

# GUIDELINE FOR PNEUMATIC TOURNIQUET SAFETY

The Guideline for Pneumatic Tourniquet Safety was approved by the AORN Guidelines Advisory Board and became effective as of May 11, 2020. The recommendations in the guideline are intended to be achievable and represent what is believed to be an optimal level of practice. Policies and procedures will reflect variations in practice settings and/or clinical situations that determine the degree to which the guideline can be implemented. AORN recognizes the many diverse settings in which perioperative nurses practice; therefore, this guideline is adaptable to all areas where operative or other invasive procedures may be performed.

## Purpose

This document provides guidance to perioperative team members for the safe use of **pneumatic tourniquets** during operative or other invasive procedures. The guideline provides information about applying and removing tourniquet cuffs; monitoring a patient before, during, and after tourniquet inflation; and maintaining tourniquet equipment.

Pneumatic tourniquets are used to obtain a near bloodless field during extremity surgeries or to confine a bolus of **intravenous regional anesthesia** (IVRA) in an extremity. Pneumatic tourniquets provide arterial occlusion through an automated pressure regulator and are attached by tubing to a bladder in a cuff that fits the extremity circumferentially. Surgeons and anesthesia professionals continue to use pneumatic tourniquets,<sup>1-5</sup> although there is conflicting evidence as to whether complications such as increased estimated blood loss and increased blood transfusion rates outweigh the benefits of their use. Researchers define estimated blood loss in multiple ways and use varying terminology for blood loss during pneumatic tourniquet-assisted procedures, including measured, intraoperative, postoperative, calculated, and total blood loss. Many researchers have found that tourniquet use decreases intraoperative and measured blood loss, but there can be a paradoxical increase in postoperative blood loss, which may result in a total blood loss that is comparable to blood loss when no tourniquet is used.<sup>6-8</sup>

Some researchers have concluded that extremity surgery without a tourniquet can be safe and efficient for patients with certain conditions.<sup>6-10</sup> Although serious patient injuries related to the use of pneumatic tourniquets are uncommon, some patient conditions may increase the risk for complications associated with pneumatic tourniquet use. These conditions include diabetic neuropathy,<sup>11</sup> previous revascularization,<sup>12</sup> sickle cell anemia,<sup>11,13</sup> severe

infection,<sup>13</sup> and a history of or current venous thromboembolism (VTE).<sup>11,13</sup> Complications that have been associated with pneumatic tourniquet use include uncomfortable skin redness,<sup>14</sup> chemical burns,<sup>14-17</sup> **compartment syndrome**,<sup>18</sup> femoral nerve palsy,<sup>19</sup> acute pulmonary edema,<sup>20</sup> cardiac arrest,<sup>21</sup> and fatal pulmonary edema.<sup>22</sup>

Tourniquets used for phlebotomy or traumatic bleeding (eg, field tourniquets) are outside the scope of this document. Other topics beyond the scope of this guideline include

- the use of medications to
  - prevent tourniquet complications (eg, heparin, steroids),
  - reduce ischemia damage (eg, dexamethasone, antioxidants),
  - alleviate pain during inflation (eg, oxygen, magnesium), and
  - facilitate hemostasis (eg, epinephrine, tranexamic acid);
- **preconditioning techniques**;
- **reperfusion techniques**;
- techniques for **staggered tourniquet deflation**; and
- prevention and management of local anesthetic systemic toxicity (See the AORN Guideline for Care of the Patient Receiving Local Anesthesia<sup>23</sup>).

## Evidence Review

A medical librarian with a perioperative background conducted a systematic search of the databases Ovid MEDLINE®, Ovid Embase®, EBSCO CINAHL®, and the Cochrane Database of Systematic Reviews. The search was limited to literature published in English from January 2012 through February 2019. At the time of the initial search, weekly alerts were created on the topics included in that search. Results from these alerts were provided to the lead author until September 2019. The lead author requested additional articles that either did not fit the original search criteria or were discovered during the evidence appraisal process. The lead author and the medical librarian also identified relevant guidelines from government agencies, professional organizations, and standards-setting bodies.

Search terms included *acido\**, *acute capillary rupture syndrome*, *adductor canal block*, *adjustment pressure*, *ankle block*, *arm injur\**, *arterial occlusion pressure determination*, *arterial occlusion pressure estimation*, *arterial tourniquet*, *arthroplasty*, *avascular necrosis*, *Bier block*, *blood pressure*, *bloodless field*, *bloodless surgery*, *brachial plexus neuropath\**, *calcifications*, *carbon dioxide*, *cardiac output*, *chemoprophylaxis*, *compartment*