Ketamine Infusion Therapy
Survey Summary

Executive Summary

This survey was conducted to gather information from Certified Registered Nurse Anesthetists (CRNAs) who provide Ketamine Infusion Therapy services for psychiatric care or chronic pain management. Ketamine Infusion Therapy is defined as the administration of a single infusion or a series of infusions of a low subanesthetic dose of ketamine for psychiatric or chronic pain disorders.

The overall response rate was 14% (N=186), although approximately 61.4% of respondents indicated that they do not provide Ketamine Infusion Therapy and exited the survey. Therefore, a 5.2% (N=69) participation rate was noted.

Ketamine Infusion Therapy services are provided by CRNAs primarily in ketamine clinics, offices, or hospitals for both psychiatric and chronic pain conditions. The top three conditions being treated with Ketamine Infusion Therapy were depression (79.7%), post-traumatic stress disorder (68.8%), and complex regional pain syndrome (67.2%). Almost two-thirds of the treatment is provided with an interdisciplinary team. CRNAs work with referring and/or collaborative physicians, and only one-third note that they are supervised during the ketamine infusions. The analysis details the roles of the providers involved in various aspects of the ketamine infusion. A physician tends to be involved with the referral or order, providing the medical diagnosis, and ordering/prescribing medication. CRNAs are involved with all aspects of ketamine infusion, and at highest rates with review of medical history, acquiring health history, initiating the infusion, remaining physically present with the patient, and monitoring. Patient monitoring includes heart rate heart rhythm, blood pressure, respiratory rate, arterial blood saturation, end-tidal CO_2, and response to ketamine infusion.

Almost half of the respondents indicate that ketamine infusions are administered to one patient at a time. Dosages vary based on diagnosis. For psychiatric disorders, respondents report a dosage of 0.5 mg/kg for 40 minutes, while for chronic pain, respondents report a dosage of 1 - 1.5 mg/kg over 120-240 minutes. Variability exists in the number of weeks a series of infusions is administered, although almost half of the respondents report 2 weeks in a series. Most respondents report collecting patient safety and quality outcomes regarding treatment effectiveness and adverse events. Almost half of the respondents obtained additional education and/or training to provide ketamine infusion therapy, which includes independent study of the literature, online research and course, and partnering with or visiting existing clinics.

Patient out-of-pocket payment or patient personally submitting to their insurer are the two primary means of reimbursement reported.

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Purpose
AANA receives inquiries about CRNA administration of Ketamine Infusion Therapy from members, state associations and boards of nursing. The purpose of this survey was to gather information from CRNAs who provide Ketamine Infusion Therapy services for psychiatric care or chronic pain management in order to better inform members, state associations and boards of nursing about this CRNA practice. This survey does not address ketamine for acute pain management or perioperative infusion.

Survey Population
A survey link was emailed to 1,323 CRNAs who expressed an interest in Ketamine Infusion Therapy or were part of a randomly selected subset of AANA Insurance Services members.

Data Collection Period
The survey was open from December 22, 2017 - January 5, 2018.

Response Rate
The overall response rate was 14**%** (N=186/1,323). About 61.4% of respondents indicated that they do not provide ketamine infusion therapy and exited the survey; therefore, a 5.2% (N=69) participation rate was noted. The response rate for each question varies and is reflected in the results summary.

Results
The results presented are based on the number of respondents to each question; therefore, the total number of respondents may vary if a specific survey question was not answered.

Provision of Ketamine Infusion Therapy Services
Survey respondents were asked whether they are currently providing ketamine infusion therapy services, defined as the administration of a single infusion or a series of infusions of a low subanesthetic dose of ketamine for psychiatric or chronic pain disorders. Figure 1 summaries responses.

Figure 1. CRNAs providing Ketamine Infusion Therapy services (N=179)

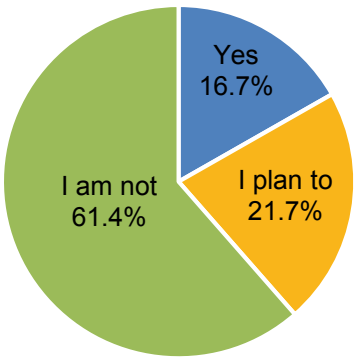

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Figure 2. Primary state in which Ketamine Infusion Therapy services are provided or plan to be provided. (N=73)

