

# Barriers to liver transplant preclinic access in British Columbia

Persistent regional disparities in access to liver transplantation highlights the need for localized and contextualized solutions to achieve timely and equitable care across the province.

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## ABSTRACT

**Background:** Vancouver General Hospital, the sole provider of adult liver transplants in British Columbia, faces increasing numbers of referrals. We examined potential areas for efficiency gain in its preclinic evaluation process.

**Methods:** This single-centre study included interviews with internal and external health providers and a retrospective analysis of all 112 liver transplants performed in 2023. Wait times were compared between outpatients and inpatients and between Vancouver Coastal Health and the other regional health authorities in BC: Fraser Health, Interior Health, Northern Health, and Island Health.

**Results:** In 2023, median wait times from referral to first consult were 87 days for outpatients (highest in the Interior Health Authority: 156 days) and 1 day for inpatients. Median evaluation times were 143 days for outpatients and 8 days for inpatients. Median referral to transplant times were 320 days for outpatients and 32 days for inpatients. Median referral to transplant times for outpatients were shortest in Vancouver Coastal Health and Fraser Health and longest in Interior Health, followed by Northern Health and Island Health. Challenges to activation in the preclinic were attributed to the referral process, staffing, and resource allocation.

**Conclusions:** To meet increasing demand for adult liver transplants and improve efficiency, the preclinic requires additional clinic space, an online referral system, and better communication among health authorities.

## Background

Liver transplantation remains the leading treatment for chronic liver failure; it extends survival and improves quality of life. Since 1989, the British Columbia Liver Transplant Program at Vancouver General Hospital (VGH) has been the province's sole provider of adult liver transplants.<sup>1</sup> In 2023, the program performed 112 transplants, meeting increasing demand across BC's five regional health authorities: Vancouver Coastal Health, Fraser Health, Interior Health, Northern Health, and Island Health.<sup>2</sup>

Transplant evaluation begins with a referral from the patient's local health authority—typically submitted by an internist, hepatologist, or surgeon—and must include the necessary documents, scans, and tests. Referrals are then triaged based on urgency and are followed by interdisciplinary assessment at the VGH preclinic. Research on systemic barriers to liver transplantation has shown that longer wait times correlate with higher wait-list mortality and reduced access, particularly for patients in remote and resource-limited areas.<sup>3–5</sup> Programs in other regions have adopted day-case assessments and telehealth solutions to improve pretransplant processes, which have reduced costs and delays while maintaining patient satisfaction.<sup>6,7</sup> Additionally, the accelerated adoption of telehealth during the COVID-19 pandemic highlighted its potential to enhance health care delivery, although

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barriers such as limited technology access and low health literacy continue to impede equitable access.<sup>8</sup> These studies have demonstrated the importance of evaluating and streamlining pretransplant workflows to ensure timely and equitable care.

No studies have formally assessed the efficiency of liver transplant preclinic assessment, wait times for each component, or barriers at each stage. This study builds on previous research by systematically analyzing wait times, identifying region-specific barriers, and gathering qualitative insights from transplant team members and referring physicians across BC. By examining the preclinic workflow in this context, we aimed to provide actionable recommendations to improve efficiency, reduce delays, and enhance equitable access to liver transplantation in the province.

## Methods

We used a mixed-methods approach that included interviews with internal and external health care providers and retrospective data collection. To be listed for transplant, referred patients typically have five consultations with a team that includes hepatology, hepatobiliary surgery, anesthesia, social work, and nutrition. Consultations with cardiology, dentistry, pharmacy, psychology, and addictions specialists are conducted in select cases. We interviewed all individuals involved in the assessment process, including a referring hepatologist from each health authority to gain provincial insight. Internal interviews explored staffing, workflows, service volumes, challenges, efficiency improvements, and departmental goals. External interviews with referring physicians similarly addressed referral completion, preclinic efficiency, and local and provincial improvement suggestions.

