

The Journal in the 21st Century

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It has always been an important part of all fields of medicine to keep in touch with changes in knowledge and practice. In recent years, Continuing Medical Education (CME) has become mandatory for some areas of licensing, such as Medical Indemnity. Self directed learning through peer reviewed literature is an important way to maintain currency. New technology has made this task easier and also allowed this learning to better lend itself to changes in practice at the bedside, potentially resulting in improved patient care.

This article will look at technological advances that may improve our ability to keep current with literature and put best evidence into practice.

INTRODUCTION

Ten years ago, part of continuing medical education typically took the form of subscription to major journals which could be read at home or carried in the briefcase to read during cases. Copies of individual articles might also be supplied by colleagues, company representatives, or at meetings. This has several downsides. As individuals, we cannot subscribe to all the relevant journals, nor find the time to flip through the table of contents of all the journals in our hospital or department library. Journal clubs are an alternative, though they have decreased with the fragmentation of our workforce throughout the growing number of private operating complexes. Even when we find quality articles of importance, and read them, they are rarely easy to find when required at a later time. If we have a well organized filing system (for example, the one described by Amar in 1992(1)), it may not be physically located where we work.

In the 21st century things have changed radically. Journal tables of contents can be received by email automatically, their contents perused, articles downloaded and stored on ultra-portable laptops or personal digital assistants to be reviewed at the bedside. Teaching at the bedside can also be augmented (2). This article describes how a practicing anaesthetist can improve their exposure to peer reviewed literature with the technology available today (2007).

PART I: SOURCES OF INFORMATION

a. eTocs

All major anaesthetic journals, and many non-anaesthetic journals containing articles of interest to our profession offer "eTocs" or emailed tables of contents (they are sometimes also called "eAlerts"). These are generally free, and only require registration at the journal's website. When a new issue of the journal is published, the table of contents is automatically emailed to you, with links to the abstracts of the articles. Some journals offer the complete text of some or all of these articles for download free of charge, particularly articles from past issues. However the majority requires either a subscription to the journal or the purchase of each article individually. Fortunately our hospitals, area health services and our College have institutional subscriptions to many of these journals, allowing access to the full text of the articles. To access the journals that the College of Anaesthetists subscribes to go to www.anzca.edu.au/libonlinejournals/index.htm (you need a college password to use this). Your hospital librarian and Area Health Service IT representative can give you a password for other journal collections (in New South Wales CIAP, the Clinical Information Access Project www.clininfo.health.nsw.gov.au).

Table 1: Major Relevant Journals Offering “eTocs”

Journal	Access Type	Earliest Online Full Text Articles
Acta Anesthesiologica Scandanavica (www.blackwell-synergy.com/loi/AAS)	Subscription only	1999
Anaesthesia (www.blackwell-synergy.com/loi/ANA)	Subscription only	1946
Anesthesia&Analgesia (www.anesthesia-analgesia.org)	Subscription only	1957
Anesthesiology (www.anesthesiology.org)	Articles free 6 months after publication	1995
Anesthesiology Clinics of North America (anesthesiology.theclinics.com/)	Subscription only	2002
BJA (bja.oxfordjournals.org)	Subscription only	1923
Canadian Journal of Anaesthesia (www.cja-jca.org)	Articles free 1 year after publication	1966
Critical Care Medicine (www.ccmjournal.com)	Subscription only	1995
Current Opinion in Anesthesiology (www.co-anesthesiology.com)		1998
International Anesthesiology Clinics (www.anesthesiaclinics.com)	Subscription only	2000
NEJM (content.nejm.org)	Certain articles free, majority subscription only	1993
Paediatric Anaesthesia (www.blackwell-synergy.com/loi/PAN)	Subscription only	1991

(Note that our local journal, *Anaesthesia and Intensive Care* does not offer eTocs but does have an excellent website (www.aaic.net.au) where articles can be downloaded)

b. websites

The majority of journals now make their contents available online in a variety of formats. Newly published issues are generally made available immediately, but many journals are endeavoring to scan back issues so that they too are available online. For example, the BJA has online every issue it has published back to its first issue in 1923.

There are other types of websites other than journal websites that may be a source of information. Colleges and societies also have online information, such as guidelines and consensus statements, much of it accessible and hence downloadable by anyone. Obviously there are many potentially useful sites, of which a few are suggested below.

