A retrospective audit of the outcomes of a community-based midazolam sedation service for complex special care patients.

Introduction:

The definition of conscious sedation as it applies to dentistry in Ireland is "a technique in which the use of a drug or drugs produces a state of depression of the central nervous system enabling treatment to be carried out, but during which verbal contact with the patient is maintained through out the period of sedation. The drugs and techniques used to provide conscious sedation for dental treatment should carry a margin of safety wide enough to render loss of consciousness unlikely"[1]. Within the context of national dental sedation guidelines[1], audit of sedation practice play an important role in the provision of safe, effective and acceptable sedation care. Clinical audit is a clinically-led quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and acting to improve when standards are not met.[2]

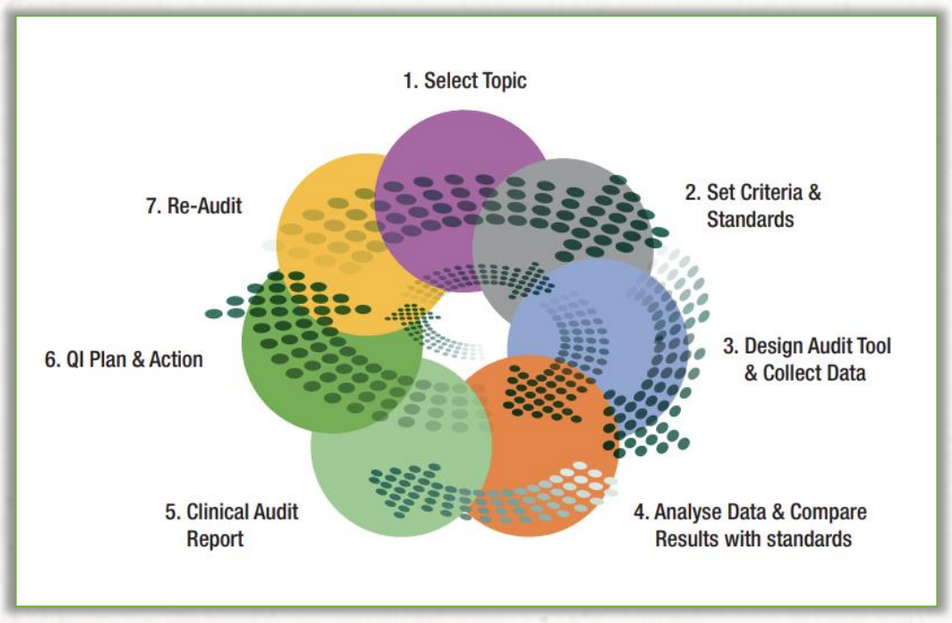

Figure 1 : The Seven Stages of Clinical Audit[2]

Aims:

Aim : To audit the clinical records of patients treated under midazolam sedation in a dedicated sedation service for adults with disabilities in a community (primary care) clinic over a 6-month period January-June 2024.

Methodology:

The electronic clinical sedation records of all patients treated under midazolam sedation were reviewed by EC to extract the following data: (1) patient demographics (age, gender, ASA classification (Figure 2)[3]); (2) patient complexity (BDA case mix model[4] banded score); (3) type of sedation administered; (4) sedation dose; (5) sedation score and operating conditions (as a record of sedation quality/effectiveness) (Table 1)[5];
(6) complications or adverse effects arising during sedation and (7) use of the benzodiazepine antagonist flumazenil as a reversal agent. All patients were treated by a single operating dental team consisting of a specialist in Special Care Dentistry and two trained dental nurses.

ASA classification	Physical status of patient
I	Fit and healthy
II	Mild systemic disease
III	Severe systemic disease
IV	Severe systemic disease that is a constant threat to life
V	Moribund, not expected to survive without an operation
VI	Declared brain-dead

Figure 2 : ASA Classification[3]

Table 1 : Summary of Sedation Score and Working Conditions

Sedation Score	Frequency (%)	Working Conditions	Frequency (%)
1 (fully awake and orientated)	10 (8.9%)	**Good (fully cooperative)**	64 (57.1%)
2 (drowsy)	33 (29.5)	**Fair (treatment completed with minimal interference)**	31 (27.7%)
3 (eyes closed but rousable to command)	69 (61.6%)	**Poor (treatment completed with difficulty)**	16 (14.3%)
4 (eyes closed but rousable to mild physical stimulus)	0	**Impossible (treatment abandoned)**	1 (0.9%)
5 (eye closed and unrousable to mild physical stimulus)	0		

Results:

