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**Literature search results**

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**Search details**

Arterial blood gas sampling

**Resources searched**

NHS Evidence; TRIP Database; Cochrane Library; CINAHL; EMBASE; MEDLINE; PsychINFO; Google Scholar; Google Advanced Search

**Database search terms:** arter* adj2 blood adj2 gas*; ABG; “blood gas analysis”; exp BLOOD GAS ANALYSIS; blood adj2 gas* adj2 sampl*; blood adj2 gas* adj2 analys*; “arterial blood gas sampling”

**Evidence search string(s):** (artery OR arteries OR arterial) (“blood gas” OR “blood gases”) (sample OR samples OR sampling)

**Summary**

There is quite a lot of recent research on arterial blood gas sampling, some of which looks at safety and efficacy.

**Guidelines and Policy**

None found.

**Evidence-based reviews**

**BestBETs**

Brachial arterial blood sampling: Safe or not? 2014
Brachial artery puncture is likely to be safe in the non-shocked patient who is not on concurrent anticoagulant therapy.

In patients presenting with an exacerbation of COPD can a normal venous blood gas pCO2 rule out arterial hypercarbia? 2014

In patients presenting with AECOPD, if they have a normal pCO2 on a VBG they do not need an ABG to exclude hypercarbia.

Canadian Agency for Drugs and Technologies in Health - Rapid Review
Routine Blood Tests for Patients in the Intensive Care Unit: Clinical Effectiveness, Cost-Effectiveness, and Guidelines 2013
The authors concluded that serial ABG measurements at one and three hours post-extubation were not useful.

Database of Abstracts of Reviews of Effects
Accuracy of blood-glucose measurements using glucose meters and arterial blood gas analyzers in critically ill adult patients: systematic review 2013

Published research – Databases

1. The comparison of heparinized insulin syringes and safety-engineered blood gas syringes used in arterial blood gas sampling in the ED setting (randomized controlled study).

Author(s) Baskin, Sevcan Baki, Oray, Nese Çolak, Yanturali, Sedat, Bayram, Basak

Citation: American Journal of Emergency Medicine, 01 May 2014, vol./is. 32/5(432-437), 07356757

Publication Date: 01 May 2014

Abstract: INTRODUCTION: The arterial blood gas measurement process is a painful and invasive procedure, often uncomfortable for both the patient and the physician. Because the patient-related factors that determine the difficulty of the process cannot be controlled, the physician-related factors and blood gas measurement techniques are a modifiable area of improvement that ought to be considered. Many hospitals use insulin syringes or syringes washed with heparin for the purpose of blood gas measurement because they do not have blood gas-specific syringes. In this prospective cross-sectional study, we aimed to compare safety-engineered blood gas syringes and conventional heparinized syringes used during the arterial blood gas extraction process in terms of ease of operation, the physician-patient satisfaction, laboratory appropriateness, and complications. METHODS: Our study included patients whose arterial blood gas needed to be measured in the emergency department and who agreed to participate in the study. Patients were randomly divided into 2 groups. The arterial blood gas of the patients from the first group was measured by using conventional heparinized syringes, whereas safety-engineered blood gas syringes were used to measure the arterial blood gas of the patients from the second group. The groups were compared in terms of demographic data, the number of attempts, the physician and patient satisfaction, early and late-term complications, and laboratory appropriateness of the taken sample. RESULTS: A total of 550 patients were included in our study in a 2-month study period. There were no significant differences between patients in terms of sex, age, weight, height, body mass index, and wrist circumference. In addition, the number of attempts (P=.489), patients’ pain level during the procedure (P=.145), and the degree of difficulty of the procedure according to the patient (P=.109) and physician (P=.554) were not significantly different between the groups. After arterial blood gas extraction procedure, 115 patients (20.9%) developed complications. In the conventional heparinized syringe group, the complication rate (n=69; 25.1%) was significantly higher compared with the group that used safety-engineered blood gas syringes (n=46; 16%; P=.0211). Localized pain, which is one of the most common early complications, was more frequent in the conventional heparinized syringe group (19.3%). Complications in women (P=.003) and
local pain (P=.01) developed lesser in the second group that used safety-engineered blood gas syringes, and the patient-physician satisfaction was higher in that group, as well. In the evaluation 48 hours after the procedure, the ratios of infection and local hematoma were higher in the conventional heparinized syringe group (P=.0213 and P < .0001). CONCLUSION: In this study, we did not find any significant differences between the conventional heparinized syringes and safety-engineered blood gas syringes in terms of ease of operation, physician and patient satisfaction, and appropriateness of the taken sample. However, patients whose arterial blood gas was extracted by using safety-engineered blood gas syringes felt less pain and experienced fewer infections and hematomas at their puncture site.