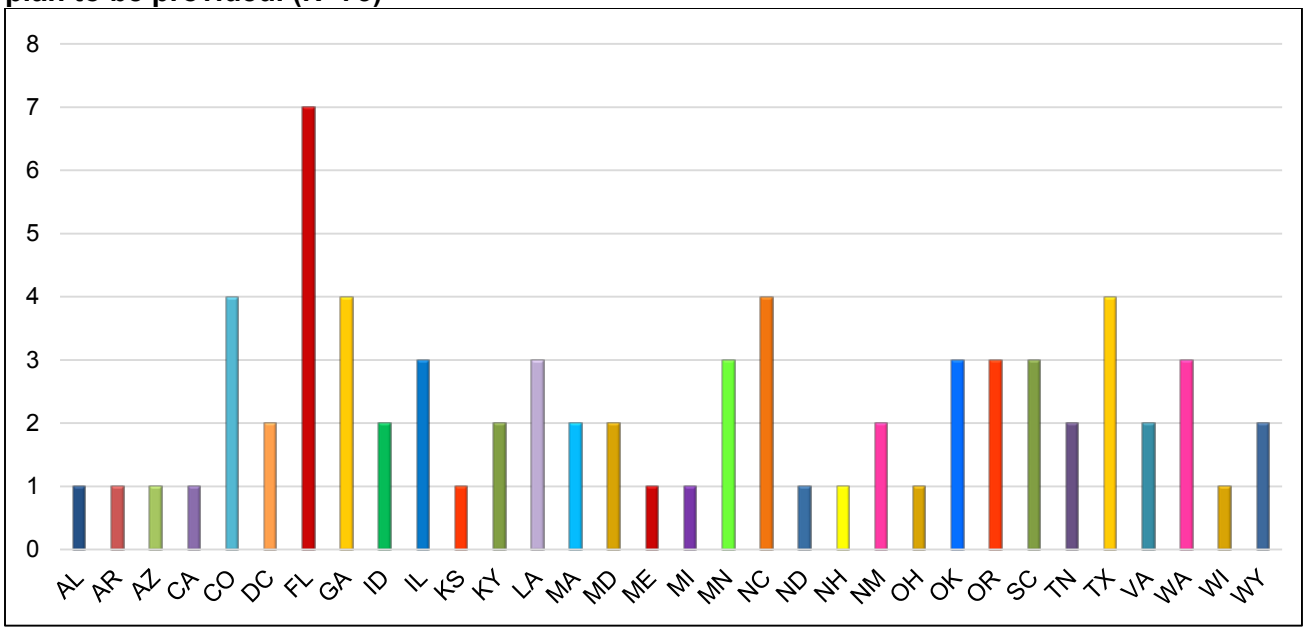

Figure 3. Location of ketamine infusion therapy services (N=68)

