

Integrating tailored approaches in perioperative care strategies for neurodivergent individuals



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Summary

Neurodivergent (ND) individuals exhibit variations in communication, behaviors, and cognition, which present both opportunities and challenges in healthcare settings. Anesthesiologists can offer personalized and compassionate care to ND patients throughout the surgical process. Yet, often, there is limited knowledge of the specific actions that anesthesiologists can take to build a healthcare environment that fully recognizes and meets the unique needs of ND patients. This document highlights the importance of integrating tailored communication and supportive strategies throughout the distinct stages of perioperative and intraoperative care.

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Introduction

“Neurodiversity” is a term that recognizes variations in brain function, highlighting the critical role diverse neurological profiles play in human society, analogous to the fundamental importance of biodiversity for sustaining life.¹ The neurodiversity paradigm embraces inclusivity, recognizing and valuing a wide range of behaviors among individuals, which manifests in a variety of differences in cognitive processes, social interactions, communication preferences and abilities, sensory perceptions, and learning styles. The spectrum of neurodivergent (ND) conditions includes autism, attention deficit hyperactivity disorder (ADHD), sensory processing disorder (SPD), and intellectual disability (ID), among others. ND individuals exhibit various sensory and behavioral patterns² (Supplementary Table S1). These variations can significantly impact a patient's experience in a hospital, creating the need for adapted protocols that better accommodate the patient's unique needs.

Traditionally, ND conditions have been approached through a deficit-based model, wherein individuals are diagnosed and treated with medications or interventions

to cure or minimize neurological differences.^{3,4} The neurodiversity perspective recognizes these conditions as variations in brain structure and function, resulting in diverse ways of perceiving and interacting with the world. While these variations can pose challenges that can benefit from supportive services and interventions, they may also offer advantages contingent on the interplay between the individual and their physical and social environments.⁴⁻⁶ However, the neurodiversity movement is not immune to controversy and has been criticized for possibly overlooking certain challenges that neurodivergent individuals, particularly those with the highest support needs, may experience in education, health, and work. The tensions between the ‘medical’ and ‘social’ models of disability may be particularly pronounced in a highly medicalized field like anesthesia. Anesthesiologists play a key role in actively adapting the perioperative environment, making it more accommodating and inclusive for ND patients, and thus, should have an understanding of the neurodivergent perspective (Fig. 1). This review aims to highlight the distinctive anesthetic needs of ND patients, providing a tailored approach to compassionate and effective care aligned with neurodiversity principles. The recommendations presented are particularly geared for individuals with intellectual and developmental disabilities (IDD) and those on the autism spectrum; however, they are also anticipated to benefit a broader range of neurodivergent individuals, given the frequent co-occurrence