Source: CINAHL

2. Seated and semi-recumbent positioning of the ventilated intensive care patient - Effect on gas exchange, respiratory mechanics and hemodynamics

Author(s) Thomas, Peter, Paratz, Jennifer, Lipman, Jeffrey

Citation: Heart & Lung, Mar 2014, vol. 43, no. 2, p. 105-111, 0147-9563 (Mar-Apr 2014)

Publication Date: March 2014

Abstract: To compare the effect of semi-recumbent and sitting positions on gas exchange, respiratory mechanics and hemodynamics in patients weaning from mechanical ventilation. Upright positions are encouraged during rehabilitation of the critically ill but there effects have not been well described. A prospective, randomized, cross-over trial was conducted. Subjects were passively mobilized from supine into a seated position (out of bed) and from supine to a semi-recumbent position (45° backrest elevation in bed). Arterial blood gas (PaOsub 2/FiOsub 2, PaOsub 2, SaOsub 2, PaCOsub 2 and A-a gradient), respiratory mechanics (Vsub E,Vsub T, RR, Csub dyn, RR/Vsub T) and hemodynamic measurements (HR, MABP) were collected in supine and at 5 min and 30 min after re-positioning. Thirty-four intubated and ventilated subjects were enrolled. The angle of backrest inclination in sitting (67 ± 5°) was greater than gained with semi-recumbent positioning (50 ± 5°, p 0.001). There were no clinically important changes in arterial blood gas, respiratory mechanic or hemodynamic values due to either position. Neither position resulted in significant changes in respiratory and hemodynamic parameters. Both positions can be applied safely in patients being weaned from ventilation. [PUBLICATION] 52 references

Source: BNI

Available in print at Lincoln County Hospital Professional Library

3. Capillary blood gas as a substitute for arterial blood gas: a meta-analysis

Author(s) Richter S., Kerry C., Hassan N., Chari A., Lunn D., Nickol A.

Citation: British journal of hospital medicine (London, England : 2005), March 2014, vol./is. 75/3(136-142), 1750-8460 (Mar 2014)

Publication Date: March 2014

Source: EMBASE

Available in fulltext from British Journal of Hospital Medicine (17508460) at EBSCOhost

4. Peripheral venous and arterial blood gas analysis in adults: Are they comparable? A systematic review and meta-analysis

Author(s) Byrne A.L., Bennett M., Chatterji R., Symons R., Pace N.L., Thomas P.S.

Citation: Respirology, February 2014, vol./is. 19/2(168-175), 1323-7799;1440-1843 (February 2014)

Publication Date: February 2014

Abstract: Peripheral venous blood gas (PVBG) analysis is increasingly being used as a
substitute for arterial blood sampling; however, comparability has not been clearly established. To determine if the pH, PCO$_2$ and PO$_2$ obtained from PVBG analysis is comparable with arterial blood gas (ABG) analysis. A search was conducted of electronic databases as well as hand-searching of journals and reference lists through December 2012 to identify studies comparing PVBG with ABG analysis in adult subjects. A systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement. A meta-analysis using a random effects model was used to calculate the average difference (bias) and the limits of agreement for the venous and arterial pH, PCO$_2$ and PO$_2$. A total of 18 studies comprising 1768 subjects were included in the meta-analysis. There was considerable heterogeneity between studies with $I^2$ approaching 100%. There was little difference between the pH obtained from the PVBG and the ABG, with the arterial pH typically 0.03 higher than the venous pH (95% confidence interval 0.029-0.038). The venous and arterial PCO$_2$ were not comparable because the 95% prediction interval of the bias for venous PCO$_2$ was unacceptably wide, extending from -10.7 mm Hg to +2.4 mm Hg. The PO$_2$ values compared poorly, the arterial PO$_2$ typically 36.9 mm Hg greater than the venous with significant variability (95% confidence interval from 27.2 to 46.6 mm Hg). PVBG analysis compares well with ABG analysis for pH estimations in adults but not to the PCO$_2$ or PO$_2$. These differences are sufficiently large to be of clinical significance.

Source: EMBase

5. Venipuncture Versus Peripheral Catheter: Do Infusions Alter Laboratory Results?

**Author(s)** Hambleton, Victoria Lerma, Gómez, Ignacio Arribas, Andreu, Francisco A Bernabeu

**Citation:** Journal of Emergency Nursing, Jan 2014, vol. 40, no. 1, p. 20-26, 0099-1767 (January 2014)

**Publication Date:** January 2014

**Abstract:** Introduction: Our aim was to evaluate the equivalence between analytic parameters from blood samples obtained from a saline solution lock device used for the infusion of drugs and those from venipuncture. In our emergency department, patients bearing a saline solution lock device have blood extracted by venipuncture to avoid possible contamination of the sample. Methods: Adults from the emergency department with a saline solution lock device who required laboratory tests were selected as candidates for this cross-sectional observational study. Infusions were halted and flushed with 0.9% saline solution; 2 minutes later, 2 mL of blood was drawn and discarded, and the corresponding laboratory tubes were filled. Immediately after, another sample was withdrawn from the opposite extremity by venipuncture. Both samples were analyzed for hematology, biochemistry, venous blood gases, and coagulation parameters. Concordance was evaluated by use of the intraclass correlation coefficient with its 95% confidence intervals; Bland-Altman plots were used to illustrate the percentage of samples with differences exceeding 2 SDs. The mean differences were also checked to detect those exceeding the laboratory's systematic error. Results: An intraclass correlation coefficient of over 0.9 was achieved for all parameters except for pH, partial pressure of carbon dioxide, and partial pressure of oxygen. Differences of over 2 SDs were found in fewer than 10% of all parameters. None of them exceeded 3 SDs, except for pH and venous blood gases. All parameters showed differences below the laboratory's accepted systematic error except for pH and venous blood gases. Discussion: Blood samples extracted from a peripheral catheter with or without drug infusions are valid for the analysis of hematology, biochemistry, and coagulation parameters but not for venous blood gases. Nurses should know the benefits of using an existing peripheral catheter for drawing blood samples for laboratory analysis even when infusing commonly used drugs. Emergency nurses should consider collecting blood specimens from a venous access device regardless of the type of drug infusions administered, because it is a safe, simple, and fast technique, which is time efficient when treating patients with limited venous access sites. This procedure reduces patient discomfort and the risk of complications related to venipunctures. [PUBLICATION] 21 references

Source: BNI
6. Guideline for proficiency testing of blood gas (pH, pCO<sub>2</sub> and pO<sub>2</sub>) measurements

**Author(s)** Shirai H., Kuwa K., Iizuka Y., Fukunaga T., Umemoto M., Goto M., Abe M., Ohnishi M., Yamazaki H., Yanagisawa H., Yamamoto M., Ohkubo K.

