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The Rise of Procedural Sedation Beyond Anesthesiology: An Urgent Need for Unified Safety Standards

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ABSTRACT

Procedural sedation has expanded far beyond anesthesiology and is now routinely performed in dental practices, gastroenterology practices, endoscopy suites, interventional radiology, emergency departments, and diverse outpatient settings. This rapid growth has not been accompanied by unified safety standards, resulting in considerable variability in monitoring, training, and readiness to manage sedation-related complications. Current evidence demonstrates that inconsistent monitoring, particularly the absence of capnography, remains a key contributor to preventable respiratory complications. This policy brief proposes a harmonized, cross-disciplinary framework that emphasizes universal risk assessment, competency-based provider training, structured oversight, and standardized monitoring requirements.

Keywords: Conscious Sedation; Non-Operating Room Anesthesia (NORA); Capnography; Airway Management; Patient Safety

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Background and Problem Statement

Non-operating room anesthesia and sedation (NORA) has become an essential component of contemporary procedural care [1]. Nevertheless, numerous NORA sites are deficient in the staffing, equipment, and emergency infrastructure that are typically available in operating rooms [2]. Reviews of NORA practices underscore several challenges, including limited rescue capabilities, inadequate airway equipment, and significant variability in provider expertise [3]. The administration of Propofol and other agents capable of inducing deep sedation by non-anesthesiologists across various specialties has rendered specialty-specific governance inadequate for ensuring patient safety [4]

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Current Evidence of Risk and Variation

Recent literature reveals key patterns:

Inconsistent Monitoring: Systematic reviews have identified respiratory depression and hypoventilation as prevalent causes of adverse events, particularly in scenarios where capnography is not employed [5].

Improved Outcomes with Capnography: Prospective trials have demonstrated that incorporating capnography into routine monitoring reduces hypoxemia during endoscopic procedures by detecting apnea 1–2 minutes earlier than pulse oximetry [6].

Event Frequency and Severity: Meta-analytic data from over 900,000 sedations administered by non-anesthesiologists indicate measurable rates of hypoxia (0.4%), hypotension (0.38%), and bradycardia (0.09%), with severe complications occurring in approximately 0.012% of cases [7].

Medicolegal Trends: Analyses of sedation-related malpractice and critical event reports have identified inadequate monitoring, insufficient airway management skills, and limited institutional oversight as recurring contributors to adverse outcomes [8].

Collectively, these findings illustrate a clear risk gradient driven by heterogeneity in training, monitoring, and institutional governance

Policy Implications

The absence of unified sedation safety standards across clinical specialties creates a regulatory gap that directly impacts patient safety and quality of care. Establishing a harmonized framework would:

- Standardize baseline competencies and credentialing.
- Reduce variability in monitoring and enhance the early detection of physiological compromise.
- Enhance institutional accountability and quality assurance.
- Facilitate data sharing and improve the comparability of outcomes across disciplines.

Practical Challenges and Implementation Barriers

The implementation of unified sedation safety standards across diverse procedural environments presents several practical and operational challenges. Many non-operating room settings operate with limited staffing models, where providers simultaneously manage procedural tasks and sedation, thereby diminishing the capacity for dedicated physiological monitoring. In resource-constrained institutions, the acquisition and maintenance of capnography devices, airway equipment, and simulation-based training programs may be financially prohibitive [2]. Variations in infrastructure, particularly in small hospitals and outpatient centers, further exacerbate disparities in rescue capabilities and emergency preparedness [9].