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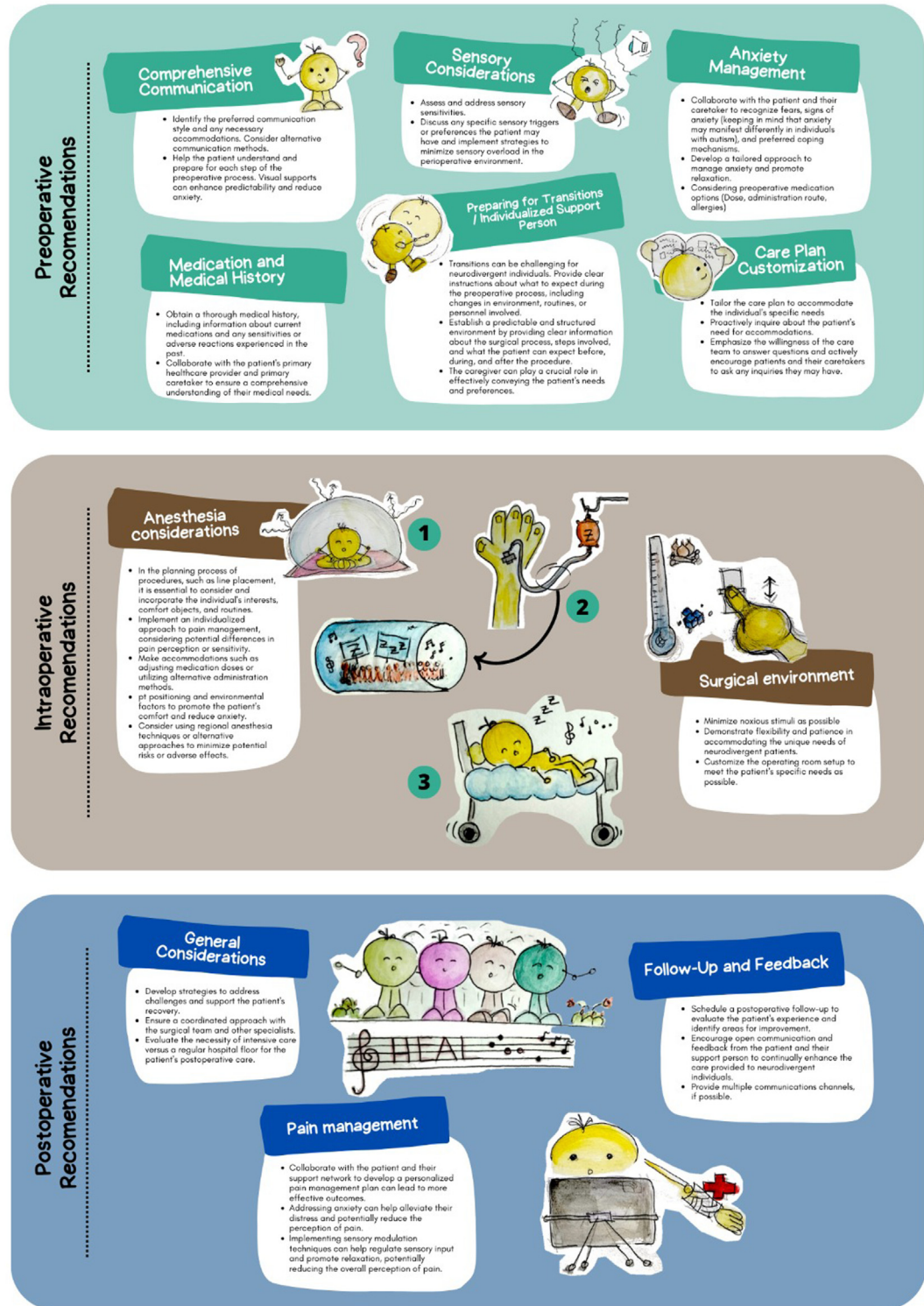


Fig. 1: Perioperative strategies to improve comfort and collaboration with neurodivergent patients.

of various forms of neurodivergence with IDD. Moreover, the overarching objective of cultivating a clinical environment that emphasizes the importance of accessibility and enhances clinicians' proficiency in discussing accommodations is expected to have a positive impact across all neurodivergent populations.

Preoperative assessment

Developing an adaptive care plan

For ND patients, optimizing the surgical experience begins during the planning phase of care. Adaptive care plans, developed preoperatively in collaboration with a child-life specialist or a psychologist, offer a practical approach to assist and prepare ND patients for navigating surgical experiences. These plans also aid the medical team in establishing expectations and goals for the patient (Supplementary Table S2). Adaptive care plans use individualized sensory and communication strategies to promote a more supportive and inclusive environment.^{7,8} One of the initial strategies that can be implemented during the planning phase of care is the rapid identification of an ND patient with an alert card/bracelet or a hospital passport. This ND patient identifier may empower ND individuals to communicate their specific needs and accommodations in medical settings, ensuring their safety, understanding, and respectful care. Offering relevant sensory and communication accommodations to all patients, regardless of whether they are identified as ND, is beneficial, as some ND individuals may not be comfortable carrying an identification alert or may be unaware of their neurodivergence.

Another strategy is to bypass the crowded waiting room, allowing staff to check in the patient in a private space. In a comprehensive care plan, the patient's preferred communication style should be included, as discussed below. Ultimately, the goal of the preoperative visit and creation of an adaptive care plan is to develop individual strategies unique to each patient that provide ND individuals with appropriate support, understanding, and tailored healthcare services.⁹ Over time, investing in adaptive care planning can lead to long-term time savings by reducing the number of missed or canceled procedures and facilitating smoother transitions, but further research is needed to fully understand its impact.