**Citation:** Japanese Journal of Clinical Chemistry, January 2014, vol./is. 43/1(57-66), 0370-5633 (January 2014)

**Publication Date:** January 2014

**Abstract:** This guideline provides the recommendation for proficiency testing (PT) material for blood gas (pH, pCO<sub>2</sub> and pO<sub>2</sub>) measurements in blood. The certified hemolyzed reference material for pH, pCO<sub>2</sub> and pO<sub>2</sub> measurements in blood has been used in calibration and performance evaluation of measurements, and quality assurance and external quality assessment (EQA) against measured values by routine measurement procedures. However, EQA for blood gas measurements has been limited only in Hokuriku district (Ishikawa, Toyama and Fukui prefectures) and never been performed nationwide. This is due to the inability of preparing the most appropriate PT materials for blood gas measurements to be used in a large-scale EQA. This has been the major issue when performing PT for blood gas. To resolve this problem in the blood gas measurements by electrode method, it is necessary to determine both performance characteristics of PT materials and the target values by using the reference methods. The performance specifications of PT materials are defined by physical-chemical components such as ionic strength, base excess, total hemoglobin and methemoglobin ratio. The target values of PT materials are determined by capillary electrodes method for pH, standard tonometry for pCO<sub>2</sub> and pO<sub>2</sub> as the reference methods, which are calibrated with certified hemolyzed reference material of JCCRM 621 by Reference Material Institute for Clinical Chemistry Standards (ReCCS). To maintain the accuracy of the measured values by the blood gas measurements, PT should be performed with the PT materials whose performance specifications and the target values are clearly defined. In this way, the optimized improvements for blood gas measurements are expected.

**Source:** EMBASE


**Author(s)** Davis, Michael D., Walsh, Brian K., Sittig, Steve E., Restrepo, Ruben D.

**Citation:** Respiratory Care, 01 October 2013, vol./is. 58/10(1694-1703), 00201324

**Publication Date:** 01 October 2013

**Abstract:** We searched MEDLINE, CINAHL, and Cochrane Library database for articles published between January 1990 and December 2012. The update of this clinical practice guideline is based on 237 clinical trials, 54 reviews, and 23 meta-analyses on blood gas analysis (BGA) and hemoximetry. The following recommendations are made following the Grading of Recommendations Assessment, Development, and Evaluation scoring system. BGA and hemoximetry are recommended for evaluating a patient's ventilatory, acid-base, and/or oxygenation status. BGA and hemoximetry are suggested for evaluating a patient's response to therapeutic interventions. BGA and hemoximetry are recommended for monitoring severity and progression of documented cardiopulmonary disease processes. Hemoximetry is recommended to determine the impact of dyshemoglobins on oxygenation. Capillary BGA is not recommended to determine oxygenation status. Central venous BGA and hemoximetry are suggested to determine oxygen consumption in the setting of early goal-directed therapies. For the assessment of oxygenation, a peripheral venous P<sub>O</sub>2 is not recommended as a substitute for an arterial blood measurement (P<sub>aO</sub>2). It is not recommended to use venous P<sub>CO</sub>2 and pH as a substitute for arterial blood measurement of P<sub>aCO</sub>2 and pH. It is suggested that hemoximetry is used in the detection and evaluation of shunts during diagnostic cardiac catheterization.
8. Understanding arterial blood gases

Author(s) Rogers, Katherine, McCutcheon, Karen

Citation: Journal of Perioperative Practice, Sep 2013, vol. 23, no. 9, p. 191-197, 1750-4589 (September 2013)

Publication Date: September 2013

Abstract: This article examines acid-base balance and the interpretation of arterial blood gases (ABG). The article begins with a brief revision of related physiology followed by a description of the primary disorders of acid-base balance. The normal ranges and the significance of abnormal ABG results are explored. The article concludes by providing an easy to follow four-step guide to ABG interpretation with practice examples presented in the continuing professional development task section. [PUBLICATION] 13 references

Source: BNI

Available in fulltext from Journal of Perioperative Practice at EBSCOhost

Available in fulltext at Journal of Perioperative Practice, The; Collection notes: On first login to a ProQuest journal you will need to select 'Athens (OpenAthens Federation)' from Select Region, and then 'NHS England' from Choose your Library.

