

Healthcare Provider Perspective-Driven Cost Analysis of Managing Treatment Delivery Using Time-Driven Activity-Based Costing Methodologies: An Interactive Costing Tool for Injectable Opioid Agonist Treatment

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Background

Injectable opioid agonist treatment (iOAT)—delivered via intravenous or intramuscular diacetylmorphine or hydromorphone—is a licensed, evidence-based therapy for individuals with opioid use disorder (OUD) who have not benefited from oral treatments. iOAT has demonstrated superior effectiveness compared to oral methadone in six randomized controlled trials (RCTs) conducted in Canada and Europe¹⁻⁶.

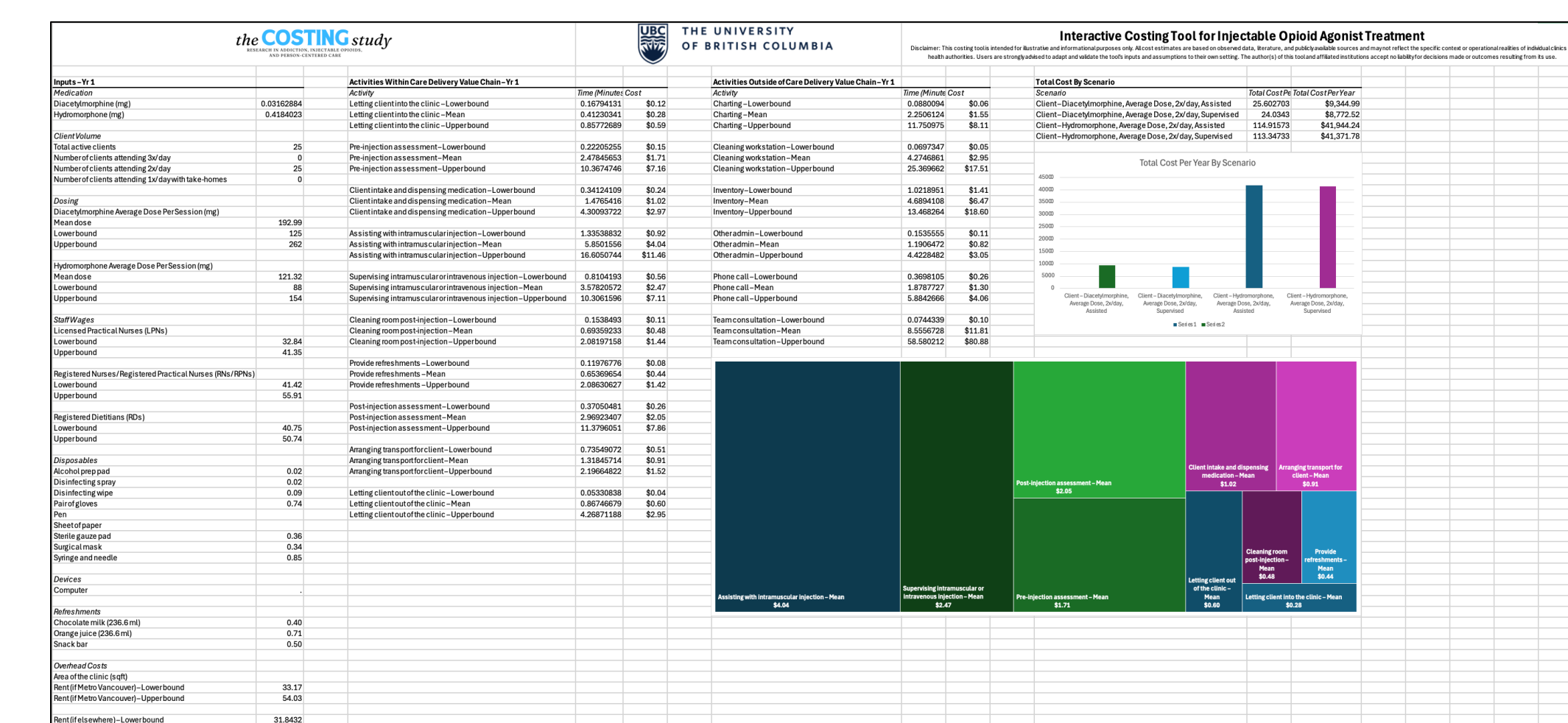
Jurisdictions such as Switzerland have successfully integrated iOAT into addiction care. Initial spikes in demand were followed by stable client retention, suggesting that iOAT addresses the needs of a distinct client population⁷.

Two Canadian cost-effectiveness analyses (CEAs) have shown that both formulations of iOAT are more cost-effective than oral methadone for clients with severe OUD, with significant quality-adjusted life year (QALY) gains and societal cost reductions over a lifetime⁸⁻⁹. Despite this evidence, uptake in British Columbia (BC) remains limited, in part due to a lack of updated, locally relevant cost structure data.

Objective

To improve the technical and allocative efficiency of iOAT delivery by collecting empirical data on time and resource use. The ultimate goal is to develop a customizable costing tool that supports planning, budgeting, and service optimization for providers, managers, and health authorities.