Destigmatizing neurodivergence in the medical environment

The medical environment is a central factor that influences a patient's sense of self and overall well-being.³ A discordance between an individual's feelings or perceptions and their external environment often leads to negative reactions, which may be amplified in hospitals, particularly in surgical and perioperative settings.⁷ Neurodivergent patients may have had previous experiences of stigma and unconscious bias that make them reluctant

to disclose their neurodivergent status, which may become a barrier to personalized and inclusive care.^{10,11} For NT people, understanding and appreciating specific behaviors and sensitivities can be challenging, often leading to misconceptions and mischaracterizations of ND patients (Table 1).^{12,13}

Creating a safe and non-judgmental environment where patients feel comfortable is paramount. The rapid identification and support of neurodivergent patients can provide them with appropriate care, understanding, and tailored healthcare services.⁹

Optimizing the preoperative visit

Preoperative planning presents an important opportunity to provide patient-centered support to reduce anxiety, increase predictability, and promote cooperation.⁹ Arranging a preoperative visit can enable patients and their support partners to ask questions, address concerns, and establish rapport with the healthcare team before the surgical procedure. This visit can also familiarize patients and caregivers with the surgical environment. Additional proactive planning through personalized preparation techniques such as picture-based educational books, visual schedules, social stories, preoperative tours, and other sensory-friendly strategies can foster a sense of empowerment for ND patients and their families and lead to a smoother surgical experience.⁷

Navigating neurodivergent communication

During the preoperative evaluation of ND patients, it is crucial to identify and accommodate the patient's preferred communication style to enhance engagement and facilitate successful information exchange. These may include alternative communication methods, such as visual aids or assistive technologies.¹² Additionally, written instructions, diagrams, or written or picture schedules that describe the visit and procedures in a concrete, step-by-step fashion can increase predictability, mitigate anxiety, and provide a structured framework tailored to the needs of ND patients.¹⁰ Enhancing communication channels between anesthesiologists and patients before surgery facilitates seamless transition at each stage of hospitalization.

Miscommunication between ND patients and clinicians can arise from misinterpreting tone of voice and facial expressions. It is, therefore, vital to prioritize understanding *what* the patient is saying rather than *how* they say it and to appreciate the benefits of their often straightforward communication style in a hospital setting. Finally, some ND patients may need to utilize different types of communication at different points in their hospital stay, such as patients who typically communicate through speaking but benefit from using augmentative and alternative communication (AAC; i.e. devices, symbols, gestures, or other means) to communicate when under stress. Care partners are

Misconception	Uniformity within Neurodiversity	Limited Social Skills	Inability to Empathize	Lack of pain perception	Lack of intelligence	Lack of agency	Behavioral problems
Reality	Neurodivergent conditions exhibit diverse characteristics, with each individual's experience varying significantly.	Neurodivergent individuals may exhibit distinct social skills and communication styles compared to neurotypical individuals. Their unique modes of interaction and expression hold inherent value and significance.	While some neurodivergent individuals may struggle with social cues, empathy is not inherently absent in neurodivergent people.	Less than half of neurodivergent children receive local anesthetics during blood draws, a standard practice for neurotypical children (13). Sensory processing differences in neurodivergent individuals can result in varying pain sensitivities, but it's not a universal trait across all neurodivergent people.	Neurodivergent individuals showcase a diverse spectrum of cognitive abilities. Recognizing and appreciating their unique strengths and intelligence is crucial, given the significant variability within this diverse community.	Neurodivergent individuals are often seen as passive recipients of care and support, rather than being recognized for their strengths, talents, and potential contributions to society.	Most patients are not intentionally exhibiting difficult behavior; rather, neurodivergent individuals are doing their best to navigate overwhelming or perplexing environments. Their behaviors may be influenced by factors such as pain, anxiety, sensory overload, or other challenges they are facing.
How to address	Acknowledge and appreciate the intricate complexity and diversity within the neurodivergent community, emphasizing the need for individualized approaches.	Embrace and accommodate differences in social skills. Cultivating empathy can greatly enhance understanding and connection with these patients.	Acknowledge the unique perspectives on emotions and empathy in neurodivergent individuals. Cultivating empathy can significantly enhance understanding and connection with these patients.	Tailor communication to individual needs, utilizing visual supports and scales, considering sensory variations, collaborating with support networks, and adopting personalized approaches based on behavioral cues.	Recognize that many neurodivergent individuals possess exceptional skills, such as attention to detail, pattern recognition, and divergent thinking. Recognize the unique insight people with intellectual disabilities have to offer	Involve the patient as much as possible (or as much as they want) instead of only directing communication to the caregiver.	Foster a neutral/accepting environment. Avoid expressing frustration (sighing, commenting on how the patient is not cooperating, generally being made to feel like a burden) to the patient or their care givers.

