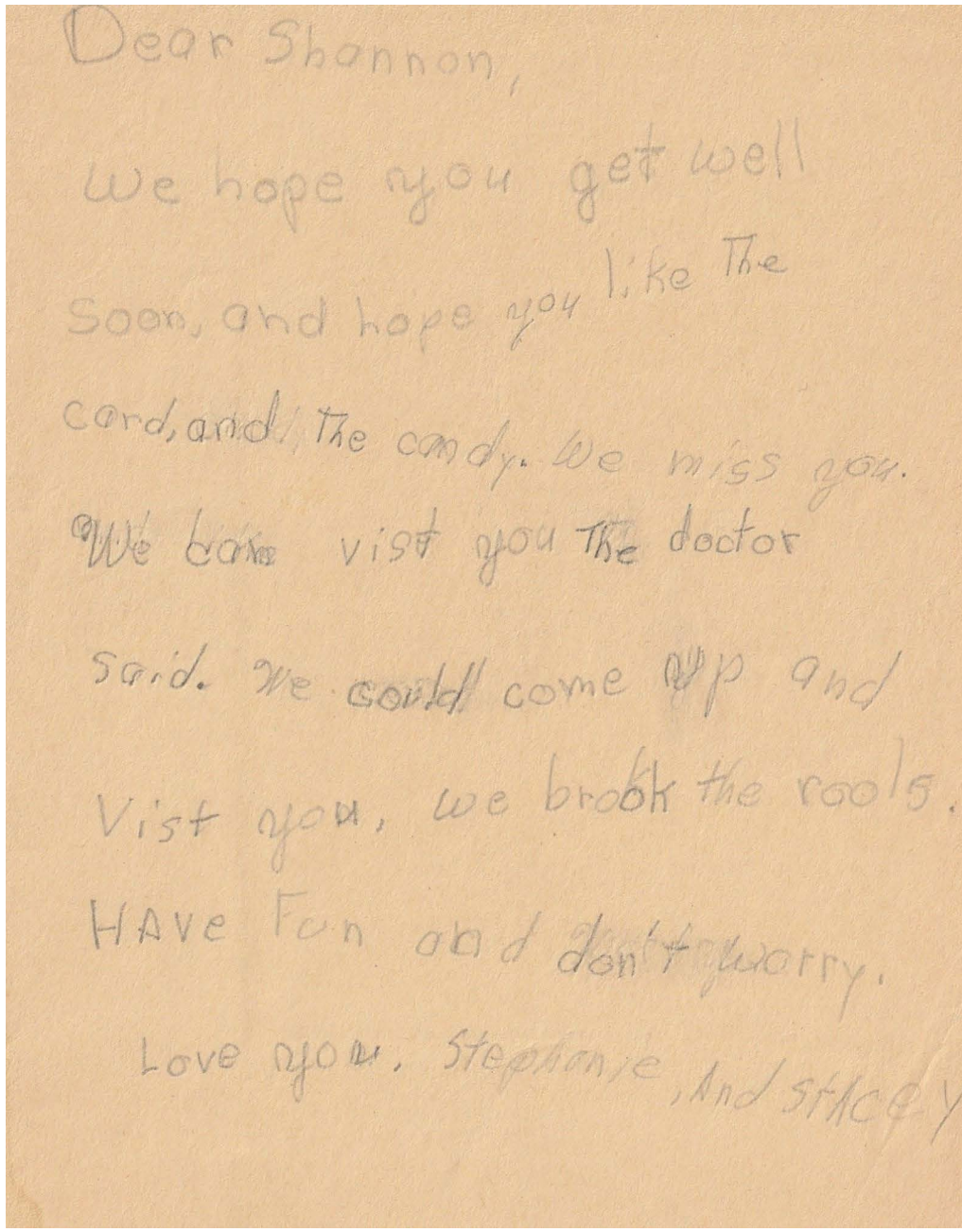
Frances Sherer of Glen Cove, who has been visiting friends for several weeks, has returned home. Going with her were Mildred Haslam, Marion DeMeyer, Vivian Williams and this correspondent.

Mr. and Mrs. Joseph Bragdon entertained at dinner recently this correspondent and Hilda and Carrie Bragdon.

A Halloween party was held at the church for the children in town.

the early years of college working for them, until the chain was eventually sold. My recommendation letters for University of Rhode Island (URI) were written by 2 of my early pharmacist mentors—Paul Homich and Bill Kenausis. They taught me all they could fit in while filling hundreds of scripts a day. We compounded ointments

Figure 2. Note from my sisters, 1981.



and suppositories, counseled many patients, fought with the Kirby-Lester counting machine, and truly felt like a team—everyone worked so hard!

