



## Patient Pilot Study

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## Pilot Study Objectives

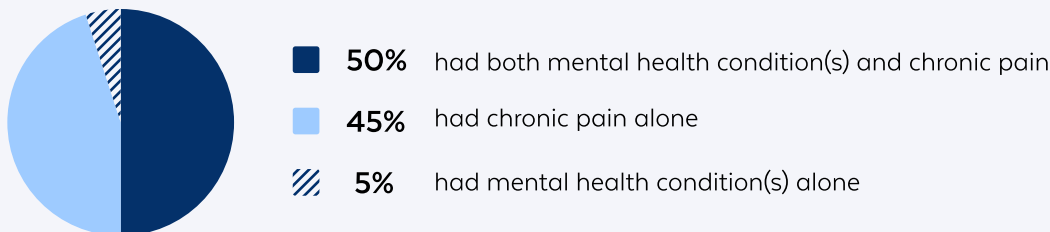
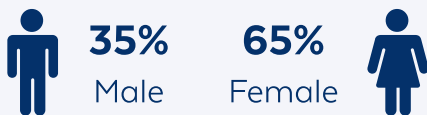
Calian Health and Inagene Diagnostics recently collaborated on a pilot study to evaluate the “real-life” value of using pharmacogenetic (“PGx”) test results to guide treatment of chronic pain and mental health conditions.

50 patients from a busy Primacy clinic in PEI who were being treated for chronic pain and/or mental health conditions were enrolled in this “proof of concept” pilot study in late 2020.

**The objective:** evaluate the impact PGx testing could have on treatment, and on the burden of time and cost involved in trialling different medications and doses.

The results of the pilot study were compelling and validated outcomes from previous PGx studies.

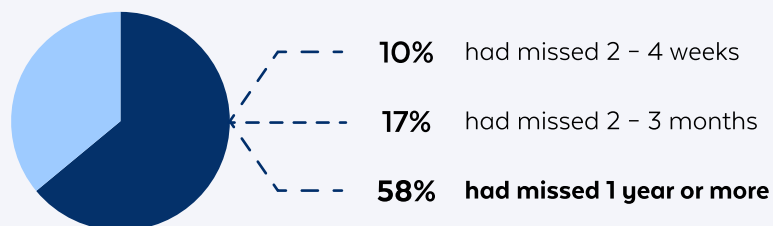
### Patients In the Study:



### Primary Reasons for Ordering the Pharmacogenetic Test:



**64%** had missed work because of sub-optimal treatment or medication side effects



**The Inagene Personalized Insights™ reports places medications into four categories, based on the detection of specific genetic variants know to impact individual responses to drugs:**



**Do Not Use**

These medications are **not recommended for you** if alternative medication options are available, as they may be ineffective or unsafe/cause unacceptable side effects .



**Use With Caution**

These medications **should be used with caution for you and come with special instructions** (such as an altered dose, possible drug-drug interactions or special monitoring requirements that differ from most people).



**Use As Directed**

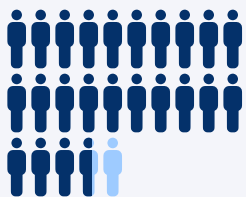
Based on your genetic profile, there is no reason to believe that these medications would not work well for you, so they **can be used as directed.**



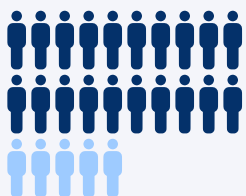
**Use As Directed/  
Preferred**

Based on your genetic profile, these medications **may have an increased likelihood of being effective for you** as compared with most other people.

**Pilot Study Results Overview**



for **94%** of patients, Inagene results helped explain prior experiences with medications

