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# The Biomedical Technology/Information Explosion: Find Yourself A Foxhole

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## Abstract

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**Approximately 5500 biomedical papers are published every day and the half-life of this information is currently only 3–4 years. Therefore, it is not only important but nearly impossible to keep up-to-date on the literature relating to one's field.**

**This paper will propose a Journal Club (JC) format designed for perfusionists. Our experience with JC the last three years encourages us to share what we have learned about design, scheduling, benefits, pitfalls, and the evolution of a JC. We will suggest a list of 50+ journals that represent a cross section of the literature from disciplines affecting perfusionists. We will discuss techniques for surveying the literature, reporting at JC, recording participation, and creating a database for reference. JC is the best way to stay current with new information in our field and the benefits justify the effort required.**

## Introduction

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The medical literature has experienced an explosion of growth which is unprecedented. In 1979 there were approximately 5500 biomedical papers published daily,<sup>1</sup> with an expansion rate of 6–7% per year. Assuming these figures have remained relatively constant, there will be more than 9300 papers published daily in 1988. The entire body of biomedical literature doubles every 7–10 years.<sup>2</sup>

To make matters worse, the half-life of the biomedical information is only 3–4 years.<sup>2</sup> This means that half of what medical professionals learned just three years prior is no longer valid. Unfortunately, most practitioners are unable to keep up with current changes

in practice as outlined in the literature, and therefore treat disorders in the manner that they were taught during training.<sup>1</sup> Their knowledge and practice grow progressively more outdated. In order to keep up with the top ten internal medicine journals, for example, the practitioner must read 200 articles and 70 editorials each month.<sup>3</sup>

Recent surveys of physicians show strong negative correlations between time since graduation and currency of knowledge.<sup>4</sup> In 1979, Stross and Harlan published a paper wherein they studied the efficiency of dissemination of new biomedical information. They found that eighteen months following publication of a definitive study which established the effectiveness of photocoagulation for the treatment of diabetic neurovascularization of the retina, less than 50% of internists and only 25% of general practitioners even knew of the study. A smaller percentage of those who knew of the study could correctly answer two questions regarding the results and applications.<sup>5</sup>

It is clearly an overwhelming task for an individual practitioner to attempt to keep up with all the biomedical literature related to his field. This is especially true of a specialty like extra-corporeal circulation, which overlaps many specialties. The well informed perfusionist must not only keep up with rapidly evolving mechanical technology, he must maintain a working knowledge of physiology, pharmacology, cardiac surgery, anesthesiology, pathology, biochemistry, cardiology, and other related disciplines.

One method of improving our ability to keep abreast of the current literature is participation in a journal club (JC). This paper will describe the JC format that our group developed specifically to address the needs of the clinical perfusionist.

### *Journal Club*

Many groups of specialists, especially those in teaching institutions, have formed JCs which aid them

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in remaining current in their discipline. This generally involves the close scrutiny of a small number of key journals. The practitioners carefully study each article for its significance, accuracy, and application to their practice. Then, if applicable, they apply the new knowledge to their patients. While this method works very well for narrow specialties, broad specialties such as perfusion must modify this approach if we wish to review the largest possible amount of pertinent information.

Since the field of perfusion has only a small number of journals which are specific to it (*Journal of Extracorporeal Technology*, *Proceedings of the American Academy, and Perfusion*), and journals of related disciplines often print perfusion articles, it seems reasonable to monitor these related journals.

In order to be exposed to the largest number of relevant articles, our group organized a JC with the goal of monitoring all current literature of value to the practicing perfusionist. We developed a list of some fifty journals (Figure 1) which we monitor. Each member of the group is responsible for approximately five journals which they review monthly. These journals are usually related to the particular interest or area of expertise of the perfusionist. This assures the best coverage of each journal, as well as keeping the perfusionist interested in what he is reviewing. Since many of the journals are only tangentially related to perfusion, it is not unusual for a year to pass between issues containing pertinent articles. While on the surface it seems excessive to monitor this vast body of material, the payoff is when that "classic" article appears in an obscure journal which would have otherwise gone unnoticed.

Although reviewing five scientific journals each month appears a formidable task, when done systematically the time commitment is minimal (Figure 2). Every month each member of the JC goes to the medical library and pulls the current issue of his journals for review. Rather than trying to read each journal cover to cover, the table of contents is scanned for interesting titles. Once titles are identified, the abstract from each article is read. If the abstract indicates that the study is applicable (may change our practice, or confirm something that we already do), and appears to have been executed with sufficient integrity, then the article should be read in its entirety.<sup>6</sup> Finally, any article which remains applicable after critical reading should be presented to the group at JC.

Once a month, usually the third Monday, we conduct our JC meeting. At this meeting each member presents articles from their assigned journals. Since they have been reading journals of particular interest to them, they are generally better able to explain an article than someone with only mild interest.