Then came the summer of 1989. I graduated high school with an early decision to URI and promptly deferred entry for a year. I had been accepted to the American Field Service (AFS) as an exchange student, a year-long study abroad program. Off to Denmark I went, the first time I had ever been on a plane and only the third time I had ever left Maine—both were field trips for school! I truly believe that year helped me discover that I could trust my ability to persevere, creating a sense of optimism I carry today and I hope I never lose. We are all bound to fail. And as we all know, it is not about the failure, it is about how we process that experience and learn from it. That year was an amazing time to be in Europe—the fall of the Berlin wall, the departure of Russian troops from Hungary. I traveled freely with little fear. I was a witness to history. Per the AFS motto, they did indeed develop an active global citizen out

of me. But most importantly, that year stoked my love of travel, of learning, and of asking endless questions.

Upon returning, I headed almost immediately to start my journey at URI. I had to start a work study job and was lucky enough to find a position with the Pacific Basin Capital Markets Research Center (known as PACAP) in the College of Business. This was a game changer. It gave me a break from pharmacy—organizing financial conferences in Pacific Rim countries will do that—and fed my desire for travel. Each year, after months of soliciting proposals and papers, organizing reviewers and developing agendas, with a twist of faxing in the middle of the night to match business hours in the host country, we would embark on 10 days in Hong Kong, Indonesia, or Malaysia. Covering those experiences alone could take up an hour! But 2 events really stand out. The first was in 1994 when I flew into Jakarta by myself with 8 large boxes, my bosses were scheduled to arrive the following day. Here I was, a young 20-something, pulled out of line after arrival and brought to a small dark room with all my boxes. Three or four armed guards entered the room, and I was certain at that point I would never be seen again. After some back and forth in broken English about my purpose in the country, I encouraged them to open one of the boxes. On the front cover of the programs was an announcement that their President was to be in attendance. Their postures transformed immediately, and they fell over themselves getting me a very nice car service to transport me and my boxes to the hotel! President Suharto was a military dictator who apparently was not someone to be crossed, and he later resigned due to civil unrest and evidence of embezzlement. Of course we had no idea back then!

The second memorable experience occurred at the Kuala Lumpur Stock Exchange. We were taking a tour with the president of the stock exchange and as we entered the floor, he told us to be careful not to brush up against the walls. They kept track of stock prices on blackboards with chalk! We could wipe out the annual corn crop revenue with one errant sleeve!

Upon entering the 5-year BS pharmacy curriculum, I knew that I did not want to go into retail pharmacy like 98% of my classmates. My professors who had hospital faculty appointments intrigued me. The more I learned about hospital pharmacy, the more I knew that I did not want to graduate with my BS Pharm, but instead I felt like there was so much left to learn. After a rigorous application process, I was accepted as a 2-year PharmD candidate. My group of 8 (yes there were only 8 of us!) were given the option to take extra classes during the final 2 years, so we could graduate with the inaugural 6-year PharmD class who were the year behind us. But something was missing. My 1 or 2 hours of pediatric calculations in class were enough to peak my interest, so I started pursuing a pediatric rotation. There were none established at URI at that time, so I reached out to alum Christine Marchese who was willing to set up a pediatric rotation at the brand new Hasbro Children's Hospital in Providence, RI. She introduced me to pediatric dosing and over the years we stayed in touch, including commiserating on how to parent teenage daughters.

During 2 summers of pharmacy school, I returned to work in that same small hospital where I spent all those months as a patient. Kathleen was the sole pharmacist on duty, making several Parenteral Nutrition (PN) bags by hand every day in a small horizontal flow hood that was literally open to the rest of the pharmacy. Looking at our state-of-the-art facilities now, producing more than 60 PNs a day, reminds me how far we have come in our understanding of sterile compounding.

My journey after graduation was also a bit different than others. I interviewed for a non-accredited pediatric residency at Hartford Hospital and was offered the position. Residency after graduation was rare at that time. The position entailed 40+ hours a week plus 1 evening staffing shift per week and every other weekend. I had a 6-week-old daughter and I turned it down. Do I regret it? No. I was hired as a new grad at Yale New Haven Hospital and spent a year learning pediatric pharmacy operations from Rob Vitale. I truly believe I could not have benefitted more. Sometimes the unusual path turns out to be the right path for you. Much of my life has been this way, as you will see!