112 patient records were audited, and full data sets were recorded for all patients. Primary diagnosis was intellectual disability for 91.1% of patients. The mean age was 37.7 years (range 19-78 years). Patients were classified as ASA grade II (76.8%) or III (23.2%), but no patients had severe cardiac or respiratory disease. Patients were mainly classified as having a BDA Casemix score of severe complexity (20-29) (86.6%). Of the patients treated 37.5% had intravenous midazolam sedation, 12.5% had oral midazolam sedation only (with placement of an intravenous cannula), 42.9% had a combination of oral and intravenous midazolam and 7.1% had a combination of intranasal and intravenous midazolam. Differing techniques were used due to the patients' varying ability to cope with cannula placement. Low levels of intranasal midazolam were apparent during this audit due to ongoing supply shortages of an appropriate intranasal midazolam preparation in Ireland. The mean dose of oral sedation given was 21.7mg (range 10-30mg) and the mean dose of IV midazolam was 7.1mg (range 1.5-15mg). Table 1 shows the sedation score and working conditions of the patients treated. From this data it is evident that no patients were allocated a sedation score of 4 or 5, meaning that no patient was rendered unresponsive or unconscious. There was no emergency use of flumazenil for oversedation, respiratory depression or hypoxia. Recovery was uneventful for 83.0% of patients. For those patients audited, 12.5% of patients had mild complications requiring corrective intervention from the dental team but no serious adverse events or complications were recorded. Examples of mild complications included:

- Reduction in oxygen saturation to 93-95% requiring encouragement to breathe or administration of supplemental low flow intranasal oxygen.
- Self-removal of the indwelling cannula by the patient during sedation recovery resulting in blood spillage.
- Persistent hypotension requiring administration of intravenous fluids.
- Prolonged recovery (>90minutes) and patient returning to sleep after being roused.
- Administration of intravenous flumazenil to aid recovery for a patient attempting to leave dental chair but at risk of falls.

32.1% of patients received an intravenous midazolam dose greater than 7mg. Figure 3 demonstrates that midazolam dose and sedation score (and resultingly working conditions) were not linear in this patient cohort. Instead, response to midazolam appeared largely individual when titrated carefully against response.

Conclusion:

Midazolam sedation using a variety of methods of administration is a safe and effective adjunct to care for complex special care populations in the community setting. Knowledge and consideration of midazolam pharmacokinetics and pharmacodynamics is important when using more than one method of administration. Titration of midazolam to clinical sedation effect is an important skill and patients with disabling conditions may require a wide range of midazolam dosages. Age, physical status, comorbidities and polypharmacy can affect a patient's response to midazolam sedation and should be considered carefully when providing community-based sedation.

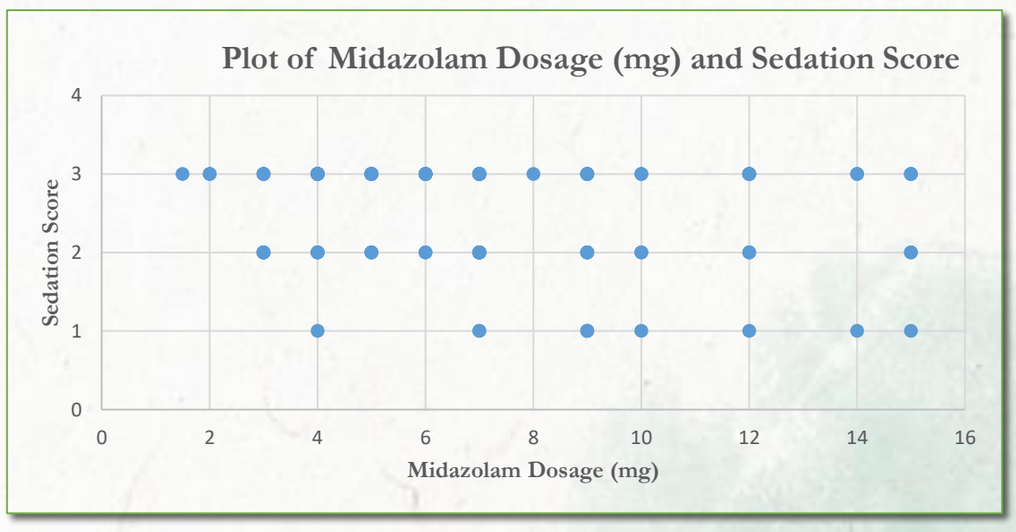

Figure 3 : Plot of Midazolam Dosage and Sedation Score

References:

1. Layout 1 (dentalcouncil.ie)
2. HSE National Centre for Clinical Audit - A Practical Guide 2023
3. Statement on ASA Physical Status Classification System (asahq.org).
4. Case Mix (bda.org)
5. Conscious sedation | Scottish Dental Clinical Effectiveness (sdcep.org.uk)