9. Clinical applications and issues of oxygen saturation level measurements obtained from peripheral sites.

Author(s) Foo JY, Chua KP, Tan XJ

Citation: Journal of Medical Engineering & Technology, August 2013, vol./is. 37/6(388-95), 0309-1902;1464-522X (2013 Aug)

Publication Date: August 2013

Abstract: Studies have suggested that the saturated oxygen level within one's arterial blood can provide crucial information about the status of one's cardiopulmonary system. Currently, a popular and convenient approach is to obtain this vital physiological sign through non-invasive measurement on suitable peripheral sites such as a finger, toe or ear lobe. This measurement is known as the SpO2 parameter. It has been increasingly adopted in not only clinical settings but also remote monitoring purposes. In order to measure this optical based parameter, light sources of both the red and infrared wavelengths are required. The most recognized waveform feature is the peripheral pulse or its AC component which is synchronized to each heartbeat. The AC component is superimposed on a constant DC baseline attributed to breathing efforts, sympathetic nervous system activities and thermoregulation. The popularity of the SpO2 parameter may be due to its viable cost, simplicity to build and portability. Moreover, the basic building blocks of a SpO2 based measurement consists of control, filtering and amplification functions that can easily be incorporated with an embedded system. In this review, a brief description of the SpO2 measurement, its normative values and technical issues in its application as a clinical monitor are discussed.

Source: Medline

10. A snapshot of guideline compliance reveals room for improvement: A survey of peripheral arterial catheter practices in Australian operating theatres

Author(s) Reynolds, Heather, Dulhunty, Joel, Tower, Marion, Taraporewalla, Kersi, Rickard, Claire

Citation: Journal of Advanced Nursing, Jul 2013, vol. 69, no. 7, p. 1584-1594, 0309-2402 (July 2013)

Publication Date: July 2013
Abstract: Aim. To report a study in Australian operating theatres of compliance by the anaesthetic team with best peripheral arterial catheter practice for blood gas sampling and infection prevention. Comparisons are made with research recommendations and Centres for Disease Control Guidelines. Background. There is wide global usage of peripheral arterial catheters in the operating theatre for haemodynamic monitoring and blood gas analysis. Frequent blood sampling from arterial catheters can lead to statistically significant blood loss and provide an infective potential. Evidence-based research and clinical guidelines prescribe best practice. Design. Cross-sectional descriptive survey Methods. Data were collected in 2009 from 64 major Australian hospitals using a self-designed internet survey. Results/Findings. Hand hygiene prior to catheter insertion was the only infection prevention practice entirely adherent with guidelines. The recommended ratio of discard to dead space volume of 2:1 to decrease unnecessary blood loss during blood gas sampling was reported by only 11 (17%) respondents. Less than 32 (50%) respondents used the preferred solution, chlorhexidine to disinfect the insertion site. Access ports were reported as 'never disinfected' before use by 30 (47%) respondents. Conclusion. The complex operating theatre environment presents barriers, which contribute to non-adherence with guidelines. These barriers need to be identified to plan strategies for improvement. A quality audit tool is proposed for development by nurses in collaboration with the anaesthetic team, providing a needed method to assess ongoing compliance with best peripheral arterial catheter care. Further international research would test the generalizability of our Australian findings. [PUBLICATION] 58 references

Source: BNI

11. The Relationship Between Arterial Carbon Dioxide Tension and End-Tidal Carbon Dioxide Tension in Intubated Adults With Traumatic Brain Injuries Who Required Emergency Craniotomies

Author(s) Dyer, Brett A, White, William A, Lee, Doohbee, Elkins, Laurie, Slayton, Donna J

Citation: Critical Care Nursing Quarterly, Jul 2013, vol. 36, no. 3, p. 310-315, 0887-9303 (Jul-Sep 2013)

Publication Date: July 2013

Abstract: Anesthetic management of patients who have suffered traumatic brain injuries can be challenging. We investigated the relationship between arterial to end-tidal carbon dioxide partial pressure gradients (Pa-etCO2) and 3 predictor variables: (1) injury severity score, (2) use of positive end-expiratory pressure, and (3) presence of rib fractures. Using a convenient sampling method, we sampled 56 patients who arrived to the operating room intubated after traumatic brain injuries between 2005 and 2011. Two groups were compared retrospectively: those with Pa-etCO2 greater than 10 mm Hg (case group) (n = 37) and those with Pa-etCO2 gradients of 10 mm Hg or less (control group) (n = 19). Descriptive and inferential statistics were employed to identify any differences between the groups. Stepwise regression was also performed. Cross tabulation analysis revealed that injury severity score of 30 or more was a predictor of Pa-etCO2 gradient. Stepwise regression analysis revealed the presence of rib fracture and body mass index to be significant predictors of Pa-etCO2 gradient (P

Source: BNI

12. Interpreting arterial blood gases

Author(s) Casey, Georgina

Citation: Kai Tiaki, Jul 2013, vol. 19, no. 6, p. 20-24, 1173-2032 (July 2013)

Publication Date: July 2013

Abstract: Arterial blood gas (ABG) testing is an essential tool in managing critically ill patients and people with respiratory disease. ABGs measure concentrations of oxygen and carbon dioxide in arterial blood, providing information about respiratory function. At the same time, by measuring pH and associated parameters, ABGs can provide evidence of acid-base disturbances and metabolic imbalance. To interpret ABG results, nurses must understand the underlying physiological processes determining gas concentrations and pH regulation, and the way these are altered in disease. Use of a systematic approach when
reading ABG results allows determination of hypoxaemia, hypercapnia, metabolic or respiratory acidosis and alkalosis, and whether these are uncompensated or compensated states. [References available at: www.cpd4nurses.co.nz] [PUBLICATION]

Source: BNI

Available in fulltext from Kai Tiaki Nursing New Zealand at EBSCOhost

Available in fulltext at Kai Tiaki: Nursing New Zealand; Collection notes: On first login to a ProQuest journal you will need to select 'Athens (OpenAthens Federation)' from Select Region, and then 'NHS England' from Choose your Library.

