White Rock-South Surrey
Division of Family Practice
A GPSC initiative

Evaluation of the Primary Care Access Clinic

Prepared by Nathalie Gagnon, LLB., PhD and Lesley Duncan, PhD

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"I wish there were more clinics like this. The province deserves more."

Clinic Patient

Executive Summary

Clinic Background and Mission

In 2008 and 2009, White Rock and South Surrey were increasingly seeing complex unattached patients using acute care services as their entry point into the health care system. This was in part because at the time unattached patients were finding it difficult to find a family physician. This dependency on the emergency and acute care departments created a number of challenges for the local hospital, Peace Arch Hospital. In particular, both emergency room providers and physicians seeing patients in hospital had nowhere to discharge patients once appropriate hospital treatment had been delivered. To address this gap and meet the needs of patients and providers, the White Rock-South Surrey Division of Family Practice (the Division) worked in partnership with the Fraser Health Authority to open the Primary Care Access Clinic (PCAC or Clinic) on November 14th, 2010.

The clinic's primary mission includes:

1. Supporting family physicians who provide care while in hospital to unattached patients by offering post-discharge follow-up care;
2. Supporting emergency room practitioners by providing a place where unattached patients can be referred for follow-up care;
3. Providing ongoing primary care for complex patients in the community, including those with mental health challenges, who are optimally managed in a multidisciplinary setting; and
4. Connecting unattached patients in the local community to GPs.

The clinic's anticipated outcomes include:

- Increased access to appropriate care (i.e., attachment)
- Increased care coordination and integration
- Reduced acute care utilization (i.e., ER admissions and bed days)

"The biggest difference to me is the time. They practice true care. Not just reacting to the patient and symptoms but more proactive care. Patient focused first."

Clinic Patient

Team Based Model

The clinic model is based on a team-based model of care. Nurse practitioners act as the primary provider for most patients, with in-house physician support for consultations or prescriptions and diagnostics that require physician credentials. The integration of a mental health worker and a psychiatrist at the clinic allows the clinic

to provide comprehensive coverage for patients' physical and mental health needs. The clinic also has strong relationships with medical and community partners. The clinic also operates a patient attachment phone line which connects unattached patients looking for a GP to GPs in the community who are accepting new patients.

The clinic served 856 patients between November 2010 and March 2015.

Clinic Referrals, Patients and Use

The clinic served 856 patients between November 2010 and March 2015. NPs and GPs see an average of 365 unique patients every year including an average of 165 new patients each year. The clinic provided a total of 1,631 GP visits and 10,105 NP visits between November 2010 and March 2015. Patients visit the clinic to see the NP or the GP an average of 7.4 times a year. The clinic attached 466 patients between November 2010 and March 2015. Since November 2010, it is estimated that approximately 30% of clinic referrals have come through the hospital.

Nearly two-thirds of patients are female (65%). The Clinic sees patients across the entire age spectrum, though the majority of patients are older. More than half of patients are over the age of 50 (61%) with approximately one quarter (27%) of patients over the age of 70. Over the 2015/2016 one year period, where NP visit complexity coding was available, visit complexity was nearly evenly split across the three categories with approximately one third of visits with low complexity, one third with moderate complexity and one third with high complexity (38%, 30% and 31%, respectively).

"Before coming to this clinic, I was in the ER all the time. I had lots of stuff going on. But then I got referred here and they got stuff figured out. I had to see lots of different specialists and I still need a lot of care but I don't go to the ER anymore".

Patient

Improved Access and Patient-Centeredness

Patients experience a high quality of care at the clinic. While interviews with patients found that their experience of care was very positive across a number of areas, one quality care indicator stood out in particular: access. Patients reported that the clinic had much improved their access to healthcare both in terms of timely access and in terms of allowing them more time during each individual appointment. Eight percent of NP appointments are same-day appointments and an additional 8% of NP appointments are telephone appointments. During interviews, more than one patient attributed their reduction of walk-in use to the short wait times at PCAC.

Follow-up appointments with NPs are approximately 30 minutes, longer than the average traditional GP visit. For one patient who had a number of complex care issues, the longer appointment length meant that she not only received care for her current pressing concerns but also received preventative care. *"The biggest difference to me is the time. They practice true care. Not just reacting to the patient and symptoms but more proactive care. Patient focused first."*

Emergency Room Use Avoidance and Estimated Cost Avoidance

In order to determine the impact of the Clinic on ER use, the use trends of PCAC patients were examined in the year prior to, and the year following their first contact with PCAC. Using this trend analysis the difference between expected ER use and actual ER use were calculated. Each of the PCAC patients examined in the analysis used the ER 3.6 times less than forecasted without the PCAC, resulting in 1,277 ER visits avoided for the 353 patients who did use the ER in the year following their first visit to the clinic. Using $288, an estimate of the average cost of an ER visit in the Fraser Region, the estimated cost avoided as a result of ER visits avoided in the year following registration at the clinic is $367,776.

Acute Hospital Bed Day Use Avoidance and Estimated Cost Avoidance

The clinic also had an impact on acute care bed day use. As with ER visits, bed day use was increasing before registration at the clinic and decreasing after. On average, for the 181 patients who were admitted into acute care in the year following their first visit to the clinic, PCAC patients used 2.0 fewer bed days than forecasted had they not been a PCAC patient. As a result, in the year following their initial clinic visit, a total of 355 bed days were avoided. Using $879, an estimate of the cost of an acute bed day in the Fraser Region, the cost avoided as a result of acute bed days avoided in the first year after registration at the clinic is $312,045.

Conclusion

The clinic has successfully filled a gap in the community. Unattached patient who are ready to be discharged from the ER or from the hospital, now have a place where they can receive the necessary follow-up care. Moreover, more than 450 patients in the community have now been attached to the clinic, many of them complex care patients. Along the way, the clinic has learned a number of lessons including the importance of strong partnerships and strong teams. PCAC is an example of the important work that can take place in the community through a collaboration between a Health Authority and a Division of Family Practice. While team based care is challenging in any setting and requires continuous focused efforts to ensure the team is operating effectively and efficiently, the rewards are well worth it. The clinic has had important impacts on the triple aim including improved patient experience and improved health and increased cost avoidance. In the single year following registration at the clinic, acute care cost avoidance is estimated to be $679,821; a savings that more than covers the cost of operating the clinic.

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Introduction

In 2008 and 2009, White Rock and South Surrey were increasingly seeing complex unattached patients using acute care services as their entry point into the health care system. This was in part because at the time unattached patients were finding it difficult to find a family physician. This dependency on the emergency and acute care departments created a number of challenges for the local hospital, Peace Arch Hospital. In particular, both emergency room providers and physicians seeing patients in hospital had nowhere to discharge patients once appropriate hospital treatment had been delivered.

The lack of post-hospital services led to two challenges for patients, particularly for complex unattached patients. First, some patients spent longer periods of time in hospital than required because with no GPs accepting patients, they could not be referred to a primary care physician for necessary follow-up care. Second, without the necessary ongoing follow-up care, patients who were discharged were often re-admitted to hospital when their original health challenges resurfaced or related conditions appeared.

This cycle created an unnecessary burden for patients, providers and the health care system more generally. To address this gap and meet the needs of patients and providers, the White-Rock South Surrey Division of Family Practice (the Division) worked in partnership with the Fraser Health Authority to open the Primary Care Access Clinic (PCAC or Clinic) on November 14th, 2010.

The Clinic's primary mission includes:

1. Supporting family physicians who provide care while in hospital to unattached patients by offering post-discharge follow-up care;
2. Supporting emergency room practitioners by providing a place where unattached patients can be referred for follow-up care;
3. Providing ongoing primary care for complex patients in the community, including those with mental health challenges, who are optimally managed in a multidisciplinary setting; and
4. Connecting unattached patients in the local community to GPs.

"We work with patients to find them an appropriate care provider in the community who is accepting new patients."

Nurse Practitioner

Location

When the Clinic opened on November 14th, 2010 it was initially located on Johnson Street in White Rock. It moved to its current location in the White Rock Centre for Active Living in December of 2012 where it is co-located with the Alzheimer Society of B.C., the White Rock South Surrey Stroke Recovery Club and the Peace Arch Hospital Cardiac Rehabilitation Program. In addition to the convenience of this co-location, the move also allowed the Clinic to benefit from reduced overhead expenses through subsidized rent. The public location, which includes a curling rink and other services in the building, has been beneficial for some patients. One Clinic practitioner noted that the location *"keeps the tension down for patients and reduces irritability, which makes them less likely to misbehave and increases safety for everyone"*. The mix of public and private space also allows patients to feel they are engaged and part of the larger community while meeting their health needs, rather than focusing on them being a patient in a purely medical setting.

PCAC Overall Model of Care

Although consistent in its mission, the clinic has seen some changes and growth over time. Through a partnership between the White Rock South Surrey Division of Family Practice and the Fraser Health Authority the following professionals are currently available within the clinic for PCAC patients:

- Nurse Practitioner
- Family Physician
- Mental Health Counsellor
- Psychiatrist

The clinic also has access to:

- Home Care Case Manager
- Clinical Pharmacist
- Consulting Physicians

The capacity of the clinic has changed over time. Nurse practitioner capacity started at five days per week and increased in 2012 with the addition of a second Nurse practitioner for another two days per week. In April 2014, the GP role was reduced from two half days per week to one half day per week. In April 2015, the role returned to two half days per week. The clinic has hosted Nurse Practitioner practicum students since 2012.

Currently, the Clinic has one full time nurse practitioner who works five days a week and one who works two days per week. The physician is at the clinic two half days per week. The Clinic model is based on nurse practitioners as the primary provider for most patients, with in-house physician support for consultations and for prescriptions and diagnostics that require physician credentials.[1] The clinic team operates much in the same way as other full service primary care establishments. They do physical exams, order and interpret medical tests, prescribe medications and treatments, make referrals to specialists and community resources and provide education and counseling to help patients achieve their health goals. As one patient put it, the practitioners "*really commit to do well for the patient*".

For each patient, the initial visit with the nurse practitioner is an hour long intake, and follow up visits are often 30 minutes long, longer than the average traditional GP visit. The longer visits allows the nurse practitioners extra time to work with complex patients and to ensure their comprehension of the current treatment plan, outline steps required for success, engage in broader discussion of issues that may be impacting health, probe for new symptoms, recommend possible preventative or proactive health steps patients could be taking, referrals, etc. The nurse practitioners also make appropriate referrals to social work and housing services when needed. One patient indicated this *"gives me the time to recollect all the things I came for, plus the NP will ask about other things I may not have thought of"*.

When first established the PCAC only accepted new patients who needed care to manage chronic diseases or urgent health challenges that required stabilization with the intent of referring them to community GPs accepting new patients after stabilization. Over time this mandate has shifted somewhat, as patients whose needs are better served by the interdisciplinary team at PCAC are not transferred to another primary provider but instead become attached to the clinic. One patient describes their practitioner at the clinic as *"a partner who is proactive in health care and keeping on top of things" in a "clinic where the primary focus is always the patient"*.

Patient Attachment phone line

The clinic also maintains a list of area GPs and maintains up to date knowledge of those clinics and GPs who are accepting new patients. When the clinic opened in 2010 there were no GPs accepting patients, so to facilitate attachment to GPs in the community the Clinic managed a phone line that area residents called if they were seeking care. Callers were asked a set of questions to triage these self-referrals. Those requiring care managing chronic diseases or presenting with urgent care needs who fit the clinic mandate were accepted as patients. Those with less urgent care needs were placed on a physician waiting list until a GP was available. In 2012, the community succeeded in retaining a sufficient number of GPs such that every patient seeking a GP was able to be served. The clinic now maintains a list of GPs who are accepting patients and no patients are on the waiting list.

Currently, when patients call in who are not a fit or priority for the Clinic, they are given the list of physicians in the community who are accepting new patients. This

1 The physician also has their own small patient base in the clinic.

phone line continues to receive between 3 and 20 calls per day. It is managed by the clinic MOA.

Team-based care

The integration of a mental health worker (3 days a week) and a psychiatrist (1/2 day a week) at the clinic allows the clinic to provide for patients' mental health needs. The clinic's nurse practitioners and physician directly refer patients to the in-house mental health counsellor or psychiatrist. Since one of the goals of the clinic is to provide primary care to complex patients, including those who have mental health comorbidities, these services are an important part of some patients care plans.

"The single visit [with the mental health worker] was very comfortable. She let me talk and we both decided one visit was enough"

Clinic Patient

The co-location of these mental health professional services help to coordinate the patient's mental health care with the rest of their primary care plan. Another important part of the integration of these services within the clinic is that the primary care provider is assured that the patient will be seen quickly. This arrangement avoids the need to refer to external mental health services which can often create barriers to access because of their complex qualifying criteria and long wait times. An additional benefit of the co-location is that it can help reduce the stigma often associated with attending mental health services which can also work as a barrier to access.