Following institutional approval from the University of British Columbia, we obtained a list of all 2023 liver transplant recipients. We selected 2023 because it was the most recent complete year of liver transplants. Notably, there were a historically high number of transplants in 2023.<sup>2</sup> Nontransplanted patients, including those

declined or still under evaluation, were excluded.

Outpatients completed individual assessments without hospitalization, while inpatients underwent their entire workup during hospitalization, including those later discharged to home. Wait times were measured from clinic referral to consultation, except for specialist referrals, which were counted from the referral date. For inpatients transferred from other institutions, the referral date is usually the day the patient arrived at VGH.

**This study builds on previous research by systematically analyzing wait times, identifying region-specific barriers, and gathering qualitative insights from transplant team members and referring physicians across BC.**

Data collection was conducted at VGH using the Vancouver Coastal Health CST Cerner system for patient records. Data analysis was conducted in Excel, with medians and interquartile ranges (IQRs) calculated for all variables except age, for which means and standard deviations (SDs) were used. A permutation test for differences in medians was performed using Python to compare wait times between Vancouver Coastal Health and other regional health authorities, because it accounts for small sample sizes, unequal group distributions, and nonparametric data.

## Results

### Transplant volume and demographics

In 2023, 112 liver transplants were performed across all health authorities in BC; they included 109 initial transplants and 3 retransplantations that occurred within the same year. A patient from Yukon was excluded from the analysis, which resulted

in 108 initial transplant recipients and 111 workups analyzed.

For outpatients at referral, the mean age was 57 years (SD: 11), the median MELD-Na score was 17 (IQR: 13,21), and the median Child-Pugh score was 8 (IQR: 6,10) [Table 1]. For inpatients at referral, the mean age was 51 years (SD: 13), the median MELD-Na score was 27 (IQR: 23,37), and the median Child-Pugh score was 11 (IQR: 10,12) [Table 1]. These findings suggest that inpatients had more advanced liver disease severity at the time of referral compared with outpatients, reflecting a population with higher acuity requiring hospitalization.

### Wait times by patient type

Sixty-four percent of patients were assessed as outpatients. Across all health authorities, the median wait time for outpatients from referral to first consult was 87 days (IQR: 52,131), compared with 1 day (IQR: 0,44) for inpatients [Table 1]. The median time to complete assessment for activation was 143 days (IQR: 80,269) for outpatients and 8 days (IQR: 5,13) for inpatients [Table 1]. Overall, outpatients waited a median of 320 days (IQR: 246,509) to receive a liver transplant, whereas inpatients waited a median of 32 days (IQR: 13,77) [Table 1].

### Regional disparities in overall wait times

Median wait times for outpatients from referral to transplant were similar in Vancouver Coastal Health (279 days [IQR: 160,320]) and Fraser Health (289 days [IQR: 230,572]) and were the lowest of the regional health authorities [Table 1]. The longest outpatient wait time from referral to transplant occurred in Interior Health (442 days [IQR: 306,572]), followed by Northern Health (426 days [IQR: 380,1189]) and Island Health (424 days [IQR: 320,561]) [Table 1]. Pairwise comparisons against Vancouver Coastal Health showed significantly longer median wait times in Interior Health and Island Health ( $P = .022$  and  $P = .018$ , respectively) in receiving a liver transplant.

These findings demonstrate notable regional disparities, with median wait times in Interior Health and Island Health approximately 5 months longer than in Vancouver Coastal Health. The absence of statistical significance in Northern Health may be partially attributable to the small sample size, which limits the power to detect differences despite the observed delays.

### Regional disparities in stages of wait times

For outpatient referral to first consult, median wait times were significantly longer in

Interior Health compared with Vancouver Coastal Health ( $P = .026$ ), with a difference of 82 days; all other comparisons between Vancouver Coastal Health and Fraser Health, Northern Health, and Island Health were not statistically different ( $P > .05$ ). For outpatient first consult to activation, Interior Health and Island Health had longer wait times than Vancouver Coastal Health ( $P = .043$  and  $P = .030$ , respectively). Similarly, in the outpatient activation to transplant stage, Island Health and Northern Health had longer wait times than Vancouver Coastal Health ( $P = .021$  and  $P = .048$ , respectively).