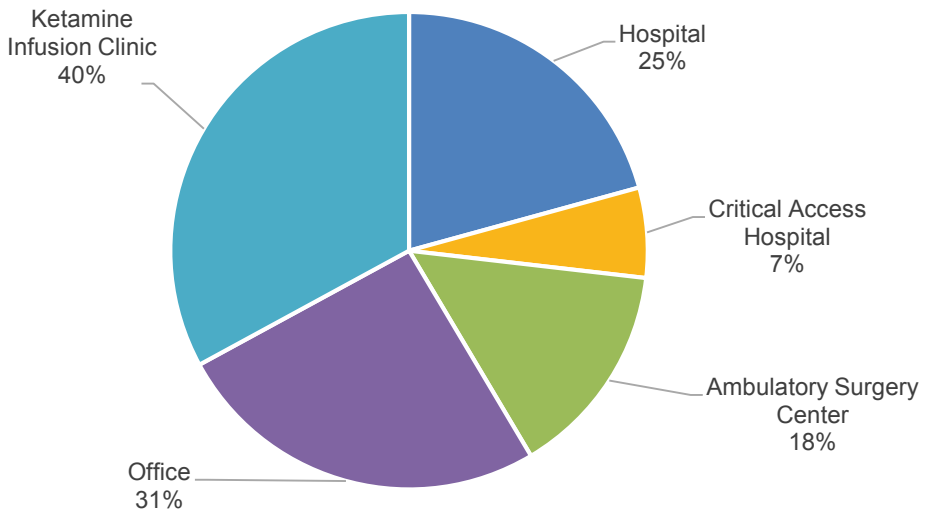

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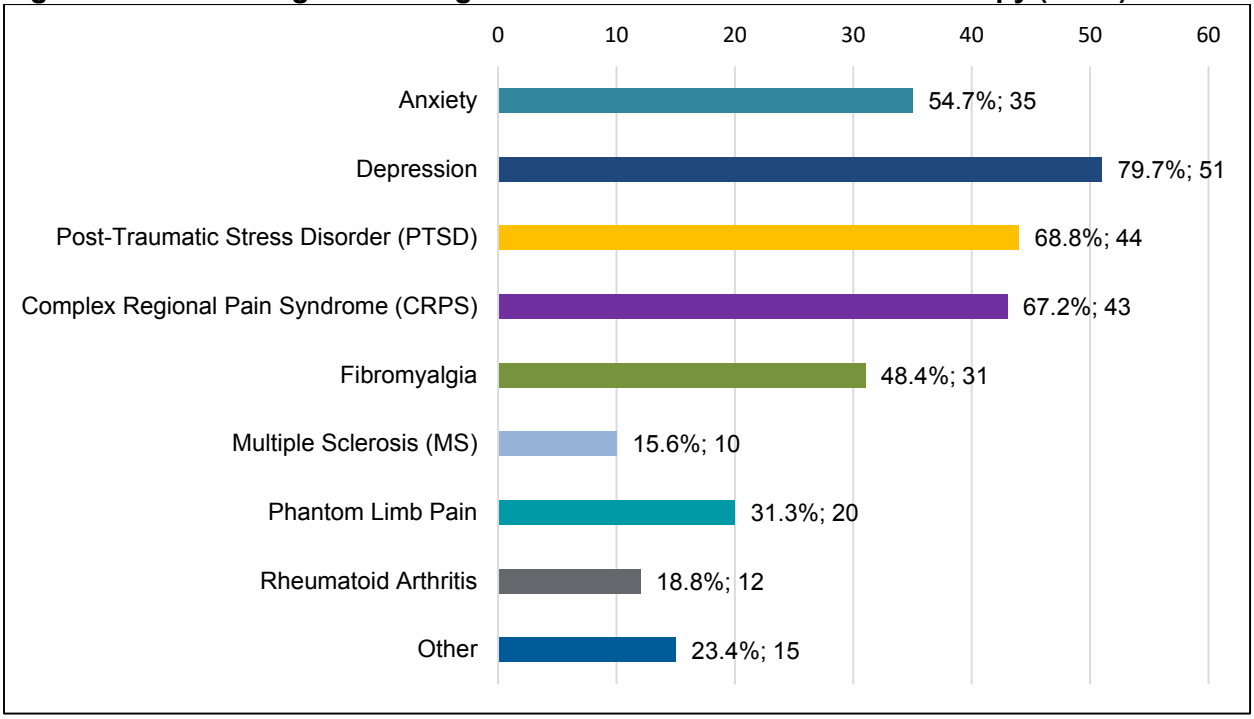
Figure 4. Patient diagnosis being treated with Ketamine Infusion Therapy (N=64)



The qualitative analysis of the 'other' responses identifies psychiatric disorders, surgical pain, neuropathic pain and chronic migraines as the other diagnoses being treated with ketamine infusion therapy. 'Other' responses were incorporated into the graph if they were one of the choices but were not selected.

An excerpt of 'other' responses includes:

- *"TMJ syndrome"*
- *"Depression, suicidality if ordered by psychiatrist"*
- *"Cancer pain, chemotherapy induced neuropathy, painful limb ischemia, chronic migraines, new onset daily headache, post Lyme disease neuropathic pain, Crohn's disease, suicidality, postpartum depression"*
- *"Bipolar, migraine headaches"*
- *"High opioid use, neuropathic pain"*

Patient Selection Criteria

Table 1. Do you have patient selection criteria? (N=60)

	N	%
Yes	37	61.6%
No	23	38.3%
Total	60	100.0%

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Twenty-nine respondents described their patient selection criteria. The qualitative analysis of the patient selection responses identifies the following eligibility criteria for ketamine infusion therapy: previous treatments failed, physician referrals, pain diagnosis, and psychiatrist diagnosis. Exclusion criteria consisted of age, pediatric patients, suicidal ideation, and substance abuse.

The following is an excerpt of responses:

Please describe your patient selection criteria (e.g., eligibility, exclusion).

- *"Diagnosis from MD, PA, NP that fits our criteria."*
- *"Eligibility: Lack of response to at least one conventional form of treatment. Properly diagnosed by a psychiatric provider or other physician or practitioner. Exclusions may include but are not limited to: psychotic or schizophrenia, glaucoma, advanced liver disease. Absolute contraindications: hemorrhagic CVA within 1 year, unstable angina, uncompensated CHF, moderate to severe pulmonary hypertension."*
- *"Inclusion: 1. Patients must have tried and failed at least 2 conventional treatments for their symptoms. 2. If pt suffers from suicidal ideations, rapid cycling bipolar, schizophrenia or other complex mental health disorder a written referral from their mental health provider is required. 3. Patients must be previously diagnosed and treated by their primary care or mental health provider. Exclusion (absolute): Current suicidal ideations with a plan, History of ketamine abuse."*
- *"Must come with medical records from mental health provider with diagnosis of TRD or from PCP or pain specialist with diagnosis of CRPS or similar syndrome. All patients are screened for potential substance abuse and assessed and evaluated prior to infusion protocol started."*
- *"We receive referrals from PCPs, psychiatrists, psychologists, LSWs, pain management clinics/physicians, department of psychiatry of regional hospitals, physician specialist (ortho, GI)."*
- *"Patients to benefit most are those with chronic pain syndromes, severe anxiety and depression, burn ICU pts. Excluded are pediatric pts in our institution."*
- *"High opioid tolerance Neuropathic pain unresponsive to gabapentin or lyrica."*
- *"Patients to benefit most are those with chronic pain syndromes, severe anxiety and depression, burn ICU pts. Excluded are pediatric pts in our institution."*
- *"Must have medical diagnosis proven in medical records. Exclusion: acute mania or psychosis, controlled hypertension, liver failure or complicated ASA 3 or any ASA 4 patients."*