13. Using ABGs to optimize mechanical ventilation

Author(s) Lian, Jin Xiong

Citation: Nursing, Jun 2013, vol. 43, no. 6, p. 46-52, 0360-4039 (June 2013)

Publication Date: June 2013

Abstract: An arterial blood gas (ABG) analysis can tell about the patient's oxygenation, acid-base balance, pulmonary function, and metabolic status. Here, Jin Xiong focuses on translating ABG information into clinical benefits, with three case studies that focus on using ABGs to manage mechanical ventilation. Endotracheal (ET) intubation and mechanical ventilation may be prescribed for patients who can't maintain adequate oxygenation or ventilation or who need airway protection. The goal of mechanical ventilation is to improve oxygenation and ventilation and to rest fatigued respiratory muscles. [PUBLICATION] 23 references

Source: BNI

14. Agreement between arterial and venous blood gases in emergency medical care: A systematic review

Author(s) Kelly A.-M.

Citation: Hong Kong Journal of Emergency Medicine, May 2013, vol./is. 20/3(166-171), 1024-9079 (May 2013)

Publication Date: May 2013

Abstract: Aim: The objectives of this review are to describe the agreement between arterial and venous blood gas values for pH, pCO<sub>2</sub>, bicarbonate and base excess. Methods: MEDLINE search of papers published 1966-September 2012 for studies comparing arterial and peripheral venous blood gas values for any of pH, pCO<sub>2</sub>, bicarbonate and base excess in adult patients with any condition in an emergency department setting. The outcome of interest was mean difference weighted for study sample size. Results: The weighted mean arteriovenous difference in pH was 0.034 pH units (n=2087), with narrow limits of agreement. The weighted mean arteriovenous difference for pCO<sub>2</sub> was 6.2 mmHg (n=1043), but with 95% limits of agreement up to the order of+20mmHg. Venous pCO<sub>2</sub> has 100% sensitivity and negative predictive value for prediction of arterial hypercarbia (n=529). For bicarbonate, the weighted mean difference between arterial and venous values was -1.20 mEq/L (n=1403), with 95% limits of agreement of the order of+ mmol/L. Regarding base excess, the mean arterio-venous difference was 0.4 (n=295) but data are conflicting regarding the width of 95% limits of agreement. Conclusion: For patients who are not in shock, venous pH and bicarbonate have sufficient agreement to be clinically interchangeable for arterial values. Agreement between arterial and venous pCO<sub>2</sub> is too poor and unpredictable to be clinically useful as a one-off test but venous pCO<sub>2</sub> may be useful to screen for arterial hypercarbia.

Source: EMBASE

Available in fulltext from Hong Kong Journal of Emergency Medicine at Directory of Open Access Journals

Available in fulltext from Hong Kong Journal of Emergency Medicine at Free Access Content
15. Preanalytical considerations in blood gas analysis

Author(s) Baird G.

Citation: Biochemia Medica, 2013, vol./is. 23/1(19-27), 1330-0962 (2013)

Publication Date: 2013

Abstract: Blood gas testing is a commonly ordered test in hospital settings, where the results almost always have the potential to dictate an immediate or urgent response. The preanalytical steps in testing, from choosing the correct tests to ensuring the specimen is introduced into the instrument correctly, must be perfectly coordinated to ensure that the patient receives appropriate and timely therapy in response to the analytical results. While many of the preanalytical steps in blood gas testing are common to all laboratory tests, such as accurate specimen labeling, some are unique to this testing because of the physicochemical properties of the analytes being measured. The common sources of preanalytical variation in blood gas testing are reviewed here.

Source: EMBASE

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Available in fulltext from Biochemia Medica at EBSCOhost

16. The use of local anaesthesia for arterial blood gas sampling-a multicentre survey

Author(s) Khan F., D'Silva A., Ahmed S., Patel E., Hassan S., Patel A.R.C.

Citation: Thorax, December 2012, vol./is. 67/(A167-A168), 0040-6376 (December 2012)

Publication Date: December 2012

Abstract: Background BTS guidance for Emergency Oxygen Use recommends that local anaesthesia should be used for all routine arterial blood gas (ABG) sampling [1]. Intradermal and/or subcutaneous local anaesthetic (LA) via small gauge needle has been shown to reduce pain associated with the procedure by more than half [2]. We aimed to quantify the prevalence of this practise and ascertain potential barriers. Methods 160 FY1 doctors with at least eight months working experience, from five hospitals in London were given a ten-item anonymised questionnaire to measure practise and opinions regarding local anaesthesia before ABG sampling. Results All 115 respondents (72% response rate) performed ABG sampling regularly, with 84% doing so at least weekly. Only 27% of respondents had ever used intradermal and/or subcutaneous LA before ABG sampling, although only 5% did this regularly. The commonest needles used were 25 gauge (orange) (49%), 28 gauge (insulin needle) (18%), and 23 gauge (blue) (16%). 70% of respondents had never used LA of any kind for ABG sampling. Topical LA use was rare. 14% of respondents had never heard of LA used for ABG sampling; 24% were unfamiliar with how to do it; 14% believed it was potentially dangerous; 34% claimed not to have time, 21% believed that LA would not reduce the overall pain of the procedure (Figure presented) Conclusion The regular use of local anaesthesia before ABG sampling among FY1 doctors is rare. Awareness of the technique is poor, and education is needed. Prominence and promotion in teaching sessions and local guidelines, along with quick access to supplies is likely to help to prevent unnecessary pain in unwell patients.

