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Pediatric Dental Sedation: Trends and Obstacles in Utilization in both Teaching at Advanced Pediatric Dentistry Training Programs and Clinical Practice

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Abstract

An assessment of contemporary teaching trends, utilization, and obstacles to the effective use of sedation for the challenging pediatric dental patient reveals numerous facets that characterize both the positive and negative components of teaching curricula in sedation in advanced training programs. Proficiency of program directors with respect to faculty familiarity and awareness of classical and contemporary literature, quality and quantity of hands-on student or resident experience, supervisory capacity, and judgment competence when choosing and making safe and effective use of various pediatric sedation regimens for varying levels of pediatric anxiety and resistance is vastly different from one training program to another. As result, clinical experience and proficiency of new graduates is highly variable.

This manuscript explores relevant variables and contributing factors that account for differing attitudes amongst clinicians, faculty, and new graduates with respect to what constitutes success when making use of sedation, and expectations for parents and patients. Despite variation and absence of general consensus for what should be included in sedation curricula and an objective measure of whether teaching goals are met for trainees, it is important stipulation that acknowledges the inherent challenge within the traditional framework of 24 month programs to provide sufficient exposure and emphasis to the broad area of child behavioral management, both pharmacological and non-pharmacological, advanced airway and anesthetic management, and proficiency in medical recognition and management of adverse reactions and medical emergency. This challenge is daunting and an entity which is readily open for dilemma, discussion, and critique.

Keywords: *Pediatric Sedation; Teaching Trends; Utilization*

Introduction

Pediatric sedation has long been recognized as much an art as science. Insights to select the most appropriate modality, agent(s) and dosing to manage a particular child following a brief meeting or initial visit is to some extent instinctual but more likely a skill cultivated from years of observation and trial [1]. Reported as a viable approach intended to ameliorate varying levels of childhood anxiety and interfering behavior since the early 1960's, it's safe and predictable use is often complicated by a variety of nuances and subtleties [2]. A plethora of studies have appeared to help aid clinicians in defining clinical success and safety through comparisons of dosage of various agents and combinations. Our understanding, growth of knowledge and progress to enhance safety and efficacy has been hampered by many shortcomings. Many of the early studies, even textbook recommendations, were based on clinical impressions; some involved weakly designed retrospective and prospective research designs. In general, sample sizes were low, patient selection criteria were ill-defined, dependent variables were rarely or poorly controlled. Nevertheless, this was the beginning of pediatric dental sedation research as advanced training programs progressed in its applications. Two notable papers, one theoretical, the other scientific and evidence-based contributed to our early understanding of principles which are still in use today. Lampshire (1959) [3] discussed the potential benefits of combining medications which complemented the favorable effects of one another while offsetting potential downsides. Using Lampshire's model, a later study reported that the addition of an antiemetic to a sedative hypnotic dramatically enhanced sedation effectiveness and safety enabling the use of significantly less sedative to achieve desired results, minimizing the degree of somnolence achieved while significantly reducing the gastrointestinal upsetting nature of chloral hydrate (Robbins, 1967) [4].

The 1970's and early 80's looked at further enhancement of sedation efficacy by the addition of a narcotic to produce smoother sedations, and to further reduce primary sedative agent dosages to minimize somnolence to maintain patient consciousness [5,6]. These developments were not without incident. Alphaprodine [7] used for its profound analgesic effects in obstetrics was adapted for the pediatric dental patient because of its propensity to obtund interfering child behavior. Highly resistive behaviors were successfully obtunded but not without morbidity and catastrophic outcome due to the profound respiratory depressant effects of this potent narcotic. These events served to most appropriately shift attention toward patient tolerance, airway management, and demands for standardization with respect to better defining levels of sedation, patient physical evaluation and physiological monitoring. Despite development of the original 1985 Guidelines for the Safe and Effective Use of In-office Pediatric Dental Sedation [8] with revisions and updates advanced over the next two decades mishaps involving morbidity and catastrophic outcomes continue to occur and reach public awareness. Non-Compliance following safety guidelines, poor clinician judgment, weak proficiency in the ability of practitioners within their environment to recognize and properly manage adverse reactions continue to occur and contribute as primary etiology for skepticism for the safety of these techniques [9].