In contrast, for inpatients, there were no statistically significant differences across health authorities at any stage of the transplant process. **Figure S1** (available at [bcmj.org](http://bcmj.org)) shows the key periods of assessment and associated wait times, by health authority.

**Figure 1** shows that most patients saw six or seven providers during their work-up prior to activation, with consultations involving six providers being the most common overall. This indicates that additional specialist referrals were frequently required beyond the standard five consultations. For outpatients, notably long

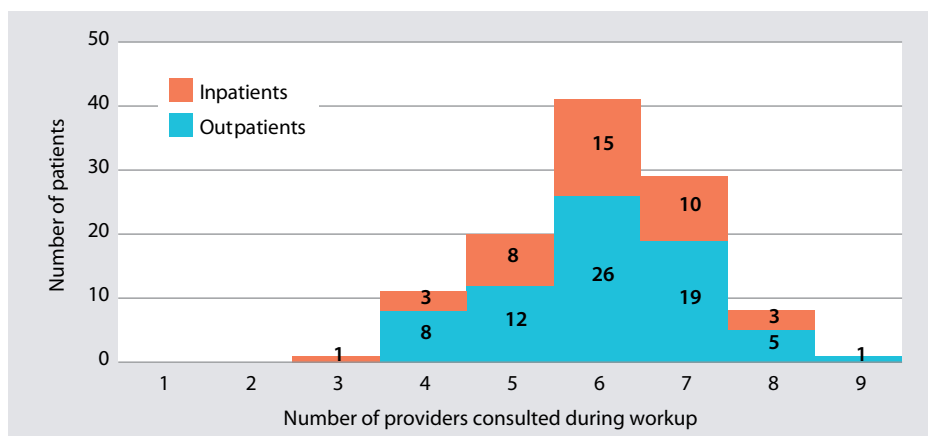
**TABLE 1.** Preclinic wait times (days) for patients who received liver transplants at Vancouver General Hospital in 2023.

Outpatients	Health authority					
	All health authorities	Vancouver Coastal	Fraser	Interior	Northern	Island
Number of transplants	71	21	22	12	6	10
Mean age, years (SD)	57 (11)	60 (10)	58 (10)	55 (11)	52 (15)	53 (12)
Median MELD-Na score at referral (IQR)	17 (13,21)	16 (9,20)	17 (13,21)	18 (13,21)	20 (15,24)	17 (14,20)
Median MELD-Na score at transplant (IQR)	17 (12,23)	13 (9,22)	16 (12,21)	17 (12,23)	22 (19,27)	21 (14,23)
Median Child-Pugh score at referral (IQR)	8 (6,10)	8 (5,10)	7 (5,8)	8 (6,10)	9 (8,10)	8 (7,9)
Median Child-Pugh score at transplant (IQR)	8 (6,10)	8 (6,11)	8 (6,9)	8 (6,10)	10 (8,10)	8 (5,9)
Male, number (%)	48 (67.6)	18 (86.0)	13 (59.0)	6 (50.0)	5 (83.0)	6 (60.0)
<b>Wait time stages, median days (IQR)</b>						
Referral to first consult	87 (52,131)	74 (31,125)	88 (57,120)	156 (80,203)	116 (95,157)	66 (42,80)
First consult to activation	143 (80,269)	122 (80,143)	146 (68,358)	227 (127,254)	227 (187,924)	265 (113,368)
Activation to transplant	56 (22,121)	28 (16,63)	55 (15,107)	54 (30,89)	100 (40,109)	130 (52,171)
Referral to activation	260 (189,399)	224 (125,264)	230 (195,402)	364 (248,449)	330 (266,1087)	306 (194,390)
Referral to transplant	320 (246,509)	279 (160,320)	289 (230,572)	442 (306,572)	426 (380,1189)	424 (320,561)
<b>Wait time by provider, median days (IQR)</b>						
Referral to surgery	88 (51,131)	75 (28,130)	88 (57,121)	156 (80,261)	116 (95,157)	66 (45,80)
Referral to hepatology	88 (56,130)	74 (31,125)	88 (57,120)	156 (80,203)	116 (95,157)	77 (55,96)
Referral to social work	158 (120,224)	143 (106,198)	182 (138,194)	224 (136,266)	224 (174,990)	148 (128,163)
Referral to anesthesiology	138 (79,234)	97 (66,170)	126 (106,178)	228 (149,346)	204 (151,794)	86 (62,136)
Referral to nutrition	152 (102,199)	130 (74,182)	171 (109,213)	162 (126,214)	215 (147,533)	149 (111,154)
Referral to cardiology consult	53 (32,62)	52 (50,53)	78*	6*	40 (26,54)	57*
Referral to dentistry	156 (96,218)	160 (103,170)	140 (107,188)	382 (301,441)	277*	94 (91,133)
Referral to pharmacy	196 (134,275)	184 (97,258)	170 (126,584)	452 (323,580)	233*	256 (202,310)
Referral to psychology	166 (103,320)	164 (51,246)	166 (78,288)	374 (312,398)	156 (148,158)	177 (138,264)
Referral to liver tumor rounds	180 (119,201)	182 (126,251)	156 (110,246)	182*	no data	98 (56,141)