Table 1: Common misconceptions related to neurodivergent individuals.

invaluable in interpreting communication that may seem idiosyncratic.

Creating accommodating environments

Preoperative evaluation of ND patients requires close attention to sensory issues, intending to minimize sensory overload. This includes adjusting lighting, controlling noise levels, reducing contacts, limiting the number of providers in and out of the room, and providing soothing tools like weighted blankets or headphones.^{9,12} It is important to address anxiety and consider that ND individuals may express fear differently and have unique coping methods. Anxiety can be identified with patient and caretaker input and improved through a personalized approach, including using suitable preoperative medication, minimizing fasting duration, fostering relaxation, and managing stress.⁸

Preparing for transitions

Providing a separate information sheet or a personalized book with information about the surgery, anesthesia, and contact details for the preoperative clinic/team can help reduce anxiety and confusion when preparing ND patients for transitions in the perioperative setting.⁷ The care team should provide clear, step-by-step, concrete instructions regarding the preoperative process, including changes in the environment, routines, and

personnel involved. Proactively inquiring about the patient's need for accommodations, emphasizing the care team's willingness to answer questions, and actively encouraging patients and caretakers to express inquiries allow for targeted adjustments and foster open communication with the medical team. A familiar support person plays a vital role in the preparation, continuity of care, emotional support, communication, and advocacy for the patient.

Involving multidisciplinary assessments

The collaborative involvement of a multidisciplinary team, including anesthesiologists, psychologists, psychiatrists, child life specialists, caregivers, and other medical specialties, is vital for comprehensive preoperative evaluation tailored to each ND patient. The combined expertise offers insights into cognitive, behavioral, and medical aspects, ensuring a thorough medical history review and understanding of specific conditions. Where applicable, collaboration with the patient's primary healthcare provider and caretaker is important to understand their medical requirements and developmental history.^{14,15}

The intraoperative environment

Anesthesia providers can optimize the operating room environment by reducing excessive stimuli, which may

Preoperatively**What can the anesthesiologist specifically do to create a tailored preoperative plan in partnership with the patient and their caregivers?**

Try to ensure that all healthcare providers involved in the perioperative process are well-informed and trained to support neurodivergent patients effectively.

Encourage open communication regarding any accommodation needs the patient/caregiver may have.

Provide the patient with clear expectations regarding the time available for their consultation, the number of questions you can address, and, if necessary, guide them on where or to whom they can direct additional inquiries that you may be unable to answer or accommodate due to time constraints.

Maintain a nonjudgmental attitude. Some patients might have phobias or anxieties that seem unusual, but that are still important to address for the individual's peace of mind.

Intraoperative**What can the anesthesiologist specifically do to improve the intraoperative experience?**

Whenever feasible, prioritize line placement under anesthesia, unless the patient expresses their agreement to proceed without it.

Offer the patient the opportunity to listen/watch to their favorite song or movie on repeat while undergoing an IV insertion.

Offer the patient a fidget toy to hold in their other hand during the placement of the IV, ensuring a more comfortable experience.

Provide noise-canceling headphones.

Reduce noise and number of people the patient interacts with

Close doors

Dim lights

Be mindful when leaving Foley, NG tubes and surgical drains, and remove as soon as possible.

Reduce use of non-absorbable sutures.

Allow for additional time, breaks, or adjustments during the surgical process as necessary.

Adjust the temperature.

Provide comfortable seating or positioning options (e.g., Provide the option to sit up or be slightly inclined during mask induction)

Accommodate any adaptive equipment they require.

Offer appropriate choices to promote control

Have one point person providing step-by-step sensory information to the patient

Lower volume on alarms

Utilize "first, then" language

Offer the option to watch IV insertion or be distracted by favorite video or song

Postoperative**How can the anesthesiologist contribute to the planning of postoperative care?**

Proactively identify potential challenges in the postoperative period, such as pain/anxiety management issues, sensory sensitivities, or communication preferences, and effectively communicate them to the postoperative care team.

Be aware of any potential interactions or contraindications between postoperative pain medications and the patient's existing medications.

The presence of a supportive individual can enhance communication between the patient and healthcare providers, facilitating the implementation of appropriate pain management interventions.