Variability of Training

A troubling if not disconcerting contemporary observation from advanced training programs in pediatric dentistry is the extent to which teaching and utilization of pediatric sedation appears to have diminished in scope, utilization, efficacy, comfort levels, and safety [10]. For some programs, residents secure ample experience, encounter frequent success when using sedation, and are likely to make greater use of sedation when they enter the private practice sector. These graduates likely shared the opportunity of exposure and use of a diverse repertoire of agents and dosing during their residency training. For others, limited to single agents or low-end dosing maximums, these graduates report infrequent success and a reliance on either restraint to perform treatment or abandonment of sedation for the use of general anesthesia [10,11].

This latter observation results from deficiencies on several planes. The intent of this article is to focus on contemporary thinking which prevails and the impact of deficiencies on current and effective practice of helping challenging children cope with varying levels of apprehension. Greater reliance on the application of restraints (protective stabilization or immobilization) and dependence on the use of general anesthesia by virtue of limited and ineffective use of sedation regimens contributes to the cost prohibitive nature of care for

many young children lacking cooperative potential. Elimination of historically and safely used agents, e.g. chloral hydrate and narcotic, abused and misused by some has resulted in a significant shrinkage in availability of the sedation arsenal for children across many states and training institutions. Sedation protocols currently advocated at many of the nation's advanced training programs make use of lowered and less than therapeutically effective dosing, out of fear of inducing deeper than intended levels of sedation, and limited or weakness in proficiency to recognize and manage an adverse reaction when using mid- to higher-range dosing [11-13].

While some programs engage extensive sedation and airway management curricula, others have curbed this curricula to minimal training in anesthesiology rotations, and make use of regimens of minimal potency such as nitrous oxide –oxygen inhalation, or low range dosing of hydroxyzine or ultra- and short-acting midazolam as the only agents employed, with general anesthesia as the fall back to accomplish treatment when the former agents prove unsuccessful [14]. While meritorious if not utopian, some have eliminated the use of any agent or regimen for which a reversal agent is unavailable [15,16]. Programs with strong faculty background and hands-on experience using oral sedation are on the decline. For some, experience using a broad and diverse arsenal of agents, alone or in combination serve to provide a comprehensive experience for their postgraduate students and residents. These graduates possess a comfort level that likely fosters a continued if not expanded use of sedation as a management tool for their practices, helping to alleviate apprehension and foster the development of coping skills of pre-cooperative and transitionally cooperative young children. For the latter, expertise in agent and dosage selection can be expected to achieve clinical success more readily and reduce the need or reliance on physical restraint when subtherapeutic dosing occurs and cut back on the frequency with which general anesthesia is needed [10]. Those not experienced in making use of a wide range of agents or dosage protocols which reflect varying levels of apprehension and resistance can likely be expected to depend more on physical restraints to permit treatment, or defer to general anesthesia for management of short to moderate extent of treatment need. In large part, modality selection, and in particular agent and dosing decisions coincide with how sedation success is judged [16-18].

Defining clinical success when using sedation: What constitutes Optimal vs Adequate vs Inadequate Success

A confounding observation for which there appears to be no general consensus among pediatric dentists is that success can carry several different definitions [10]. To some extent and to be fair, this phenomenon might be reasonable and understandable. Programs differ, patient populations differ; training experience of program faculty and comfort levels differ; some children by virtue of heightened levels of apprehension cannot safely be titrated (in particular when using the oral route of administration) to sufficiently obtund interfering behaviors without induction of deeper than desired planes of sedation. Clinician judgment and comfort level and decisions to abandon lighter levels of sedation for deep or unconscious techniques are rarely simply or universal. To what extent does the application of protective stabilization become acceptable? [14-16].