The next year, a job transfer to Massachusetts required us to move. I was hired as 1 of 2 staff pharmacists at Boston Children's Hospital (BCH) with PharmD degrees. BCH is now a huge enterprise with more than 450 beds, a quaternary care center with the largest pediatric research program in the country. But in the late 1990s, we were a much smaller facility with a very small clinical pharmacy program consisting primarily of Dr Kathleen Gura's work with nutrition. So Dr Holly Owens and I hatched a plan to pitch an aminoglycoside dosing service, performing kinetics for all patients receiving gentamicin, tobramycin, and amikacin. Working with scientific calculators and a Word document, we made it happen. Then after rounding with Neurology for several years, I eventually decided my type triple A personality needed a different venue. The ICU position was filled (we only had 1 back then!) so I set my sights on the Emergency Department (ED), even though there had never been a pharmacist dedicated to the ED. In fact, there was only 1 pediatric ED pharmacy program in a teaching hospital at the time—it was actually a presentation at PPA by pharmacists from Texas Children's that caught my attention. They had a clinical service but not an operational satellite. I was interested in a hybrid approach—provide the clinical services while ensuring the ED patients benefited from the same standard of care from pharmacy as the inpatients. Dr Gary Fleisher, Chief of the Emergency Department, and nursing leadership accepted my pitch and over time, I became part of the ED staff and family. There were so many things

to tackle. Vials of heparin 20,000 units/mL in a random drawer in the resuscitation room, several nurses at once mixing medications in a closet sized medication room literally bumping into one another, no standardization of written orders (some made the wall of shame!). I learned so much—Dr Fleisher allowed me to sit in on all the lectures for the medical students, residents, and fellows. The day he came into the trauma room and asked me "sick or not sick?" in order to prepare himself, I knew I had just moved from student to colleague. Sick or not sick is more than a simple question. It reflects the ability to discern from the doorway whether or not a patient needs immediate intervention. My fellow ED pharmacists and EMS colleagues learn to build their next steps in their response around the sick or not sick determination. That day remains seared in my memory, along with the day in Haiti when we were standing at the edge of the cot in the tent with a seizing baby and Dr Fleisher said "I have taught this for 30 years but never seen it in person. This is neonatal tetanus." But I am getting ahead of myself.

As we continued to lobby for a full ED pharmacy satellite, I started to collate future teaching materials. It took several years of petitioning the hospital's board to invest in constructing an ED pharmacy with a sterile compounding room, but with the promise of timely medication delivery for better patient throughput, providing drug information for the prescribers and nurses, and patient counseling it finally happened. What truly sold it was the ability for pharmacists to assist with medication reconciliation since the Joint Commission had just made medication reconciliation a National Patient Safety Goal and the ED at that time was not exempt. This taught me a valuable lesson in negotiating. First, don't give up. Three years in a row we put the proposal in front of the board before it was approved. Second, align your request with a regulatory or financial (or both!) goal of the institution and you will be much more likely to succeed. We all want to believe that improved patient safety or increasing patient satisfaction will be enough, but it usually is not. Especially when you cannot demonstrate a tangible return on investment. It took years before I was part of the budgeting process and started to understand sustainability. The best programs in the world will not survive without continued funding. The other valuable lesson I learned was patience. OK, maybe I have not fully learned patience, but I certainly am more accepting that large endeavors do not happen quickly. It took a year and a half to construct the pharmacy after the funding was secured. To become fully staffed with pharmacists and technicians 24/7 took another 18 months. Now it is impossible to imagine not having the satellite staffed all the time.

I was about a year in when Dr Fleisher came by one day and said "I need a pharmacist." My first thought was for the toxicology case in room 14, but he clarified that he was asking me to join a federal disaster team as part of the National Disaster Medical System (NDMS). I had heard a little bit about the federal pediatric specialty team (PST-1) sponsored by BCH, but I really had no idea what they did. So of course I said yes! I did not realize it would take 2 years from the time I applied to the time I received my credentials. In the interim, 9/11 happened. I was crushed to have been left behind while my teammates headed out that afternoon to NYC. They staged near the pile and prepared to care for victims. Sadly, as we all know, there were no victims. However, the team took great care of the first responders and the search dogs. What they did not know at the time was how exposed they were to so many toxic chemicals. Several NDMS members are 9/11 cancer victims and survivors. Debbie Turco, a brilliant Physician's Assistant on our Massachusetts-1 Disaster Medical Assistance Team (MA-1 DMAT), was not so lucky. In her early 40s, she passed away from 9/11-related gastric cancer, leaving her young children and husband to go on without her.

