
LETTER FROM THE EDITOR

It is with great pleasure that I greet you as the new editor of *JECT*. As many of you know, the journal has been one of my pet projects over the last few years and I have enjoyed watching the growth under Nancy Achorn's leadership. The society owes her its gratitude for bringing the journal along in its maturity.

I met with the editorial committee in early March and must say that I was greatly encouraged by the dedication and thoughtfulness of the editors. With their help and your input, the *Journal of Extra-Corporeal Technology* will grow to its potential.

One of the outgrowths of that meeting was the generation of the two letters to the editor that appear in this issue. The issues addressed are similar and important. I urge you all to read the letters carefully and determine whether you wish to make the effort to contribute to the

growing scientific knowledge base of our profession. I encourage you to do so. We, the editors are committed to assist you in many ways. We will be informing you of these mechanisms in future issues of *JECT* and *Perfusion Life*.

If you have questions concerning *JECT* and the mechanisms of publication, please feel free to contact me or any of the editorial board. We need your input and contributions.

Sincerely,

James P. Dearing
Editor, *JECT*

LETTERS TO THE EDITOR

To the Editor:

I have been deeply disturbed by both the quality and the quantity of the articles submitted by the perfusion community to *JECT* for publication. I have, therefore, undertaken a brief study in an attempt to determine where the trouble lies.

I first felt that the origin of the problem lay in the insufficient education of perfusionists with regard to the preparation and publication of pertinent manuscripts. However, a brief review of publications in other medical sciences showed that this premise was incorrect.

If one traces the study of myocardial preservation from its inception and then monitors it to the present time, one can see the logical growth and development of this discipline. Before we can achieve the level of good scientific studies and investigations, we must have the background on which to build. I doubt that at this time many perfusionists could document their technique of perfusion or the logic of what they do. The reason for this, I believe, is that the documentation

simply does not exist. This is analogous to building a house without a foundation. As a consequence, some of the existing articles by perfusionists are often extremely weak. Topics such as arterial filtration and membrane vs. bubble oxygenators have been widely studied with very little new information disseminated.

As one looks at a developing medical science or technology, the literature pertinent to that specialty appears to follow a clear-cut evolving order. The initial phase is simply one of reporting observations, i.e., patients with pulsatile perfusion produce more urine; hearts do better with alkaline pH's.

This initial reporting phase is quickly followed by actual case reports, i.e., the pulsing of a patient with the reasons and techniques. This second phase is extremely important in developing technologies and is, I think, the area that we are missing. It is this phase that communicates the similarities and differences between perfusion techniques. It establishes the basis for valuable pro and con discussions with conclusions being drawn.

With this completed, a progression to the third phase is easily accomplished, for it is really just a variation in

that it is a case series analysis and literature review. To continue my scenario: the pulsing of patient with carotid stenosis with a review of the pertinent literature which supports this. This literature is, of course, a result of phase two and written by many practitioners.

Finally we arrive at the scientific publication. This is where the Student's t-test, the bivariate analysis, the double blind study and other scientific and statistical tools are used to investigate i.e., why there is more urine output during pulsatile perfusion.

It is my opinion that most perfusionists would write concerning steps 1, 2 and 3, but most at this time are not prepared to deal, either academically and/or financially, with phase four. Yet unfortunately, we have been led to believe that it is the only worthy type of publication and therefore attempt phase four with unflattering results.

If the majority of the perfusion community was to

follow this logical development, the literature would become abundant and, I believe, the quality would be vastly improved as well. At the most recent meeting of the American Academy of Cardiovascular Perfusion, a book was available entitled: *How To Write and Publish Papers In The Medical Sciences*, by Edward J. Huth. In this book the author outlines each of the above types of publication and explains how one accomplishes them. It is an excellent reference.

I look forward to discussing this most important issue with you. With best regards,

Sincerely,

Roger Vertrees, B.A., C.C.P.
Associate Editor
Journal of Extra-Corporeal Technology

To the Editor:

A Plea for Blood Gas Standards During Cardiopulmonary Bypass: I have recently reviewed the presentation by JB Riley, MS Jallad, MB Hurdle, PA Wagoner and BA Winn, entitled, "Blind Study of the Adequacy of Continuous Monitoring of Blood Gases and pH vs Intermittent Sampling During CPB"¹. In the study, 20 perfusionists were each asked to give the highest and lowest acceptable values for arterial and venous pO₂, pCO₂ and pH. A comparison was then made between these values and either those obtained by standard blood gas sampling or those obtained by an in-line continuous monitoring unit.