Table 2: Websites with useful online resources

Website	URL
ASRA American Society of Regional Anesthesia	www.asra.com
AHA American Heart Association	www.americanheart.org
ANZCA	www.anzca.edu.au
RCA Royal College of Anaesthetists	www.rcoa.ac.uk
Malignant Hyperthermia Association (MHAUS)	www.mhaus.org
NYSORA New York School of Regional Anesthesia	www.nysora.com

c. Searching tools

eTocs alert us to new articles, but not archived articles. For these searching tools are available online, including various gateways to the database of the National Library of Medicine in Washington DC such as Medline OVID (gateway.ovid.com) and Pubmed (www.pubmed.com). These databases allow complex searches through medical and scientific journals. The scope of searching techniques is another topic in itself. Some journals themselves have responded by no longer publishing paper indices (e.g. Anaesthesia and Intensive Care in 2007) reasoning that online access to indices rendered them redundant.³

Articles as clinical reference tools?

Now we have found our information, later use as a reference could be approached in three different ways:

- (i) search for it at the time required
- (ii) keep details of the data and access it online at the time required
- (iii) download at a time convenient and store on offline hardware

Searches, even with experience and using the best databases, typically result in hundreds of articles that require sifting through for the one that most suits our needs. A more efficient technique is understanding the areas of relevance to our practice and building up a collection of articles to match. Currently, bandwidth and availability of internet connections don't allow on-demand rapid downloading of data in the operating room or bedside. This may arrive in the future, but I think at all times it will be slower than keeping a stored version such as I'll be describing.

When storing published information it is important to be mindful of copyright. In Australia, copyright law is set out in the Commonwealth *Copyright Act 1968*⁴. This is federal legislation, and applies throughout Australia, regardless of where the article was published. The Act allows people to use copyright material without the copyright owner's permission in certain situations. This includes "research or study"⁵. You do not need to be enrolled in a course – you could be researching or studying something for yourself. You will not infringe copyright if you use material for the purposes of research or study, provided that your use is "fair". What exactly determines "fair" use is open to interpretation, but in general articles from journals paid for by your institution can be downloaded and stored on media for later reading. However, giving them to others who do not have a subscription or publishing them to other websites may not generally be considered "fair" and may be a breach of copyright.⁶

PART II : STORAGE

a. data types

Journal articles can be read online, downloaded and stored. There are typically two file formats: PDF and HTML/Full text.

PDF stands for Portable Document Format, and is a product of Adobe Corporation. These documents can be created and read by the program "Acrobat" which must be purchased, but also by many free document readers, including Adobe's own "Acrobat Reader". The majority of computers will have some form of PDF file reader already installed. The advantage of the PDF format is it is nearly identical to the journal article as published in the paper journal. This means that PDFs are easy to read and are in familiar form. All the tables and figures are placed correctly as the journal intended. In addition, when printed, it is identical to that published, which makes reading easier and is particularly useful for giving paper copies to colleagues. The main disadvantage of the PDF format is that it is designed for reading on a page somewhat larger than a typical computer monitor and often in two columns. This means scrolling up and down the page to read.

A typical 10 page journal article without pictures or tables is about 200 Kilobytes(K). Adding pictures or tables often will double this size to 400K. Articles scanned from paper are much larger, typically around 1-2 Megabytes (Mb). Hence you can expect to store 3000-4000 articles per Gigabyte (Gb) of storage.

HTML stands for HyperText Markup Language, and is the file format of most web pages. Journal articles in this format (also often called “full text” articles) have the advantage that they tend to be in a single column which is easier to read, plus, references will have “hyperlinks”. Clicking on these will take you to other web pages with more information on the referenced articles. On the downside, tables and figures are often separate, requiring you to click on them to view them, and the printed format is often much harder to read, less like the original, and takes up many more pages (typically 3-4 times as many pages).

Which format you choose to download and store will depend on your preference and way of working.

Data File versus Paper

In general, I believe we should be steering away from paper copies of articles (“dead tree” versions in Information Technology speech), and trying as much as possible to source, read, store and distribute articles in data/file formats only. Why?

Electronic articles:

- (i) reduce paper use for environmental reasons
- (ii) enable easy storage, filing and searching
- (iii) can be made available for reading and referral in the operating room and at the bedside
- (iv) encourage others to use similar systems

If we give our information to others in this way, they can store and use the information similarly, without having to scan articles which is time consuming and produces larger files of poorer quality and legibility.

Converting archival articles

We may not get all our information online or from colleagues digitally (although we should try hard, for the reasons outlined above), and we are likely to have paper articles from the past. It would be ideal to get all of this information in data form as well, though it can be laborious. If we are lucky some articles we have already can be downloaded from journal websites where those journals have scanned their back issues. Otherwise the only way is to use a scanner. This is not only hard work, but articles scanned in this way always take up more data storage space – typically between 4 and 6 times as much space. Adobe Acrobat can be used for this purpose, and has the advantage of creating PDF files, plus it can perform “character recognition” – this means that there is not only an image of the article, but the words within are able to be searched (as will be discussed later). This is preferable to simple images.

b. Hardware

Information can be stored in many locations which may have differing utility in terms of storage size, physical size and connectivity. Any of the hardware described below can be used to store all your references and allow searching and reading of the articles.