While I knew there would be some risks, there is nothing that could prepare me for the extent of the damage of Katrina or the massive death in Haiti. Yet even after more than 20 deployments, I would not trade this part of my journey for anything. Disaster medicine is unlike anything I ever experienced. The ability to care for others who have lost everything, sometimes including their families, is a privilege. At least in my pharmacy curriculum, there was no mandatory or elective option to learn about practicing in an austere environment with little to no clean water, extreme temperatures, sleeping in a tent with 35 of your teammates or how to staff 12- to 14-hour shifts for 14 to 21 days in a row with no break. Working by headlamp, learning to prepare rehydration solution from the meals-ready-to-eat (MRE) components, trying to prepare IVs when the aftershocks keep raining asbestos and dirt down on everything were not core competency skills on any rotation I had! As we traveled to the site in the middle of the night in Haiti, we were sitting on top of all of the supplies and tent boxes in the back of dump trucks. The electrical wires were hanging low over the roadways after the earthquake, and someone in the back of the first truck with a flashlight was the lookout. They would spot the low wire, yell "DUCK" and everyone had to relay that back to the next vehicle (there were approximately 7 in the convoy) so that no one got their head chopped off! This is only one of the crazy adventures we have had—too many to cover today! Sleeping on cardboard boxes for 2 weeks, using port-a-potties when the heat index inside is 124 degrees, or using hand warmer packs on the fuel line when the temperature is −20 degrees to keep it from gelling and the generator running heat into the tent all night are not skills I ever dreamed of possessing! Our deployments have spanned a great many natural disasters as well as manmade, including the unaccompanied minor border crossings in 2014 (I got assigned to lice patrol and immunization duties—in

my limited Spanish I had to say "Cinco vaccunas, lo ciendo!). Then came 2020 and COVID. Little did we know that when we were sent on a mission to care for quarantined cruise ship passengers at a military base that it would turn into several more COVID missions, sent to the areas of the country where the COVID rates and the deaths were staggering. But the resiliency of the staff, the dedication to caring for others, and of course a moose coming through the COVID testing drive through in Alaska was awesome!

But through it all, the team is everything—you are family, for better or worse (and trust me, it is a lot of both!). It is also important to understand that disaster response does not just affect the responder but also their family and coworkers. Employees leaving abruptly with < 2-hour notice for 14 days is not something that most employers are thrilled about! One of my most clear memories happened after I returned from 2 back-to-back deployments to Louisiana for Hurricane Katrina. We were watching a benefit on TV to raise money for disaster recovery and my son who was 6 years old piped up and said "we donated mommy to Katrina." It was endearing and heart wrenching at the same time. It was his way of saying he was proud of me but also a reminder that I missed out on a month of his life. Navigating this absence with family can be very difficult, as your role needs to be urgently filled for an extended period of time. Having a plan for this is absolutely essential. I have long taught that you need to have your own house in order before you try to help others. This refers not only to having a disaster kit with flashlight batteries and water, but also having a plan for all family members, pets, and others who depend on you. As for your employer, having a discussion about the expectations and protections for federal disaster responders before you deploy is key. The Uniformed Services Employment and Reemployment Rights Act (USERRA) protects your employment and certain benefits, but does not engender goodwill with your boss and colleagues!

It is hard to encapsulate all that I have gained from federal service. There is a level of hurry up and wait, a frustration that things are not moving forward and you are wasting valuable time sitting around not helping those who need you the most; that is impossible to explain to those who have not done it. Disasters are often calamities with little to no notice, defined as events that overwhelm the available resources. This also means that good, accurate information from the disaster area is very difficult to obtain and verify. Thus, there is an element of delay built into every deployment. This is actually critical for the safety of responders and success of the mission. Another challenge is being able to accept that crisis standards of care often must be used—we have to do the most good for the most people. This is a very different mindset from our civilian jobs, when we throw all the resources we have to save individual patients. There will be times when you do not have enough resources (drugs, people, equipment) to save or treat everyone. Many have left the teams because they could not deal with this aspect. Sometimes you could provide an intervention that would only be a temporizing measure, not sustainable and would be more harmful in the end. For example, in Haiti, we had antihypertensive agents in the cache. We could give a 30-day supply to a patient with hypertension, but if there is no availability of the drug on day 31 and we are long gone by then, it is far more likely that patient will have a bad outcome when they stop abruptly versus if we had not treated and they stayed at baseline.

