FAQs for Drug Concentration Standardization Materials - for Anesthesiologists Based on Joint Commission Historical Citations

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Question	Proposed Response
FAQ #1: What is the origin and history of the ASA's effort to standardize drug concentrations?	Initiatives to standardize intravenous medications have been underway since the early 2000s based on the perceived importance of best practices' dissemination to patient safety, cost reduction, consistent education of trainees across institutions and interhospital patient transport. Exemplary initiatives include guidance from the Joint Commission in 2004 to standardize pediatric infusion concentrations; a national summit convened by the American Society of Hospital Pharmacists (ASHP) in 2008 ("Proceedings of a Summit on preventing patient harm and death from I.V. medication errors" *Am J Health-Syst Pharm*. 2008;65:2367-79; and the FDA-ASHP "Standardize for Safety" initiative (https://www.ashp.org/Pharmacy-Practice/Standardize-4-Safety-Initiative). A large percentage of U.S. hospitals have implemented enterprise-wide clinical information systems, such as EPIC and Cerner; these systems have acted as a forcing function for hospitals to achieve harmonization of drug concentrations across many scenarios, settings and domains, including CPOE (computerized provider order entry); formularies; order sets; I.V. room compounding practices; pharmaceutical supply chain; and 'one-step' infusion ordering capabilities within anesthesia recordkeeping applications such as EPIC's "OpTime". This initiative within the Anesthesia specialty is responsive to these trends; paying particular attention to situations in the operating room, interventional environments, and critical care, including NICU/PICU, where the standard formularies and concentrations developed in (3) may not have fully addressed our specialty's needs.
FAQ #2 - Why are only 10 drugs featured in the ASA's list of standardized concentrations?	The ASA's initial process has focused on high-potency drugs, will be ongoing and will be expanded over time, based on feedback. The current list includes representatives from various pharmacological categories: • ***Opioids***: hydromorphone; remifentanil • ***Sedative/Hypnotic***: ketamine; dexmedetomidine • ***Anticoagulants***: heparin • ***Antiarrythmics***: lidocaine • ***Hormone/metabolic***: insulin • ***Vasopressors***: epinephrine; norepinephrine; phenylephrine ASA members expressed an interest in expanding the list in the future, with several requests for morphine, vasopressin and other drugs.

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FAQ #3 - Do these drug concentrations apply to all patients?	At present, the list is divided into ***adult*** patients and ***pediatric patients greater than 10 kg.*** Standard concentrations for neonatal and pediatric patients less than 10 kg may be added in a subsequent phase.
FAQ #4 - Why do some drugs have a single standard concentration, and some other drugs have multiple standard concentrations?	After a thorough review of national initiatives, every effort has been made to adopt a single standard concentration for each drug. However, certain drugs, particularly vasopressors, are titrated to effect over a very wide-dose rate range. For these drugs, a single concentration could result in drug flow rates that were ***unacceptably slow*** (beyond the capabilities of infusion pumps) or ***unacceptably high*** (resulting in fluid overload, especially in pediatric or fluid-restricted patients). For guidance on drugs where there is more than one standard concentration, the ASA may release guidance, in the form of tables or charts, to assist a caregiver in choosing which one of a set of standard concentrations to use in a particular patient, based on the patient's weight, the expected dose rate of the drug, and the need or desire to limit fluid intake.
FAQ #5 - What if my hospital's formulary, guidance in provider order entry, standard order sets or premixed floor stock medications dispensed from the pharmacy are not consistent with these concentrations proposed by the ASA?	In many institutions where anesthesia providers work, there may already be comprehensive initiatives underway or in place to "harmonize" standard drug concentrations across the enterprise formulary, order sets, infusion pump drug libraries, and floor stock premixed infusions from outsourced suppliers or mixed in the hospital I.V. room. If this is the case, the ASA's proposed standard concentration list can be a 'benchmark for discussion' ***to make sure that the drug concentration standards that are in place in the enterprise are fully meeting the needs of the anesthesia providers.*** In institutions where standardization initiatives are ***NOT*** yet underway, the ASA's proposed standard concentrations can be a starting point for discussion with pharmacy administration and the quality and safety teams as to the expectations from our profession.
FAQ #6 - Will the dilution and compounding process to achieve these standard concentrations result in wasted medications and exacerbation of drug shortages (i) if pharmacists are mixing drugs for use in the operating room according to the ASA's proposed standard concentrations, or (ii) if anesthesiologists are mixing these drugs at the point of care?	The ASA has no reason to believe that the process of mixing these proposed concentrations will exacerbate drug shortages. When syringes are prepared in batches in an I.V. room or outsourced supplier, individual syringes are typically drawn from a bulk bag with minimal wastage. When syringes are mixed at the point of care from standard glass vials, the concentrations have been chosen with minimization of wastage in mind.

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FAQ #7 - Does the ASA's list of proposed standard concentrations address only syringe containers and infusion via syringe pumps, or do these concentrations also apply to infusions prepared in bags for administration by large volume pumps?	The concentrations apply to ***both*** syringe pumps and large volume pumps. Syringe pumps are common in neonatal and pediatric intensive care settings and in operating room settings, so particular attention has been paid to creating standard concentrations that work well with the ability of syringe pumps be accurate at low fluid flow rates (3.0 ml/hr or lower). When a drug has multiple concentrations, in some patients who are pediatric or fluid restricted, the ***higher concentrations*** will be suitable for ***syringe pump*** accurate delivery and titration of e.g. vasopressors at low flow rates. Separate guidance / training materials will be forthcoming from the ASA on key principles to understand when using syringe infusion pumps at low flow rates. ***Each facility should develop a policy to determine whether syringe pumps should be available to anesthesia practitioners, and in what settings***, such as O.R.s, critical care and interventional settings where sedation is provided. This decision will need to take into account what type of large volume pumps are in use; some large volume pumps cannot be set to deliver fluids at lower than 0.5 ml/hr.
FAQ #8: 8 - Why are there no bolus recommendations for norepinephrine?	Norepinephrine is an extremely powerful vasoconstrictor, and the ASA cannot recommend the use of this drug by bolus except in highly specialized settings (cath lab, cardiac surgery, etc.) by specialists operating under their own clinical practice guidelines.
FAQ #9 - Are these concentrations recommended for peripheral infusion, or are some of these concentrations restricted to central line administration?	The hazards of peripheral administration of short-acting vasopressors, with respect to effective delivery to the central circulation, and with respect to hazards if extravasation occurs, are well known to anesthesia practitioners. Each facility should make and disseminate its own clinical practice guidelines with respect to peripheral administration of vasopressors. In unstable or deteriorating patients, peripheral administration of vasopressors may be permitted for a short period of time while central access is achieved.