Appointments with the mental health counsellor are 1-hour long. In this regard, the clinic model provides an experience akin to a private practice model. One patient appreciated "*the single visit was very comfortable. She let me talk and we both decided one visit was enough"* but knows "*that I can go back whenever, I don't need to be on the edge*".

Anticipated Outcomes

The outcomes associated with the clinic's approach and service attributes are anticipated to have an overall positive impact on both patients and the medical system. Anticipated outcomes include:

- Reduced acute care utilization (i.e., ER admissions and bed days)
- Increased access to appropriate care (i.e., attachment)
- Increased care coordination and integration

Evaluation Questions and Scope

"…the primary focus is always the patient"

Clinic Patient

The evaluation was designed to answer the following 5 evaluation questions:

1. How are patients referred to the clinic?
2. What types of patients does the clinic serve?
3. How is the clinic utilized?
4. What impact does the clinic have on quality care and patient experience?
    a. Access and patient-centeredness
    b. Acute care utilization
5. What is the cost to run the clinic?

Evaluation Methods

The evaluation employed a multi-method approach in order to allow for the triangulation of findings. There were six primary sources of data:

- ***Provider interviews:*** Semi-structured interviews were conducted with a majority of clinic staff including two nurse practitioners, two medical office assistants, the Mental Health counselor, the psychiatrist and the director. Previous stakeholders (Physician Lead, Attachment Lead) were also interviewed.

- ***Patient interviews:*** Semi-structured interviews were conducted with five current patients who represented a range of medical needs and who had been attached to the clinic for varied amounts of time.

- ***Electronic Medical Records (EMR) Data:*** Data was collected from the PCAC EMR system on clinic use, appointment types and referral sources.

- ***Administrative Data:*** Data on attachment, gender and age was provided by the Ministry of Health. Acute care utilization data was obtained by linking the clinic's patient's personal health number to their MSP billing data. The data linkages were obtained through collaboration with Fraser Health and the Ministry of Health after a lengthy and comprehensive data sharing agreement process. The acute care utilization data were analyzed by the Fraser Health Authority with input from the evaluators and the director of the PCAC.

- ***Financial Data:*** Financial records from the White Rock-South Surrey Division of Family Practice and the PCAC clinic are included to help describe the cost of operating the clinic.

- ***Documents:*** A review of PCAC documents was conducted including a review of interview notes taken by a previous evaluation team.

Evaluation Findings

How are patients referred to the clinic?

When the clinic was first created, family physicians in White Rock and South Surrey were not accepting new patients and as a result some unattached patients were using the acute care system to meet their ongoing care needs. One of the key roles of the clinic was to provide treatment for referrals from the Peace Arch Hospital. Consistent with this, the clinic has a referral form that the hospital can use when referring patients. An examination of referral sources over time shows that the clinic received many of its patients from the hospital early in its inception.

The clinic continues to prioritize patients who are being discharged from hospital. It ensures that there is always capacity to accept new hospital referrals, which is important as the clinic remains the only facility in the area for unattached patients with post-discharge treatment needs. Hospital referrals continue make up a large proportion of the clinic's referrals, however, the number of referrals from this source has decreased over time.

When the clinic first opened, there were no GPs accepting new patients. Patients who called the Patient Attachment phone line were seen and stabilized at PCAC with the intent of moving them on to GPs when one became available. The landscape in White Rock and South Surrey has changed somewhat since the clinic opened. There are now GPs in the community who accept new patients. As the clinic has established itself and evolved over time to meet changing community needs, patient referral patterns have also changed. One common referral method to the Clinic is through another patient. Current patients often refer their friends and family to the clinic, who then approach the clinic through a self-referral process. New patients also come to the clinic from many different referral sources including, walk-in clinics, home health, mental health workers, elderly homes and community groups. It is important to note that the clinic does not operate as a walk-in clinic open to the public.

The clinic remains the only facility in the area for unattached patients with post hospital discharge treatment needs.

We examined referral patterns for a 12 month period in 2011/2012 and for a similar 12 month period in 2015/2016. As can be seen in the table below, early in the Clinic's history more than a third of referrals came from hospital (34%) with nearly as many coming in through self-referrals (30%). The remaining approximate third came through other health care providers or community agencies (36%).

Table 1: The majority of patients are referred to the Clinic by the hospital or through self-referral

Referral Source	2011/2012	2015/2016
Hospital (including ER)	34%	24%
Self-referral	30%	53%
Walk-in Clinics	19%	6%
Fraser Health Mental Health	10%	3%
Community Agencies	7%	14%

The pattern has shifted somewhat over time. In the most recent year, the majority of referrals have come through self-referrals (53%) – patients who are looking for a new primary care provider. Many of the remaining referrals are coming from hospital (24%).

What types of patients does the clinic serve?

The clinic has served 856 patients between November 2010 and March 2015. Perhaps not surprisingly the clinic saw the highest number of new patients in its first full year of operation, 2011. In that year, nearly 300 new patients were seen at the clinic. In subsequent years, the number of new patients seen at the clinic has been relatively stable at an average of about 165 new patients each year.

Table 2. The clinic serves an average of 165 new patients each year.

	Number of new patients
2010 (Nov 11 – Dec 31st only)	22
2011	292
2012	183
2013	171
2014	142
2015 (Jan 1 - March 31st only)	46
Total	856

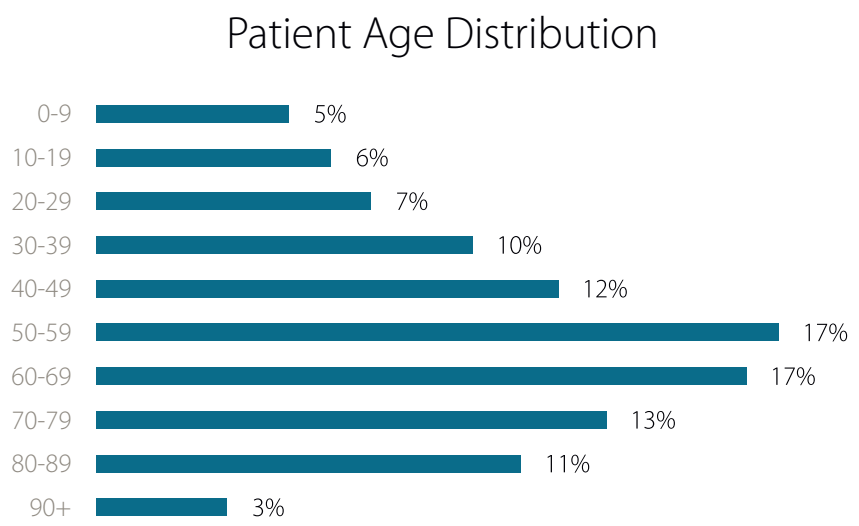
The Clinic served 856 patients between November 2010 and March 2015.

Table 3. The clinic sees an average of 365 patients a year.

	Patients seen by an NP	Patients seen by a GP	Total patients seen
2010 (Nov 11 – Dec 31st only)	16	14	22
2011	284	145	314
2012	305	113	324
2013	379	123	400
2014	406	82	421
2015 (Jan 1 to March 31st only)	262	54	293
Total	798	347	856

Nearly two-thirds of patients are female (65%). The Clinic sees patients across the entire age spectrum, though the majority of patients are older. More than half of patients are over the age of 50 (61%) with approximately one quarter (27%) of patients over the age of 70.

Figure 1. More than half of the clinic's patients are over the age of 50.



Approximately one quarter of patients seen at the clinic are 70 or older.

As expected, the vast majority of patients (88%) are from the Fraser region. Although the clinic only accepts patients in the Fraser region, it has retained some attached patients who have moved outside the community since starting at the clinic.

Data on the complexity of patients (i.e., Ministry of Health "Health System Matrix") was available only for the 2011/2012 and 2012/2013 fiscal years. Overall, half the patients who presented at the clinic during this time presented with complex care

needs[2]. Nearly a third of patients were patients with chronic conditions that were either moderately complex (14%) or highly complex (17%). Additionally, a number of patients presented with mental health and/or substance use challenges (8%), often with comorbid physical conditions. Moreover, an additional 10% have cancer, were frail or were near the end of their life. Taken together, these groups represented nearly half of the clinic's patients (49%).

Table 4. Nearly half of patients in 2011/2012 and 2012/2013 could be considered "complex".

Health System Matrix	% of PCAC patients
End of Life	3%
Frail in Care	3%
Cancer	2%
High Complex Chronic Conditions	17%
Frail in Community	2%
Maternity and Healthy Newborns	2%
Mental Health and Substance Use	8%
Medium Complex Chronic Conditions	14%
Low Complex Chronic Conditions	28%
Child-Youth	0%
Adult Major	4%
Healthy	14%
Non-User	2%

Nearly only-third of clinic visits (30%) are coded as moderate complexity visits with another nearly one-third coded as high complexity visits (31%).

In 2014/2015, the Ministry of Health in British Columbia implemented a new coding system that allowed nurse practitioners to code the complexity of patients' visits. This complexity coding, considers both the patient's presenting medical condition, their psychosocial situation and the complexity of any decision making or coordination that needs to take place. The complexity of the visit is then coded on a 3-point scale with 1 being a low complexity visit, 2 being a moderately complex visit and 3 being a high complex visit.

We examined the complexity of patient visit to NPs over an approximately one-year period in 2015/2016. Visit complexity was nearly evenly split across the three categories with approximately one third of visits with low complexity, one third with moderate complexity and one third with high complexity (38%, 30% and 31%, respectively).

2 The Ministry of Health's *Health System Matrix* divides the health population into 13 health status groups, from those with the lowest health care needs to those with the highest health care needs.

How is the clinic utilized?

We were able to examine the number of visits to NPs and GPs by examining the administrative data provided by the Ministry of Health up until the end of March, 2015. There were a total of 10,105 visits to the NP and 1,631 visits to the GP up until the end of March, 2015. While the number of visits to the NPs have been increasing over time, the number of visits to the GP decreased during the same time frame. However, data gathered from the Clinic's EMR more recently suggests that GP visits have increased in this last fiscal year to levels more similar to those seen in 2011. This is likely due to the availability of GP appointments. Recall that between April 2014 and March 2015 the Clinic had a GP for only one half-day per week, but returned to the pre-April 2014 levels of two half-days per week in April 2015. The increase in GP appointments after March 2015 is also likely influenced by the GP's ability to attach patients to their practice at the Clinic.

Table 6. Patients visit the clinic to see the NP or GP an average of 7.4 times a year.

Year	GP visits	NP visits	Total number of visits	Average number of visits to GP or NP per year
2010*	27*	46*	73*	--
2011	571	1,909	2,480	7.9
2012	451	2,024	2,475	7.6
2013	337	2,464	2,801	7.0
2014**	171	2,885	3,056	7.3
2015***	74***	777***	851***	--
Total	1,631	10,105	11,736	7.4

** The clinic opened in November 2010 and as such the data reflects only an approximately 2-month period.*
*** The 2014/2015 fiscal year saw a reduction in GP FTE from 0.2 FTE to 0.1. It returned to 0.2 FTE in the 2015/2016 fiscal year.*
**** The data was captured only until the end of March 2015 and therefore represents only a 3-month period.*

Patients visit the clinic to see the NP or GP an average of 7.4 times per year.

The majority of patients seen at the clinic are subsequently attached to the clinic. Using the robust attachment algorithm supported by the Ministry of Health (Attachment Algorithm technical documentation, Prepared by the BC Ministry of Health, Integrated Primary and Community Care Branch; see Appendix A), an average of 55% of patients seen in 2011, 2012, 2013 and 2014 are currently attached to the clinic (as of March 2015). Between November 2010 and March 2015, the clinic has attached 466 patients.

EMR data was extracted to examine visits to the mental health counsellor and the psychiatrist. Data was extracted for an approximate 12-month period in 2011/2012 and for an approximate 12-month period in 2015/2016 to allow for comparison over time. There were approximately 150 visits to the mental health counsellor by 48 patients and approximately 59 visits to the psychiatrist by 14 patients in the 2011/2012 twelve-month period. There was an increase in patient visits in the 2015/2016 twelve-month period to approximately 218 visits to the mental health

counsellor made by approximately 27 patients and approximately 112 visits to the psychiatrist made by 30 patients.

Table 7. Number of patients seen and number of visits to mental health worker and psychiatrist.

	Mental Health Worker		Psychiatrist	
	2011/2012	2015/2016	2011/2012	2015/2016
Patients	48	27	14	30
Visits	150	218	59	112

What impact has the clinic had on patient experience and quality care?