Visual aids, such as pain scales or pictorial representations, can assist neurodivergent individuals in articulating their pain levels and locating the source of pain.

Deep breathing exercises, relaxation techniques, or providing a calm and predictable environment.

Minimize unnecessary sensory stimuli

Provide weighted blankets, offering access to preferred sensory stimuli (e.g., fidget toys), or creating a quiet and soothing environment.

Consider a telehealth visit instead of a physical visit if the patient is at home.

Verbal discussions, suggestion boxes, or anonymous surveys

In-person conversations, written communication, email, or online platforms for feedback submission.

Table 2: Empowering anesthesia providers: concrete strategies for neurodivergent patient care.

cause stress and overwhelm individuals with sensory issues.¹⁰ Strategies include limiting the number of operating room personnel, mindful noise control, dimming lighting, comfortable positioning, and minimizing unexpected touch. Providing noise-canceling headphones or music options can help reduce excessive or unpleasant noises. Implementing scent-free policies and clear communication aids in creating a calm and soothing environment.

Explaining procedures beforehand can help ND individuals feel more comfortable during surgery. Placing

an IV line before the procedure can be difficult. If needed, sedation should be discussed as an option for the patient. Premedication can help manage stress and sensory sensitivities ([Supplementary Table S3](#)), improving the patient's experience during medical procedures by reducing distress.^{9,16,17} Premedication can be administered through various routes to suit individual preferences. Anesthesiologists can explore alternative techniques, like desensitization protocols, calming methods, distraction techniques, and collaboration with child-life specialists, to address sensory challenges.^{8,16,18,19}

In general, the anesthetic management for ND patients, specifically regarding medications, closely follows standard practices for NT patients, with no strong evidence suggesting differential responses to anesthetic medications in ND individuals.²⁰ Providing effective pain relief through intraoperative administration of adjuvants such as acetaminophen, anti-inflammatory medications, and utilizing local/regional anesthesia can be helpful, if medically indicated. Implementing preventive measures for postoperative nausea and vomiting (PONV) and maintaining optimal intraoperative hydration can facilitate the early removal of intravenous cannulas, which may help prevent negative emotional experiences in the recovery room.

Postoperative care and transitions

Postoperative care and transitions for ND patients require implementing personalized pain management strategies, recognizing non-verbal cues, developing alternative pain assessment methods, monitoring for adverse reactions, facilitating smooth transitions, and collaborating with the patient's support system. When deciding between a postoperative intensive care unit (ICU) bed or a bed on the ward for an ND patient, it is essential to consider the patient's medical condition, sensory issues, mobility, safety, caregiver support, and recovery plan. Alerting the postoperative care team to some of these issues may help reduce stress and anxiety for patients and their caregivers.

Pain assessment and measurement

Pain assessment encompasses cognitive, physiological, sensory, behavioral, psychosocial, and environmental factors, making it a complex and subjective process. Self-report pain measurement tools like the 11-point numerical rating scale (NRS) for adults and adolescents or a visual analog scale (VAS) (i.e.: Wong-Baker FACES) for children are considered the gold standard.²¹

For non-speaking or minimally verbal ND patients or patients with difficulty understanding or communicating their pain, validated behavioral/observation tools have been developed, including the Revised-Face, Legs, Activity, Cry, Consolability (r-FLACC),²² Child Facial Coding System (CFCS), and Revised Noncommunicating Children's Pain Checklist (NCCPC-R).¹³ These tools consider nonverbal cues like squirming, tension, self-injury, moaning, arching, crying, grimacing, and flushing. The Parental Post-Operative Pain Measure (PPPM) is a 15-item tool for at-home assessment of post-surgery pain, with a score greater than 6 indicating acute pain.²³ Self-report scales should be tried first before using behavioral/observational tools.

It is important for clinicians to 1) identify the correct pain scale to use for the patient's developmental level and

communication preferences; 2) avoid over-attributing behaviors (i.e.: rocking, flapping, etc.) solely to ND conditions and consider pain as a potential cause for an increase in self-stimulatory/regulation behaviors¹²; and 3) involve caretakers early and often in identifying pain and distress in ND patients. Caregivers provide invaluable support and insight to ensure that the needs of the ND individual are adequately addressed.

