Dr. Patrick Frosk
Medical Genetics

Overview

1. **Profile**: Assistant Professor (Manitoba), Researcher (Manitoba); Clinical Genetics Residency (Manitoba), Post-doctoral fellowship in medical genetics (Calgary), MD (Calgary), Biochemistry and Medical Genetics PhD (Manitoba), B. Sc (Manitoba)
2. **Pitch**: Generalists in a very specific niche, able to see ultra-rare diseases and be the ultimate diagnosticians for a very challenging group.
3. **Path**: Re-focused on medicine after a PhD in Genetics and encounters with a Clinical Geneticist. Despite in-depth exploration of medical subspecialties, ultimately kept coming back to genetics.

Elevator Pitch (2:00)

- **Generalist - Every Age, Every System, Every Aspect of Medicine**
- Ultra rare diseases in patients from preconception to post-death.
- Diagnosis, Prevention, Management

Personality (3:00)

- Curiosity, Puzzle-solving is needed for the diagnostician aspect of Genetics
- Use pathophysiology and understand problems at their core
- Doctors exist on the spectrum of both introverts and extroverts

Stereotypes (4:24)

- Lack of studies of medical student perceptions of Geneticist - perhaps telling?
- Response: Gaining more visibility but it is a blind spot in many students' medical education
    - Students often think of genetics as a lab specialty, despite there being no laboratory component.
    - In fact, geneticists are patient-first clinicians - manage, diagnose and treat.
    - Often think of them as pediatricians first, but in Canada, Geneticists treat all ages.

    - Master's or PhD in genetics not required!
- Limited patient connections - Diagnose + Adios?
    - Patient-dependent, but often have long-term follow-up with families, rather than patients.
    - Some diseases with new therapies (e.g. SMA, metabolic disorders) often require ongoing genetics monitoring and diet management, especially as emerging therapies continue to evolve.

Path (10:55)

Medical School

- Entered university in science, but was not ultimately focused on medicine.
- Unsure of medicine and feels that this limited his application to medical school, which was ultimately rejected.
- Joined a microbiology lab and a genetics project for genome mapping, which became a PhD, at which point he collaborated with a Clinical Geneticist.
- At this point pivoted towards medicine over becoming a scientist.
- Naturally gravitated towards genetics, but kept his options open, hoping to sub-specialize and do research in specific genetic factors of disease.
- Ultimately chose genetics in order to remain a generalist and be able to satisfy his curiosity and investigative nature, in a direct patient-contact setting.

Day-to-Day Life (17:35)

- Most geneticists work in academic centres, and thus join together into a group practice.
- Other than clinical work, Dr. Frosk runs the residency program, with its associated administrative duties, and research (20%).
    - Most of his administrative tasks are placed on Monday and Tuesday to it, but clinical work typically burrows into all days of the week.
- Clinical Work:
    - 4-5 patients per half-day clinic - most appointments take 1+ hour
    - Connective tissue disorders, Autism spectrum disorders, immunodeficiencies, movement disorders
    - Afternoon typically works with genetic counsellors at different clinics (e.g. cardiology, ophthalmology, cancer) around the province, supervising assessments and plans.

        - Cardio clinics often see families of patients who have passed from sudden death.
    - Call - gets phone calls from positive newborn screenings, new diagnoses of genetic conditions and query congenital malformations. Can often counsel over the phone.
        - Schedule depends on group practice, type of genetics (general vs. biochemical)
        - Occasionally must go in for acute biochemical genetic disorders.

Personal Takeaways (29:37)

Personal Interactions: Helping people through the most difficult and vulnerable situations, after they've been disappointed by wrong roads and false leads, and finally being someone who can solve their problems, or at least give them insight into them.

Personal Story:

*"One that sticks out, partly because it was early on in my career. I had a 6-month-old come in with **status epilepticus**. She had to be admitted to PICU for midazolam infusion - a **complete medically-induced coma**. The question asked of me was "Why?", which is usually the question people ask me. When I delved into the history, development seemed ok, but her head size was quite a bit smaller than what it should have been, and it was not compatible with what she had at birth. Over 2 months, it was becoming clear that it was a specific disease of the white matter and looked degenerative. Eventually, we diagnosed her with a condition called **Vanishing White Matter disease**, which unfortunately is **universally fatal**. It was a very tough time trying to counsel the family - **we basically sat together and cried**. Unfortunately, she ended up getting influenza, which accelerated the process even more. She passed away. At that point, the family had spent some time grieving, as did I. They did want to have more children. This was their first and **they'd always wanted to have a big family**. Since I knew what the genetic problem was, I could help them through that part. There's a few options that they had available to them, including **pre-implantation genetic diagnosis**, where you test the embryo during IVF. Other prenatal testing options are telling very early on in a pregnancy, and being able to mitigate it from there.*

The second time they tried, the baby was again affected, and they decided to end that pregnancy. ***The third time, that baby was unaffected****. For me that was the rewarding part. It was a rollercoaster for me going through that with them and finally having a normal baby for them, and I felt so happy for them when I finally gave them that news."*

Note: While we tried to keep these transcriptions as true to the speaker as possible, some dialogue is paraphrased and/or edited for easier reading.

Research Projects

1. Cataract Arrhythmogenic Cardiomyopathy 35:45
    a. Manitoba Hutterites are a commune-based group with a very strong founder effect (e.g. very small gene pool), with limited allelic diversity.
    b. Dr. Frosk is doing research on this fascinating gene pool as it is uniquely isolated and founded.
    c. High prevalence of cataract disorders in juvenile onsets.
    d. Dr. Frosk was able to do an in-depth analysis of cardiac, ophthalmologic and certain other genes.
    e. They have diagnosed 25 patients with ultra-rare fibrotic cardiomyopathies, and they have been able to understand and manage this otherwise fatal disease.
    f. Since they've discovered the gene, nobody has died from the condition
2. Congenital MARCH Syndrome
    a. Met a family whose first child passed away because he was born with no kidneys and no brain. Second and third children had the same anomaly, after which Dr. Frosk became heavily involved.
    b. He was able to isolate the specific genetic origin of the anomaly, a gene that had otherwise been unidentified. He proved it through animal model testing.
    c. Published MARCH syndrome (Multinuclear Neurons, Anhydramnios, Renal Dysplasia, Cerebellar hypoplasia and Hydranencephaly).
    d. Having proved existence of disease, the option for pre-implantation diagnosis now became available to the family.
    e. There have since been more than 10 patients diagnosed with this condition worldwide.

Final Comments (46:55)

1. Diversify your experience, even if you think you are set on one specialty - those experiences will be valuable in your application to residency and beyond.
2. Slow burn of enjoyment, every day he becomes more passionate about his specialty.
3. Make sure you choose a path that works for you in medicine.