Access and patient centeredness

Patients experience a high quality of care at the clinic. While interviews with patients found that their experience of care was very positive across a number of areas, one quality care indicator stood out in particular: access. Patients reported that the clinic had much improved their access to healthcare.

"My NP is an incredible care provider, she has become a key person in my personal health journey and I couldn't ask for a better advocate"

Clinic patient

All the patients interviewed reported that the longer-than-usual appointment lengths had very positive impacts on their ability to obtain the healthcare they needed. For example, for one patient who had a number of complex care issues, the longer appointment length meant that she not only received care for her current pressing concerns but also received preventative care. "*The biggest difference to me is the time. They practice true care. Not just reacting to the patient and symptoms but more proactive care. Patient focussed first.*" For another patient, the longer appointment times meant that he could really participate in his own care. "*They give you time to recollect. And to think. They ask you lots of questions. And you can ask lots of questions too.*"

Patients also reported better access to care as a result of shorter wait time for appointments. Eight percent of appointments with NPs are same-day appointments and an additional 8% of NP appointments are telephone appointments. For example, one patient reported "*I don't have to use walk-in anymore. If I need an appointment right away, they can always fit me in either that day or the next day. I can't tell you how great that is!*" More than one patient shared with us that they had reduced their use of walk-in clinics since their first visit to the clinic.

Patients report having strong, honest and productive relationships with their healthcare providers at the Clinic. They appreciate being "*comfortable enough to express myself regardless of gender or position*" and having an NP who "*is an incredible care provider, she has become a key person in my personal health journey and I couldn't ask for a better advocate*". It is described as "*a place I feel safe revealing vulnerabilities*".

The clinic's focus on patient centeredness is further evidenced through the additional supports they provide patients who need them to achieve self-care

targets and stable health. For example, the clinic provides appointment reminders, treatment follow-up contact and reminders, and advocacy (both by the staff and by creating patient competence and confidence to advocate for themselves). Some patients reported that the high quality of care they receive at the clinic has had strong direct benefits on their health. One patient in particular shared, "*I am healthier now than I have been in many years*" explaining that her nurse practitioner's "*constant reminders*" and individualized attention were key to her much improved health. In fact, she admitted that she took better care of herself because she knew that her nurse practitioner would be checking in with her to make sure that she had engaged in the recommended self-care.

I don't have to use walk-in anymore. If I need an appointment right away, they can always fit me in either that day or the next day. I can't tell you how great that is!

Clinic Patient

Acute care utilization

The Fraser Health Authority Primary Healthcare - Health Business Analytics unit investigated the impact of PCAC on emergency room (ER) and on acute bed use. This analysis was made possible by the joint collaborative efforts of the Division, Primary Health Care at Fraser Heath and the Ministry of Health. We thank them for their time and expertise.

For both of these service types, the analysis compared the use trends of PCAC patients in the year prior to, and the year following, their first visit to PCAC. The following provides the main findings from this analysis. The full analysis is provided as an appendix (Appendix B).

Of particular note is a correction that was made to the data as a result of direct referrals from the hospital to PCAC. To compare emergency room visits and acute bed use for clinic patients before and after they first visit to PCAC, the number of ER visits and acute care bed days were grouped into two week periods. An initial investigation revealed a spike in ER visits and number of acute care bed days in the two weeks prior to the first PCAC visit. This is likely due to that fact that some patients have been referred to the PCAC following an ER visit or an acute care stay. To avoid any bias or inflation that could result from clinic recruitment from hospital visits, the two week period just prior to the first visit is excluded from the analysis. While this approach is consistent with data analysis best practices, the outcome of this conservative approach means that the reported outcomes likely underestimate the impact of the Clinic on ER and acute care bed use by these individuals. The investigation also revealed that the PCAC cohort consist of a heterogeneous group of patients of both frequent and infrequent acute care users. Given that avoided utilization of infrequent users are likely to be small, the inclusion of infrequent users can result in an overestimate of overall impact of the clinic on acute care utilization, although this overestimate is expected to be small to negligible for follow-up periods of up to one year.

"Before coming to this clinic, I was in the ER all the time. I had lots of stuff going on. But then I got referred here and they got stuff figured out. I had to see lots of different specialists and I still need a lot of care but I don't go to the ER anymore".

Clinic Patient

Reduced Emergency Room Use

The Clinic has reduced ER admissions among PCAC patients. In total, 545 PCAC patients met the inclusion criteria for the ER use analysis. Of these, 429 patients (79%) had at least one ER visit in the year before they went to the PCAC for the first time, and 353 patients (64%) had at least one visit in the year after they first visited the clinic.

Looking at these patients, the data show that ER visits were increasing in the year leading up to the first PCAC visit, and, importantly, the frequency of ER visits was decreasing in the time period from the first PCAC visit to the end of the following year. The fact that these use patterns differed significantly from each other once the patient became a PCAC patient demonstrates that the clinic had an important impact on ER use.

By comparing the expected ER use to the actual ER use once patients were registered at the clinic, the number of ER visits avoided can be calculated. For example, in the two week period starting 196 days after the first visit to the PCAC, the estimated number of ER visits if patients had not gone to the clinic is 86, and the actual number of visits is 27. This means 59 ER visits were avoided in this particular 2 week period. Using this approach for the entire 365 day period following the initial clinic visit, there are a total of 1,277 ER visits avoided for the 353 patients who did use the ER in the year following their first visit to the clinic. On average, in the year following their first visit, each of these PCAC patients used the ER 3.6 times less than forecasted without the PCAC. To estimate the cost avoided by these avoided ER visits, we multiplied the total number of visits avoided in the post-registration year by $288, an estimate of the average cost of an ER visit in British Columbia[3]. Using this formula, the estimated cost avoided in the year following registration as a result of ER visits avoided is $367,776.

Table 8. Approximately 1, 277 ER visits were avoided in the year following registration at the Clinic.[4]

	Cohort size	ER Visits
ER visits pre-registration	n=429	993
Expected ER visits post-registration	n=*353*	*2,155*
Actual ER visits post-registration	n=353	878
ER visits avoided in year following registration	n=353	1,277

3 The 2014/2015 Fraser Health Hospital Rates can be found in Appendix C. Since no ER visit rate is provided for Peace Arch Hospital, the rate for Abbotsford Regional Hospital, $288, is used.

4 To estimate this cost, we multiplied the total number of ER visits avoided in the post-registration year (1,277) by $288, an estimate of the average cost of an ER visit in the Fraser region. See previous footnote for source of $288 estimate.

Table 9. Approximately 3.6 ER visits per patient were avoided in the year following registration at the Clinic.

	Cohort size	ER visits/patient
Average ER visits per patient pre-registration	n=429	2.3
Expected average ER visits per patient post-registration	n=*353*	*6.1*
Actual average ER visits per patient post-registration	n=353	2.5
Average ER visits/patient avoided in year following registration	n=353	3.6

In addition to the overall ER use, the analysis looked at those individuals who had 8 or more ER visits in the year prior to their registration at the Clinic (n=14). For this cohort of 14 patients, ER use dropped drastically once they joined the Clinic, from an average of 11.2 ER visits per year prior to registration to only 3.9 in the same time period following registration. In this group alone over 100 ER visits were prevented within a year. Although this represents a relatively small number of people, the decrease in ER use among this group once connected to the PCAC clinic is notable and suggests that there is great potential in the PCAC model of attaching frequent ER users to ongoing and accessible primary care providers.

On average, each patient avoided 3.6 ER visits in the year after they were registered at the clinic.

Acute care hospital day bed use

In total, 257 PCAC patients met the inclusion criteria for the acute care hospital bed day use analysis, comprising a total of 532 admissions. To better capture the full impact of these admissions on the health care system, the analysis for acute care use was run on the number of bed days, not the number of admissions, as some stays may be shorter in duration than others.

The pre-registration period linear trend line indicated acute care bed days were increasing for these patients in the year leading up to their first PCAC visit. In the year following their first visit to the clinic, the linear trend line had a negative slope, indicating that the number of acute care bed days was decreasing in the time period from the first PCAC visit to the end of the following year. These slopes differed significantly from each other ($p<.00005$), demonstrating the clinic had a significant impact on acute care bed day use.

Approximately 1, 277 ER visits were avoided in the year following registration at the Clinic for an estimated cost avoidance of $367,776.

By comparing the expected acute care bed days to the actual use once patients were connected to the clinic, the number of acute care bed days avoided can be calculated. For example, in the two week period starting 196 days after the first visit to the PCAC, the estimated number of bed days if the patient had not been connected to the clinic is 27, and the actual number of visits is 15. This means 12 bed days were avoided in this particular 2 week period. Using this approach for the entire 365 day period following the initial clinic visit, there are a total of 355 bed days avoided for the 181 patients who were admitted into acute care in the year following registration at the clinic. On average, in the year following their first visit, each of these patients used 2.0 fewer bed days than forecasted had they not been a PCAC patient. In order to estimate the cost avoided by these acute bed days, we multiplied the total number of avoided bed days in the year post-registration (355)

with an estimated cost of an acute bed day in Canada, $879[5]. Using this formula, the cost avoided in the year post-registration as a result of acute bed days avoided, is $312,045.

Table 10. Over 355 acute bed days were avoided in the year following registration at the Clinic

	Cohort size	Acute bed days
Acute bed days pre-registration period	n=141	226
Expected acute bed days post-registration	n=*181*	*661*
Actual acute bed post-registration	n=181	306
Acute bed days avoided in year following registration	n=181	355

The cost avoidance of ER admissions and acute bed use totals, in the year following registration at the clinic is $679,821.

Table 11. Approximately 2.0 bed days per patient were avoided in the year following attachment to the Clinic

	Cohort size	Average acute bed days per patient
Acute bed days pre-registration period	n=141	1.6
Expected acute bed days post-registration	n=*181*	*3.7*
Actual acute bed post-registration	n=181	1.7
Average acute bed days saved per patient in year following registration (Expected – Actual)	n=181	2.0

Taken together, the cost avoidance of ER admissions and acute bed use totals, in the year following registration at the clinic is $679,821.

5 The 2014/2015 Fraser Health Hospital Rates can be found in Appendix C. The "Standard Ward Medical Stay Bed" rate for Peace Arch Hospital, $879, is used throughout the acute bed day cost avoidance analysis.

What is the cost to run the clinic?

In addition to patient centeredness and quality care, the success of the clinic can also be seen in the overall savings that it provides to the health care system. The ER visits and bed days saved result in an estimated savings of $679,821 in a single year[6]. The total cost of the clinic is between $300,000 and $340,000 per year, showing that the investment into the clinic is entirely offset by the cost avoided elsewhere in the local health care system.

	FY 2013	FY 2014	FY 2015	FY 2016*
REVENUE				
MSP Fees	$32,524	$24,235	$10,764	$32,960
Total REVENUE	$32,524	$24,235	$10,764	$32,960
EXPENSES				
Clinic Administrative Support	$7,574	$12,393	$10,721	$9,054
Rent & Occupancy Costs	$9,933	$11,247	$11,405	$11,405
Clinic Operational	$18,297	$16,570	$16,669	$17,000
Wages	$315,283	$312,603	$285,528	$289,622
Total EXPENSES	$351,087	$365,206	$335,044	$336,135
COST TO RUN CLINIC	**$318,563**	**$340,971**	**$324,280**	**$303,175**

The cost of the clinic is entirely offset by the cost avoided in acute care utilization

The expenses of the clinic were covered by both the Division and Fraser Health. The Division paid the physician and management wages in addition to the EMR and office supply costs. Fraser Health paid the Nurse Practitioner, Psychiatrist and Mental Health Worker wages in addition to the medical supply costs. The MOA wages were cost shared between the two organizations.

6 Estimated ER cost avoided is $287,325 and the estimated acute bed day cost avoided is $312,045. See previous section for details of these calculations.

Lessons Learned and Recommendations

The clinic has successfully filled a gap in the community. Unattached patients who are ready to be discharged from the ER or from the hospital, now have a place where they can receive the necessary follow-up care. Moreover, more than 450 patients in the community have now been attached to the PCAC clinic, many of them complex care patients. The clinic has had important impacts on the triple aim including improved patient experience and improved health and increased cost avoidance.

The clinic's success is due in large part to the dedication and hard work of the clinic staff. The staff are committed to working well together and continually strive to improve their team functioning. Team based care is challenging in any setting and requires continuous focused efforts to ensure the team is operating effectively and efficiently. Important lessons learned with respect to team based care include the importance of role and process clarity, mutual trust and effective communication. Given British Columbia's Ministry of Health's recent strategic direction, PCAC's team based care lessons learned are important for health care providers across the province.

"I wish there were more clinics like this. The province deserves more."