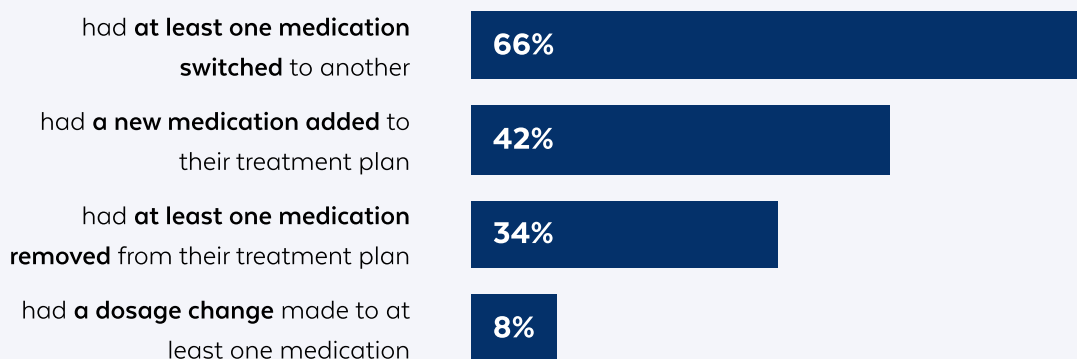


**76%** had a change made to their treatment plan as a result of the insights provided by the Inagene test.

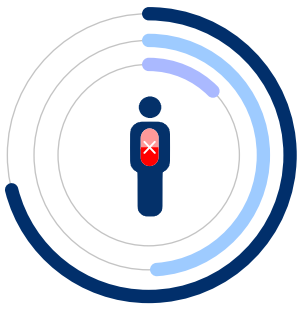


Indicating that, even after years of "trial and error", the majority had still not found optimal treatment.

**Changes Made to Treatment Based on the Inagene Test Results:**



**98% had previously trialled (and subsequently discontinued) medications that were incongruent with their genetic profile:**



- 70%** of patients had previously tried and failed drugs that turned out to be **Do Not Use**
- 49%** of those patients had failed 2 or more **Do Not Use** drugs in the past
- 20%** had failed 3 or more **Do Not Use** drugs in the past



- 96%** of patients had previously tried and failed drugs that turned out to be **Use With Caution**
- 58%** of those patients had failed 3 or more **Use With Caution** drugs in the past

Average number of **Do Not Use** or **Use With Caution** medications that were trialled and subsequently discontinued:



**According to the treating physician, having access to the Inagene PGx test results sooner would have improved the treatment experience/journey for 100% of these patients and would have:**



resulted in a different treatment plan than was provided for **94%**



been helpful for **100%** of patients and “very or extremely helpful” in guiding treatment for **64%**



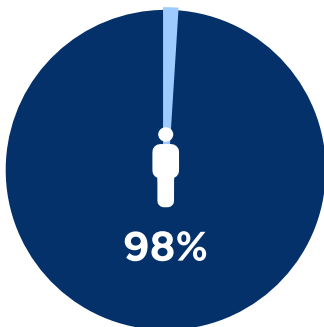
made a “very or extremely meaningful difference” for **74%** of patients

Based on the treating physician's assessment, having the test results prior to initiating treatment would have led to the following benefits:



**All 50 Patients:**

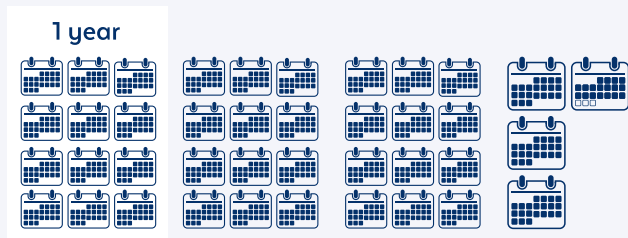
- would have found a **more effective treatment sooner**
- would have avoided **drug wastage/unnecessary drug costs**



**All but 1 Patient:**

- would have avoided time dealing with **side effects**
- would have avoided (or had less) **time off work** due to lack of efficacy or medication side effects

Having the test results sooner could have saved patients (on average):



Patients spent an average of **170.4 weeks (>3.3 years)** trialling "Do Not Use" and "Use with Caution" medications that were later discontinued due to lack of effect, side effects, or both.



**\$3,008\*** per patient  
(\$918/year over 3.3 years)

\*\$3,008 is based on an average weekly drug cost per drug of \$17.65 X average of 170.4 weeks spent trialling "Do Not Use" and "Use with Caution" medications that were ultimately discontinued.



Projected **ROI** of testing prior to initiating treatment: **>1,000%\*\***

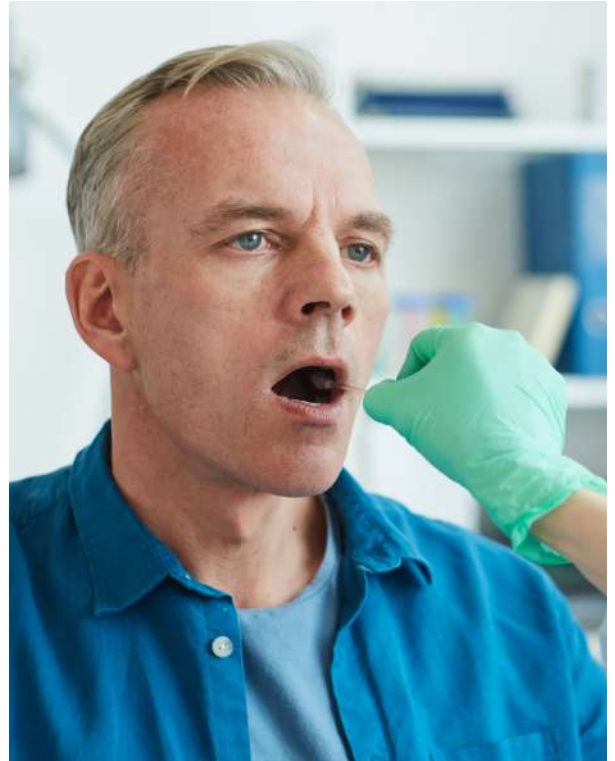
\*\*Based on a retail price of \$299 per test, and avoidance of \$3,008 in wasted drug costs