Source: EMBASE

Available in fulltext from Thorax at EBSCOhost
17. AARC clinical practice guideline: Transcutaneous monitoring of carbon dioxide and oxygen: 2012

Author(s) Restrepo R.D., Hirst K.R., Wittnebel L., Wettstein R.

Citation: Respiratory Care, November 2012, vol./is. 57/11(1955-1962), 0020-1324;1943-3654 (November 2012)

Publication Date: November 2012

Abstract: An electronic literature search for articles published between January 1990 and September 2011 was conducted by using the PubMed, CINAHL, SCOPUS, and Cochrane Library databases. The update of this clinical practice guideline is the result of reviewing a total of 124 articles: 3 randomized controlled trials, 103 prospective trials, 1 retrospective study, 3 case studies, 11 review articles, 2 surveys and 1 consensus paper on transcutaneous monitoring (TCM) for $P_{tcO_2}$ and $P_{tcCO_2}$. The following recommendations are made following the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) criteria: (1) Although $P_{tcCO_2}$ has a good correlation with $P_{aCO_2}$ and is a reliable method to evaluate plasma CO$_2$ levels, it is recommended that arterial blood gas values be compared to transcutaneous readings taken at the time of arterial sampling, in order to verify the transcutaneous values, and periodically as dictated by the patient's clinical condition. (2) It is suggested that $P_{tcCO_2}$ may be used in clinical settings where monitoring the adequacy of ventilation is indicated. (3) It is suggested that $P_{tcCO_2}$ and $P_{tcO_2}$ may be used in determining the adequacy of tissue perfusion and monitoring of reperfusion. (4) It is suggested that TCM should be avoided in the presence of increased thickness or edema of the skin and/or subcutaneous tissue where the sensor is applied. (5) It is recommended that sites used for a TCM be changed as often as necessary and that they be alternated and observed to avoid thermal injury. Manufacturer recommendations should be followed. 2012 Daedalus Enterprises.

Source: EMBASE

Available in fulltext from Respiratory Care at Highwire Press


Author(s) Restrepo, Ruben D., Hirst, Keith R., Wittnebel, Leonard, Wettstein, Richard

Citation: Respiratory Care, 01 November 2012, vol./is. 57/11(1955-1962), 00201324

Publication Date: 01 November 2012

Abstract: An electronic literature search for articles published between January 1990 and September 2011 was conducted by using the PubMed, CINAHL, SCOPUS, and Cochrane Library databases. The update of this clinical practice guideline is the result of reviewing a total of 124 articles: 3 randomized controlled trials, 103 prospective trials, 1 retrospective study, 3 case studies, 11 review articles, 2 surveys and 1 consensus paper on transcutaneous monitoring (TCM) for $P_{tcO_2}$ and $P_{tcCO_2}$. The following recommendations are made following the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) criteria: (1) Although $P_{tcCO_2}$ has a good correlation with $P_{aCO_2}$ and is a reliable method to evaluate plasma CO$_2$ levels, it is recommended that arterial blood gas values be compared to transcutaneous readings taken at the time of arterial sampling, in order to verify the transcutaneous values, and periodically as dictated by the patient's clinical condition. (2) It is suggested that $P_{tcCO_2}$ may be used in clinical settings where monitoring the adequacy of ventilation is indicated. (3) It is suggested that $P_{tcCO_2}$ and $P_{tcO_2}$ may be used in determining the adequacy of tissue perfusion and monitoring of reperfusion. (4) It is suggested that TCM should be avoided in the presence of increased thickness or edema of the skin and/or subcutaneous tissue where the sensor is applied. (5) It is recommended that sites used for a TCM be changed as often as necessary and that they be alternated and observed to avoid thermal injury. Manufacturer recommendations should be followed. 2012 Daedalus Enterprises.
perfusion and monitoring of reperfusion. (4) It is suggested that TCM should be avoided in the presence of increased thickness or edema of the skin and/or subcutaneous tissue where the sensor is applied. (5) It is recommended that sites used for a TCM be changed as often as necessary and that they be alternated and observed to avoid thermal injury. Manufacturer recommendations should be followed.

Source: CINAHL
Available in fulltext from Respiratory Care at Highwire Press

19. Less painful arterial blood gas sampling using jet injection of 2% lidocaine: a randomized controlled clinical trial.