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Collaboration with Interdisciplinary Team

Table 2. Do you collaborate with an interdisciplinary team in the management of the patient receiving Ketamine Infusion Therapy (e.g., pain management, psychology, occupational therapy)? (N=55)

	N	%
Yes	36	65.4%
No	10	18.2%
Other (comment)	9	16.4%
Total	55	100.0%

The qualitative analysis of the 'other' responses identifies physician, anesthesiologist, and internist as the most commonly mentioned healthcare providers involved in patients receiving Ketamine Infusion Therapy.

The 'other' responses include:

- *"Internist"*
- *"Anesthesiologist"*
- *"I have a collaborative physician as medical director and I work with referring practitioners."*
- *"I don't have staff able to supervise the infusion so I do it myself. I provide this treatment very, very rarely. It should be a last resort due to lack of evidence."*
- *"I consider the ketamine infusions as a temporizing measure. Pt's need other therapies as indicated."*
- *"Trying to get psychology involved to diagnose depression/ptsd and then we could provide the service."*
- *"I am not currently providing ketamine services, but I am interested in the process."*
- *"Yes if pt is also being managed postop in the ICU."*
- *"Plan to do so"*

Physician Supervision

Table 3. Are you supervised by a physician during the ketamine infusion? (N=55)

	N	%
Yes	17	30.9%
No	32	58.2%
Other (comment)	6	10.9%
Total	55	100.0%

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The qualitative analysis of the 'other' physician supervision responses identifies other collaborative arrangements CRNAs are engaged in or plan on engaging in.

The 'other' responses include:

- *"Supervision available, not at bedside."*
- *"Collaborate"*
- *"I am not currently providing ketamine services, but I am interested in the process."*
- *"Yes, but no more than the usual collaboration we have with our attending in overall management of our patients."*
- *"We plan to have anesthesiologist as partners in the practice."*
- *"Ordered by a physician infused as any other RN would be permitted with an order."*

Physician Specialty

If respondents answered 'yes' to the supervision question, they were further asked about the supervising physician's specialty.

Table 4. What is the specialty of the physician? (N=16)

	N	%
Anesthesiologist	11	68.7%
Psychiatrist	1	6.2%
Neurologist	0	0.0%
Other (comment)	4	25.0%
Total	16	100.0%

The 'other' responses include:

- *"General Surgery/Plastic Surgery"*
- *"Internist"*
- *"Rehabilitation"*
- *"Surgeon*"

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Healthcare Providers and Roles

Table 5. Healthcare providers involved and their role in Ketamine Infusion Therapy (Select all that apply)