\* IQR not available; only one data value reported.

Table continued on page 291

specialist referrals, in increasing order, were dentistry, social work, psychology, and pharmacy, suggesting that pharmacy consultations may be a significant source of delay for those who require them during their workup [Table 1]. Similarly, for inpatients, the order of increasing wait time was social work, pharmacy, psychology, and dentistry, suggesting that dentistry and psychology consultations may also be important contributors to inpatient delays [Table 1]. This pattern suggests that specialist consultations may be a key source of variability in workup duration, and that both regional disparities



**FIGURE 1.** Frequency of preclinic provider consultations, by patient type.

**TABLE 1** (continued from page 290). Preclinic wait times (days) for patients who received liver transplants at Vancouver General Hospital in 2023.

Inpatients	Health authority					
	All health authorities	Vancouver Coastal	Fraser	Interior	Northern	Island
Number of transplants	40	10	8	12	3	7
Mean age, years (SD)	51 (13)	54 (15)	47 (14)	51 (13)	55 (20)	55 (9)
Median MELD-Na score at referral (IQR)	27 (23,37)	29 (23,39)	28 (23,37)	35 (24,40)	27 (25,32)	25 (23,27)
Median MELD-Na score at transplant (IQR)	28 (24,40)	35 (27,40)	28 (25,39)	37 (30,40)	20 (18,24)	25 (23,27)
Median Child-Pugh score at referral (IQR)	11 (10,12)	11 (10,12)	10 (9,11)	12 (11,13)	10 (10,12)	10 (10,11)
Median Child-Pugh score at transplant (IQR)	12 (10,13)	13 (12,13)	11 (11,13)	13 (10,13)	10 (10,12)	9 (9,12)
Male, number (%)	20 (50%)	6 (60%)	4 (50%)	6 (50%)	1 (33%)	3 (43%)
<b>Wait time stages, median days (IQR)</b>						
Referral to first consult	1 (0,44)	2 (0,80)	< 1 (0,17)	< 1 (0,1)	< 1 (0,28)	24 (10,59)
First consult to activation	8 (5,13)	8 (5,12)	8 (8,14)	6 (4,10)	13 (11,15)	11 (4,14)
Activation to transplant	11 (6,22)	8 (2,27)	8 (5,12)	15 (6,25)	19 (15,46)	9 (8,28)
Referral to activation	13 (7,62)	10 (7,112)	20 (8,37)	7 (6,13)	17 (15,41)	51 (27,72)
Referral to transplant	32 (13,77)	21 (11,127)	26 (16,48)	20 (12,62)	32 (30,84)	69 (50,83)
<b>Wait time by provider, median days (IQR)</b>						
Referral to surgery	2 (0,40)	15 (1,102)	1 (1,18)	< 1 (0,2)	4 (3,30)	25 (12,59)
Referral to hepatology	1 (0,36)	17 (2,102)	1 (0,18)	< 1 (0,1)	< 1 (0,28)	24 (10,60)
Referral to social work	6 (2,54)	6 (4,109)	6 (3,20)	3 (1,5)	7 (4,33)	38 (22,68)
Referral to anesthesiology	4 (2,51)	10 (4,110)	2 (1,20)	2 (1,3)	6 (4,32)	26 (12,63)
Referral to nutrition	5 (2,54)	6 (3,103)	2 (2,18)	3 (2,5)	7 (6,32)	38 (8,68)
Referral to cardiology consult	3 (3,23)	3*	13 (2,34)	3 (2,4)	no data	no data
Referral to dentistry	48 (26,90)	no data	105 (70,140)	2 (2,2)	62*	no data
Referral to pharmacy	6 (2,52)	93 (78,108)	4 (1,18)	4 (3,10)	33 (18,48)	18 (10,33)
Referral to psychology	11 (6,41)	120 (63,122)	8 (5,12)	6 (4,7)	11*	34 (18,56)
Referral to liver tumor rounds	23 (16,30)	37*	no data	9*	no data	no data