Clinic Patient

An important strength of the clinic is its commitment to full comprehensive care. Patients report much appreciation for the time staff take to help them find appropriate referrals, follow up with allied health professionals, connect them with community services and help them navigate through a complex system of care. The clinic has worked hard to forge and maintain relationships with several important community resources (e.g., Sources). The work of connecting patients is incredibly important but also incredibly time consuming for MOAs, NPs and the other staff. Nurse practitioners may be able to spend their time more efficiently by delegating some of this work to other care providers such as social workers or other appropriate community providers if they were made more readily available – for example, through a co-location arrangement.

PCAC is an example of the important work that can take place in the community through a collaboration between a Health Authority and a Division of Family Practice. The clinic would not have been possible without the strong partnership between the Fraser Health Authority and the White Rock – South Surrey Division of Family Practice. One unique challenge that is born out of this collaborative model is staff management. As a result of the nature of the two organizations and the resulting structure of the clinic, different staff report to different managers. This presents a challenge for both staff and management who must come together to work despite different operating models and structures.

Conclusion

The success of the clinic can be summarized by examining its impacts on quality care and the triple aim. Patients at the clinic experience a system of care that is integrated, timely and comprehensive. Not surprisingly, patients readily report significant improved health outcomes as a result of this care. Moreover, the avoidance of ER visits and acute bed days in the year following their first visit to the clinic suggests that the clinic is having a positive impact on the cost of health care in White Rock. Moreover, the clinic's focus on patient centeredness, timely access and team based care is well aligned with the Ministry of Health's recent strategic focus on Primary Care Homes. We echo the voice of one patient we interviewed, we "wish there were more clinics like this. The province deserves more".

Appendix A:

Ministry of Health Attachment Algorithm

Technical Documentation

Attachment Algorithm

Background

The Attachment Algorithm is a method to measure the number (or percent) of patients who apparently have a continuous relationship with one practice or with one GP.

The algorithm looks through the lens of MSP administrative data, primarily medical claims, which may not in all cases match the patient's and/or GP's perception of whether an attachment relationship exists. Measuring patients' and GPs' perception of attachment, however, would require performing surveys or interviews and extrapolating those results to larger populations. The Attachment Algorithm has the advantage that it can be applied to the entire population of the province (or to any geographic sub area), and can easily be refreshed to include the most current information.

The Attachment Algorithm was developed in 2011 for the General Practice Services Committee's (GPSC) Provincial Attachment Working Group (PAWG) and a modified version was the basis for implementation funding to physicians in three communities prototyping attachment. The algorithm estimates patient attachment to a family physician practice and also to a specific physician within that practice.

Summary of Attachment Algorithm Rules

- Practices are identified using payee number, *or* using a group of payee numbers (where postal code is in common)
- For patients with relatively frequent visits, only the latest year of visits is used – i.e. when there were at least five visits in the most recent year for a patient, all visits in the year are used
- Up to 10 years of data is used per patient, but only as much history as required to find the most recent 5 visits. About 93% of the population have sufficient visits to be eligible for the algorithm. (Technical note: The algorithm always looks for a majority within a denominator 5 or more visits per patient. If <u>exactly</u> 3 or 4 visits in total were found for a patient in the last 10 years, the algorithm is applied by effectively assuming the missing one or two visits would have been to different practices than the 3 or 4 visits found. That is, only if all 3 of 3 or at least 3 out of 4 visits were to one practice would the patient be considered attached based on a majority within a denominator of 5 visits.)
- The algorithm is applied both at the practice level, and then – for patients attached at the practice level – the algorithm is further applied at the GP level for visits within the practice attached to. Patients not designated as attached at the practice level are not considered for GP level attachment.
- Patients the algorithm counted as attached at the practice level, but who did not have the majority of visits with one specific GP in the practice, are considered shared among GPs in the practice. That is, they are not counted as attached at the GP level.

Summary of Changes to the Attachment Algorithm Rules

2013/2014 (run: 201502)

- Denominator: For all percentages (attached, unattached, unknown), the denominator is the count of people in the Ministry of Health *Healthideas* Client Roster for the year. Previous versions used Medical Services Plan coverage (from Registration & Premium Billing) and included only people with MSP coverage on March 31 of the fiscal year. The Client Roster is larger than the BC population (based on a single point in time) as it includes all people in BC during the year; for

example anyone who died and/or had coverage at any time during the year. The impact of this change on the attachment rates is minimal – by geography, population complexity and over time.

2012/2013 (run: 201403)

- Percentage for the patient cohort where the attachment status is Unknown has been added: Approximately 7 - 8% of British Columbians (who had less than 3 GP visits within the past 10 years) is categorized as “Unknown”.

2011/2012 (run: 201306)

- Hospital based and residential care services are excluded; previously only hospitalist payees. Services provided in the Emergency Room (ER) are included.

Algorithm Details

The Attachment Algorithm involves three steps:

1. Practices (solo or group) are identified, using MSP administrative data.
2. Patients are assigned[1] to practices by examining patient visits to GPs (under MSP) where the majority of recent visits were provided by the practice.
3. For each patient assigned at the practice level, a specific GP within the practice is assigned where possible.

Diagrams in Appendix 1 give a visual illustration of how patients are assigned to a practice, and assigned to a specific GP within the practice (Steps 2 and 3).

Step 1: Identifying practices

Practices are identified using the MSP payee number[2]. Either a single payee or a group of payees are used to identify each practice. A practice identified by a single payee number may be either a solo practice or a group practice (when the physicians share a payee number).

In many cases, two or more payees are grouped together to represent one practice in the algorithm, as there are instances where physicians practice together but do not share a payee number. The Attachment Algorithm looks for practices made up of more than one payee number by examining the Teleplan[3] number (also known as data centre number) and postal code of each payee. If payees share a Teleplan number and have the same postal code[4,5], the algorithm designates that Teleplan number to represent a practice group, and considers all of these payees to represent a single practice.

The rule that payees must both share a Teleplan number and postal code is meant to avoid treating service agencies (who submit claims on behalf of two or more practices) as practices. Furthermore, Teleplan numbers with names that appear to be those of a service bureau[6, 7] are explicitly not used for grouping payee numbers into practices.

In some cases, however, the algorithm may incorrectly attribute a group practice when two or more autonomous practices cost-share both office location and billing software (Teleplan number). Avoiding grouping these types of practices together would likely require manual investigation of all groups – this is not done. In addition, there is no special treatment for walk-in practices, which are considered group practices.

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[1] An assigned patient is considered attached for the purposes of the Attachment Algorithm.

[2] The payee number is assigned by the Medical Service Plan (MSP) to identify recipients of MSP payments. Each physician also has a practitioner number uniquely identifying them. One or more physicians may bill MSP under the same payee number.

[3] Teleplan is a telecommunications system used by practitioners to securely submit claims, notes and eligibility requests to Medical Services Plan (MSP), and receive payment statements, rejected claims and patient eligibility data from MSP through an encrypted Internet connection. The Teleplan number uniquely identifies a location from which claims are submitted to MSP.

[4] The algorithm makes some allowance for inconsistencies in recording postal codes. If all but one of the payee numbers sharing a Teleplan number is in the same postal code, the entire group of payee numbers will be considered to make up a group practice.

[5] After designating the Teleplan numbers in each year that appear to represent practice groups (each comprising multiple payees), these decisions are reviewed across multiple years. Inconsistencies in the designation of Teleplan numbers from year to year are usually smoothed out by changing the designation of the Teleplan number as a group (or not) in an inconsistent year. See *Appendix 3 - Rules for Identifying Group Practices*.

[6] Teleplan numbers classified as types other than Practitioner or Clinic are also not used to group payees.

[7] A service bureau submits claims to the Medical Services Plan via Teleplan on behalf of physicians. A service bureau may provide data processing and online services; offer a variety of software packages, batch processing services (data entry, COLD, etc.) as well as custom programming. Customers pay for storage of data on the system and processing time used. Connection is made to a service bureau through dial-up connections, private lines, the Internet, frame relay or other WAN services.

Step 2: Assigning patients to practices

A patient is assigned to a practice when the patient meets both of the following conditions:

a) The patient has had at least five visits within the most recent ten years[10]; and
b) The clear majority of considered patient visits[8] were provided by the practice, where considered patient visits were the maximum of:
   i. All GP visits within the most recent 12-month period[9]; or
   ii. The most recent five visits, looking back as far as required (up to ten years ago) to find the most recent five visits. Fine Point: a patient for whom only three or four GP visits were found (within the full ten years) will be assigned to a practice if at least three visits (of the three or four) were provided at that one practice[10].

   Note: The clear majority rule means that for each assigned patient, the number of (considered) visits to a single practice exceeds the total of (considered) visits across all other practices.

Step 3: Assigning patients to a specific GP within a practice

A patient may be assigned to a specific GP within a practice, or may be considered shared between the GPs in the practice.

a) A second pass of the ten years of considered visits is made.
b) Only visits at the patient's assigned practice are examined. If a majority of these visits had been provided by a single GP in the practice, the patient is assigned to that GP.
c) If there is no majority, the patient is considered shared within the physicians at the practice.

Data Limitations

- Both MSP fee-for-service plans and alternate payments plan (APP) encounter data is included in counting GP visits. APP data may be under-represented to some degree, depending upon the level of compliance in reporting APP or encounter claims. However, an exploration of group-level attachment in a few remote LHAs where primary care is mostly APP-funded found relatively high rates of attachment at the practice level, which is encouraging.
- The payee numbers grouped together to represent practices may in some cases not represent strong working relationships; rules for grouping payees into practices are based on co-location and the sharing of billing software (indicated by Teleplan number) to submit claims. If separate practices share office space and software, they may erroneously be considered to be a practice group.
- Payee postal code stored in MSP may not be as accurate as the BC College of Physician and Surgeons address information, which physicians need to keep current to maintain licensure.
- A denominator of five (or more) visits was chosen for the algorithm. Since the Attachment Algorithm assigns patients based on the majority of visits (within the denominator), a minimum denominator that is an odd number works best. Some other work has used a minimum denominator of three visits. Generally, one of the trade-offs in using a

[8] Considered visits are all MSP fee-for-service visits and alternative payment plan $0 encounters provided by a general practitioner (GP), excluding third party claims (ICBC, WorkSafeBC, etc), claims for newborns under the mother's PHN, laboratory and diagnostic services, hospitalist services, services in hospital, identified by selected service codes, fee items, and in some cases also based on reported service location, no charge referrals, surcharges and tray fee items. Two or more services provided by a GP to the same patient on the same day are grouped into a single visit.

[9] When the number of visits to a patient in the most recent 12-month period is an even number (e.g. 6, 8, 10, etc), the latest visit occurring prior to this 12-month period is also included. This way, the majority is (almost) always determined within an odd number of visits.

[10] If only three or four visits were found for the patient within the last 10 years, the algorithm will consider the patient to be assigned to a group if all three (or three out of four) visits were to the same group. This is using an effective denominator of five visits. If we have been able to go back further and find additional visits to make a total of five, three visits to the same group would provide a majority. The same rules hold for attaching a physician within a group.

minimum denominator higher than three is that more patients would be excluded from the algorithm right off the top. This is more of an issue for rules that are applied over shorter time spans, such as one or two years. Since the Attachment Algorithm will look back as far as 10 years to find five visits, it is not problematic to use the higher denominator of five. Using a larger number of visits may provide greater confidence in the algorithm. With a denominator of five visits, patients must have made at least three visits to the practice they are being assigned to; with the denominator of three visits, patients could be assigned to a practice based on just two visits to that practice.

- GP-level attachment is assessed at the level of GP within practice. An alternative would have been to derive GP-level attachment directly, without the intermediate step of determining attachment at the practice level first. Without the intermediate step, a majority for GP would need to be found within each patient's visits to any GP in the province, as opposed to the majority within visits to GPs in the practice only. We found that attachment directly at the GP level would be slightly lower (at around 61%) than GP-level attachment within practice (approximately 64%). If we had performed GP-level attachment without the intermediate practice level, there would in some cases be inconsistencies for patients between the practice-level and GP-level algorithm results.
- The algorithm only applies to patients who have at least three[10] GP visits within the last 10 years. As a result, approximately 8% of British Columbians (who had fewer than 3 GP visits within the last 10 years) are excluded. This cohort is considered "unknown". (Hence, if the attached and unattached rates are summed by geographic region, the total will be less than 100% due to residents in the "unknown" cohort.)
- No adjustment has been made for age/gender differences when reporting LHA level figures.