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| Advances in Free Radical Biology and Medicine | JAMA   |
| Annals of Surgery                             | Journal Cerebral Blood Flow and Metabolism     |
| Annals of Thoracic Surgery                    | Journal Cardiovascular Surgery                 |
| ACTA Chirurgia Scandinavica                   | Journal of Clinical Investigation              |
| American Heart Journal                        | Journal of Extracorporeal Technology           |
| American Journal of Cardiology                | Journal of Heart Transplantation               |
| American Journal of Hematology                | Journal of Legal Medicine                      |
| Anesthesia                                    | Journal of Medical Education                   |
| Anesthesia and Analgesia                      | Journal of Medical Ethics                      |
| Anesthesiology                                | Journal of Molecular and Cellular Cardiology   |
| Arteriosclerosis                              | Journal of Surgical Research                   |
| Artificial Organs                             | Medical Instrumentation                        |
| Blood   | Pediatric Cardiology                           |
| British Heart Journal                         | Perfusion                                      |
| Catheterization and Diagnosis                 | Proc of the American Academy of Cardiovascular |
| Cardiac Chronicle                             | Perfusion                                      |
| Chest   | Prostaglandins                                 |
| Circulation                                   | Scandinavian Journal Thoracic and              |
| Circulation Research                          | Cardiovascular Surgery                         |
| Cleveland Clinic Quarterly                    | Seminars in Thrombosis and Haemostasis         |
| Cryobiology                                   | Stroke   |
| European Heart Journal                        | Surgery  |
| Haemostasis                                   | Surgery, Gynecology, and Obstetrics            |
| Health Education                              | Texas Heart Journal                            |
| Health Marketing Quarterly                    | Thrombosis and Haemostasis                     |
| Health Policy                                 | Thorax   |
| Heart and Lung                                | Transfusion                                    |
| International Journal of Artificial Organs    | Transplantation                                |
| Japanese Heart Journal                        |  |

Figure 1. Journal Club List

Presentations follow a specific format. First the title and authors and institution are revealed, followed by a concise explanation of the central question or issue. Then the materials and methods are explained along with the reviewer's opinion of the validity of the study method. A synopsis of the results and conclusions follows. Finally, the paper is discussed among the JC participants. Each article is scrutinized for applicability to our practice.

### Pitfalls

Participation in JC is not compulsory in our group. However, the very nature of our format depends on

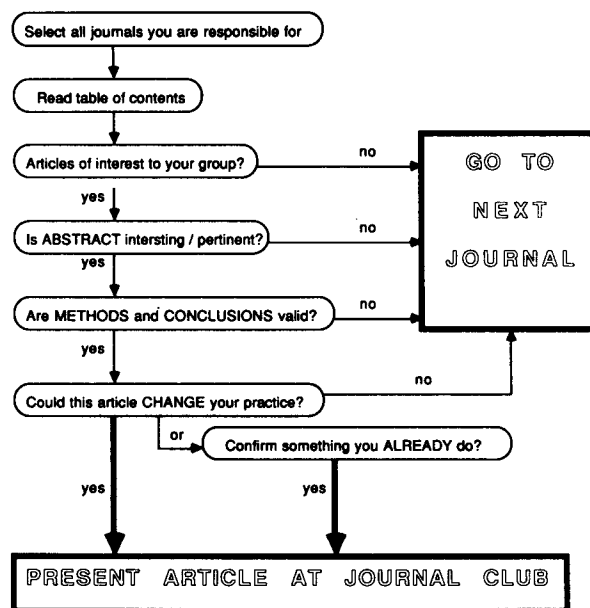


Figure 2.

each member monitoring those journals assigned to him. If journals go unmonitored, valuable information may escape review of the group and the goal of JC will not have been met. All who participate benefit tremendously from the efforts of the other members.

Perhaps the single largest problem in coordinating the JC has been scheduling. The perfusionist's schedule is unpredictable at best: often busy to the extent of neglecting all but essential bodily needs. It is easy to see how something like JC could be neglected. This is a problem that we have encountered and addressed.

Initially we would schedule JC, and if a certain number of the group could not attend it would be postponed. This usually did not occur until after the specified meeting time had arrived. Unfortunately, many of these postponed meetings were never rescheduled. Since the group was committed to continuing JC, it was decided that a better plan would be to have a specific day for JC. This date turned out to be the third Monday of each month. By having an identified day each month, we have been better able to plan and prepare for JC, making it more rewarding for all participants.

#### *Creating a Database*

After three years of JC, we have been exposed to a tremendous amount of material. While some of the more important papers are remembered by the members, many are forgotten. Fortunately, computers are capable of archiving this information for us. Since the majority of our group members have Macintosh<sup>®</sup> computers, we are in the process of developing a systematic method of indexing and cross referencing all papers presented at JC into an electronic database. Those papers which were not presented, but which might interest some of the members, will be included as well. Each member would have access to the database for customized searching. This should facilitate the implementation of the applicable articles, and provide a more tangible benefit of participation in JC.