\* IQR not available; only one data value reported.

and the complexity of coordinating multiple referrals may substantially lengthen the transplant evaluation process.

### Internal interviews

Table 2 summarizes key barriers and proposed solutions identified by transplant

team members, including nurse coordinators, program assistants, hepatobiliary surgeons, hepatologists, social workers, anesthesiologists, and dietitians. Key barriers included incomplete referral packages due to missing or delayed imaging, high administrative workload, patients arriving

unprepared for consultations, delays in receiving signed forms, difficulty accessing prior test results, and limited clinic capacity. Proposed solutions included developing an online referral form with mandatory fields, hiring additional staff, creating educational resources to improve patient preparedness,

**TABLE 2.** Preclinic staff-identified barriers and suggested solutions.

Person/role	Problems identified	Possible solutions	Additional comments
Nurse coordinators	<ul style="list-style-type: none"> <li>Incomplete referral packages and missing imaging delay initial consults.</li> <li>Increased workload and coordination efforts are causing delays.</li> </ul>	<ul style="list-style-type: none"> <li>Create an online referral form with mandatory fields, including a test status label (e.g., "Ordered"), hosted on BC Transplant's website.</li> <li>Hire an additional coordinator to support patient education and manage administrative demands.</li> </ul>	<ul style="list-style-type: none"> <li>Referring physicians must order all tests locally, because the Liver Transplant Program cannot. Additional staff will be needed to handle increased administrative and patient education demands.</li> </ul>
Program assistants	<ul style="list-style-type: none"> <li>Reminder phone calls are time-consuming.</li> </ul>	<ul style="list-style-type: none"> <li>Hire an additional program assistant to manage scheduling and phone calls, perhaps across the entire transplant department, creating a full-time-equivalent role.</li> </ul>	<ul style="list-style-type: none"> <li>The assistants do most of the nonmedical administrative work of the nurse coordinators.</li> </ul>
Hepatobiliary surgeons/hepatologists	<ul style="list-style-type: none"> <li>Missed dual assessments and delays due to scheduling conflicts.</li> <li>Incomplete referrals for advanced hepatocellular carcinoma (HCC) patients can delay evaluation and jeopardize candidacy.</li> <li>Imaging is often unavailable or is inaccessible at the time of consult.</li> <li>Patients, particularly those with encephalopathy, often arrive unprepared, with incomplete forms.</li> </ul>	<ul style="list-style-type: none"> <li>Improve communication and possibly consult patients together.</li> <li>Create mandatory indication-specific fields (e.g., for HCC) within an online referral form.</li> <li>Grant the Liver Transplant Program provincewide image-/lab-ordering privileges.</li> <li>Develop online educational videos to support patient preparation, allowing them to watch at their own pace.</li> </ul>	<ul style="list-style-type: none"> <li>Surgeons' and hepatologists' capacity to follow up with patients preoperatively is limited. There is interest in developing a re-referral system to streamline this process.</li> <li>Automated text reminders were proposed to improve appointment preparedness.</li> </ul>