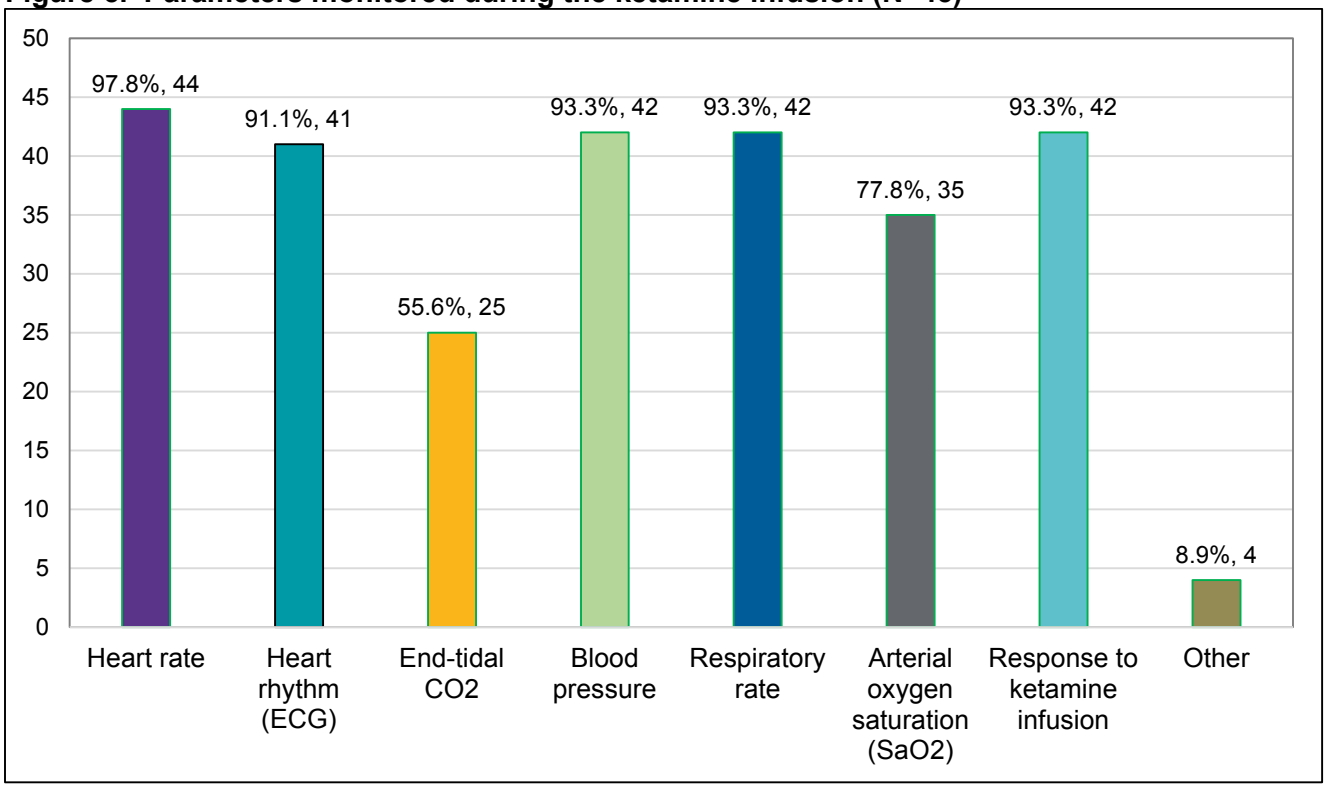
	CRNA	Physician	Physician Assistant	Nurse Practitioner	Registered Nurse	LPN or LVN	Medical Assistant	N/A	N
Does not participate	28.9% 11	47.3% 18	44.7% 17	42.1% 16	28.9% 11	44.7% 17	34.2% 13	18.4% 7	38
Write referral or order	23.8% 10	78.5% 33	23.8% 10	45.2% 19	0.00% 0	0.00% 0	0.00% 0	4.7% 2	42
Review past medical and psychiatric records	82.2% 37	57.7% 26	15.5% 7	37.7% 17	11.1% 5	0.00% 0	0.00% 0	2.2% 1	45
Provide medical diagnosis	20.4% 9	77.2% 34	18.1% 8	40.9% 18	2.2% 1	0.00% 0	0.00% 0	6.8% 3	44
Perform history and physical	65.9% 29	68.1% 30	25.0% 11	47.7% 21	4.5% 2	0.00% 0	2.2% 1	2.2% 1	44
Acquire health history	82.6% 38	54.3% 25	23.9% 11	45.6% 21	17.3% 8	2.1% 1	6.5% 3	2.1% 1	46
Conduct preinfusion	83.7% 36	13.9% 6	0.00% 0	9.3% 4	16.2% 7	2.3% 1	4.6% 2	6.9% 3	43
Order diagnostic tests	58.1% 25	60.4% 26	20.9% 9	41.8% 18	2.3% 1	0.00% 0	0.00% 0	11.6% 5	43
Order or prescribe medication	45.2% 19	71.4% 30	16.6% 7	38.1% 16	0.00% 0	0.00% 0	0.00% 0	4.7% 2	42
Initiate infusion	95.5% 43	22.2% 10	2.2% 1	8.8% 4	20.0% 9	2.2% 1	0.00% 0	2.2% 1	45
Physically present in facility during infusion	95.4% 42	27.2% 12	4.5% 2	13.6% 6	27.2% 12	2.2% 1	6.8% 3	0.00% 0	44
Monitors patient during and after infusion	86.6% 39	20.0% 9	4.4% 2	11.1% 5	42.2% 19	2.2% 1	4.4% 2	0.00% 0	45

A total of four qualitative responses are included in the following comments:

- *"I am not currently providing ketamine services, but I am interested in the process."*
- *"I am present during all infusions. MA in addition to myself."*
- *"I am both a CRNA and FNP so I meet all these roles."*
- *"Our group will consist of CRNA and MD providing infusions independently."*

Administration and Monitoring

Figure 5. Parameters monitored during the ketamine infusion (N=45)



'Other' responses were incorporated into the graph if they were one of the choices but were not selected. A total of four qualitative responses are included in the following comments:

- *"Temperature"*
- *"SpO2"*
- *"All"*
- *"SpO2 on all pts, and ET CO2 on patients with moderate sedation"*