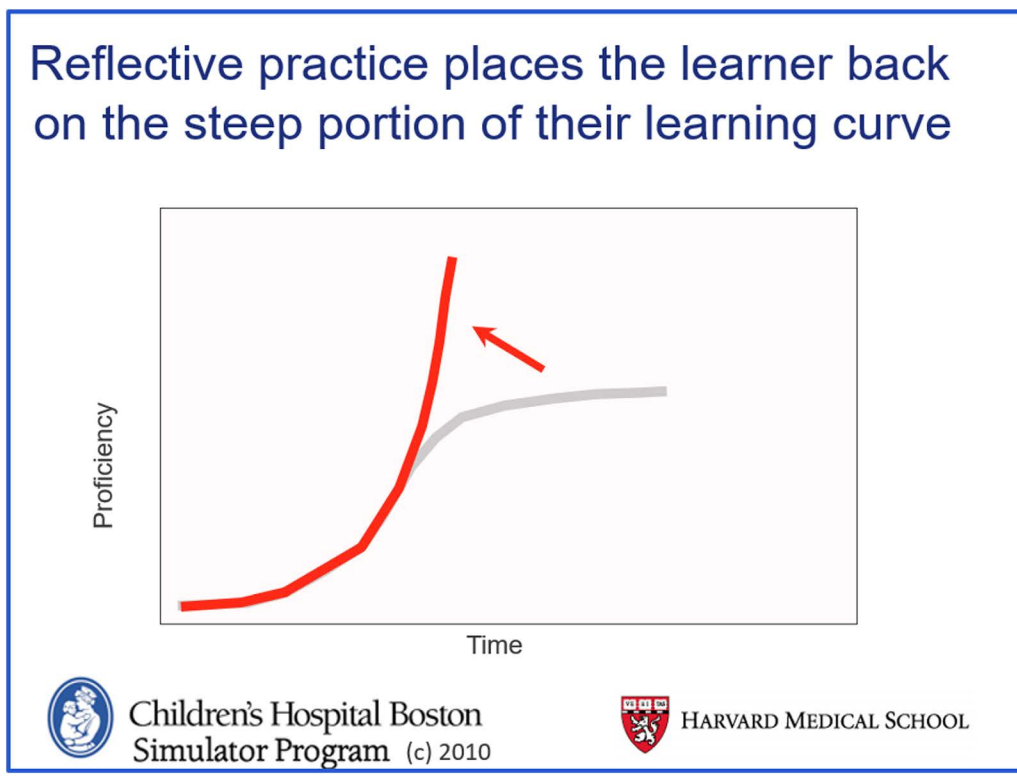
The benefits from service on the federal team extended beyond our team. In 2003 I was asked to travel to Israel with Dr Fleisher and several of my other ED physician colleagues to work with the Israeli Defense Force on response to terror attacks. I am quite sure they taught us more than we taught them, at least in the realm of mass casualty throughput in the ED. They had a protocol for providing only airway and hemorrhage control in the ED, everything else was done "upstairs." We learned about outdoor decontamination shower set ups, and installing medical gases in conference rooms and underground garage spaces so they can be quickly converted to mass patient care areas just to name a few.

By volunteering to work on different projects for NDMS, I was able to meet and work with talented disaster responders from all disciplines. From that, my work with Emergency Medical Services for Children (EMS-C), the Strategic National Stockpile and Centers for Disease Control and Prevention working groups focused on the treatment of Anthrax, Botulism, Plague, andTularemia arose. I was also involved with the Boston Marathon, running the operations at medical tent 8 (mile marker 13) for nearly 10 years, including the year of the bombing. That experience was like no other. We were completing our after action huddle right before breaking down the tents when all of our pagers started beeping at once (we all worked for different institutions). One of our physician's assistants was an early Twitter adopter and told us there was chatter of an explosion near the finish line. We all dispersed immediately, trying to get to our respective hospitals to be ready to help. I still don't know who took down the tents and packed everything up. My husband drove my car like it was his ambulance, as if it had lights and sirens and could drive on the wrong side of the road with impunity! I was emailing and calling everyone on our hospital disaster phone tree and only looked up once (I still have flashbacks of that!). He dropped me off 2 blocks from the hospital so he could park somewhere and I ran the rest of the way, still in my DMAT uniform and boots. While I coordinated our pharmacist and code responses, he took over the radio communication between the ambulances and the central dispatch center. We received 10 patients that

day. No patient who was alive when first responders reached them that day died. Much of that had to do with the large number of teaching hospitals in Boston, the fact it was a state holiday with little OR volume, and occurred exactly at shift change so that we had double the staff that we would have otherwise had. And while that day was hard and we were all exhausted by the end, it was felt to be a success. We did what we knew how to do best. That following Friday was much worse. The city went on complete lockdown—no one could get in or out—no patient movement—no taxis, no trains, no vehicles allowed even with hospital IDs. This restriction on health care worker travel was lifted by the governor a few hours later, but it did require significant delays at checkpoints. We had federal law enforcement agents with long guns in the hospital. Some employees said it made them feel better, but I did not. I knew they thought we were a soft target and needed to be protected. Finally the last of the bombing suspects was apprehended and the city breathed a sigh of relief. I have deployed many times to many places, but having this happen in our own backyard was jarring. As a responder, I am used to traveling to places of utter destruction but with the knowledge that we are going back home to intact houses, workplaces, and families. This was different. Big Papi said it best and I cannot repeat it here, but in essence it captured the anger and determination perfectly.