For some, optimal clinical success when using an oral regimen can be declared only when the patient remains fully conscious, requires either no need or very transient application of restraint to accomplish treatment objectives. Others express no difficulty considering sedation successful despite need for restraints in a persistent manner, and treatment objectives are partially completed. These results might be defined as "adequate or acceptable." Still others, perceive success simply if general anesthesia is avoided regardless of the need for harsh and persistent restraint. For those encountering overwhelming and frequent need for restraints to accomplish treatment, it might be hypothesized that these clinicians might wish to re-assess the agents and dosages being employed that prove insufficient to obtund or overcome need for restraint. The acceptability of the deployment of protective stabilization or physical restraint becomes in large part clinician and parent dependent. Literature is emerging which seems to suggest parental preference is in the direction of sedation over application of restraint for their children [18].

Sedation arsenals taught in advanced training programs theoretically should be diverse and broad based. Exposure and experience should involve using agents and combinations with specific benefit and predictable expectations. Judgments regarding agent and dosage selection should be objectively based on several assessment criteria. The subtlety and nuance, however, of the below criteria can be hypothesized to aid in decisions related to dose selection of agents employed:

1. The level of anxiety to be managed and depth of sedation required to overcome or obtund mild vs moderate vs heightened apprehension and resistance;
2. the duration of working time needed to complete or reasonably complete treatment objectives, and
3. the degree of invasiveness of treatment to be undertaken.

Each of the above criteria are subject to judgments based on what dosage range is warranted be it low-end, mid-range, or high-end and the ultimate decision is determined by a composite representation of all three. Each of said criteria above, while appearing logical, have in essence never been explored or subjected to scientific scrutiny [10,13-16]. Final decisions remain at the discretion of the Program or Departmental director which are consistent with his/her experience and comfort levels. When all is said and done, responsibilities for safety, patient monitoring and management fall on departmental leadership. Clinic supervision in some instances has potential to be short of optimal; following the worst scenario, this can generate nightmarish consequences for faculty and program directors.

Additional Factors Influencing Agent and Dosage Selection

For some if not many states, regulatory agencies, university pharmacy formularies, and/or program administrators are limited with respect to the arsenal of agents made available for use. Despite the demand for broad teaching exposure and experience, significant constraints no doubt contribute to limited expectations for successful outcomes. Reliance on agents using low- range dosing, or only those agents with reversal capabilities can be expected to necessitate greater need for restraints. Under these conditions, it might be reasonable to understand need to err on the safe side of dosing to the safest ranges for respective populations.

Safety Implications for Limited Continuing Education Programs

An emerging concern are CE offerings of a limited nature for profit spanning two or three days intended to bring clinicians up to speed with the gamut of adult and pediatric sedation. Clear and expressed intent of non-comprehensive CE offerings is to add or refine this dimension to one's private practice by virtue of its profitability. Perhaps need exists for these programs which offer the possibilities of avoiding cost prohibitive general anesthesia for families without medical insurance coverage. Such courses, are not without benefit. Their faculty are presumably well-versed and no doubt can aid experienced clinicians refine or upgrade their sedation skills. It might be argued that novices without extensive familiarity with a broad base of agents and the respective literature, weak airway management skills and experience, can be vulnerable to premature use and extrapolation that invites dosing mishap or inadvertent induction of deeper than intended levels of central nervous system and respiratory depression. There is at this time, no regulatory mechanisms in place to set boundaries for these courses. Assumptions that common sense will prevail for less experienced clinicians to avoid the temptation to extend the envelope of safety within their practices remains to be tested. An opposing argument might stipulate that new graduates with limited sedation experience or history of successful sedations in their training program will be unlikely to expand their use of sedation in private practice settings where mentorship is not readily available.

Conclusions and Summary

Need exists to further standardize teaching curricula in advanced pediatric dentistry training programs in the area of sedation and pharmacological management of challenging pediatric behavior. Scrutiny of whether existing training experience in sedation adequately prepare new graduates for clinical practice of pediatric dentistry has by todays standards shown elevated demands for enhancement of aspects of the its curriculum. For sedation alone, greater knowledge and proficiency seems warranted regarding advanced airway management, anesthesiology with respect to safer use of deeper planes of sedation, physical diagnosis and evaluation and medical management of adverse reactions. Potential advantages and rationale for extending the traditional 24 month program to elevate training experience in this arena might be considered. Enhanced regulation to assess and verify emergency equipment availability, proficiency and preparedness in the private sector seem warranted.

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