## Physician Comments/Conclusions:

*"Having used the Inagene test on more than 50 patients now, it is my belief that every single chronic pain patient who a medication is being considered for use on, should have the Inagene test completed prior to drug initiation. At our clinic we are now routinely asking for every patient referred to us to have the test done upon arrival or after initial assessment.*

*Knowing what treatment options you should avoid before you start treatment (and what other options there are), is just such a powerful tool for the prescriber to use."*

*"Think about this scenario in primary care: a patient who has been experiencing pain for three to four months duration, either from some injury/event or a non-specific pain, who is now starting to lose time at work, and who's pain is starting to affect their mental health due to financial and emotional stressors, or who has some pre-existing mild mental health issues; you are seeing them in a busy office and trying to decide what to do. Instead of reaching for a prescription pad immediately, you can get the Inagene test done by the patient, and in less than 2 weeks be starting that patient on medication knowing up front what definitely won't work and which drugs need to be used cautiously or dosed differently/have special instructions for the patient. Think of the value to the patient in preventing lost time at work and medication costs, the savings to their employer from a more productive and present employee, to their family from more effective treatment, and to society as a whole by preventing the typical downward spiral into chronic pain or mental health disorders."*



*"As a physician, we consider risk/benefit and number needed to treat for our patients before doing any intervention. In my experience the Inagene test results give 100% benefit with no risk, and a NNT of 1. Every single Inagene test will give you useful information that will help you modify and individualize a patients treatment plan."*

*"I look back at some of the patients we have followed for a number of years, with multiple drug trials and all the individual and societal costs from mental illness and chronic pain, who are now stabilized on a regimen through trial and error, persistence and sheer luck, who could have arrived there years earlier if we had the Inagene test; and I wonder just how different their life could have been if we had this ten years ago, and how much it is going to change how I do things going forward."*

[Dr. Ron Whalen](#)

MD CCFP(EM) FCFP, Co-Medical Director of the PEI Pain Institute



## Personal Details

“Marci” is a 46-year-old mother of a young daughter who works as a lawyer. She enjoys yoga, exercise, and meditation, and spending time with her young daughter. Unfortunately, she suffers from chronic pain which prevents her from attending work full time, and limits her ability to exercise and enjoy activities with her family.

## Medical History

Marci was involved in two separate motor vehicle accidents over the past 10 years, resulting in generalized mid-thoracic back pain that radiates into the lumbar and cervical regions. It has also left her suffering from recurrent headaches and general malaise, which impacts her ability to be present at work and at home with her child.

Marci has a pain disability index score of 46/60. She has been seen by several specialists over the years and has a diagnosis of fibromyalgia and chronic mechanical back pain. Her pain makes it difficult to drive for more than 5-10 minutes, and significantly affects her ability to work, her intimacy with her husband, and her enjoyment of activities with her daughter.

Marci had tried and failed multiple medications for her pain but was still experiencing symptoms limiting her ability to be productive at work, do the things she enjoys, and be present/active at home with her family.

Other medical issues include Type 1 Diabetes, mild asthma, hypothyroidism (on replacement therapy), and mild generalized anxiety.

## Relevant Medical History

- Chronic mechanical back pain
- Hypothyroidism
- Fibromyalgia
- Type 1 Diabetes
- Mild Anxiety
- Asthma



**Estimated work time missed due to poorly controlled symptoms and or drug side effects:**



**3.25** years\*

*\*Patient can only work 25 - 30 hours per week for last 10 years, and has missed an additional week per year due to symptoms*

## Objectives for Ordering a Pharmacogenetic Test

- Evaluate current medications to determine if treatment could be further optimized

### Treatment History of:

- Medication side effects
- Lack of medication effectiveness

## Insights Gained Through Pharmacogenetic Testing:

### Previous Medications

Classifications of past medications were largely in line with her experience, with at least **five** medications she had tried in the past that were revealed to be either 🟡 **“Use with Caution”** (two medications) and 🛑 **“Do Not Use”** (three medications) that were found to be either ineffective, intolerable, or both.