Author(s) Hajiseyedjavady, Houman, Saeedi, Morteza, Eslami, Vahid, Shahsavarinia, Kavoos, Farahmand, Shervin
Citation: American Journal of Emergency Medicine, 01 September 2012, vol./is. 30/7(1100-1104), 07356757
Publication Date: 01 September 2012
Abstract: Abstract: Objective: The aim of this study was to compare pain levels from arterial blood gas (ABG) sampling performed with or without application of lidocaine via jet injector. Background: Pain is still a primary concern in the emergency department. Arterial blood gas sampling is a very painful procedure. No better technique for decreasing the pain of the ABG procedure has been presented. An ideal local anesthesia procedure for ABG sampling should be rapid, easily learned, inexpensive, and free of needlestick risk.
Materials and Methods: We evaluated the effectiveness of a lidocaine jet injection technique in achieving satisfactory pain control in patients undergoing ABG sampling. Forty-two patients were randomized to 2 groups: group A, which received lidocaine by jet injection (0.2 mL of lidocaine 2%), and group B, a control group that received a topical application of 1 mL of lidocaine gel 2% 2 minutes before the ABG sampling. Pain was assessed on a 10-cm visual analog scale (0, absence of pain; 10, greatest imaginable pain).
Results: The pain visual analog scale score during ABG sampling was considerably lower in group A compared with group B (1.29 ± 0.90 vs 4.19 ± 1.43; P < .001). The number of attempts required for ABG sampling was significantly lower in group A compared with group B (1.29 ± 0.46 vs 2.1 ± 0.12; P = .009). All residents reported ease of use with the lidocaine jet injection procedure (P < .05). Conclusion: Lidocaine jet injection provides beneficial and rapid anesthesia, resulting in less pain and a greater rate of successful ABG sampling. Therefore, it is recommended for use before ABG sampling to decrease the patient’s pain and the number of unsuccessful attempts and to enhance the patient’s satisfaction.
Source: CINAHL
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Available in fulltext from American Journal of Emergency Medicine at EBSCOhost


Author(s) McCanny, Peter, Bennett, Kath, Staunton, Paul, McMahon, Geraldine
Citation: American Journal of Emergency Medicine, 01 July 2012, vol./is. 30/6(896-900), 07356757
Publication Date: 01 July 2012
Abstract: Abstract: Objective: The purpose of this study was to investigate the clinical correlation between arterial and venous blood gas (VBG) values in patients presenting to the emergency department (ED) with acute exacerbation of chronic obstructive pulmonary disease. Methods: A prospective study of patients with chronic obstructive pulmonary disease presenting to the ED with acute ventilatory compromise was done. Patients were included if their attending physician considered arterial blood gas sampling important in
their initial assessment. Data from arterial and venous samples were compared using Spearman correlation and bias plot (Bland-Altman) methods. Results: Ninety-four patients were enrolled in the study. Eighty-nine patients had complete data sets for analysis. Arterial hypercarbia was present in 30 patients (33.7%; range, 51-140.19 mm Hg). All cases of arterial hypercarbia were detected using VBG sampling when a screening cutoff of 45 mm Hg was applied (sensitivity, 100%; 95% confidence interval, 88.7%-100% and specificity, 34%; 95% confidence interval, 23.1%-46.6%). Bias plot revealed moderate agreement between arterial and venous Pco<sub>2</sub> with an average difference of 8.6 mm Hg and 95% limits of agreement of −7.84 to 25.05 mm Hg. For pH, mean difference between each group was 0.039 (range, −0.12 to 0.03). Linear regression analysis for pH demonstrated very close equivalence with a regression coefficient of 0.955, and Spearman correlation showed significant correlation of 0.826 (P = .001). Conclusion: Venous pH and HCO<sub>3</sub> values show excellent correlation with arterial values. Using a previously validated screening cutoff of 45 mm Hg, venous CO<sub>2</sub> has 100% sensitivity in detecting arterial hypercarbia. There is insufficient agreement between venous and arterial CO<sub>2</sub> for VBG to replace arterial blood gas in determining the degree of hypercarbia.

Source: CINAHL

Available in fulltext at American Journal of Emergency Medicine, The; Collection notes: On first login to a ProQuest journal you will need to select 'Athens (OpenAthens Federation)' from Select Region, and then 'NHS England' from Choose your Library.

21. Venous vs arterial blood gases in the assessment of patients presenting with an exacerbation of chronic obstructive pulmonary disease

Author(s) McCanny P., Bennett K., Staunton P., McMahon G.

Citation: American Journal of Emergency Medicine, July 2012, vol./is. 30/6(896-900), 0735-6757;1532-8171 (July 2012)

Publication Date: July 2012

Abstract: Objective: The purpose of this study was to investigate the clinical correlation between arterial and venous blood gas (VBG) values in patients presenting to the emergency department (ED) with acute exacerbation of chronic obstructive pulmonary disease. Methods: A prospective study of patients with chronic obstructive pulmonary disease presenting to the ED with acute ventilatory compromise was done. Patients were included if their attending physician considered arterial blood gas sampling important in their initial assessment. Data from arterial and venous samples were compared using Spearman correlation and bias plot (Bland-Altman) methods. Results: Ninety-four patients were enrolled in the study. Eighty-nine patients had complete data sets for analysis. Arterial hypercarbia was present in 30 patients (33.7%; range, 51-140.19 mm Hg). All cases of arterial hypercarbia were detected using VBG sampling when a screening cutoff of 45 mm Hg was applied (sensitivity, 100%; 95% confidence interval, 88.7%-100% and specificity, 34%; 95% confidence interval, 23.1%-46.6%). Bias plot revealed moderate agreement between arterial and venous Pco<sub>2</sub> with an average difference of 8.6 mm Hg and 95% limits of agreement of −7.84 to 25.05 mm Hg. For pH, mean difference between each group was 0.039 (range, −0.12 to 0.03). Linear regression analysis for pH demonstrated very close equivalence with a regression coefficient of 0.955, and Spearman correlation showed significant correlation of 0.826 (P = .001). Conclusion: Venous pH and HCO<sub>3</sub> values show excellent correlation with arterial values. Using a previously validated screening cutoff of 45 mm Hg, venous CO<sub>2</sub> has 100% sensitivity in detecting arterial hypercarbia. There is insufficient agreement between venous and arterial CO<sub>2</sub> for VBG to replace arterial blood gas in determining the degree of hypercarbia. 2012 Elsevier Inc. All rights reserved.