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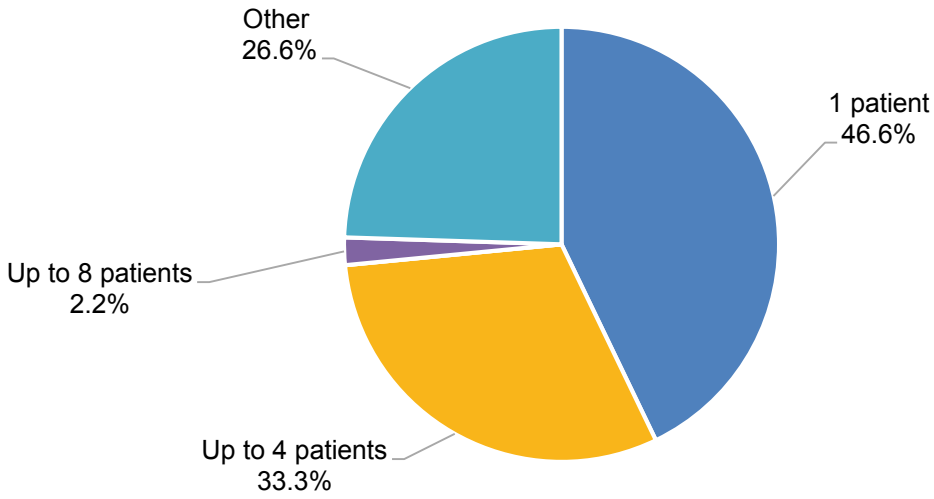
Figure 6. Number of patients administered Ketamine Infusion Therapy simultaneously (N=45)



A qualitative analysis of the 'other' responses identifies that CRNAs are administering ketamine infusions up to 2 – 3 patients simultaneously.

An excerpt of 'other' responses includes:

- *"Up to 3"*
- *"Currently, no more than 2 at once."*
- *"As needed"*
- *"2 at most"*
- *"Always on a one to one basis"*
- *"2"*

Ketamine Infusion Dosage

Respondents were asked to describe what the mg/kg ketamine infusion dose administered and over how many minutes. Respondents were asked to specify if the dose varies by diagnosis.

The qualitative analysis of ketamine infusion dosages for psychiatric diagnoses identifies 0.5mg/kg over 40 minutes; whereas ketamine infusion dosages for chronic pain diagnosis are between 1mg/kg - 1.5mg/kg over 120 -240 minutes.

The following is an excerpt of responses (N=33):

- *"0.4-0.6 mg/kg 60 minutes, 1.2 mg/kg 120 minutes."*
- *"0.5 mg/kg first infusion. Subsequent infusions vary based on response, tolerance, and benefits."*
- *"2mg per kg over an hour"*

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- *"Mood Disorders: Ketamine 0.5 mg/kg X 40 minutes Pain: Initially Ketamine 1 mg/kg/hr X 4 hrs with a goal of 1.5 mg/kg/hr X 4hours."*
- *"Depression or mood disorders: 0.5 mg/kg in 40 minutes. Chronic pain 0.5-0.8 mg/kg/hr for 4 hours."*
- *"Depression = 1 mg.kg over 30 minutes. For other types of neuropathic pain, I start at 1 mg/kg and titrate to effect. Have used up to 6mg/kg (infused over 3 hours)."*
- *"0.5-2mg/kg over 40-60 minutes and we base dosage on history, patient health and response."*

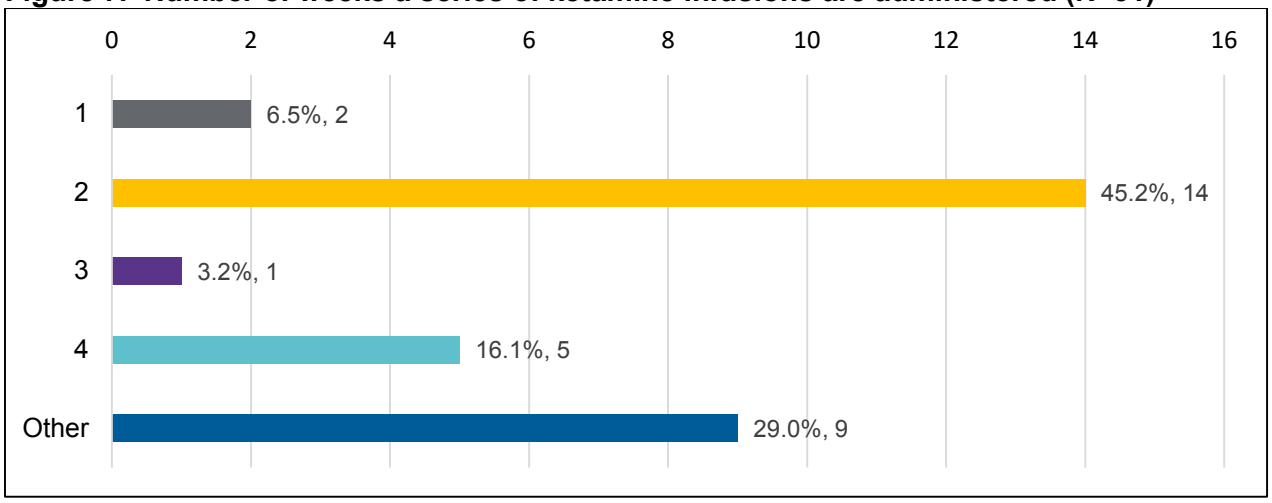
Number of Days Between Ketamine Infusions

Respondents were asked to list the average number of days between ketamine infusions. The qualitative analysis showed that there is an average of 2-7 days for both psychiatric and chronic pain disorders.

