

# SUBCUTANEOUS VERSUS INTRAVENOUS ADMINISTRATION OF MEDICATIONS AND FLUIDS FOR CANCER PATIENTS IN THE UNITED STATES AND CANADA



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## Introduction

Subcutaneous administration of fluids and medication remains largely underutilized in the United States (US) despite the numerous benefits over intravenous administration.(1,2) These benefits include the following: cost savings, less burden of equipment for institutions to purchase and patients to carry, ease of subcutaneous access and less frequent site changes.(3,4)

The objective of this study was to compare the frequency of use of subcutaneous versus intravenous methods of administration between patients in acute palliative care units (APCU) at MD Anderson Cancer Center in Houston, Texas and Princess Margaret Cancer Centre in Toronto, Ontario.

## Methods

This study was approved by each site's institutional review board. It was a cross-sectional study that conducted a retrospective review of 200 admissions at each institution collected in a reverse chronological order with a start date of October 30, 2020. Patients with a diagnosis of advanced cancer defined by locally advanced, recurrent or metastatic cancer were included in the study.

The primary outcome was the use of the subcutaneous route for medications and hydration by patients, categorized as: only subcutaneous, only intravenous, a combination of subcutaneous and intravenous, or neither of the routes. Secondary outcomes included examining associations between patient characteristics and the use of the subcutaneous route.

Table 1. Patient Characteristics (N=398)

Characteristic	Canada 200 (50.3%)	USA 198 (49.8%)	p-value*
Age (in years) – mean (SD)	67.68 (11.86)	61.30 (14.04)	<0.001
Gender – n (%)			
Female	97 (48.5%)	100 (50.5%)	0.689
Male	103 (51.5%)	98 (49.5%)	
Cancer type – n (%)			
Breast	13 (6.5%)	11 (5.6%)	0.147
GI	51 (25.5%)	60 (30.3%)	
GU	32 (16.0%)	13 (6.6%)	
GYN	18 (9.0%)	18 (9.1%)	
Head and Neck	13 (6.5%)	13 (6.6%)	
Hematologic	24 (12.0%)	38 (19.2%)	
Sarcoma	7 (3.5%)	4 (2.0%)	
Skin	9 (4.5%)	10 (5.1%)	
Thoracic	29 (14.5%)	28 (14.1%)	
Other	4 (2.0%)	3 (1.5%)	
Died in the APCU or discharged – n (%)			
Alive	109 (54.5%)	99 (50.0%)	0.369
Deceased	91 (45.5%)	99 (50.0%)	
Discharged to location – n (%)			
ACH	5 (4.6%)	0	<0.001
ARF	2 (1.8%)	0	
Home	10 (9.2%)	2 (2.0%)	
Home with Hospice	54 (49.5%)	68 (68.7%)	
Hospice Inpatient	18 (16.5%)	29 (29.3%)	
IPU	19 (17.4%)	0	
LTC	1 (0.9%)	0	
Length of stay in the APCU– mean (SD)	10.05 (8.08)	4.02 (3.55)	<0.001
ESAS – mean (SD)			
Pain	4.67 (3.08)	4.05 (3.27)	0.095
Fatigue	6.36 (2.78)	6.34 (2.43)	0.957
Nausea	1.91 (2.58)	0.99 (2.26)	0.001
Depression	3.88 (3.25)	2.23 (2.90)	<0.001
Anxiety	3.89 (3.32)	3.29 (2.97)	0.110
Drowsiness	5.53 (2.96)	4.30 (3.04)	0.001
Shortness of Breath	2.80 (3.03)	3.36 (3.29)	0.140
Appetite	5.20 (3.24)	6.19 (3.08)	0.012
Wellbeing	5.39 (2.90)	5.86 (2.41)	0.213
Sleep	3.80 (3.09)	4.19 (2.83)	0.300
Symptom Distress Score (total)	43.12 (17.69)	42.05 (15.56)	0.696

\*two sample t-test or Chi-squared/Fisher's exact test

ACH- Acute care hospital; ARF- Acute Rehab Facility; IPU- Inpatient Palliative Unit\*; LTC- Long Term Care (nursing home),

\*In the Canadian data, hospice inpatient refers to a community based hospice inpatient facility whereas IPU refers to a palliative care unit located within a hospital. In the USA data, hospice inpatient refers to any facility in which a hospice organization is providing inpatient hospice services.

## Results

A total of 398 cancer patients were analyzed, 200 (50.3%) from Canada and 198 (49.8%) from the US (2 patients had 2 admissions, only the first admission was used).

Patient characteristics are seen in Table 1. In Canada, 106 (55.5%) received subcutaneous only, 9 (4.7%) received intravenous only, and 76 (40%) used both routes. In the USA, 197 (99.5%) used intravenous only and one patient (0.5%) used both routes.(Table 2)

In Canada, longer APCU admissions predicted slightly less likelihood of using subcutaneously only and greater likelihood of receiving both subcutaneous and intravenous routes.

## Discussion

A dramatic difference exists in the use of subcutaneous administration of medications and fluids between the US and Canada.

Lack of familiarity with the subcutaneous route may be playing a role in this difference.(5) Also, reimbursement models in the US could also have an effect. The US reimbursement models incentivize the use of IV pumps since institutions can bill for infusion run times or bill for administration in clinical settings rather than home settings.(6)

This study shows that the subcutaneous route is dramatically underutilized in the US as compared to Canada in similar care settings. Further research is needed to better understand its potential future roles in patient care in the US.

## References

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Table 2. Use of subcutaneous administration of medications and hydration in Canada versus the United States.

	Canada*	USA	p-value
	200 (50.3%)	198 (49.8%)	
Subcutaneous only	106 (55.5%)	0	<0.001
Intravenous only	9 (4.7%)	197 (99.5%)	<0.001
Both intravenous and subcutaneous	76 (39.8%)	1 (0.5%)	<0.001

\* There were nine values that were missing from the Canadian data.