- |                 |           |                 |
|-----------------|-----------|-----------------|
| 🛑 Amitriptyline | 🛑 Codeine | 🛑 Nortriptyline |
| 🟡 Oxycodone     | 🟡 Tylenol |                 |

Had testing been available earlier, it would have revealed several 🟢 **“Use As Directed”** options that would have had a better chance of working for Marci, potentially saving her the last 10 years trialing different medications that were incompatible with her genetic profile.

#### Total Number of 🛑 “Do Not Use” Drugs Trialled

3 Drugs

#### Total Number of 🟡 “Use with Caution” Drugs Trialled

2 Drugs

#### Estimated Time Spent Trialling Incongruent Drugs

5 drugs x 10 weeks\*  
= 50 weeks  
(Reality: Patient spent 10  
years cycling through  
medications)

#### Minimum Spent Trialling Incongruent Drugs that were Later Discontinued

50 weeks x \$17.85\*\*  
= \$893

\*Average minimum duration of drug trial with dose adjustment

\*\*based on average weekly cost of drugs used by at least 25% of patients in the study

### Current Medications

Testing also revealed that Marci’s current medications were incongruent with with her genetic profile:

🛑 **Tramacet** 1 tablet, 3-4x per day

Poor metabolizer – not recommended due to lack of efficacy and possibility of side-effects.

(This recommendation was consistent with Marci’s experience; explains persistent symptoms and feeling of “general malaise”)

🟡 **Duloxetine** 120mg per day

Patient may require a lower dose.

### Change to Treatment as a Result of Insights Provided

🛑 **Tramacet** Will be discontinued and replaced with a 🟢 **“Use as Directed”** medications

🟡 **Duloxetine** Although it did produce a therapeutic response, this medication has been deemed to be no longer needed and will be discontinued.



## Patient Comments

Marci is “thrilled and intrigued” with the results; *“I believe that having the test sooner could have shortened the duration of time to find an effective therapy by YEARS. I am looking forward to using these results to plan out my treatment going forward.”*

## Physician Comments

*“As a physician, knowing what options are likely to be ineffective or intolerable prior to initiation is priceless. In this patient’s case, she will now have “Use with Caution” and “Do Not Use” medications discontinued and replaced with other “green” medication options.”*

Name: Rebecca

Gender: Female

Age: 50

936 237 6938 1985

## Personal Details

Before her persistent pain and mental health concerns left her no option but to go onto long term disability three years ago, “Rebecca” had a career as a workplace safety inspector, and also enjoyed her role as an equine specialist at an equine therapy ranch. Her symptoms have also left her unable to do many of the things she previously enjoyed like walking her dog on the beach, curling with her husband, doing work around her home, and participating in many activities and social and sporting events with her children and spouse.



**Estimated work time missed due to poorly controlled symptoms and or drug side effects:**



**>3** years

## Medical History

Rebecca has a history of a small non-operative syringomyelia with an 8-year history of mid thoracic back pain that radiates up to the scapula, around to anterior chest, and occasionally into her lumbar region. She also suffers from significant migraines on a bi-weekly to monthly basis. She has a pain disability index score of 41/70. In addition to her pain conditions, she has suffered from severe bipolar illness for the past ten years for which she is followed regularly by a psychiatrist.

## Relevant Medical History

- Mid thoracic back pain radiating to scapula, anterior chest, and lumbar region
- Small non-operative syringomyelia
- Severe migraine headaches
- Severe bipolar illness

## Objectives for Ordering a Pharmacogenetic Test

- Investigate possible causes for lack of efficacy and side effects from previous medications
- Confirm appropriateness of current treatment regimen (which seemed to be working well)

### Treatment History of:

- Medication side effects
- Lack of medication effectiveness

## Insights Gained Through Pharmacogenetic Testing:

### Previous Medications

Test results revealed that a total of five 🛑 “Do Not Use” and five ⚠️ “Use with Caution” drugs had been tried in the past with no success.

## Current Medications

After years of trial and error, a lot of out of pocket expense, 3 years of lost work and many years of impact to her ability to be productive and enjoy life and activities with her family, and being exposed to significant potential for harm from medication side effects and undertreated mental health issues, Rebecca is now stabilized on a regimen of medications that are working well, all of which were revealed to be ● "Use as Directed".

### ● "Do Not Use" Drugs Trialled

5 Drugs

### ● "Use with Caution" Drugs Trialled

5 Drugs

### Estimated Time Spent Trialling Incongruent Drugs

10 drugs x 10 weeks\*  
= 100 weeks  
(Reality: Patient spent 8  
years cycling through  
medications)

### Minimum Spent Trialling Incongruent Drugs that were Later Discontinued

100 weeks x \$17.85\*\*  
= \$1,785

\*Average minimum duration of drug trial with dose adjustment

\*\*based on average weekly cost of drugs used by at least 25% of patients in the study

## Change to Treatment as a Result of Insights Provided

Patient's current regimen of medications, which have proven to be effective in their treatment of her conditions, were all confirmed to be ● "Use as Directed", confirming that, although it took many years of medication trial and error, she is finally on the right treatments.