Appendix 1 - Diagrams of Visit-based Rules

Assigning patients to practices

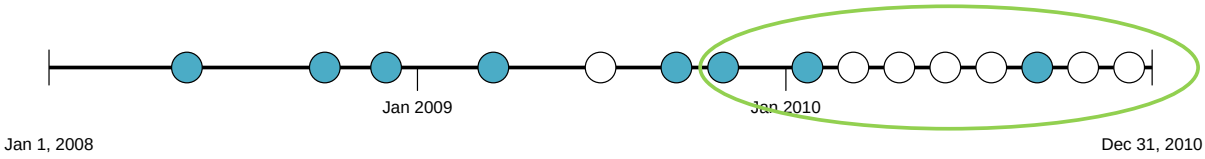
The following diagrams provide a visual illustration of how patients are assigned to a practice. For simplicity, each of the time-lines shows visits of a single patient over a three calendar year period; the actual algorithm uses 10 fiscal years. Times-lines should be read from right (most recent) to left. White circles indicate visits at a specific practice, referred to as practice 1.

Legend:

○ Visit at practice 1

● Visit at any other practice

Diagram A: Patient assigned to Practice 1 (Step 2b i on page 4)



In the situation shown in diagram A, the patient would be assigned to practice 1 on the basis of all visits in the most recent 12-month period (here shown as Jan 2010 – Dec 2010), since there are at least five visits within this period. Since there was an even number of visits (eight) in the year, the algorithm will use an additional (9^{th}) visit to arrive at an odd denominator. Six out of nine GP visits were at practice 1, constituting a majority.

Diagram B: Patient assigned to Practice 1 (Step 2b ii)

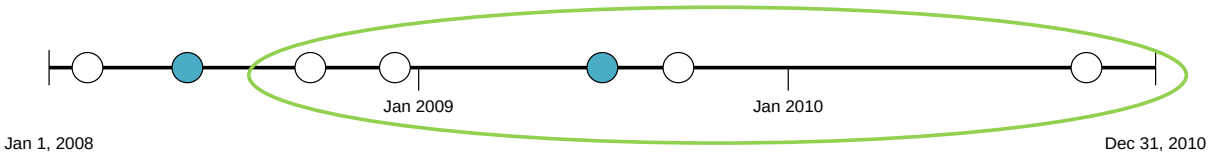


Diagram B represents the visits for a patient who had only one visit in the most recent year (therefore the algorithm looks back up to 10 years). Three years were required to find the most recent five visits. Since four out of five of these visits were to practice 1, the patient will be assigned there.

Diagram C: Patient NOT assigned to Practice 1

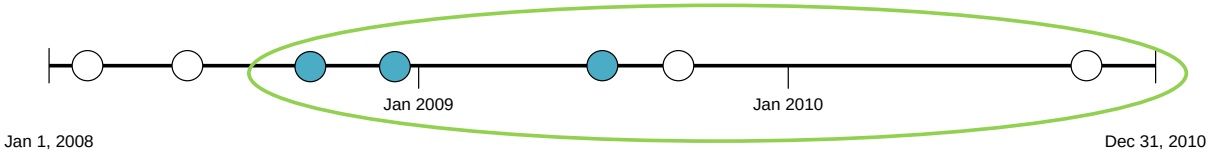


Diagram C represents the visits for a patient who would not be assigned to practice 1, since the majority of the last five visits were elsewhere. If the three visits outside practice one were all at the same practice (which we'll call practice 2), the patient would be assigned to practice 2; if not, the patient would not be assigned to any practice.

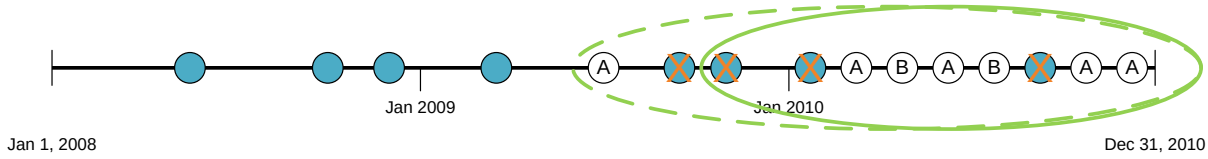
Assigning a patient to a GP at a practice

Within patients assigned to each practice, patients may be assigned to a specific GP, or may be considered shared between the GPs in the practice, described in Step 3. In the diagrams, the solid ovals enclose the visits used to assess practice level attachment and the dashed ovals enclose visits used for GP level attachment.

Legend:

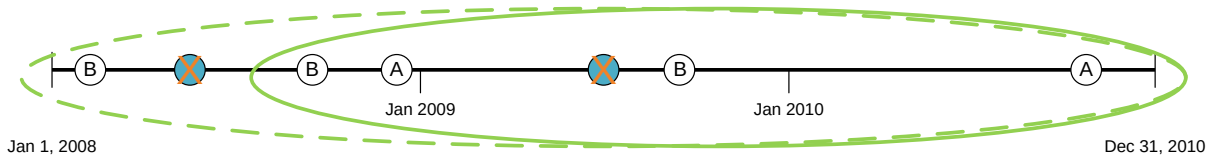
- (A) Visit at practice 1 (with GP "A")
- (B) Visit at practice 1 (with GP "B")
- Visit at another practice

Diagram D: Patient assigned to GP "A" within Practice 1



Within the six visits[11] at practice 1 in the final year (in Diagram D above), four visits were to GP "A" and two visits were to GP "B". Since six is an even number, a 7th visit to the site is required. Within the most recent seven visits to practice 1, GP "A" provided the clear majority (with five visits); therefore the patient would be assigned to GP "A".

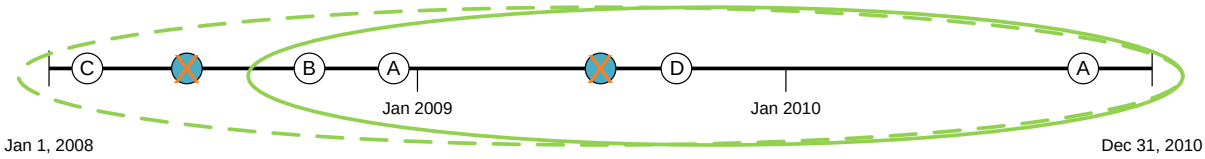
Diagram E: Patient assigned to GP "B" within Practice 1



The patient shown in Diagram E above would have been assigned to practice 1 on the basis of the five most recent visits (enclosed by the solid line). When determining whether this patient will be assigned to a specific GP, we will examine the five most recent visits at practice 1 (enclosed by the dashed line). The leftmost visit on this timeline now comes into play, although it was not considered earlier, when performing assignment at the practice level. Based on the five most recent visits to practice 1, this patient would be assigned to GP "B"; three of the last five visits at practice 1 were to GP "B".

[11] For GP level attachment, we exclude visits at site(s) other than the practice the patient was considered attached to.

Diagram F: Patient shared by GPs in Practice 1 (Step 3c)



The above patient (in Diagram F) was assigned to practice 1 similarly to the patient in Diagram E, but was not assigned to any specific GP with practice 1. Since no GP in the practice had a clear majority within the visits made by this patient, the patient is considered shared between the GPs in the practice.

Appendix 2 -Defining a Visit

There are two major aspects to defining a visit: (i) which types of services are included, and (ii) how individual claims are converted to visits.

Since the second aspect - deriving claims from visits - is more straightforward, we'll get this out of the way first before getting into the details of types of services.

Converting MSP claims into Visits

MSP claims represent services performed by physicians. On a given day, a GP will typically see many patients, and may submit one or more claim for patient. That same patient could potentially visit a different GP on the same day. Each MSP claim has either positive paid services, negative paid services (for reversals), or paid services of zero (for refused claims or $0 encounter claims). Note: for $0 encounter claims, we use billed services in place of paid services[12].

The key to deriving visits from claims is to summarize the claims to the level representing a visit: patient, provider, date. Multiple services are treated as a single visit when they are for the same patient, provider, and service date. After summarizing the claims, only instances with total services greater than zero are included as visits: this automatically drops reversed claims (and refused claims).

Depending upon whether we are deriving visits at the practice level (for practice level attachment figures) or at the GP level, the definition of provider is slightly different. For practice level attachment, visits are summarized at the level of:

- PHN
- service date
- practice (either a single payee number, or a group of payee numbers identified by the first step of the attachment algorithm)

For GP level attachment, visits are summarized by practitioner within practice, at the level of:

- PHN
- service date
- practice (either a single payee number, or a group of payee numbers identified by the first step of the attachment algorithm)
- practitioner number

[12] In general, paid services are used to determine whether a claim should be included or not - i.e. for the purpose of collapsing out reversed claims. An exception is made for $0 encounters, which have zero paid services. These encounters have been submitted to represent services to patients, but do not directly relate to payment. They are submitted by Population-Based Funding (PBF) physicians and by Alternative Payments (APP) physicians. These claims are either under service code 66 (PBF), service code 67 (APP), or are within the regular fee schedule and have an encounter claim flag set to 'E'.

After summarization, each of the resulting records is considered to be a visit. If a GP provided multiple services for the same patient on the same day, these are treated as a single visit at the GP level. If the patient visited a different GP on the same day, however, this is counted as a second visit.

If a patient had multiple visits to GPs at the same practice on the same day, these are combined together to become one visit at the practice level, even if the patient was seen by more than one GP in that practice. If multiple GPs within a practice were visited on the same day, there would be just the one visit for the purpose of determining attachment at the practice level, but separate visits (one per GP) for determining attachment at the GP level.

Which services are included by the attachment algorithm?

The following inclusion rules apply to claims processed by the attachment algorithm. The algorithm is generally applied after the end of a fiscal year (ending March 31).

- service date up until the end of the fiscal year
- service dates in that fiscal year or any of the nine prior fiscal years can be included
- paid date up to six months past the end of fiscal year (September 30)
- client province is BC
- claim type is MM (physician, covered by MSP)
- claim specialty is 00 (GP)
- dependent number not equal to 66 (excludes claims for newborns under the mother's PHN)
- service code less than 81 (excludes lab and diagnostic services)
- service code not in the set {9, 19, 29, 49, 71} - excludes no charge referrals, premiums, tray fee items
- fee item not between 96090 and 96093 (excludes PBF patient registrations and deregistrations)
- payee number not within a set of hospitalist payees

To avoid regional disparity (due to different models of providing GP services in hospital around province) we have excluded hospital-based services. Services provided in the Emergency Room (ER) will still be included.

The above rules for inclusion of claims will apply unless any of the following further **rules for excluding claims** apply.

- Claims under service code 07 (Institutional Visits) are excluded, except for the following fee items:
    - 00114 Nursing-home visit - one or multiple patients, per patient
    - 00115 Nursing-home visit - one patient, when specially called and patient seen between hours of 0800 hrs and 2300 hrs - any day
    - 13114 Long-term care institution visit - first visit of the day
    - 13334 Long-term care facility visit - first visit of the day bonus, extra
- Claims under service code 02 (consultations) are excluded. These services are performed by GPs who have specific knowledge, when consulted by the patient's "attending practitioner". These services would not normally be performed by the patient's own GP.

- Within GPSC incentives (service code 12 and 17), certain fee items will be excluded. The following fee items are bonuses akin to surcharges - removing them should not affect visit counts since the original service should still be present.
    - 14000 incentive for full-service GP – obstetrical premium (effective from 2003-2005)
    - 14004 full-service GP obstetric delivery bonus, with delivery
    - 14005 full-service GP bonus with transfer higher care
    - 14008 full-service GP bonus with postnatal care
    - 14009 full-service GP obstetric delivery bonus, with C-section

  The following fee items are not patient specific, and are billed using reserved nonperson PHNs:
    - 14010 maternity care network initiative payment
    - 14020 general practice one-time incentive payment (used in 2006)
    - 14070 GP attachment participation
    - 14071 GP locum attachment participation
    - 14086 GP assigned inpatient care network

  The following fee item is for in-hospital care:
    - 14088 GP unassigned inpatient care fee

  The following fee items are $0 encounters recording hospital visits (under a program that applies only to specific hospitals):
    - 14080 divisions – hospital visit – family GP admitting privilege
    - 14081 divisions – hospital visit – without family GP
    - 14082 divisions – hospital visit, family GP with no admitting privilege
    - 14083 divisions – hospital visit, family GP outside catchment area
    - 14084 divisions – hospital visit, support of patient under care of a specialist

  The following fee items are for conferences or telephone calls where the patient is not present:
    - 14015 General Practice facility patient conference
    - 14016 General Practice community patient conference fee
    - 14017 General Practice acute care discharge conference
    - 14018 GP urgent telephone conference with a specialist
    - 14021 GP with specialty training telephone advice - urgent
    - 14022 GP with specialty training telephone patient management 1 week
    - 14023 GP with spec training telephone patient management - follow up

  Annual review of GPSC fee items will be performed.

- Any stray billings under service code 15 and 16 (specialist services committee) are excluded.
- Services under service code 30 (specialists critical care services) are excluded.
- In-hospital services are excluded by examining the submitted service location. These service location codes are excluded[13]:
    - D – Diagnostic Facility
    - G – Hospital – Day Care (Surgery)
    - H – Hospital (expired)
    - I – Hospital - Inpatient
    - P – Hospital - Outpatient

[13] The exclusion of in-hospital services was made for the 2012/2013 version of the Attachment Algorithm, and goes further than previous rules excluding in-hospital services.