Interactive Costing Tool



Methods

We applied time-driven activity-based costing (TDABC) to estimate the cost per unit time of resource capacity used in iOAT delivery. The eight-step TDABC framework by Etges et al.¹⁰ guided the approach.

Direct observation of clinical activities was conducted by paired researchers across four iOAT clinics in BC. Each two-hour session covered a full intake shift, during which 26 clients were seen—representing 21.3% of the provincial iOAT client population. A stopwatch app was used to time each activity.

To assess interrater reliability, we calculated the Intraclass Correlation Coefficient (ICC) using a two-way random effects ANOVA (absolute agreement, single-rater model). Unique observations from individual researchers were included in the dataset.

Time data were log-transformed to account for skewness. For each activity, log-mean and log-standard deviation were calculated and used to generate Monte Carlo simulations (n = 10,000) and estimate uncertainty intervals.

Cost inputs included:

- **Medications:** Unit prices (per mg) were adapted from previous CEAs⁸⁻⁹ and adjusted for inflation using Bank of Canada data¹¹.
- **Wages:** Hourly rates were derived from local union wage schedules¹²⁻¹³ and verified against current job postings.
- **Supplies and disposables:** Prices were sourced from literature¹⁴ and wholesale listings.
- **Average doses:** Derived from clinical literature¹⁵.

Process mapping was conducted in Microsoft Visio, capturing all observed activities and associated inputs. Provider perspectives were gathered via interview and survey responses to the open-ended prompt:

Assuming that existing policies regulating treatment provision remain unchanged, what would you consider doing at the clinic level—in terms of planning, budgeting, monitoring, or service delivery—to optimize treatment costs?

Results

High interrater reliability was achieved for direct observations across all clinics (ICC: 0.89, 0.95, 0.94, 0.97).

The **iOAT process map** (below) represents the first micro-level breakdown of service delivery activities in iOAT programs, serving as a foundation for integration into broader addiction care.

Costing tool development: An interactive prototype with a 1-year horizon allows users to input local data and simulate treatment costs per client and per client volume. It includes all activities within and outside the care delivery value chain, mapped to relevant wage inputs and 95% uncertainty intervals.

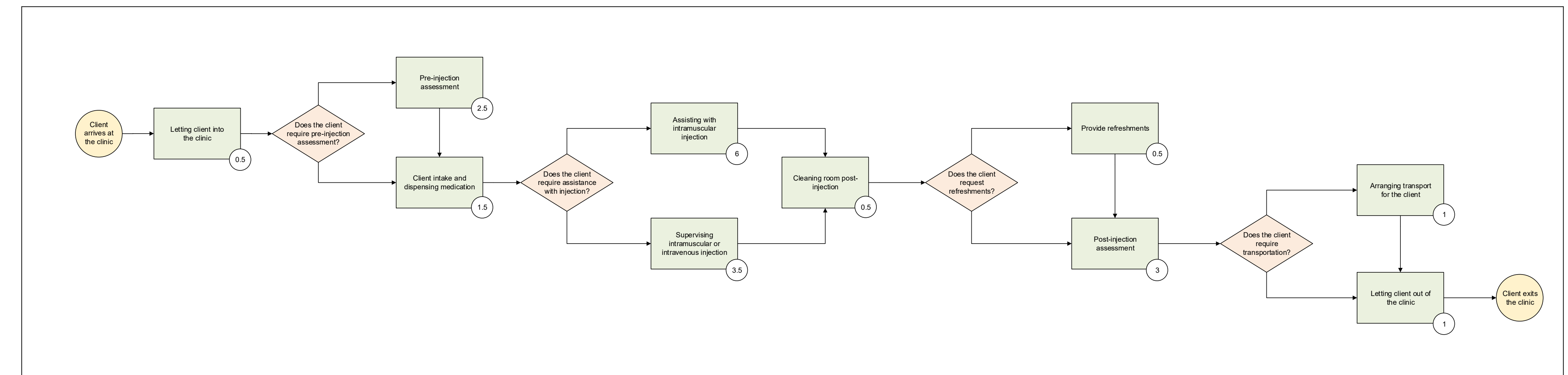
Scenario analysis suggests that under the diacetylmorphine, average dose, twice per day scenario, annual costs of delivering iOAT are \$8772.52-9344.99 per client, indicating that iOAT may be less resource-intensive when embedded within broader addiction or primary care settings.

Provider feedback highlighted opportunities to optimize care, including:

- Streamlining outreach to free up clinical capacity;
- Receiving medications in powder form to reconstitute onsite, reducing waste from unused liquid doses

Care Delivery Value Chain

Process map built from direct observations, depicting clinical activities and resource use across the full care pathway—including activities outside standard treatment delivery—serving as the foundation for the costing tool.



Conclusions

This study is the first to use TDABC to estimate the cost structure of iOAT in BC. The resulting process map and interactive costing tool provide essential infrastructure for supporting cost-informed decisions about program planning and optimization. The approach offers a replicable model for integrating iOAT into existing clinics in a cost-effective manner and supports budget impact analyses.

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