## Patient Comments

*"I had such bad experiences with antidepressants that even the word makes me anxious and upset. I was starting to lose hope and was even considering some really awful options."*

*"The relief to know it was not all in my head is enormous...To know that I still have options is worth every cent this test costs."*

## Physician Comments

*"As a physician, the results of this testing have been insightful. Although (Rebecca) is currently stabilized, it was through a combination of years of trial and error and blind luck."*

*"The insights provided in the test (had we had access to them sooner) may have allowed us to reach this point three to five years earlier, with less cost to the patient, perhaps maintained her in the workforce, with huge benefits to her and to society as a whole."*

## Personal Details

“Gilles” is a 60 year old father of three sons who suffers from chronic pain stemming from a motor vehicle accident in 2011. Prior to his accident, was very active and fit, serving as a paratrooper in the Lebanese Army during their civil war. After subsequently moving to Canada, he served in the Canadian Army Reserves, and worked for the Department of Veterans Affairs.

## Medical History

Gilles presented to the pain clinic with a history of neck pain, bilateral occipital neuralgia, and bilateral shoulder pain resulting from a motor vehicle accident ten years ago. Before his injury, he had never missed any work. Soon after his pain began, he began to miss work, and ultimately had to go onto long term disability, which he has been on for 7 years. Being unable to work and being largely home-bound due to his pain has resulted in more time reliving old memories, ultimately resulting in a diagnosis of PTSD, chronic anxiety, and chronic fatigue. He misses the things he used to enjoy like camping, fishing, gardening, and sports with his sons.

Gilles had to endure nearly 10 years of cycling through different medications, dealing with ongoing symptoms and a variety of side effects before arriving at his current treatment regimen, which seems to be working relatively well for him.

## Relevant Medical History

- Neck Pain
- PTSD
- Bilateral Occipital Neuralgia
- Chronic Anxiety
- Bilateral shoulder pain
- Chronic Fatigue

## Objectives for Ordering a Pharmacogenetic Test

- Understand what was behind the history of poor responses and side effects with medications
- Validate current treatment

### Treatment History of:

- Medication side effects
- Lack of medication effectiveness

## Insights Gained Through Pharmacogenetic Testing:

### Previous Medications

Testing revealed that **seven** drugs Gilles had previously tried and been unable to continue were **Do Not Use** drugs, and **four** were **Use with Caution** drugs. With each drug trial taking on average 8 - 12 weeks, it is estimated that he



Estimated work time missed due to poorly controlled symptoms and or drug side effects:



>7 years

had spent a minimum of 88 - 124 weeks (1.7 - 2.5 years) trialing medications that could have been avoided entirely had he had access to the Inagene test results earlier.

## Current Medications

After many years spent cycling through medications, Gilles is stabilized on his current regimen, which seems to be working relatively well. Gilles' current treatment regimen was revealed to consist of **only** ● "Use as Directed" medications with the exception of **one** ● "Use with Caution" medication, for which the recommendation called for a lower than standard dose to achieve therapeutic effect. (This recommendation was consistent with the dose he was already taking, as higher doses had produced little resulted in intolerable side effects.)

Total Number of "Do Not Use" Drugs Trialled	Total Number of "Use with Caution" Drugs Trialled	Estimated Time Spent Trialling Incongruent Drugs	Minimum Spent Trialling Incongruent Drugs that were Later Discontinued
7 Drugs	4 Drugs	11 drugs x 10 weeks* = 110 weeks <i>(Reality: Patient has spent 10 years cycling through medications)</i>	110 weeks x \$17.85** = \$1,964

\*Average minimum duration of drug trial with dose adjustment

\*\*based on average weekly cost of drugs used by at least 25% of patients in the study

## Change to Treatment as a Result of Insights Provided

The test results validated and explained Gilles' difficult history/past experiences trialling medications, and confirmed his current treatment regimen is appropriate/congruent with his genetic profile.

## Physician Comments

*"The patient wanted to know if there was a reason why; why the pain, why the side effects, why the poor response to some medications. He was grateful that we had spent all these years continuing to try and come up with some regimen and not just give up, or say it was all in his head. He was, in fact, looking for validation."*

*"The Inagene test results were entirely consistent with his experience. (Having had the test sooner) would have markedly changed this patient's treatment plan, with much different results."*

## Personal Details

Before going on disability as a result of his persistent pain condition and associated mental health concerns, Rolland was a bank manager and avid athlete, who enjoyed playing baseball and recreational hockey, and golfing 3-4 times per week. His pain has left him unable to play sports for over ten years, and he has been unable to golf 18 holes since the pain began.