    - Z - Other (i.e., Accident Site or in an Ambulance etc.)
- Non-minor surgery (service code 43) services is generally included, except that surgical assistance fee items identified below will be excluded:
    - 00193 non-CVT certified surgical assist at open-heart surgery
    - 00194 surgical assist – less than $105 (canceled in 2008)
    - 00195 surgical assist – less than $317 inclusive
    - 00196 surgical assist - $317.01 to $529 inclusive
    - 00197 surgical assist – operations over $529
    - 00198 surgical assist – assist time after 3 hours – per 15 minutes

  The following surgical assist bonus is also excluded:
    - 13194 GP first surgical assist of the day
- An identified list of hospitalist payees (numbering 32) are excluded
- Generic, non-person PHNs (in a list numbering 19) are excluded

Appendix 3 - Rules for Identifying Group Practices

The first step of the Attachment algorithm is to identify payee numbers to group into practices. Payee numbers may represent group practices on their own (when multiple GPs at a site bill through the same payee number), or a payee may represent a solo practice. In other cases, GPs may work together in practice while each of them bills their own payee number.

Grouping of payees (for the algorithm) is performed using the Teleplan number (also known as the data centre code), which indicates when the payees are sharing the same software system for the purpose of submitting claims. In some cases, a Teleplan number represents a claims processing site (a.k.a. service bureau) that submits claims for a number of unrelated payee numbers – we do not want to treat these as practice groups. In other cases, a shared Teleplan number indicates a shared practice of GPs at one location – we want to treat the payees of these GPs together as a group practice. This grouping process is performed separately for each fiscal year the algorithm is applied to. While the second step of the algorithm (attachment at the patient-GP level) will use up to 10 years of data per patient, this first step of identifying group practices uses only one fiscal recent year of data at a time.

The first step is to remove from consideration data centers where the name indicates the Teleplan number is used by a billing service, and not by a group practice. If a data centre name has any of the following patterns, its Teleplan number will not be used for grouping payees:

- contains any word starting with DATA, COMPU, HOSP, or MGMT (i.e. DATA*, COMPU*, HOSP*, or MGMT*)
- contains SYS anywhere, as any part of a word (i.e. *SYS*)
- contains any of the following as words: BILLING, SERVICES, SRVCS, SVCS, OFFICE, CLIENT, MSP, MEDCOM, MANAGEMENT, HOLDINGS

Other keywords may be added if identified.

In addition, data centres not of status ‘P’ (Production) or ‘D’ (Deleted), or not of type ‘P’ (Practitioner) or ‘C’ (Clinic) will be excluded.

The next step is to associate each payee with one Teleplan number for the year being considered. Although each payee number can be associated with only one Teleplan number any given time, a payee can move between Teleplan numbers, and hence may have been associated with two or more data centers within a fiscal year. The most recently associated Teleplan number for each payee number in the year is used, based on MSP billings. If more than one Teleplan number was associated within the most recent month of billings for a payee (within the fiscal year), the Teleplan number with the highest number of services will be used.

The address (postal code and LHA) for each payee number, used in processing described below, is the most recent address effective within the fiscal year, selected from tables in Health Ideas.

Next, the algorithm counts the number of payees associated with each Teleplan number. Also counted are the number of postal codes found across the payees associated with a Teleplan number, and the number of payees who share the most commonly found postal code within those found for the Teleplan number.

Teleplan numbers with two or more associated payee numbers are considered group practices when they meet any of the following rules, applied in order:

1. all payees for the Teleplan number share a single postal code
2. across all the (two or more) payees for the Teleplan number, exactly two different postal codes are found, and those two postal codes are within the same LHA
3. across all the (two or more) payees for the Teleplan number, exactly two different postal codes are found, and all but one of the payees share one of those same postal codes
4. the proportion of payees under the most commonly occurring postal code (in relation to the count of all payees for the Teleplan number) is at least 70%

Applying these rules year-by-year generally results in consistent designations of Teleplan numbers as either group practices or not, but in some cases a Teleplan number will be designated as a group in some years while not in others. This situation has the potential to cause spurious fluctuations in attachment measurements at the practice level, particularly in geographic areas where there are only a handful of GPs. To reduce the risk of these fluctuations, we reconciled the designation of practices across multiple years.

The algorithm was applied to each of 10 consecutive years, including one additional (incomplete) year, so that gaps could be identified in each of the years.

- where a data centre has a single year gap (or two single year gaps) when not categorised as a group by the rules above, the gap was removed and the Teleplan number was considered as a group in the gap year (or years)
- where there is a single two-year gap, the Teleplan number was considered as a group in those years

After applying the above rules, a few gaps remained. These were reviewed manually, with decisions made on whether to consider the Teleplan number as a group (or not) in each year.

Appendix B:

Primary Health Care Health Business Analytics PCAC Acute Care Utilization Evaluation Report.

EVALUATION REPORT

THE IMPACT OF WHITE ROCK SOUTH SURREY PRIMARY CARE ACCESS CLINIC ON ACUTE CARE UTILIZATION

Primary Care Access Clinic-PCAC
Revision 1.2 - June 16, 2016

Summary

This report describes the evaluation results conducted to assess the impact of the White Rock South Surrey Primary Care Access Clinic (PCAC) on acute care bed day utilization and emergency room (ER) visits. This clinic is the result of the collaboration between the White Rock South Surrey Division of Family Practice and Fraser Health. Only patients who were considered as attached to the clinic were included in the analysis. The attachment status was compiled by the Ministry of Health using their custom attachment algorithm. The details of this algorithm is not discussed in this report, however, attachment status is based on whether the patient met a minimum number of visits to the clinic within a given time range.

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The strategy of the evaluation was to trend pre-intervention and post-intervention utilization (where the y-axis represents total utilization and the x-axis represents time in days). Segmented regression was used to test for the statistical significance of observed trend changes between the pre-intervention period compared to the post-intervention period (see FAQ for more detail on segmented regression).

We analyzed the trend for pre-intervention utilization using a 365-day period and compared this to the post-intervention utilization trend based also on a 365-day period. The date boundary between pre-intervention and post-intervention was defined by the date of the first visit to the White Rock South Surrey clinic per patient (supplied by the Ministry of Health), and this was repeated for all patients.

One key consideration in patient cohort selection is to allow the same amount of time to make use of acute care services for all members of the cohort. In this evaluation, pre-intervention and post-intervention were limited to 365 days. Only utilization that fell within this study window period was counted.

Given these criteria, below are the key findings of this report based on the selected cohorts of patients:

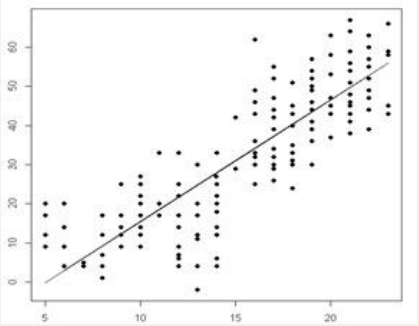
- There is evidence to indicate that clinic intervention can change the trajectory of ER visits. The observed change in ER utilization trend is statistically significant ($p<0.0005$).
- On average, during the first 365 days following registration at the clinic, the data shows that each member of the cohort is estimated to have avoided 3.6 Emergency visits.
- There is also evidence to indicate that clinic intervention changes the trajectory of bed day utilization. The observed change in acute care bed day utilization trend is statistically significant (slope: $p<0.00005$).
- On average, during the first 365 days following registration at the clinic, the data shows that each member of the cohort is estimated to have avoided approximately 2.0 acute care bed days.

FAQ: ABOUT SEGMENTED REGRESSION

HOW DOES SEGMENTED REGRESSION WORK?

The concept of segmented or piecewise regression is quite simple. It is a methodology suitable for time-related intervention outcome data. As an example, suppose that we have multiple measures of some performance, over time, both before training and after start of training. The question that we may ask is whether or not training has impacted performance measures in some way. The two figures below provide an example of what the data for the above scenario might look like. Note that in these figures the y-axis represents mean performance measures and the x-axis represents time.

Figure FAQ1



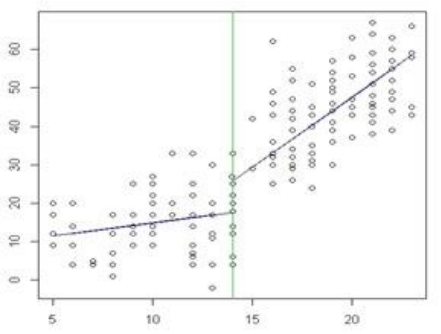
While these analyses focused on a 1-year post-intervention period, given the strength of the results, it is likely that the observed trend changes should hold for even longer periods of time. Additionally, if the clinic maintains the existing recruitment process without change, these results are likely to also hold for future patients recruited in the same manner.

Finally, it is important to note that this evaluation project is only made possible by the joint collaborative efforts of the White Rock South Surrey Division of Family Practice, Primary Health Care at Fraser Health, the Ministry of Health.

FAQ: ABOUT SEGMENTED REGRESSION – CONT.

One way to answer the impact question above is to ask if we can fit a two-segment regression model (segmented regression model) with the segmentation line at the point where training began, instead of the single-line regression model in Figure FAQ1. Such a two-segment fit using the exact same data as in Figure FAQ1 might look like that shown in Figure FAQ2.

Figure FAQ2



Visually, it seems clear that training has changed the performance trend. If the improvement in fit resulting from the two-segment model is statistically significant, then we would have demonstrated that training has an impact.

Context

The expected increase in population size in the province, especially among the seniors, will put increasing pressure on the health care system. Given that financial and human resources are not unlimited, the general consensus is that unless changes are made to implement new ways to provide health care services, the health care systems will find it difficult to continue to perform at an optimum level. In that regard, it is believed that a reduction in the dependence on the acute care system will, in the longer run, contribute to a more sustainable health care system. Additionally, it is also believed that more energy should be devoted to re-focusing some of the health care system's efforts at the primary health care level. The White Rock South Surrey clinic represents one such effort to improve the overall sustainability of the health care system.

Purpose of this Report

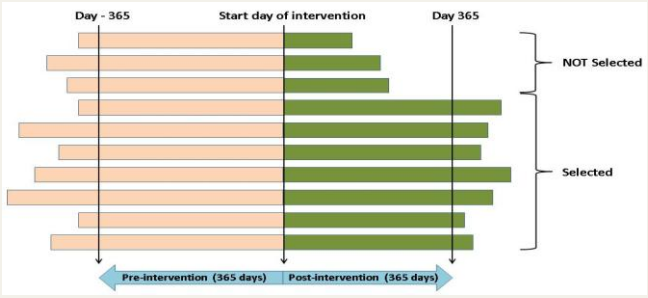
The purpose of this report is to examine the impact of the White Rock South Surrey PCAC on hospital utilization for ER visits and acute care bed day.

Overview of the Acute Utilization Data

Two separate datasets were extracted based on patient information provided by the Ministry of Health. One set focused on ER visits and the second set focused on acute care bed days. For both sets of data, the data extraction window covered the period beginning from 365 days prior to a patient's first visit to the White Rock South Surrey clinic up to the data extraction date (June 8, 2016). This data was then filtered to include only utilization that fit the study window period of 365 days of pre-intervention and post-intervention. Since utilization data is centered on a patient's first visit to the clinic, every patient has a different window period with respect to the calendar year. Within this window period, any acute care utilization prior to the first visit to the White Rock South Surrey clinic is considered part of the pre-intervention period and any utilization that occurred on or after the first visit to the clinic is considered to be part of the post-intervention period.

Figure 1

Cohort Selection Process



Cohort Selection Strategy

For each patient, the range of post-intervention period is defined by the length of time between the patient's first visit to the clinic and the date of data extraction. It is assumed that all patients have at least 365 days of pre-intervention data[1].

Figure 1 provides an example of the logic for choosing cohort members. In Figure 1, each horizontal bar represents a patient. Seven of 10 (70%) have a minimum of 365 days of post-intervention data. Three of 10 (30%) do NOT have a minimum of 365 days of post-intervention data. These three patients are therefore excluded from the study cohort because they have yet more opportunities to incur utilization during what remains of the 365-day trending period.

In summary, in this study, cohort selection rules consist of the following:

- All selected patients must meet the 365-day post-intervention period criteria.
- Those who did not meet the 365-day criteria were excluded from the studies.
- Only utilization data that fit between the 365-day pre-intervention period and the 365-day post-intervention period were included in the analyses.

Results

In the following sections, we present the evaluation results for emergency visits and acute care hospital bed days. All of the statistical analyses were done with software R.