The following is an excerpt of responses (N=30):

- *"3 days"*
- *"5 days"*
- *"4-10"*
- *"7-14"*
- *"Day 1, 3, 7, 14, 30, 60, 90 then as needed every 90 days"*
- *"Mood disorders: 1-2 days. Pain: 4-7 days"*
- *"Every other day excluding weekends for mood disorders for 2 weeks. Chronic pain is 2 weeks of 5 days each."*
- *"Mental health: new patient = 6 infusion every other day. Followed by booster infusions PRN every 3-12 weeks. Chronic pain: 3-7 days of infusions every day or every other day (4 hour infusions)"*

Figure 7. Number of weeks a series of ketamine infusions are administered (N=31)



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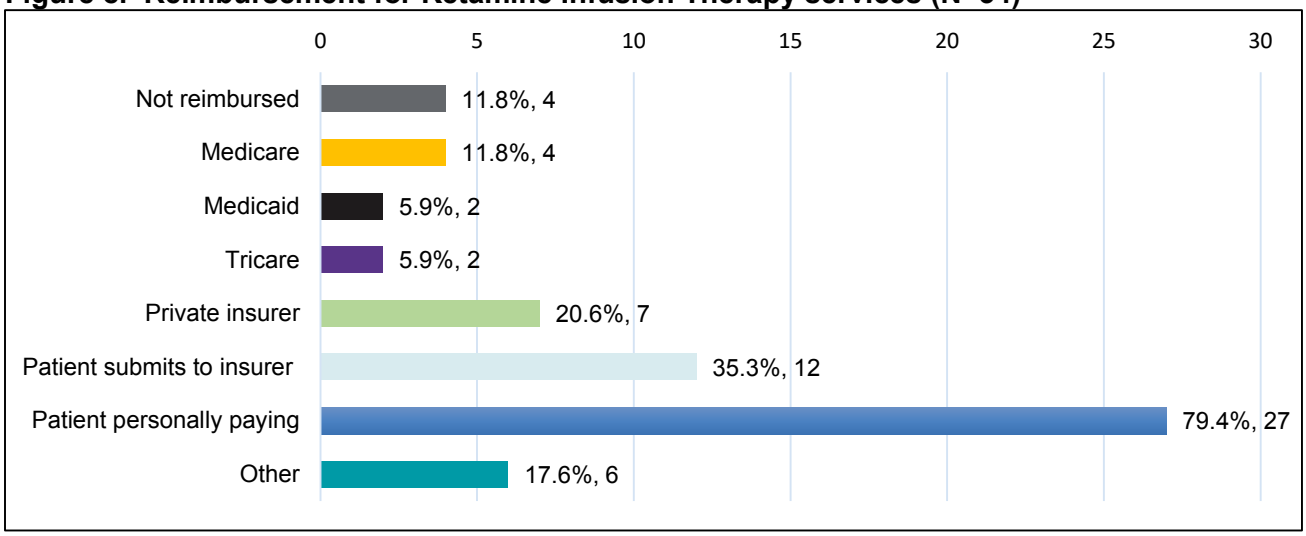
Eight qualitative 'other' responses were received. An excerpt includes:

- *"I did 10 days of 4 hour infusions based on an old article. I did these back in 2006-2008. I still would offer this treatment, again, if a patient had failed all measures. I haven't had patients who fit this qualification in the past few years. It is also expensive even if insurance pays which they don't generally."*
- *"Mood disorders: 2 weeks. Pain may be 4-5 weeks."*
- *"6"*
- *"2 weeks or mental health. 1 week for chronic pain."*

Reimbursement for Ketamine Infusion Therapy Services

Respondents were asked how their ketamine infusion therapy services are being reimbursed. Figure 8 presents the overall results.