## Medical History

Rolland's chronic pain began in 2010 following inguinal hernia repair surgeries. Believed to be neuropathic pain secondary to scarring and complications from these procedures, his intermittent groin pain and associated low back and bilateral knee pain varied in intensity and location, and appeared to have no discernable pattern. Investigations by surgeons failed to reveal any surgically correctable issue, leaving medical management of the pain as the only option. The persistent pain was so disabling that it resulted in him having to stop working as a bank manager and go on long term disability. Rolland also suffered from bipolar disorder, with significant and persistent anxiety and depression, which contributed to his need to go on long term disability.

At the time of testing, Rolland had already endured many years of medication trials which were stopped for various side effects or lack of efficacy. His current regimen, although an improvement over previous treatments, still did not have him where he wanted to be, and with so many previous drugs having previously tried with little success, it was unclear which medication options would be best to try.

## Relevant Medical History

- Chronic Intermittent Groin Pain
- Inguinal Hernia
- Depression
- Low Back Pain
- Bipolar Disorder
- Bilateral Knee Pain
- Anxiety

## Objectives for Ordering a Pharmacogenetic Test

- Understand previous history of failed medication trials
- Identify viable/suitable alternative treatment options to better manage pain and mental health related symptoms

### Treatment History of:

- Medication side effects
- Lack of medication effectiveness



**Estimated work time missed due to poorly controlled symptoms and or drug side effects:**



**>10 years**

## Insights Gained Through Pharmacogenetic Testing:

### Previous Medications

Testing revealed that **three** of the medications Rolland had previously tried with no success had been 🛑 **“Do Not Use”** and **four** had been 🟡 **“Use with Caution.”** Individual recommendations provided for these drugs were consistent with the poor responses and/or intolerable side effects Rolland had experienced.

### Current Medications

All three drugs currently in use were revealed to be 🟡 **“Use with Caution,”** with Rolland’s experience with them mirroring the test results (either needing a lower than expected dose, or having more side effects than would be expected). Several previously un-trialed 🟢 **“Use as Directed”** medication options were also revealed through testing.

#### Total Number of 🛑 “Do Not Use” Drugs Trialled

3 Drugs

#### Total Number of 🟡 “Use with Caution” Drugs Trialled

4 Drugs

#### Estimated Time Spent Trialling Incongruent Drugs

7 drugs x 10 weeks\*  
= 70 weeks  
(Reality: Patient spent >11 years cycling through medications)

#### Minimum Spent Trialling Incongruent Drugs that were Later Discontinued

70 weeks x \$17.85\*\*  
= \$1,250

\*Average minimum duration of drug trial with dose adjustment

\*\*based on average weekly cost of drugs used by at least 25% of patients in the study

### Change to Treatment as a Result of Insights Provided

As a result of the test, two of Rolland’s current medications were discontinued completely, and the third was switched to a 🟢 **“Use as Directed”** medication.

### Patient Comments

*“These results are priceless, and I only wish I had them sooner”*

### Physician Comments

*“Both (Rolland) and I agree that had these results been available 10 years ago, his course would have been entirely different, and he would likely be now successfully retired and still golfing, instead of constantly dealing with the pain and mental health effects.”*



## Personal Details

“Bonnie” is a 46 year-old mother of three boys who underwent a cancer-related surgery ten years ago that has left her with a chronic pain condition that completely changed her life. Her three sons are active in sports, and her pain has made it impossible for her to travel to their games, or even to sit and watch local games for extended periods. Prior to developing chronic pain, she also loved to go camping and to the beach with her family, activities she can no longer do.

## Medical History

Eleven years ago, Bonnie underwent surgical removal of a chordoma. Although subsequent repeated MRI’s confirmed that she was cancer free following the surgery, she developed a chronic pain syndrome postoperatively (back pain and a left sided foot drop) which included pins and needles sensations, a freezing cold sensation, and severe left leg pain. She went on to develop right hip pain as well from compensating for the left side. Temperature differences of greater than 1 degree from left to right feet have been measured, as well as skin colour changes, leading to a diagnosis of Complex Regional Pain Syndrome. Bonnie also suffers from mild anxiety, possibly related to/exacerbated by her chronic pain condition.

Since developing her chronic pain condition, she has struggled through multiple medication trials with associated side effects, never achieving adequate control of her symptoms and the balance that would allow her to resume her pre-cancer activities/lifestyle.