Interdepartmental differences in professional culture and autonomy may also contribute to resistance, especially in specialties accustomed to independently managing sedation [10]. Additionally, the lack of national regulatory alignment can lead to inconsistent adoption, resulting in heterogeneity in practice, even within the same institution. Without targeted administrative support, funding mechanisms, and structured implementation strategies, these barriers may limit the feasibility of immediate nationwide or institution-wide standardization

Alternative Policy Pathways

Several policy pathways should be considered to strengthen sedation safety across clinical settings. One option is to retain specialty-specific governance, allowing each discipline to set its own standards; however, this approach maintains the current variability in monitoring, training, and emergency preparedness within the field. The second pathway is a tiered model in which requirements are based on the depth of sedation rather than provider specialty, reducing resource demands for low-risk procedures but still permitting inter-institutional variability. The third option involves institution-level credentialing without national coordination, enabling rapid local improvements but limiting consistency and equity across regions. In contrast, a unified cross-disciplinary framework provides the most comprehensive mechanism for the standardization, oversight, and reduction of preventable sedation-related harm.

Stakeholders and Implementation Considerations

The effective adoption of unified sedation safety standards depends on coordinated actions across key stakeholder groups. Health system leaders are responsible for allocating resources, ensuring equipment readiness, and establishing institutional oversight structures. Professional societies across relevant clinical fields influence practice expectations

and play an important role in promoting consistent and safe norms. Regulatory and accrediting bodies translate the recommended standards into operational requirements that reduce variations across settings. At the clinical level, nurses, anesthesiologists, proceduralists, and respiratory therapists must engage in targeted training and preparedness activities to ensure a safe response during sedation-related events. Patient safety organizations and insurers further reinforce implementation by emphasizing risk reduction and supporting standardized monitoring practices. Alignment among these groups is essential to achieve durable, system-wide improvements in sedation safety.

Recommended Policy Framework

1. Universal Pre-Procedural Risk Assessment: Implement standardized tools (e.g., ASA classification, airway assessment) for all procedural sedation candidates across all departments and specialties.
2. Competency-Based Training and Credentialing: Mandate structured education in sedation pharmacology, airway management, crisis resource management, and rescue techniques supported by simulation-based assessments.
3. Mandatory Monitoring Standards: Adopt uniform monitoring requirements, including electrocardiography (ECG), noninvasive blood pressure, continuous pulse oximetry, and capnography for all sedations involving agents with respiratory depressant potential.
4. Institutional Sedation Oversight Committees: Dedicated committees should be responsible for provider credentialing, equipment audits, incident review, and compliance monitoring.
5. Incident Reporting and Data Integration: Standardize the reporting of adverse events and establish institutional or national registries to guide quality improvement and research.
6. Interdisciplinary Simulation-Based Team Training: Conduct regular team-based drills addressing apnea, airway obstruction, hemodynamic instability, and sedation-related emergencies

Conclusion

Procedural sedation has expanded beyond anesthesiology; however, safety and governance structures have not evolved in accordance with this expansion. Recognizing procedural sedation as an interdisciplinary practice necessitates the establishment of unified policies that prioritize patient protection over professional boundaries.

A harmonized international standard for training, monitoring, and oversight will help ensure equitable and high-quality sedation care across all clinical environments. Regulators, hospital administrators, and professional societies should act promptly to align the standards and reduce preventable sedation-related harm.

Key Messages

- Procedural sedation is rapidly expanding across dentistry, gastroenterology, radiology, emergency medicine, and outpatient settings; however, safety standards remain fragmented.
- Variability in provider training, monitoring practices, and emergency preparedness can lead to preventable sedation-related harm.
- Evidence consistently shows improved safety with capnography and standardized competency-based training.
- A unified, cross-specialty governance framework is urgently needed to ensure equitable patient protection across all settings.

Authorship contribution statement

Conceptualization: L HM. and E D.S. Methodology: L HM. and E D.S. Formal analysis: E.DS. Writing-original draft: E D.S. Writing- review and editing: L HM. and E D.S. Supervision: E.DS. All authors have read and agreed to the publish the manuscript.

Ethical Consideration

This article did not involve human participants or animals; therefore, ethical approval was not required.

Declaration of Competing Interest

The authors have no conflict of interests related to this article.

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Data Availability

All data represented are available in the public domain.

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