Emergency Visits

Emergency Visit Cohort

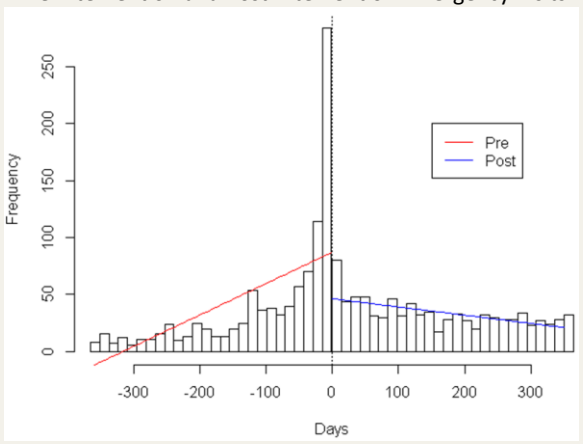
Given the cohort selection criteria, the emergency data consists of a total of 1871 ER visits. These visits were made by 545 patients. 429 patients had at least one ER visit in the pre-intervention period, and 353 patients had at least one ER visit in the post-intervention period.

Figure 2a shows the results of pre-intervention and post intervention trending. In this figure:

- The number of emergency visits was binned based on 14-day intervals.
- The binned visits were divided into two segments: pre-intervention (to the left of zero on the x-axis) versus post-intervention (to the right of zero on the x-axis).
- The linear trend lines were computed separately for the pre-intervention and post-intervention periods.

Figure 2a

Pre-intervention and Post-intervention Emergency Visits



Although there is quite a bit of variation in the grouped visit totals, visual inspection of the utilization trend lines (red and blue) in Figure 2 clearly shows that there was a change in trend at the point when patients made their first visit to the PCAC[2]. Both the change in intercept and the change in slope are statistically significant ($p<0.05$ for intercept, and $p<0.0005$ for slope).

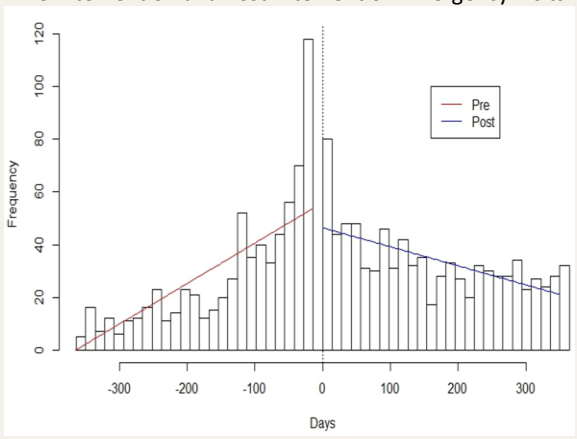
We next addressed a potential confounding factor that the date the patients were recruited into the clinic could be correlated to the date when they frequently visited the ER. This was supported by the fact that some patients were recruited into the White Rock South Surrey clinic during their ER visit (although the exact percentage is unknown). To account for this putative confounding factor, we took a conservative approach by removing any ER visits that were seen within the last 14 days prior to the date of clinic registration and repeated the analysis as done for Figure 2a. The results are plotted in Figure 2b.

[1] Although this may not be exactly true. There may be a small number of patients who could have moved to the Fraser Health area in recent months. Their prior acute care utilization would not be found in Fraser Health data systems, and therefore would not be available for trending.

[2] It is possible the peak of ER visits seen right before the patients' first visit may be due, in part, to some patients being recruited form the ER or form acute care. In fact this is the case for many patients, especially during the initial phase of PCAC. An adjustment was made in a second analysis (see Figure 2b).

Figure 2b

Pre-intervention and Post-intervention Emergency Visits



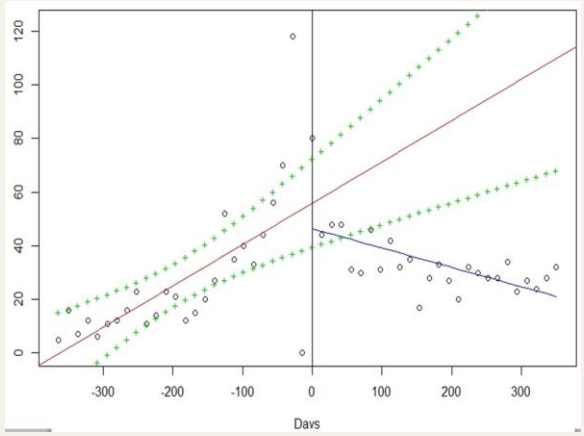
While the change in slope remains statistically significant (p<0.0005), the change in intercept is not (p>0.2). However, this still means that the overall change in visit trend from pre-intervention to post-intervention is statistically significant despite this very conservative adjustment.

Estimated number of ER Visits Avoided

Given that the change in trend is statistically significant, we proceeded with estimating avoided ER visits. The strategy was to forecast what utilization would have been without the White Rock South Surrey clinic, and compute the difference between forecasted and actual utilization. We forecasted based on the ER visits with the visits within last 14 days prior to clinic registration removed (to account for the potential confounding factor, as described earlier). In Figure 3:

Figure 3

Estimated and Actual Emergency Visits by 14 Day Periods



- The red line in the left panel is the trended pre-intervention utilization
- The blue line in the right panel represents actual trended post-intervention ER visits
- The extension of the red line segment into the right panel represents the forecasted utilization (e.g. what the utilization would have been if not for the White Rock South Surrey clinic).
- The difference between the red line and the blue line (actual utilization) represents avoided utilization.
- The two green lines represent the 95% confidence interval for the forecasted emergency visits.

Table 1 shows the detailed calculations for avoided emergency visits. This table indicates that on the average health care services provided by the PCAC can result in the estimated avoidance of approximately 3.6 visits for each member of the cohort during the first 365 days following the first visit to the clinic.

Table 1

Estimated Avoided ER Visits (14-Day Periods)

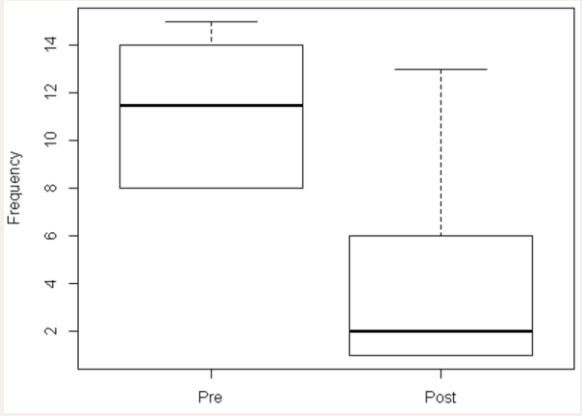
	Forecasted ER Visits					Estimated Avoided ER Visits		
Days		95% Confidence Bounds					95% Confidence Bounds	
14-Day Periods	Forecasted	Lower Bound	Upper Bound	Actual		Forecasted - Actual	Lower Bound	Upper Bound
0	56.0	39.6	72.3	80		-24.0	-40.4	-7.7
14	58.1	40.8	75.4	44		14.1	-3.2	31.4
28	60.3	42.0	78.5	48		12.3	-6.0	30.5
42	62.4	43.2	81.7	48		14.4	-4.8	33.7
56	64.6	44.4	84.8	31		33.6	13.4	53.8
70	66.7	45.5	87.9	30		36.7	15.5	57.9
84	68.9	46.7	91.1	46		22.9	0.7	45.1
98	71.0	47.9	94.2	31		40.0	16.9	63.2
112	73.2	49.0	97.4	42		31.2	7.0	55.4
126	75.3	50.2	100.5	32		43.3	18.2	68.5
140	77.5	51.3	103.7	35		42.5	16.3	68.7
154	79.6	52.4	106.8	17		62.6	35.4	89.8
168	81.8	53.6	110.0	28		53.8	25.6	82.0
182	84.0	54.7	113.2	33		51.0	21.7	80.2
196	86.1	55.8	116.4	27		59.1	28.8	89.4
210	88.3	57.0	119.5	20		68.3	37.0	99.5
224	90.4	58.1	122.7	32		58.4	26.1	90.7
238	92.6	59.2	125.9	30		62.6	29.2	95.9
252	94.7	60.3	129.1	28		66.7	32.3	101.1
266	96.9	61.5	132.3	28		68.9	33.5	104.3
280	99.0	62.6	135.5	34		65.0	28.6	101.5
294	101.2	63.7	138.7	23		78.2	40.7	115.7
308	103.3	64.8	141.8	27		76.3	37.8	114.8
322	105.5	65.9	145.0	24		81.5	41.9	121.0
336	107.6	67.0	148.2	28		79.6	39.0	120.2
350	109.8	68.2	151.4	32		77.8	36.2	119.4
Total	2154.8	1405.4	2904.1	878		1276.8	527.4	2026.1
					Cohort size:		353	
					Average number of ER visits avoided per patient:		3.6	

ER Avoidance among Frequent Flyers

We focused on patients who had at least 8 ER visits in the pre-invention period, and compared against the number of ER visits they had in the post-intervention period. The idea is to see how the PCAC intervention affected these "frequent flyers". The number 8 was chosen arbitrarily and was not based on an existing standardized definition. We found a sharp decrease in the average number of ER visits from 11.2 in pre-intervention to 3.9 in post-intervention (Figure 4). However, the small size of this "frequent flyers" cohort (n=14) makes it hard to attach any statistical significance on this particular observation. Nevertheless, this apparent trend is in the expected direction.

Figure 4

Patients who Frequently Visited the ER

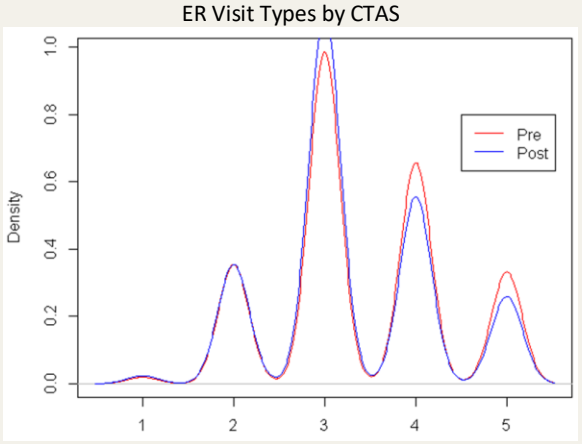


Types of ER Visits by CTAS

Thus far we have shown that the ER utilization had decreased in the post-intervention period compared to pre-intervention. In this section, we showed how the compositions of ER visits had changed based on CTAS (Canadian Triage and Acuity Scale) score. In Figure 5, the proportion of ER visits belonging to CTAS category 1-5 are plotted for the pre-intervention and post-intervention periods. The Y-axis represents density, not the absolute count. We see that during post-intervention period, ER visits that were less urgent (represented by CTAS score 4 & 5) had decreased while the urgent visits (represented by CTAS score 1 & 2) remained unchanged. This is expected based on the nature of the White Rock South Surrey clinic, which we expect to take on more of the non-urgent cases and alleviate the burden off the ER department. It should be noted however that the difference observed is not statistically significant (p=0.054).

Figure 5

ER Visit Types by CTAS



Acute Care Hospital Bed Days

Acute Care Hospital Cohort

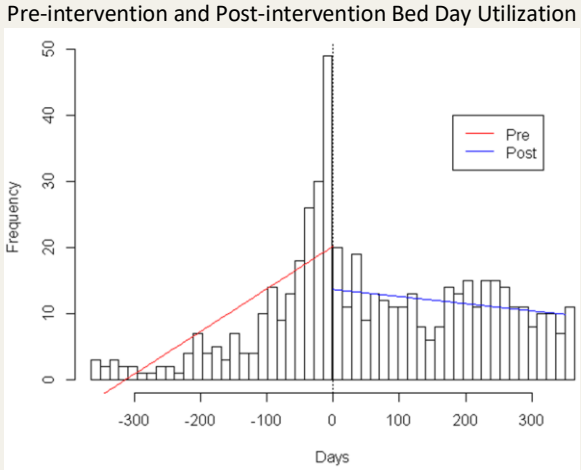
The same data extraction and data processing rules were used for acute care hospital admission data. The acute care hospital dataset consists of a total of 532 acute care hospital admissions. These admissions were incurred by 257 patients. 226 admissions belonged in the pre-intervention period and 306 admissions belonged in the post-intervention period. 141 patients had at least one admission in the pre-intervention period, and 181 patients had at least one admission in the post-intervention period.

Similar to ER dataset, segmented regression analysis was employed on the acute care hospital dataset. However, we analyzed on the total bed days rather than total admissions to account for the fact that not all admissions are equal (e.g. some admissions can last three or four days while other admissions can many more days).

