

Reducing Pain Associated with Arterial Punctures for Blood Gas Analysis

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■ ABSTRACT:

Arterial punctures for arterial blood gases (ABGs) analysis are described as the most painful laboratory procedure and are performed without the benefit of pain management. This study originated from one nurse's concern about the level of pain her hospitalized patients endured when she drew their ABGs. A review of the literature found that ABG pain relief has not been studied in hospitalized patients. Therefore, this study explored the question "Can the pain of arterial blood gas draws be reduced through the use of infiltration with a local anesthetic agent?" This study compared the pain scores of 40 hospitalized patients who received either no intervention or one of three analgesic interventions (infiltration of 0.7 ml 1% lidocaine, 0.7 ml buffered 1% lidocaine, or 0.7 ml of bacteriostatic saline at the arterial puncture site). Results showed that, although lidocaine and buffered lidocaine are effective in reducing the pain associated with the arterial puncture, plain lidocaine was the only intervention in which the pain rating score for the overall experience was significantly diminished. This study is limited by partial randomization, small sample size, and patient duress; however, it provides a foundation for further nursing research that explores methods to reduce the pain associated with this very painful procedure. Future studies should be directed at larger, diverse populations, multiple operators, and comparison of interventions to topical analgesics and nonpharmacological measures.

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Pain relief has become a major focus in health care. The Joint Commission has identified pain management as a measure of quality health care and patient satisfaction, which will be tied to federal reimbursement in the future. The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey publicizes perceptions patients have of their hospital experience by asking questions such as, "How often did hospital staff do everything they could to help you with your pain?" (HCAHPS Online, 2009). Additionally, specialty nursing organizations have written position statements advocating pain management as a priority standard of care (Academy of Medical-Surgical Nurses, 2009; American Society for Pain Management Nursing, 2008; Czarnecki et al. 2011; Hospice

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and Palliative Nursing Association, 2008). This study addressed one area of pain experienced by patients at OSF Saint Anthony Medical Center (SAMC): the pain associated with the drawing of arterial blood gases (ABGs).

Over 10,000 ABGs are performed annually at SAMC. Arterial punctures for ABG are described as the most painful laboratory procedure (Clinical Laboratory Standards Institute, 2004) and are performed without the benefit of pain management (Hudson, Dukes, & Reilly, 2006; Malley, 2010). In a study of 100 critical care patients, obtaining the blood sample for arterial blood gas (ABG) analysis was the number one factor that moderately or severely worried the participants, and the participants identified this pain as separate from regular pain (Hudson et al., 2006). Despite recommendations from nursing and medical organizations, clinicians remain hesitant to use local analgesia because of concerns that the pain from injection of the anesthetic is just as painful as that of the arterial puncture, that infiltration of an anesthetic will hinder the ability to obtain the sample, that it takes too long to administer the anesthetic, or that the pain is no worse than a venipuncture (Hudson et al., 2006; Malley, 2010).

Administration of a local anesthetic before arterial puncture is the recommended standard of practice for both critical care (Wiegand & Carlson, 2005) and emergency department nurses (Peohl, 2004). However, a review of the Medline and CINAHL databases from 1990 through 2012 did not reveal one intervention that was most effective in reducing pain associated with arterial punctures. Furthermore, no systematic studies on the reduction of pain for arterial punctures in hospitalized patients were identified. There was some evidence that buffering and warming of lidocaine may reduce pain associated with intradermal and subcutaneous infiltration (Colaric, Overton, & Moore, 1998; Giner, Casan, Belda, Gonzalez, Miralda, & Sanchis, 1996; Lightowler & Elliott, 1997; Martin, Jones, & Wynn, 1996); and normal saline and lidocaine are effective for venipunctures for intravenous therapy (McNaughton, Zhou, Robert, Storrow, & Kennedy, 2009; Ong, Lim, & Koay, 2000; Xia, Chen, Tibbits, Reilley, & McSweeney, 2002). Topical anesthetics have demonstrated some success with local anesthesia for arterial punctures; however, the lengthy time of onset (ranging from 30 minutes to two hours) generally precludes widespread use (Aaron, Vandemheen, Naftel, Lewis, & Rodger, 2003; Argoff, 2003; Olday, Walpole, & Wang, 2002). Additionally, many of these studies were conducted on nonhospitalized participants. No studies were identified that tested intradermal or

subcutaneous infiltration with an analgesic before radial artery puncture for ABG draws. Thus, despite recommendations, local analgesia before arterial puncture for ABG analysis has not been tested and is not a routinely provided standard of care for hospitalized patients.

Critical care nurses and laboratory personnel routinely obtain specimens for ABGs at OSF. The standard practice is to draw the ABGs without local anesthesia before the arterial puncture. Nonverbal and verbal feedback from patients indicate that this is a very painful procedure and one that the nursing staff believes they have a responsibility to diminish if possible. As the literature does not support an evidence-based practice for the administration of analgesia before arterial punctures, we conducted a study to identify an effective method of pain relief. Therefore, this study addressed the question "Can the pain of arterial blood gas draws be reduced through the use of infiltration with a local anesthetic agent?" The aim of this study was to compare standard practice and three methods of analgesic infiltration to determine if one method was more successful than the others at reducing pain with the ABG needle stick.

SELECTION OF SAMPLE PARTICIPANTS

A convenience sample of 40 hospitalized patients at OSF with orders for nonemergent ABG draws were asked to participate in this study. Participants were selected from a daily list for ABG orders obtained from the OSF laboratory department. Participants' electronic medical records (EMR) were screened according to the following criteria: English speaking, older than 18 years, a score of 15 on the Glasgow coma scale, and able to sign an informed consent to participate in the study. Participants were selected without respect to gender. Exclusion criteria included allergy to lidocaine, Raynaud's disease, inability to palpate pulse, AV fistula for dialysis, infection or burns over the arterial puncture site, and circulatory impairment. The Allen test was used to assess for circulatory impairment. This test is performed by asking the patient to clench his fist tightly, manually compressing the radial or ulnar artery, and observing for return of blood flow into the hand when opened (National Committee for Clinical Laboratory Standards [NCCLS], 2004).

Patients were approached the day before or immediately before the procedure to inquire if they would be willing to participate in the study and to obtain the informed consent. The study was approved through OSF Saint Anthony Medical Center Institutional Review Board.

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