Though the purpose of this work was to show the advantages of continuous blood gas monitoring, it seems to me that the work has inadvertently demonstrated the urgent requirements for blood gas standards during cardiopulmonary bypass (CPB). For each parameter of interest the highest, lowest and the mean values obtained from the survey are summarized in Table 1^{1,2}. As can be seen, the highest acceptable pO₂ ranged from a high of 500 mmHg to a low of 150 mmHg with the mean being 270 mmHg. The lowest acceptable arterial pO₂ ranged from a high of 150 mmHg to a low of 60 mmHg with a mean of 121 mmHg. These values dictate that during CPB the arterial pO₂ can range from 60 to 500 mmHg and be

Table 1
The Range and Mean of Acceptable Blood Gases
Obtained from 20 Perfusionists.

Parameters		Upper Limits			Lower Limits		
		High	Mean	Low	High	Mean	Low
Arterial	pO ₂ mmHg	500	270	150	200	121	60
	pCO ₂ mmHg	50	44	35	37	30	20
	pH	7.60	7.49	7.42	7.38	7.33	7.25
Venous	pO ₂ mmHg	100	59	40	65	35	25
	pCO ₂ mmHg	55	47	35	45	35	20
	pH	7.60	7.44	7.35	7.35	7.28	7.20

acceptable to at least one of the perfusionists surveyed. Similarly, acceptable arterial pCO₂ ranged from 20 to 50 mmHg and pH ranged from 7.25 to 7.60. On the venous side, the acceptable values for pO₂ were 25 to 100 mmHg, for pCO₂ from 20 to 55 mmHg and for pH from 7.20 to 7.60. Furthermore, 25% of the perfusionists did not temperature correct blood gases, 45% did not routinely monitor venous blood gases and in the presence of metabolic acidosis more than half of the perfusionists did not increase blood flow.

If the survey results are clinically acceptable, then the requirements for continuous monitoring of blood gases may not be necessary. However, this is probably not the case as each perfusionist had narrower limits, though members of the same perfusion team did not always agree on acceptable limits. My question is: what is more important, continuous gas sampling or agreeing on standards for blood gases? It seems to me that the standards must be established before the frequency of sampling can be set.

If the author's statements, that "... most perfusionists are familiar with acid/base physiology..." and that "... perfusionists generally have a logical approach to the task of maintaining the patients acid/base status¹ are correct, then why such extremes in acceptable blood gases during cardiopulmonary bypass?

There are no recommendations by AMSECT or any other society. In many cases, the acceptability of blood gases is left up to the individual perfusionist. With the lack of agreement among perfusionists, the best interest of the patient may not be served. It is therefore imperative that guidelines be set. It does not make sense that AMSECT, whose members are responsible for maintaining patients on artificial respiration, does not have guidelines for the blood gases its members are supposed to control.

Guidelines can start with obtaining references in the literature to determine values that are not acceptable and values that are ideal. For example, normally arterial pO₂ does not go above 100 mmHg.³ Clinically, an

arterial pO₂ over 75 mmHg (saturation 95%) of a sedated patient, breathing room air is acceptable. Since pO₂'s above 100 mmHg do not significantly increase the O₂ content of the blood, there may be no physiological advantage of a pO₂ above 100 mmHg. In fact, very high pO₂ may increase the chance of microemboli.^{4,5}

The guidelines should: 1. List the values for ideal, acceptable and unacceptable blood gases; 2. Settle the question of whether blood gases should be temperature corrected; 3. Settle the question of whether venous blood gases should be monitored; 4. Make specific recommendations for proper changes in blood flow and/or gas flow when the blood gases exceed the recommended limits.

With increase use of the membrane oxygenators, which provide more predictable and easier to control blood gases, along with the availability of in-line blood gas monitors, it is time to make the effort and accept the responsibilities expected from professional societies.

Respectfully,

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References

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3. Nosé Y: Manual on artificial organs Vol. II The Oxygenator (p. 10) C.V. Mosby Co. St. Louis, 1973.
4. Pearson DT, Holden MP, Waterhouse PS and Clark IV: Gaseous microemboli during open heart surgery: detection and prevention. *Proceed Am Acad Cardiovasc Perf* 4: 103-109, 1983.
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