Pain management

Individualized pain management strategies are essential as ND patients may display different pain thresholds and/or the ability to report verbally or visually on their internal states and pain experience. While some individuals may experience hyposensitivity and require less pain medication, others may experience hypersensitivity and significant pain.²⁴ Before surgery, the anesthesiologist should complete a comprehensive pain history, including 1) responses to prior acute pain or injury, 2) concerns about ongoing chronic pain, 3) a review of exposure to pain medications including what the ND patient or caregiver believed worked or did not work well. It is important to avoid setting firm expectations on what pain level is expected postoperatively, as these may not be accurate in the ND patient. Under or overestimating pain following a procedure may result in a breach of trust between the clinician, the patient, and/or caregivers. Frequent reassessment of pain using the above tools is fundamentally important. It allows the ND patient and/or caregivers to evaluate the response to therapeutic pharmacologic and non-pharmacologic interventions to manage pain.

Monitoring for adverse reactions or delayed recovery

This requires a comprehensive approach beyond patient self-report. General instructions like "Come back if it gets worse" or "Watch out for swelling/redness" may leave ND patients uncertain about when to seek further medical attention. Introducing quantifiable metrics for adverse reactions to address this issue is helpful. For example, specific fever thresholds or predetermined redness areas provide explicit guidance, ensure accurate monitoring, and empower patients, caregivers, and other support persons. Pictures and written instructions should be used whenever possible.

Follow-up and feedback

Follow-up care and long-term considerations for ND patients should involve collaboration with patients' support systems. Engaging with the patient and their family members, caregivers, or advocates can ensure the patient receives appropriate ongoing care and support. This collaboration should include comprehensive discharge planning, providing necessary resources, and educating the support system regarding the patient's

needs and any potential challenges they may face during recovery.

Conclusion

Anesthesia providers can enhance the care of ND patients by proactively recognizing and addressing their distinctive needs and preferences. Embracing neurodivergence in perioperative care is crucial for providing inclusive and effective healthcare to ND patients. Pre-operative efforts should focus on destigmatization, optimized communication, sensory accommodations, and tailored care plans. Intraoperatively, minimizing sensory overload and stress can improve the surgical experience. Postoperatively, personalized pain management and smooth transitions, with input from the patient's support system, are essential. Integrating neurodivergent-informed practices ensures equitable treatment and enhances overall healthcare outcomes for ND individuals. By creating an environment that aligns seamlessly with the unique needs of ND patients, we can collectively foster an atmosphere that upholds their well-being and dignity at every stage of perioperative care. The proposed strategies may seem geared toward well-resourced settings, but many can be effectively applied in less resourced environments. These recommendations serve as a starting point and can be adapted to the specific needs and resources of each institution or country.

Contributors

- Ingrid Moreno Duarte, MD: literature search, figures, data collection, data analysis, data interpretation, writing
- Sam Brandsen, PhD: literature search, data analysis, data interpretation, writing
- Geraldine Dawson, PhD: literature search, data analysis, data interpretation, writing
- Lisa M. Einhorn, MD: literature search, data collection, data analysis, data interpretation, writing
- Madhav Swaminathan, MD, MMCI: data analysis, data interpretation, writing

Data sharing statement

Not Applicable.

Declaration of interests

The authors have the following declaration of interests to disclose:

Ingrid Moreno Duarte, MD: No conflicts relevant to this paper.
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Appendix A. Supplementary data