## Relevant Medical History

- Complex Regional Pain Syndrome (Post-Operative) - Back, Leg, Hip
- Anxiety

## Objectives for Ordering a Pharmacogenetic Test

- Understand previous history of failed medication trials
- Identify viable/suitable alternative treatment options to better manage pain and mental health related symptoms

## Treatment History of:

- Medication side effects
- Lack of medication effectiveness



**Estimated work time missed due to poorly controlled symptoms and or drug side effects:**



**10 years\***

*\*Patient has been unable to return to work since surgery*

## Insights Gained Through Pharmacogenetic Testing:

### Previous Medications

Testing revealed a total of ten medications that had been trialed and discontinued that were either 🛑 “Do Not Use” (two) or ⚠️ “Use with Caution” (eight).

### Current Medications

Two of Bonnie’s current medications were revealed to be 🟢 “Use as Directed,” both of which she credits for *significantly improving her life*. While it was revealed that she was not currently taking any 🛑 “Do Not Use” drugs, two of her medications were classified as ⚠️ “Use with Caution.”

#### Total Number of 🛑 “Do Not Use” Drugs Trialed

2 Drugs

#### Total Number of ⚠️ “Use with Caution” Drugs Trialed

8 Drugs

#### Estimated Time Spent Trialling Incongruent Drugs

10 drugs x 10 weeks\*  
= 100 weeks  
(Reality: Patient spent 11 years cycling through medications)

#### Minimum Spent Trialling Incongruent Drugs that were Later Discontinued

100 weeks x \$17.85\*\*  
= \$1,785

\*Average minimum duration of drug trial with dose adjustment

\*\*based on average weekly cost of drugs used by at least 25% of patients in the study

### Change to Treatment as a Result of Insights Provided

For the two medications in her current treatment that were classified ⚠️ “Use with Caution,” the Inagene test recommended a lower dose for one, and that the other be switched to a 🟢 “Use as Directed,” option, and both of these suggested changes were made to Bonnie’s treatment. The patient noted a significant reduction in side effects as a result of these changes.

### Patient Comments

*“The test results are entirely consistent with my past experience...I feel validated seeing them. I spent years trying different drugs, and was told the problems were in my head, and I felt like no one believed me. I can’t help but wonder what it would have been like if ten years ago I had taken the Inagene test, and then started to try medications with this information available to all of my doctors.”*

### Physician Comments

*“Having worked with (Bonnie) this long, and knowing her desire to get better and to resume her normal life activities, I can see how this test could be life altering.”*

Name: Richard

Gender: Male

Age: 55

153 434 0364 0584

## Personal Details

Richard is a 55 year old former construction worker who suffers from chronic pain that originated from a workplace accident over a decade ago, when he fell over 40 feet on a construction site resulting in injuries to his left and right shoulders requiring several surgeries. Persistent pain from his injuries, combined with neuropathic pain from his Type 2 diabetes impairs his ability to sleep or to work, and ultimately forced him to go on disability. He works on a fishing boat three months of the year and is on unemployment insurance the rest of the year.



**Estimated work time missed due to poorly controlled symptoms and or drug side effects:**



**>14 years**

## Medical History

Richard's workplace accident in 2007 resulting in injuries to his left and right shoulder, and the surgeries that followed, led to persistent pain which eventually forced him to quit construction work and go on disability. He also suffers from very painful diabetic neuropathy of the hands and feet which has tormented him daily. Over time, the persistent pain has led to the development of depression and anxiety, for which he has also been receiving treatment.

Many medications, both narcotic, and non-narcotic, as well as cannabinoids, have been tried over the years, with either no efficacy or severe side effects. Having tried multiple drugs and doses over many years, Richard decided to try the Inagene test in the hopes of finding other, unexplored options, and for explanations of why his side effects have been so severe in the past, and why multiple medications had failed to provide adequate pain relief.

## Relevant Medical History

- Chronic Pain in Both Shoulders
- Painful Neuropathy of the Hands and Feet
- Type 2 Diabetes
- Generalized Anxiety

## Objectives for Ordering a Pharmacogenetic Test

- Understand previous history of failed medication trials
- Identify viable/suitable alternative treatment options to better manage pain and mental health related symptoms

### Treatment History of:

- Medication side effects
- Lack of medication effectiveness

## Insights Gained Through Pharmacogenetic Testing:

### Previous Medications

Looking back, Richard recalls having trialled at least three ● "Do Not Use" medications, and nine ● "Use With

**Caution**” medications over the years. He recalls that while many of these medications provided some/mild efficacy, they also caused unacceptable side effects including intolerable nightmares and suicidal ideation.

## Current Medications

At the time of testing, Richard was no longer taking on any **Do Not Use** medications, and was only taking one **Use With Caution** medication, which he has been unable to increase to a therapeutic dose due to side effects. The decision was easily made to discontinue his **Use With Caution** medication in favor of a **Use As Directed** medication option.