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22. Understanding blood gases/acid-base balance

Author(s) Goel N., Calvert J.

Citation: Paediatrics and Child Health, April 2012, vol./is. 22/4(142-148), 1751-7222;1878-206X (April 2012)

Publication Date: April 2012

Abstract: Acid-base balance is regulated by intracellular & extracellular buffers and by the renal and respiratory systems. Normal pH is necessary for the optimal function of cellular enzymes and metabolism. Disorders of acid-base balance can interfere with these physiological mechanisms leading to acidosis or alkalosis and can be potentially life threatening. Blood gas analysis is a routine procedure performed in the neonatal unit and combined with non-invasive monitoring, aids in the assessment and management of ventilation and oxygenation and provides an insight into the metabolic status of the patient. The following discussion details the basic terminology and pathophysiology of acid-base balance and the main disorders. It aims to provide a logical and systematic approach to the understanding and interpretation of blood gases in the newborn period. The application of these concepts, together with relevant history and examination, will help the clinician assess the medical condition, make therapeutic decisions and evaluate the effectiveness of any intervention provided. 2011 Elsevier Ltd.

Source: EMBASE

Available in fulltext from Paediatrics and Child Health at the ULHT Library and Knowledge Services’ eJournal collection

23. Neonatal blood gas sampling methods

Author(s) Goenka A., Bhoola R., McKerrow N.

Citation: SAJCH South African Journal of Child Health, 2012, vol./is. 6/1(3-9), 1994-3032 (2012)

Publication Date: 2012

Abstract: Blood gas sampling is part of everyday practice in the care of babies admitted to the neonatal intensive care unit, particularly for those receiving respiratory support. There is little published guidance that systematically evaluates the different methods of neonatal blood gas sampling, where each method has its individual benefits and risks. This review critically surveys the available evidence to generate a comparison between arterial and capillary blood gas sampling, focusing on their relative accuracy and complications, as well as briefly mentioning the management of such complications. This evidence-based summary and guidance should help inform best practice in the neonatal intensive care unit, and minimise the exposure of babies to unnecessary and potentially serious risk. The most accurate and non-invasive method of measuring oxygenation is oxygen saturation monitoring. Indwelling arterial catheters are a practical, reliable and accurate method of measuring acid-base parameters, provided they are inserted and maintained with the proper care. Capillary blood gas sampling is accurate, and a good substitute for radial 'stab' arterial puncture, avoiding many of the complications of repeated arterial puncture.

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... Briefly, after puncture of radial artery using 21 G butterfly BD Vacutainer® (Becton, Dickinson and Company, Franklin Lakes ... Value of arterial blood gas analysis in patients
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had equivalent precision, implying that, as long as only one sample site is ... S, Kamangar N, Corry D. Agreement between central venous and arterial blood gas measurements in ... Can peripheral venous blood gases replace arterial blood gases in emergency department patients ...
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Furthermore, blood sampling from one of the pulsating umbilical arteries, as performed in the DCC ... Also, there was no difference in umbilical artery pH or pCO 2 between groups ...
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T Küme, AR Şişman, A Solak, B Tuğlu, B Çinkooğlu… - Biochemia …, 2012 - hrcak.srce.hr ...
Küme T. et al. Blood gas collection with liquid heparin ... Sampling Volumes (mL) Received Sample (N) Mean PDRs (%) ... According to RiliBAK's TEa for each parameters According to IFCC recommends pH and blood gases Electrolytes Dilution ratio Heparin conc. ...
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CRH White, DA Doherty, R Kohan… - … Journal of Obstetrics …, 2012 - Wiley Online Library ...
societies strongly advocate obtaining and analysing samples from both the umbilical artery and vein 8 ... previous studies using UCBG data have included all incidents where blood gas data were ... errors are primarily the result of inadvertent collection of mixed arterial and venous ...
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Umbilical blood gas analysis: I. Effect of storage of samples on outcome. ... Postpartum determination of umbilical artery blood gases: effect of time and temperature. ... ISI. Dessolle L, Lebrec J, Darai E. Impact of delayed arterial cord blood sampling for lactate assay. ...
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S Delerme, V Montout, H Goulet, A Arhan... - The American journal of ..., 2012 - Elsevier
... The arterial blood gas sample was analyzed within 10 minutes using a Radiometer ABL 725 Blood Gas ... it is painless, is easier to set up than blood gases drawing, and ... Concordance between capnography and arterial blood gas measurements of carbon dioxide in acute asthma. ...
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K Heidari, H Hatamabadi, N Ansarian... - The American journal of ..., 2013 - Elsevier
... Sampling from arteries for the analysis of blood gases is a common procedure in emergency ... Arterial blood samples were taken after carrying out Allen test and explaining the procedure to the ... angle of 45° under aseptic conditions to take a 0.5-mL sample from the radial artery. ...
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