Many other professional opportunities grew out of combining my disaster experience with simulation. I became a simulation instructor, seeing the impact this type of training could have on improving disaster care and pediatric emergency medicine. Simulation can be a very powerful tool for improving teamwork, familiarity with resources, communication, patient flow, the use of protocols, improving patient and responder safety. We have run programs for volunteers responding to Haiti, trained NDMS personnel at the yearly summits, developed Patient Zero scenarios for the Boston Marathon volunteers, created *in situ* programs for EMS providers working on pediatric emergencies in the back of ambulances, ED mass casualty, traumas, and now we are working on an Augmented Reality program for pharmacy staff for glove fingertip/media fill failure remediation. I have included a very old figure (Figure 3) from our Immersive Design Program because this spoke the loudest to me when I began in simulation. We started our careers in unconscious incompetence early on (we don't know what we don't know), we progress to conscious incompetence—now we know we don't know anything! We move into conscious competence—thinking about what we do as we do it, but are confident in our decisions. The danger zone for most of us is the fourth level—unconscious competence. Practicing on autopilot, like driving home after a shift and not remembering how you got there. This is when medicine

Figure 3. Competence Graph, courtesy of Immersive Design Program, Boston Children's Hospital.



becomes dangerous, balancing on assumptions and pattern recognition. Simulation helps us push learners back into the conscious competence zone.

Simulation is extremely flexible and can be used in the most austere environments as we proved when working with the Malawi Ministry of Health to teach Emergency Triage and Treatment (ETAT) in rural health centers. This required a change in mindset for my disaster-focused brain. We were used to being the stabilizing group, come in quick, provide structure, turn over to local stakeholders, and leave. This global health project was based on the sustainability of whatever we could teach and then leave with the local health care workers. During our visit we were shown what had been a beautiful building, built in Malawi by a US university. But they only funded the original construction with no plan or budget for sustainment. Five years later, there were no lightbulbs, no ability to pay for the air conditioning to cool the building, and therefore it had been abandoned. What was the purpose? Think about sustainability in whatever you design or build. How will this intervention affect patients in the future? How will it affect them if you have to abandon your intervention because you cannot support it? Will this be worse than never intervening at all?

In my career I envisioned 2 goals very clearly, to be appointed as faculty at Harvard Medical School and to be elected to the Board for PPA. No pharmacist had ever been appointed as faculty to the Department of Pediatrics at the School of Medicine, yet I was determined to make it happen. As it turned out, Dr Kathy Gura was appointed and then I was 6 months later! We celebrated by taking a tour of the Harvard Halls of Medical History—it is quite amazing. We will get to the PPA journey in a few minutes.

In 2011, I was asked to help build 1 of 4 cores of the new personalized medicine program at BCH, pharmacogenomics (PGx). The other cores included autism, cancer genetics, and development of an institutional biorepository for everyone to use. I spent a lot of time working on the early build of the biorepository in addition to the PGx service. It was exciting to see the evolution of a database and sample repository that would be open to everyone, regardless of level of training or home department. This is how discoveries are made! But this was a curve ball that I was not expecting. I realized the extent of everything I would need to learn (and relearn) in order to be successful at this challenge. I had not really thought about genetics since pharmacy school, there just are not that many genetic emergencies in the ED! Plus I would now move from the pharmacy department to the division of genetics, an unknown situation. So of course I accepted the challenge and still brokered 1 shift a week in the ED. Long distance learning courses through Vanderbilt and Stanford allowed me to build a foundation for the PGx service. I will also be forever indebted to St Jude's—Mary Relling, James Hoffman, Kristine Crews, Don Baker—all of whom were gracious with their time and experience to answer my many questions as we set up the inpatient service and then the outpatient clinic. Dr Jonathan Picker was a geneticist at BCH who saw the promise of what we could do with PGx and enthusiastically volunteered to be my codirector and supervising physician, as I became the first credentialed prescribing pharmacist at BCH under a collaborative practice agreement.

In addition to the clinical service, I pursued a research arm. I was approved as the first pharmacist sole principle investigator for a human subjects trial at BCH. It was a 2-year odyssey to get the InforMED Kids study approved by the IRB. InforMED Kids was an ambitious study design, recruiting patients from outpatient clinics that were likely to be taking medications heavily influenced by pharmacogenomic variants, obtaining samples, performing panel assays, returning results, and recording the changes made over time by the clinical team. The IRB had not been previously confronted with a study that was designed to return research results, from a clinical lab, into the electronic health record. We spent many months defending the design, the potential benefit to the participants, as well as the possible harms. It helped that we were using a narrow single nucleotide polymorphism (SNP)-based platform and not sequencing. That way, we could isolate pharmacogenes as much as possible, although there are genes that are responsible for both drug metabolism and disease manifestation such as APOE (certain beta blockers and Alzheimer's disease) and UGT1A1 (irinotecan and Gilbert's disease). Eventually we were successful and now the IRB actually requests actionable genetic CLIA results be returned to the electronic health record wherever possible. What a difference a decade makes! Now, sitting on the other side of the table as a voting member on the Harvard Medical School IRB, I have a better appreciation for the responsibilities on both sides. We were able to enroll 750 participants and conducted genetic screening matched with electronic health record data on more than half of them. These data have been used as the source for several important studies as well as refining our clinical services, preventing patient harm, and teaching students. In addition, we were able to create a 2-year fellowship with the Massachusetts College of Pharmacy and Allied Health Sciences University. Drs Laura Chadwick and Hyun Kim graduated the fellowship while I oversaw it, both committed to fostering excitement for pharmacogenomics in patients and peers in health care. They all remain dear friends even as I moved on to oversee the Collaborative Drug Therapy Management (CDTM) program for pharmacists and direct the medication safety program.