#### **Discussion**

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Clearly, the biomedical literature is growing at a rate which is impossible to keep up with. Unless the perfusionist takes active measures to ensure that his knowledge is current, he will fall hopelessly behind. The JC is a method of keeping up which is relatively pain free; however, there are other alternatives. One option is for the individual to attempt to read all the literature himself. For perfusion that would mean reading a large portion of the journals in Figure 1. Another method would be to just read the three journals specific to perfusion and hope that the authors write about all the important changes affecting our

field. One final method is one which frightens us a great deal: to not read at all and rely solely on the knowledge remembered from perfusion training.

Journals are perhaps the best source of biomedical information. They contain the earliest complete reports of new findings. Textbooks are generally two years behind. Journals are usually peer reviewed. Articles in journals begin with an abstract providing the reader an overview of the study to determine if it is worth his time to read the entire text. They adhere to a standardized format which is concise and consistent. Finally, journals are extensively indexed both by services like Index Medicus as well as electronic databases which may be easily accessed by computer.

The majority of perfusion articles are not peer reviewed because they are contained in the *Proceedings of the American Society of Extra-Corporeal Technology* and the *Proceedings of the American Academy of Cardiovascular Perfusion*.

There are some logistical problems regarding organizing a JC which should be addressed. Since our group is rather large, it is relatively easy to monitor such a large group of journals. Many perfusionists work alone or in small groups. In these instances, it seems reasonable to seek out other perfusionists to form a JC who are in close proximity and under similar circumstances. Large metropolitan areas lend themselves well to this type of arrangement. Typically there are several small groups who could team together in this endeavor. The reward will likely be more than just the intellectual stimulation.

#### **Conclusion**

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We have presented a concept for the creation of a journal club for perfusionists and our experience with its implementation. The benefits of this JC are that each participant is exposed to a body of literature much larger than he would be able to review himself. Further, each participant may feel comfortable that important literature is not escaping their attention. By spending time in the medical library, participants become familiar with techniques used to find information: an invaluable skill. They develop more critical reading skills and learn to become more skeptical when considering an alternate method based on "a study." A secondary benefit from participating in JC is improved public speaking skills. The act of presenting a complicated study to a group of peers is difficult, but after practice the presenters' skills develop considerably.

Perhaps the most important benefit from our JC is the worthwhile and stimulating discussion which is invariably triggered by one of the presentations. These discussions often turn into debates which stray from the original topic. It is not unusual to decide to imple-

ment a change in our clinical practice based on the interaction which was promoted by the discussion at JC. By making changes in this way, there is a higher likelihood that there is some precedence, increased interest, and support for trying something new. When we try something new or different, it is our responsibility to report the experience so that others may benefit.<sup>7</sup>

Finally, JC is an important part of the perfusion quality improvement effort. Proper training and an adequate knowledge base are the most important factors in preventing the largest source of perfusion accidents: operator error. The JC ensures that the knowledge base is current, accurate, and defensible.

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## Questions from the Audience

*Ace Adams, Alabama: Question:* Are copies made of all of these articles and passed out to the journal club members?

*Answer:* We generally make copies of the abstracts and all the citations of the papers which are available and handed out to the group.

*Question:* I was thinking that for the benefit of the long working perfusionist, is it possible to publish an address that the membership might send for some of these copies or would that be too devastating and you couldn't possibly take care of this?

*Answer:* An interesting idea. There is actually a form of this that appears in *Perfusion Life* under Articles of Interest, that is not unlike what we are doing. I am not sure they cover quite the number of journals where they list the citations and you can go and pick up the paper yourself. I don't think that we are in a position to do that.

*Question:* I can see where it would be a big job. It would be nice if this was made available to a lot of people who could not do it.

*Answer:* It has been a great experience.

*Comment:* Very impressive. A lot of us don't do enough reading and this would be a remedy for the problem.

*Al Stammers, University of Michigan: Question:* Thank you very much for bringing up a very nice presentation that is very important to perfusionists. Are you familiar with or does your group use the publication, I believe on a weekly or bi-weekly basis, Current Comments or Current Contents, as a rapid review of the publications that are available in bio-medical literatures and if so, have you gotten away from using this as a quick review of the publications? Are you familiar with Current Comments?

*Answer:* I am vaguely familiar. We have never used that specifically for this. We primarily just pick the journal and go through that journal monthly. That may be a good way to pick up some more literature.

*Comment:* My comments are that it is a very rapid way to go through and instead of picking up the individual journals, you pick up a small publication that is about 5 x 7 and you can review the 50 journals or 50 publications that you have listed in a very rapid format to review that table of contents and from that point on you should go to the actual journal to review the abstract. We have used this in the past ourselves and have been quite successful with it.

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