Social workers	<ul style="list-style-type: none"> <li>Delays in receiving signed social support and medical adherence agreement forms from patients.</li> <li>Patients often mistakenly believe they will be listed for transplant after the initial social work consultation.</li> <li>Balancing pre-assessments with lifelong postoperative follow-ups.</li> </ul>	<ul style="list-style-type: none"> <li>Include all key forms and resources upfront in the transplant package, allowing more time for completion.</li> <li>Clarify the evaluation process and requirements for activation during the initial hepatology or surgical consult.</li> <li>Hire an additional program assistant to support outpatient social work operations.</li> </ul>	<ul style="list-style-type: none"> <li>Most patients have one social work consultation, with occasional follow-ups for financial or accommodation support. Inpatient assessments take longer than outpatient assessments.</li> <li>The social workers highlighted the need for more patient education earlier in the evaluation process. This was previously done by the nurse coordinators, but they no longer have the time or resources.</li> </ul>
Anesthesiologists	<ul style="list-style-type: none"> <li>Significant time is spent searching for missing charts, imaging, and cardiac data.</li> </ul>	<ul style="list-style-type: none"> <li>Introduce a tagging system to CST Cerner with a "Liver transplant evaluation" tag to streamline file organization.</li> </ul>	<ul style="list-style-type: none"> <li>Limiting evaluations to key specialists was proposed to improve efficiency. If a patient is an unlikely candidate, the hepatologist could refer them to the appropriate provider for a quicker final decision.</li> </ul>
Dietitians	<ul style="list-style-type: none"> <li>Severely understaffed and essentially no clinic space, which is required for physical tests.</li> <li>Severely backlogged with reports.</li> <li>Patients get confused while waiting for multiple initial consult appointments on the same day.</li> </ul>	<ul style="list-style-type: none"> <li>Implement additional dietitian and clinic prioritization following the first hepatology consult.</li> <li>Hire an additional dietitian.</li> <li>Install a monitor in the waiting area to display wait times, implement automated text reminders, and hire a support staff member to guide patients to appointments.</li> </ul>	<ul style="list-style-type: none"> <li>Consultations after social work sessions are often difficult due to the emotional impact on patients. Limited clinic room availability in the afternoons creates scheduling conflicts, and frequent no-shows further complicates rescheduling efforts for the dietitians.</li> </ul>



providing the key forms earlier in the process, granting the transplant program provincewide image- and lab-ordering privileges, and expanding clinic space.

The referral package consists of a referral form and all necessary documentation describing the patient’s history and the indications for liver transplant assessment. This includes information on comorbidities, cardiac risk factors, and reports on recent blood work and imaging. To be assessed at VGH, the package must be complete, with all testing performed within the local health authority. **Table 3** outlines the main components of the referral package and highlights items that are often incomplete or missing.

**External interviews**

All hepatologists identified delays and inefficiencies in VGH’s transplant referral process as major challenges, although long wait times were also shaped by region-specific factors.