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References

- 1 Blume H. *Neurodiversity*. The Atlantic. 1998.
- 2 Doherty M, Haydon C, Davidson IA. Recognising autism in healthcare. *Br J Hosp Med*. 2021;82(12):1–7.
- 3 Sonuga-Barke E, Thapar A. The neurodiversity concept: is it helpful for clinicians and scientists? *Lancet Psychiatr*. 2021;8(7):559–561.
- 4 Franke B, Team MtcoAM. Editorial: it is time to modernize the concept of ADHD. *J Child Psychol Psychiatry*. 2023;64(6):845–847.
- 5 Schippers LM, Horstman LI, van de Velde H, et al. A qualitative and quantitative study of self-reported positive characteristics of individuals with ADHD. *Front Psychiatry*. 2022;13:922788.
- 6 Dupuis A, Mudiyansele P, Burton CL, Arnold PD, Crosbie J, Schachar RJ. Hyperfocus or flow? Attentional strengths in autism spectrum disorder. *Front Psychiatry*. 2022;13:886692.
- 7 Liddle M, Birkett K, Bonjour A, Risma K. A collaborative approach to improving health care for children with developmental disabilities. *Pediatrics*. 2018;142(6).
- 8 Winterberg AV, Jones E, Ding L, Hill LM, Varughese AM. Adaptive care for perioperative patients with developmental disabilities: an exploration of interventions and family experience. *J Pediatr Health Care*. 2022;36(6):529–539. <https://doi.org/10.1016/j.pedhc.2022.05.019>.
- 9 Vlassakova BG, Emmanouil DE. Perioperative considerations in children with autism spectrum disorder. *Curr Opin Anaesthesiol*. 2016;29(3):359–366.
- 10 Doherty M, Neilson S, O'Sullivan J, et al. Barriers to healthcare and self-reported adverse outcomes for autistic adults: a cross-sectional study. *BMJ Open*. 2022;12(2):e056904.
- 11 Como DH, Florindez LI, Tran CF, Cermak SA, Stein Duker LI. Examining unconscious bias embedded in provider language regarding children with autism. *Nurs Health Sci*. 2020;22(2):197–204.
- 12 Nicolaidis C, Raymaker DM, Ashkenazy E, et al. "Respect the way I need to communicate with you": healthcare experiences of adults on the autism spectrum. *Autism*. 2015;19(7):824–831.
- 13 Rattaz C, Dubois A, Michelon C, Viellard M, Poinso F, Baghdadli A. How do children with autism spectrum disorders express pain? A comparison with developmentally delayed and typically developing children. *Pain*. 2013;154(10):2007–2013.
- 14 Dhanasekara CS, Ancona D, Cortes L, et al. Association between autism spectrum disorders and cardiometabolic diseases: a systematic review and meta-analysis. *JAMA Pediatr*. 2023;177(3):248–257.
- 15 Hand BN, Angell AM, Harris L, Carpenter LA. Prevalence of physical and mental health conditions in Medicare-enrolled, autistic older adults. *Autism*. 2020;24(3):755–764.
- 16 Ciccozzi A, Pizzi B, Vittori A, et al. The perioperative anesthetic management of the pediatric patient with special needs: an overview of literature. *Children*. 2022;9(10).
- 17 Shirakami G, Tanimoto K, Matsuura S, Fukuda K. [Ambulatory anesthesia for an adult patient with autism and epilepsy: sedation using oral and intravenous dexmedetomidine]. *Masui*. 2008;57(6):735–738.
- 18 Sahyoun C, Krauss B, Bevacqua M, Antonsen A, Jardinier L, Barbi E. Safety and efficacy associated with a family-centered procedural sedation protocol for children with autism spectrum disorder or developmental delay. *JAMA Netw Open*. 2023;6(5):e2315974.
- 19 Pettersson E, Christensen BM, Berglund IG, Huus K. Healthcare professionals' experiences of situations during a procedure with a child with autism spectrum disorder in the high-technology

- environment. *Child Care Health Dev.* 2023;49(6):1087–1095. <https://doi.org/10.1111/cch.13119>.
- 20 Arnold B, Elliott A, Laohamroonvorapongse D, Hanna J, Norvell D, Koh J. Autistic children and anesthesia: is their perioperative experience different? *Paediatr Anaesth.* 2015;25(11):1103–1110.
- 21 Birnie KA, Hundert AS, Lalloo C, Nguyen C, Stinson JN. Recommendations for selection of self-report pain intensity measures in children and adolescents: a systematic review and quality assessment of measurement properties. *Pain.* 2019;160(1):5–18.
- 22 Malviya S, Voepel-Lewis T, Burke C, Merkel S, Tait AR. The revised FLACC observational pain tool: improved reliability and validity for pain assessment in children with cognitive impairment. *Paediatr Anaesth.* 2006;16(3):258–265.
- 23 Franck L, Noble G, Liossi C. Translating the tears: parents' use of behavioural cues to detect pain in normally developing young children with everyday minor illnesses or injuries. *Child Care Health Dev.* 2010;36(6):895–904.
- 24 Nicolardi V, Fanizza I, Accogli G, Macchitella L, Scoditti S, Trabacca A. Pain assessment in autism: updating the ethical and methodological challenges through a state-of-the-art review. *Neuro Sci.* 2023;44(11):3853–3861. <https://doi.org/10.1007/s10072-023-06942-2>.