### **Do Not Use** Drugs Trialled

3 Drugs

### **Use with Caution** Drugs Trialled

10 Drugs

### Estimated Time Spent Trialling Incongruent Drugs

13 drugs x 10 weeks\*  
= 130 weeks  
*(Reality: Patient spent >10 years cycling through medications)*

### Minimum Spent Trialling Incongruent Drugs that were Later Discontinued

130 weeks x \$17.85\*\*  
= \$2,321

\*Average minimum duration of drug trial with dose adjustment

\*\*based on average weekly cost of drugs used by at least 25% of patients in the study

## Change to Treatment as a Result of Insights Provided

Since receiving the Inagene results, Richard’s **Use with Caution** medication has been switched to a **Use As Directed** medication, one that had not been considered prior to the test results as all other medications in that class had been previously tried and subsequently discontinued due to side effects. (All of these previously trialled drugs were revealed to be **Do Not Use** or **Use With Caution** medications by the Inagene test.) One month into taking his new medication at the low starting dose recommended by the test results, he reports complete resolution of his neuropathy pain, and a significant reduction in his shoulder pain with a subsequent decrease in his opioids with no side effects of any kind.

## Patient Comments

*“I cannot put into words how valuable this is to me. To wake up in the morning and my hands and feet aren’t on fire or screaming at me, to look forward to working again, to be able to do stuff with my kids....I would pay all the money I have for this chance at life again”*

## Personal Details

Deborah is a 35 year old married mother of a young child who has been dealing with moderate to severe chronic pain for the last six months. She is employed full time in the health care sector, and prides herself on never missing time at work. Unfortunately, the pain has made Deborah unable to stand straight, and she now walks hunched over and with a limp, and is facing time off work as she is physically unable to meet the demands of her job as a youth worker. She really enjoys her work and has significant anxiety as a result of the increasing likelihood that her unresolved pain will force her to go on disability. In large part due to the nature of her work, she does not want to use opioids except as a last resort.

Because Deborah's pain only developed recently she has not yet tried many medications. She decided to take the Inagene test in the hopes of being able to avoid spending weeks or months engaged in medication "trial and error", and to find the most effective and tolerable treatment for her pain as quickly as possible.



**Testing helped patient avoid time off work/going on disability**

## Medical History

Deborah has a prior history of Crohn's colitis which has been well controlled, hiatal hernia, previous appendectomy and tubal ligation. 6 months prior to taking the Inagene test she developed the onset of an atraumatic left sided lumbar back and hip pain which radiates into the lower leg muscles. This pain is a 10/10 at its worst, a 5/10 at its best, and on average 7-8/10. Her MRI showed a small left paracentral and posterolateral disc protrusion at L5-S1, which mildly compresses and displaces the left S1 nerve root, but which was determined to be non-surgical.

## Relevant Medical History

- **Atraumatic radiating left sided lumbar back and hip pain due to left paracentral and posterolateral disc protrusion**
- **Crohn's Colitis**
- **Hiatal Hernia**
- **Previous surgeries (appendectomy and tubal ligation)**

## Objectives for Ordering a Pharmacogenetic Test

- Quickly identify viable/suitable treatment options to better manage pain symptoms

## Insights Gained Through Pharmacogenetic Testing:

### Current Medications

- 1  "Do Not Use"

**Total Number of  
"Do Not Use"  
Drugs Trialled**

1 Drug

**Total Number of  
"Use with Caution"  
Drugs Trialled**

TBD

**Estimated Time Spent  
Trialling Incongruent  
Drugs**

1 drug x 26 weeks\*  
= 26 weeks

**Minimum Spent  
Trialling Incongruent  
Drugs that were Later  
Discontinued**

26 weeks x 17.85\*\*  
= \$464

\*Average minimum duration of drug trial with dose adjustment

\*\*based on average weekly cost of drugs used by at least 25% of patients in the study

## Change to Treatment as a Result of Insights Provided

Upon receipt of her Inagene results, we were able to immediately switch her off a "Do Not Use" medication she had been currently taking and replace this with another in the same class which was "Use as Directed." 1 month after doing this, she noted a 20-25% improvement in her pain with no significant side effects, even at a relatively low dose. The testing also identified several other treatment options which we will use in the next phase of her treatment plan that would otherwise not have been selected as the next course of action, but which the test results revealed to be better options within that specific class of drugs.

## Physician Comments

"Considering that, based on standard treatment approaches, at least 3 medications that were revealed by the test to be "Do Not Use" or "Use with Caution" would have been tried before the recommended "Use as Directed" options were trialled, and considering that each drug trial usually lasts at least 6 - 8 weeks, the benefit of having the test results to guide treatment for Deborah were significant. "