**TABLE 3.** Referral package sections and common incomplete or missing items.

Section	Common incomplete or missing items
<b>Indication for liver transplant assessment:</b> Cirrhosis, liver cancer, other	No major issues reported.
<b>In the context of:</b> Hepatitis C virus (HCV), hepatitis B virus, nonalcoholic steatohepatitis, primary sclerosing cholangitis, primary biliary cholangitis, autoimmune hepatitis, alcohol and abstinence demonstration, other	No major issues reported.
<b>Complicated by:</b> Ascites, controlled by diuretics, regular paracentesis, spontaneous bacterial peritonitis, variceal bleed, encephalopathy, dates of last episodes	No major issues reported.
<b>Cardiac risk factors:</b> Hypertension, diabetes, hyperlipidemia, personal and family history of coronary artery disease, smoking history, alcohol consumption history, nontherapeutic drug history, counseling history	Often incomplete.
<b>Mandatory reports:</b> Consult notes with medication list and allergies, recent blood work (complete blood count, international normalized ratio/partial thromboplastin time), electrolytes, urea, creatinine, liver function tests, albumin  For hepatocellular carcinoma including tumor markers: alpha-fetoprotein (carcinoembryonic antigen, cancer antigen 19-9), fecal immunochemical test (for patients over 50 years of age)  Abdominal imaging within the last 2–3 months (contrast CT or MRI, ultrasound if low glomerular filtration rate, chest X-ray, electrocardiogram (ECG), transthoracic echocardiogram (ECHO [TTE]), myocardial perfusion imaging (MIBI; for patients with diabetes or over 60 years of age), chest CT (for long-term ex-smokers or patients who have recently quit), gastroscopy in the last year if portal hypertension history	Often missing: <ul style="list-style-type: none"><li>- Abdominal imaging within the last 2–3 months.</li><li>- ECG.</li><li>- ECHO (TTE).</li><li>- MIBI.</li><li>- Chest CT (smoker/ex-smoker).</li><li>- Mammogram and Pap test where applicable.</li></ul>
<b>Condition-specific reports:</b> HCV genotype report, dynamic phase imaging for hepatocellular carcinoma, HIV viral load, cluster of differentiation 4 count, neurology consult notes for familial amyloid polyneuropathy; if available, colonoscopy reports, liver biopsy report, all abdominal imaging from the last 2 years	No major issues reported.

In Fraser Health, improved communication with VGH has helped, but delays have persisted due to incomplete referral packages and restrictive cardiac testing policies, such as requiring cardiologist approval for myocardial perfusion imaging scans. Proposed solutions included clearer transplant status recognition and streamlined processes to improve patient flow.

In Interior Health, first consult wait times were the longest (up to 156 days) due to limited services in smaller communities. The local hepatologist emphasized that addressing this requires not only expanding VGH’s capacity but also adapting referral processes for patients with incomplete testing.

In Northern Health, geographic distances and socioeconomic challenges, especially for remote and First Nations communities, contributed significantly to delays. The hepatologist suggested tailoring referral requirements to each health authority’s unique challenges, with solutions such as establishing flexible processes, expanding local testing, and providing transportation support.

In Island Health, delays in cardiac testing and geographic isolation sometimes led to avoidable hospitalization. A triage system and rapid access clinic in Victoria have reduced hospitalizations and improved outcomes, but further refinements are needed.

Collectively, hepatologists stressed the need to expand VGH’s capacity, adopt more flexible referral processes, and address inefficiencies within each health authority to reduce wait times and meet growing transplant demands.

**Discussion**

The VGH liver transplant preclinic serves all of BC and has doubled the number of transplants performed over the last 12 years. A key driver of this success was increasing the clinic’s weekly capacity for new consults. This was achieved by mandating complete referral packages before submission, which allowed the identification of patients with contraindications to transplant at the time of triage and minimized the number

of visits per patient before a decision for activation could be reached. By minimizing follow-ups and addressing incomplete referrals, the clinic significantly enhanced both efficiency and consult volume.

However, challenges have persisted, particularly in managing referral delays caused by incomplete submissions and systemic constraints. Many studies have highlighted health care disparities and disparities in access to liver transplantation related mostly to race and ethnicity,<sup>9-13</sup> but few have specifically examined the referral and evaluation stages.<sup>14</sup> Those that have focused on the referral stage identified barriers such as poor adherence to referral guidelines, provider biases, administrative delays, and poor coordination.<sup>14,15</sup> While our study did not indicate poor adherence to referral guidelines, it did identify administrative inefficiencies and poor coordination. Geographic and regional disparities in wait times were also evident. Similar to Madabhushi and colleagues, who highlighted how geographic isolation and limited specialist access hindered transplant access in rural areas,<sup>16</sup> we observed similar trends and increased wait times in underserved regions of BC.