My title now is Director of Medication Safety and Quality for the Department of Pharmacy, but honestly

regardless of the title, I never left the patient safety values behind. Safety principles have been entwined throughout each and every stop I have made along the way. From early days on the Massachusetts Coalition for the Prevention of Medical errors and the nascent medication reconciliation interventions (now fondly referred to as med wreck) to the rollout of the Patient Safety Roadmap from the Betsy Lehman Center in April 2023. This was because I made a serious error during my early years, before the ED or the Disaster Team came about. Luckily the patient recovered. However, I perseverated and could not get past this error, and I became a second victim even though I did not know that term at the time. I could not watch my own healthy kids play without extreme guilt. I nearly left the profession completely. But what stopped me and sent me on this lifelong safety journey was the support of my pharmacy director, the oncology team, and the psychiatrist assigned to me from the office of clinician support. Because of all of them, I realized that I was only human, the system was flawed, and I was not a bad clinician. It took time, but it refocused my approach to the practice of pharmacy and how I educate peers, students, and trainees.

Another important lesson is to be cognizant of the need to think about future ramifications of what you build and design. This was top of mind as we started to navigate the world of PGx and the biorepository. There is a fantastic New York Times article entitled The Brilliant Inventor Who Made Two of History's Biggest Mistakes (https://nyti.ms/407xq23) written by Steven Johnson, detailing the life of a man who was hailed as ahead of his time, a hero in his day. However, his inventions turned out to be the source of some of the biggest harms to human health we have ever known, including lead in gasoline that exposed millions of children to its neurotoxic effects and chlorofluorocarbon refrigerants that ended up creating the hole in the ozone layer. I think about this now as we embark on the birth of artificial intelligence (AI), and particularly the use of AI in medicine. I am honored to be a faculty member of the Computational Health Informatics Program (CHIP) at BCH and Harvard, working on natural language processing with some of the brightest minds in the field. But everyone is wary now of how fast this is moving. ChatGPT and other programs will change our lives. We need to be part of the conversation that AI improves the lives of our patients, families and selves for the better. We need to embrace human error in that our fallibility also brings our humanity to the forefront. Humanity must be preserved in medicine. How we do that will be our legacies.

In order to continue to help progress the pediatric pharmacy practice, you all need to speak up. At times you will feel the dreaded "imposter syndrome"; heck I am feeling that today. But it is important to remember that all of our unique perspectives create a stronger, safer medication system. You will learn how to read your audience over time and how to negotiate to get to a better place, even if it was not exactly what you envisioned originally. You're not going to win every battle and you shouldn't because you're not always right. We all are human and the only way we grow is through disappointments, failures, and challenges. In some cases you will have been right and you're still going to lose. And that's okay. But what's not OK is giving up the fight when you know that the outcome can be dangerous or harmful to patients. We need to be flexible, overcome fear, and to do the right thing–in fact I have that a sign on my wall in my office that says "You will never regret doing the right thing" in order to remind me of that principle every day and hopefully to remind the visitors to my office as well. For the fights where you can't give up, you will need to find a new way to battle. Be creative and ask the opinions of others, particularly those who have been on the front line and have successfully navigated the challenge that you are experiencing. PPA members are a huge resource. I have reached out to people who I barely knew numerous times and as well as to people who I've known my whole professional life. That is the strength of PPA—we are a small organization with a big heart and an even bigger mission.

Soon after I arrived at BCH, Dr Kathy Gura quite literally introduced me to PPAG—all of PPAG! I swear she knew everyone. Rich Helms, Bob Poole, Bob Kuhn, Stephanie Phelps, Jim Dice.... Matt Helms had not yet been hired as Executive Director and the meetings were small, ~100 people and my first meeting was in San Antonio, TX in 2000. Look at us now! I think I hold the PPA record for leaving immediately before or in the middle of lectures at the annual and Fall meetings to respond to some federally declared disaster! Yet each time, Matt, Jennifer, and Lauren would figure something out, knowing exactly who would have a canned lecture with them and could get up and speak with no preparation. I started by presenting posters, lectures, and workshops, then became involved with committee work, then served on the Board, and finally started my term as President during the pandemic. Matt and I joked that we should have expected some disaster would have to befall us if I became president! We switched over to completely virtual conferences and it was a remarkable success, both for attendance and financially, with no small credit to Matt and Lauren. I have so many acknowledgements, statements of gratitude, and friends because of PPA. We have had some crazy adventures, like shepherding 50+ pharmacists onto the light rail when the transport buses did not arrive in Salt Lake City, each board member paying for as many tickets as allowed by the machine! Probably the most memorable was the PPA meeting in St. Louis in October 2001, only a few weeks following 9/11. People were afraid of flying and everyone was on edge. It was an