Figure 8. Reimbursement for Ketamine Infusion Therapy services (N=34)



Six qualitative 'other' responses were received:

- *"Workman's comp pays, the other patients paid out of pocket since we could not get it covered. One of the patients paid out of pocket for the drug and I provided my services for free."*
- *"Patient personally pays for entire series of treatment in advance."*
- *"Anesthesia"*
- *"Don't know...the hospital has always been vague about reimbursement."*
- *"Patient can submit to insurance if they wish"*

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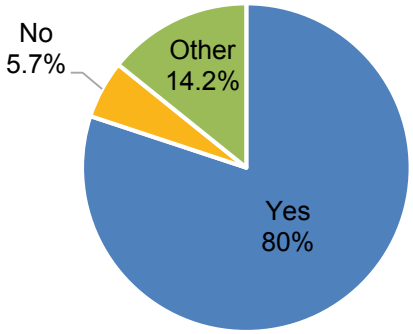
Malpractice Insurance Coverage
Respondents were asked whether they have malpractice insurance to provide ketamine infusion therapy services.

Figure 9. Malpractice insurance coverage for Ketamine Infusion Therapy services (N=35)



Four qualitative 'other' responses were received:

- *"Not sure. AANA insurance is what I have. I am new to it though."*
- *"Covered as standard CRNA malpractice"*
- *"AANA Insurance"*
- *"Insured via hospital"*

Patient Safety and Quality Outcome
Patient safety and quality outcomes are collected by **72.2% (N=26/36)** of respondents. The qualitative analysis of the descriptions (N=20) identifies that results of standardized evaluation instruments (e.g., questionnaires), treatment effectiveness, and adverse effects are patient safety and quality outcome measures being collected.

An excerpt of the patient safety and quality outcomes descriptions includes:

- *"QRDS"*
- *"Same as operating room"*
- *"I had a little spreadsheet on pain scores, diagnoses, VS, medications and doses pre and post, etc. It turned out the patients did not get a great deal of durable relief despite my fairly high doses. It is possible their tolerance affected the outcomes but I find the oral ketamine works so well I don't need to resort to infusions. That said, I have 4 pts on the oral form out of at least 300 active patients."*
- *"Results of the treatments and how effective or not effective it was. Did the patient benefit from the treatment or did we have to stop the treatment?"*
- *"Gad 7 and PHQ (PDQ 9) questionnaires for mood disorders. 0-10 pain score for pain patients."*
- *"Side effects, post infusion pain scores, hallucinations, post infusion depression scores, post infusion PTSD eval"*
- *"Validated Self-administered symptoms questionnaires."*
- *"Adverse effects and continual protocol improvement based on research and patient results."*
- *"We monitor patient monthly after infusions complete."*

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- *"Becks score pre and post"*

Acquiring Ketamine
Respondents were asked how they acquire ketamine for these services. Table 6 summaries the responses.

Table 6. Acquiring Ketamine (N=36)

	N	%
Provided by pharmacy	10	27.8%
Provided by facility / office	17	47.2%
Other (comment)	9	25.0%
Total	36	100.0%

The qualitative analysis of 'other' means of acquiring ketamine identifies the following: order the medication (N=4); pharmaceutical company (N=3); medical supply company (N=2).

An excerpt of responses includes:

- *"Medical supply company; Southern Anesthesia, McKesson"*
- *"I order it"*
- *"Hospital pharmacy"*
- *"Pharmaceutical distributor delivers to ketamine clinic"*
- *"Ordered by collaborative physician"*

Additional Training / Education
Respondents were asked whether they obtained additional education and/or training prior to administering Ketamine Infusion Therapy. Table 7 summaries the responses.

Table 7. Did you Acquire Additional Education and/or Training? (N=35)

	N	%
Yes	17	48.6%
No	10	28.6%
Other (comment)	8	22.9%
Total	35	100.0%

If respondents answered 'yes' or 'other', they were provided the opportunity to describe their training/education. Twenty-one respondents provide additional detail. The qualitative analysis identifies that CRNAs used literature research (N=11), online research and courses (N=4), partnered with or contacted/visited existing clinics (N=3), used skills established through previous clinical experience and education (e.g., pain fellowship) (N=2), and obtained a Psychiatric Mental Health Nurse Practitioner (PMHNP) certification (N=1).

An excerpt of responses includes:

- *"Obtaining PMHNP certification"*
- *"Personal research over the course of 6 months"*

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- *"Went to several conferences and spoke with other clinicians."*
- *"There are a lot of research articles that could be read and there are classes being offered that would be very beneficial, but neither are required."*
- *"Self-studied and read several dozen research articles and then built an online ketamine infusion course (applying for AANA CE credit in Jan 2018)"*
- *"This is a standard medication used in the hospital. No additional formal training is required to administer subanesthetic doses. I have diligently researched literature and protocols to ensure we have providing the most optimal evidence based protocols."*
- *"Studies and refresher to ketamine infusion"*
- *"Background in mental health graduate education, employed in mental health field for 5 years"*
- *"Reading published literature on the subject"*
- *"Partnering with a physician who has currently been administering infusions for 2 years"*
- *"Ketamine Academy course on-line"*
- *"Visited of clinics that are providing this service"*
- *"Pain management fellowship, and refresher course after graduation"*

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