In Figure 6a, bed day utilization was organized and plotted as an interrupted time series,

Figure 6a

Pre-intervention and Post-intervention Bed Day Utilization



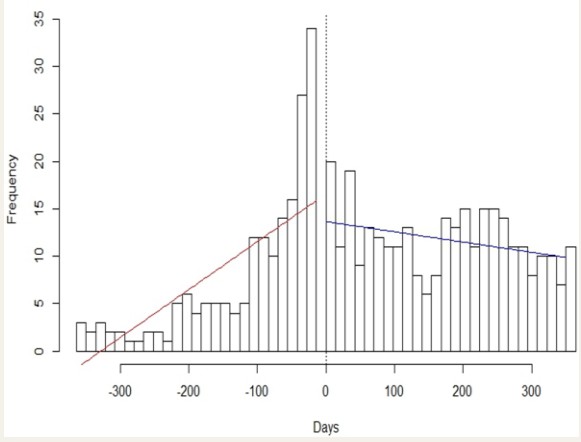
- Bed days were binned into 14-day interval.
- The binned bed days were divided into two segments: pre-intervention (to the left of zero on the x-axis) versus post-intervention (to the right of zero on the x-axis). The linear trend lines were computed separately for the pre-intervention and post-intervention periods.

Segmented Regression was used to test for the statistical significance of trend changes, confirming that there is a change in trend moving from the pre-intervention period to the post-intervention period. The change in intercept is not significant (p>0.05), but the change in slope is statistically significant (p<0.00005).

As we did for the ER visits, we addressed the potential confounding factor that the date the patients were recruited into the clinic could be correlated to the date when they were hospitalized. We removed acute bed days that were seen within the last 14 days prior to the date of clinic registration and repeated the analysis as done for Figure 6a. The results are plotted in Figure 6b.

Figure 6b

Pre-intervention and Post-intervention Bed Day Utilization



The change in intercept remains not significant (p>0.2), but the change in slope is still statistically significant (p<0.00005).

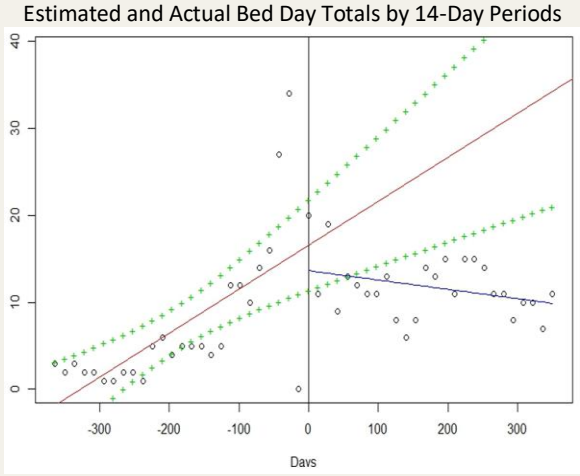
Estimated Bed Days Avoided

Given that the change in trend is statistically significant, we proceeded with estimating avoided bed days. Again, the strategy was to forecast what bed day utilization would have been without the White Rock South Surrey clinic and then compute the difference between the forecasted and actual utilization. Similar to how we forecasted for ER visits, we removed acute bed days within last 14 days prior to clinic registration. This is illustrated in Figure 7. In Figure 7:

- The red line in the left panel is the trended pre-intervention utilization
- The blue line in the right panel represents actual trended post-intervention bed days
- The extension of the red line segment into the right panel represents forecasted utilization (what the bed days would have been if not for the clinic).
- The difference between the red line and the blue line (actual utilization) in the right panel represents avoided bed days
- The two green lines represent the 95% confidence interval for the forecasted bed days.

Figure 7

Estimated and Actual Bed Day Totals by 14-Day Periods



Estimated bed days avoided was computed by the difference between the red line and the blue line (actual utilization) in the right panel represents estimated avoided utilization. Details of the calculations are shown in Table 2.

Table 2

Estimated Avoided Acute Care Bed Days (14-Day Periods)

	Forecasted Bed Days				Estimated Avoided Bed Days		
Days		95% Confidence Bounds				95% Confidence Bounds	
14-Day Periods	Forecasted	Lower Bound	Upper Bound	Actual	Forecasted - Actual	Lower Bound	Upper Bound
0	16.6	11.4	21.8	20	-3.4	-8.6	1.8
14	17.3	11.8	22.8	11	6.3	0.8	11.8
28	18.0	12.2	23.8	19	-1.0	-6.8	4.8
42	18.7	12.6	24.8	9	9.7	3.6	15.8
56	19.4	13.0	25.8	13	6.4	0.0	12.8
70	20.1	13.4	26.9	12	8.1	1.4	14.9
84	20.8	13.8	27.9	11	9.8	2.8	16.9
98	21.5	14.2	28.9	11	10.5	3.2	17.9
112	22.2	14.6	29.9	13	9.2	1.6	16.9
126	23.0	14.9	31.0	8	15.0	6.9	23.0
140	23.7	15.3	32.0	6	17.7	9.3	26.0
154	24.4	15.7	33.0	8	16.4	7.7	25.0
168	25.1	16.1	34.0	14	11.1	2.1	20.0
182	25.8	16.5	35.1	13	12.8	3.5	22.1
196	26.5	16.9	36.1	15	11.5	1.9	21.1
210	27.2	17.2	37.1	11	16.2	6.2	26.1
224	27.9	17.6	38.2	15	12.9	2.6	23.2
238	28.6	18.0	39.2	15	13.6	3.0	24.2
252	29.3	18.4	40.3	14	15.3	4.4	26.3
266	30.0	18.8	41.3	11	19.0	7.8	30.3
280	30.7	19.1	42.3	11	19.7	8.1	31.3
294	31.4	19.5	43.4	8	23.4	11.5	35.4
308	32.1	19.9	44.4	10	22.1	9.9	34.4
322	32.9	20.3	45.4	10	22.9	10.3	35.4
336	33.6	20.7	46.5	7	26.6	13.7	39.5
350	34.3	21.0	47.5	11	23.3	10.0	36.5
Total	661.2	422.8	899.5	306	355.2	116.8	593.5

Cohort size:	181
Average number of avoided bed days per patient:	2.0

This table indicates that on the average attachment to the clinic can result in the estimated avoidance of approximately 2.0 acute care bed days for each member of the cohort

during the first 365 days following a patient's first visit to the Clinic.

Conclusion

It is reasonable to conclude that the White Rock South Surrey clinic can impact ER visits and acute care bed days in a positive way, and that this impact is likely to hold for future patients so long as the clinic's intake process, intake criteria and other operational processes remain the same. As more data becomes available, the numerical results presented thus far are expected to change, but it is reasonable to assume that the overall pattern will remain relatively stable.

Caveats

There are some caveats associated with using the trending approach. First, it is assumed that when patients were recruited into the clinic, they had not yet peak their acute utilization, or were not yet about to peak in their utilization. If patients were in fact reaching their peak utilization, then the observed utilization drop reported previously could in part be due to the effect of peaking (because we expect to see a drop following a peak, by definition). Therefore, our trending analysis assumed that at the individual patient level, while acute utilization is increasing prior to the clinic intervention, each patient still had some ways to go before peaking if left unattended. In other words, we assumed that when patients joined the clinic, they were not at their worst, which we believed to be a reasonable assumption.

The second caveat relates to the fact that many PCAC patients may have been recruited from the ER or from acute care hospitals. This would have the effect of raising the number of visits or bed days immediately preceding enrolment into PCAC in a way that that is not consistent with the ongoing utilization trend. We have made an adjustment to remove this confound. This adjustment is likely more conservative than necessary. However, the overall utilization trend changes for both ER visits and hospital bed days still statistically significant.

The third caveat relates to the estimated avoided ER visits and avoided bed days. Even though it is reasonable to conclude that there is a change in utilization trends, making an estimate about the number of avoided ER visits or bed days raises the bar substantially in terms of accuracy. We provided the 95% confidence bounds on forecasted utilization to illustrate the lower and an upper bound for estimated avoided utilization. However, what is still not known at this juncture is how high forecasted utilization should be allowed go. For that reason, to be more cautious and until more is known, forecasted utilization should not be extended beyond a period of one year.

Prepared by:
Casper Shyr, Ph.D.
George Tien, Ph.D.
Primary Health Care
Health Business Analytics
Fraser Health Authority

Appendix C:

Fraser Health 2014/2015 Hospital Rates

fraserhealth Better health. Best in health care.

2014/2015 Hospital Rates
EFFECTIVE April 1, 2014

	Uninsured Resident														
	ARH[1]	BUH[1]	CGH[1]	DH	ERH[1]	FCH	LMH[1]	MMH[1]	MSA[1]	PAH[1]	QPH[1]	RMH[1]	RCH[1]	SMH[1]	Non-Resident
Per Diem[1]															
Standard Ward Medical Stay Bed	$1,449.00	$803.00	$997.00	$1,223.00	$934.00	$1,223.00	$951.00	$1,223.00	$1,223.00	$879.00	$579.00	$982.00	$1,324.00	$1,274.00	$3,405.00
Plus Operating Room (first 2 hours)	N/A														$2,280.00
Each additional hour	N/A														$1,150.00
Maternity	$1,449.00	$803.00	$997.00	$1,223.00	$934.00	$1,223.00	$951.00	$1,223.00	$1,223.00	$879.00	$579.00	$982.00	$1,324.00	$1,274.00	$3,405.00
Plus Natural Delivery	N/A														$1,325.00
Plus C-Section	N/A														$2,270.00
Newborn Medical Stay Bed	$408.00														
Before mother's discharge															$1,050.00
After mother's discharge															$3,405.00
Critical Care (ICU, CCU, SCN, NICU)	$3,542.00	$2,765.00	$2,210.00	$1,223.00	$934.00	$1,223.00	$2,028.00	$1,223.00	$1,223.00	$2,725.00	$579.00	$2,557.00	$3,369.00	$2,612.00	$9,545.00
Day Care Surgery	$1,169.00														$2,925.00
ECU/TCU/ALC	$315.00														N/A
Per Visit or Procedure															
Emergency Visit	$288.00														$720.00
Emergency Physician's Fee (applicable to RCH, ERH, DH, BUH)															$235.00
Plus CT Scan (if applicable)	$630.00														$1,625.00
Inpatient Doctor Visit															$235.00
Ambulatory Care/Outpatient Visit per day	$288.00														$720.00
Out-Patient Clinical	MSP Rate														MSP Rate + 100% surcharge (min.$720)
Haemodialysis	$423.00														$1,205.00
Computerized Axial Tomography (CAT or CT Scan)	$630.00														$1,625.00
Medical Imaging & Nuc Medicine Diagnostic Procedures															Variable Rate
Outpatient Laboratory	MSP rate														MSP Rate + 100% surcharge (min.$288)
Dietetic Counselling	$288.00														$720.00
Psychiatric Day/Night Care	$288.00														$720.00
Diabetic Day Care	$144.00														$720.00
Physiotherapy	$144.00														$720.00
Cancer Chemotherapy Visit	$1,334.00														$2,436.00
Cyclosporin/AZT/Acti Vasc/Erythropoietine/Growth Hormone															
Therapy Visit: Outpatient visit **plus actual cost of drugs**	$221.00														$720.00
Outpatient Lithotripsy - per procedure	$717.00														$1,434.00
Magnetic Resonance Imaging (MRI) Head Scans	$686.00														$1,810.00
Magnetic Resonance Imaging (MRI) Body Scans	$686.00														$1,810.00
Magnetic Resonance Imaging (MRI) Neck & Thorax Scans	$686.00														$1,810.00
Radiotherapy Services (Outpatient Resident Rate)	$382.00														$720.00
Cosmetic Rates (Uninsured Procedures)[2]															
First Day Inpatient	$2,700.00														N/A
Subsequent Hospital Stay - per day	$1,449.00	$803.00	$997.00	$1,223.00	$934.00	$1,223.00	$951.00	$1,223.00	$1,223.00	$879.00	$579.00	$982.00	$1,324.00	$1,274.00	N/A
Day Care Surgery	$1,420.00														N/A
Ambulant Care	$570.00														N/A
Circumcision (Maternity or Ambulant Care)	$288.00														N/A
Surgical Treatment of Benign Lesions	$288.00														N/A
Cardiovascular Procedures															
501 Cardiac Surgery Without Valve Replacement															Non Resident - Contact Accounts Receivable Collections
502 Cardiac Surgery With Valve Replacement															
503 Cardiac Catheterization Without Stents															
504 Cardiac Catheterization With Stent(s)															
505 Pacemaker Insertion or Replacement															
(Excluding Defibrillator-Pacemaker)															

[1] Rates are same as first column unless otherwise specified
[2] Applies to Insured Residents as well AND subject to GST