amazing meeting in a beautiful city, and then it was time to go home. As Kathy and I waited at the gate for our flight, there was a disturbance. People were refusing to fly based on the appearance of another passenger, who they felt resembled the hijackers. We looked at each other and then tried to figure out how long it would take us to drive back to Boston if this escalated further. Suddenly there was an announcement that a US Marshall would be on our flight—who knows if this was true or if the airline just said that to calm everyone down. To calm our jittery nerves, Kathy and I started playing a game we called "Not the Marshall." I will say the 95-year-old woman with the walker was declared the winner of "Not the Marshall"! We got home safe and sound. It remains today an important life lesson in how judgments based on appearances can quickly devolve into a mass response that is likely not warranted nor based on facts.

I have come to realize that while I did not follow the usual path and specialize in one area, I have become facile at building sustainable programs and handing them off. The aminoglycoside kinetics service, the ED pharmacy, the PGx program, the CDTM program, the simulation programs, the vaccine clinic. All were another example of saying yes to something unknown and new, even though I had the opportunity to stay safely where I was. Allow yourself and others that you supervise or mentor to have the room to grow and the support structures in place to evolve. Do not become overwhelmed by the big picture and paralyzed by the anxiety that you will not be able to overcome the challenge. You will invariably envision hurdles that may never manifest. As my father used to say "don't borrow trouble." Make small doable tasks and check them off. Literally one step at a time.

None of this would have been possible without so many people, my DMAT family, my ED family, my pharmacy phamily, fellow PPA members, and all who came before. Rich, Stephanie, Bob, Lisa, Charla, Miranda, Jeff, Amy, Jared, Edress, Jim, Michelle, Kristin, Hanna, and so many more! Thank you to Dr Gary Fleisher who believed and supported me in every aspect of my career. To Dr Michael Shannon, a brilliant toxicologist, ED physician, and professionally trained dancer who left us too soon—you are missed every day. To Dr Al Patterson who allowed me to grow into my big ideas and was always there to lend a shoulder, to Dr Peter Lutz who has been unfailing in leading our department and keeping me out of trouble as much as possible. To Dr Kathy Gura, my former roommate, my mentor, and my friend. To Dr Brenda Dodson, who works to keep me sane on a daily basis and has taught me more about systems level thinking than I ever imagined was possible. My ED and ICU teams at home (and here with Dr Esther Chu), my safety team, all of my present and former colleagues, students, trainees, patients, and families who have made everything worth it. And my family—my mom and sisters, and our children who are now adults in their own rights. In 2005 on deployment to Katrina I met my future husband. Six years later we returned to New Orleans. I spoke in the morning at a session for midyear, rounded up Kathy and a few other BCHers as witnesses, and we were married in the afternoon near Jackson Square. Several months later when I needed the marriage certificate for insurance, the clerk in the New Orleans city hall stated they had no record of the ceremony. This may have something to do with the fact they provide golf pencils to fill out the marriage license application and store the paper records in huge stacks of boxes! So back we went in April 2012 and made everything official (of note they back dated the official certificate to 12/7/2011!). To my co-conspirator, travel partner, starring member of the "Jim and Shannon" show when we teach together and my best friend—my husband Jim. He rights the ship every time I capsize it.

My one piece of personal advice for everyone is to travel. Travel as much and as often as you can. Soak up the culture, the food, the experiences. Learn and ask questions. Do your best, get back up when your best is not enough, say yes more often than you say no. Take the challenge to work at the top of your license, rely on your colleagues, stay engaged with PPA. We will all be better for it. Thank you!

Article Information

Affiliations. Department of Pharmacy (SFM), Boston Children's Hospital, Boston, MA; Department of Pediatrics (SFM), Harvard Medical School, Boston, MA.

Correspondence. Shannon Manzi, PharmD, BCPPS, FPPA; shannon.manzi@childrens.harvard.edu

Disclosure. The author declares no conflicts or financial interest in any product or service mentioned in the manuscript, including grants, equipment, medications, employment, gifts, and honoraria. This lecture was the author's own work and should not be construed to represent the opinion of the US Federal Government.

Submitted. May 15, 2023

Accepted. May 21, 2023