Our findings demonstrated that outpatients experienced substantially longer wait times at each stage of the evaluation process compared with inpatients, with regional disparities contributing to median differences of up to 5 months. The need for multiple specialist consultations, particularly pharmacy, dentistry, and psychology referrals, also emerged as a possible factor prolonging workup durations.

### Local preclinic challenges

Internally, incomplete referral packages and outdated fax systems, combined with difficulty tracking the status of required laboratory and imaging studies, continued to delay the scheduling of first consultations. Nurse coordinators often had to follow up to confirm whether essential tests were complete, adding to their administrative burden. Once patients were in clinic, additional challenges could arise during the evaluation process. They often stemmed

from poor health literacy, inadequate social support, and geographic isolation.<sup>17</sup> Staffing shortages, particularly among social workers and dietitians, further exacerbated these issues by limiting the clinic's ability to handle increasing patient volumes and provide comprehensive education. Insufficient clinic space also restricted patient flow. As a provincial service, the program would benefit from provincewide ordering privileges for labs and imaging, and the development of an online referral system that resets requirements by indication and can flexibly accommodate the unique challenges of each health authority.

**Persistent regional disparities, driven by imaging delays, geographic isolation, and consultation bottlenecks, highlight the need for localized and contextualized solutions.**

### Health authority-specific challenges

Geographic isolation in Northern Health and Island Health and inconsistent access to testing facilities in smaller communities, such as those in Interior Health, compounded delays. Socioeconomic barriers, particularly in remote and First Nations communities, complicated coordination efforts, which often required long-distance travel with limited support. McCormick and colleagues similarly noted that geographic proximity and financial barriers significantly affected access to liver transplantation, even within systems that offered universal health care.<sup>18</sup> Addressing these regional disparities necessitates expanding localized testing infrastructure—especially for cardiac and imaging services—and introducing transportation support for patients in underserved areas. Barritt and colleagues found that the number of gastroenterologists in a rural-referred patient's health authority influenced transplant

likelihood; that likelihood increased by 12% with each additional gastroenterologist per 100 000 population.<sup>19</sup>

### Proposed solutions

To address the challenges identified in our study, we propose several solutions. Internally, increasing the number of hepatologists, expanding clinic space, and enhancing technological infrastructure are critical to reduce bottlenecks in first consults. Implementing an online referral system with mandatory fields tailored to specific indications could minimize incomplete submissions, although care must be taken to avoid overburdening referring physicians. Centralized tagging in CST Cerner for “Liver transplant” files could streamline workflows, and online educational videos could support patient education, particularly for those with encephalopathy. Investments in localized testing and transportation programs are also needed to reduce regional inequities. Addressing intraprovincial disparities will require coordinated efforts across all health authorities.

### Study limitations

Our study is limited by the inherent challenges of retrospective chart reviews, including incomplete or missing records. Additionally, only patients who received liver transplants in 2023 were included; those who were referred but did not receive transplants that year were excluded. We interviewed only a small sample of referring physicians, and their answers may not reflect the opinions of other physicians. However, we included representation from each health authority, which provided a provincial perspective. Despite these limitations, this study provides valuable metrics on the VGH liver transplant preclinic efficiency, integrates insights from referring physicians and allied health teams, and highlights wait times experienced by liver transplant recipients in 2023.

### Conclusions

Patients experience major barriers to accessing liver transplantation in BC. Persistent

regional disparities, driven by imaging delays, geographic isolation, and consultation bottlenecks, highlight the need for localized and contextualized solutions. Additionally, coordinated reforms to streamline the preclinic process are essential to advancing timely and equitable care across the province. Future research should evaluate the impact of these solutions and explore additional strategies to improve patient outcomes. ■

### Competing interests

None declared.

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