(i) PDAs & Smartphones

PDAs or Personal Digital Assistants are very useful for mobile medical practitioners like anaesthetists, although in the last few years they have tended to be replaced by mobile phones or “smartphones”. They are of two main types: the “Palm” operating system, and Microsoft Windows “Pocket PC” system. The Palm operating system has been around for longer and more avidly taken up by medical personnel, and hence has more software available for it. It also runs a little faster and is a little more stable. However, for the purpose of storage of files in PDF format it really offers little advantage over the Pocket PC system. Both offer data cards which can store up to 2-4 Gigabytes of information, more than adequate for most personal filing systems. Neither system allows easy viewing of PDF files (they must first be converted) and smaller screens make reading articles a bit more difficult when compared with laptops. This means that they tend to be a good place to store a few frequently referred to documents, but not as a place for a complete library of articles.

(ii) Laptop computers

Modern laptops are becoming so small (around one kilogram) it is truly possible to carry them daily in your briefcase, much as we do with journals. They have large easily read screens and long lasting batteries. The fact that they can also provide mobile internet access as well means they are the overall winners in terms of mobile data storage.

(iii) USB data storage devices

USB “drives” are flash memory (memory that can be read and written many times and does not require power to maintain the data) that can be accessed by plugging the device into the universal serial bus (USB) port of a computer. They can carry data as well as programs, and currently (2007) can store up to 2-4 Gigabytes of data although capacity is increasing all the time. If you work in a location with easy access to computer terminals, these may provide a much lighter and simpler library storage source. Small PDF readers (for example, “Foxit Reader” http://www.foxitsoftware.com/pdf/rd_intro.php) can also be stored on the device, so by simply plugging into a terminal you can view your entire library. However, no computer, no library!

PART III: FILING

Once we have all this information stored on our computer, we need to be able to find it later. Any article we can’t locate at the time we want to read it might as well not be in our collection! There are a few problems and solutions.

a. Naming

Most journal articles downloaded from journal websites are not named in any useful way. Frequently they are just the page number (e.g. 954.pdf)! We need names that make articles easy to recognize at a glance and distinguish one from another. There are obviously many ways we could name data, but it will depend on what we find most useful in discriminating one article from another, and how useful those articles themselves are actually likely to be. Data we *could* include in the name include:

- Date of Publication (year=YYYY, month=MM, Day=DD)
- Journal name (e.g. aic, nejm, bja)
- Journal issue, volume and page
- Author names
- Subject of article
- Type of Article (e.g. editorial, review, letter, meta-analysis)

Surprisingly, some of these such as page, issue and volume are less useful than others – if we already have the article we don’t need to go looking for it! My personal structure of naming is as follows:

YYYYMM_subject_type_author_journal.pdf

Example:

199612_betablock_periop_mortality_mangano_NEJM.pdf

(I use “underscores” (shift dash) rather than spaces between words because in the long run these file names are a safer style from a computer storage perspective). In fact the only absolutes I have are the year of publication and the subject. I add the others as required. In the case of the above, I might only call it “1996_mangano.pdf” since the article is so well known that is all that is required to distinguish it from others.

Personally I decided date was most important, because as articles get older they become less useful (though not of no use), and by using the date at the start of the name it neatly orders articles by date of publication when viewed as an alphabetical file list (as opposed to the date you saved them on your computer, which is how computer operating systems tend to order them). This puts more recent and possibly more useful articles higher in the list. The subject comes next so I can determine what the article contains at a glance. Other pieces of information are added

when there are already many articles on the subject in my files to further differentiate them from each other. You can add or leave out the month of publication depending on whether you have a few or a lot of articles. Fifty articles all starting with a single year can be subdivided further by adding a two digit month after the year, or even better by making subfolders.

b. Searching

Once we have a store of articles we need to find things of interest. That's easy when we have 20 articles in a folder named "articles". It's much harder when we have 3300 articles collected over a decade in 550 folders (that's about how many I have now). Microsoft Windows inbuilt searching system is very slow and not very accurate. An alternative is "Google Desktop" which can be downloaded for free. This uses computer "idle time" (the computer is on but not being used) to sift through your files and index them. This includes not just the name of the file, but also its contents. You can then do a search for your subject of interest. The Apple Mac Operating System offers a similar system called "Spotlight". Adobe Acrobat also allows searching through multiple files and directories, looking both at the text and keywords/metatags.

None of these is perfect for our needs however because of the lack of specific metadata tagging systems, the subject of the next section. So while I can search for a term (say "haemachromatosis") I cannot specify whether it is in the title, subject or keywords, whether the article is a review article or editorial, or concepts such as whether the article is specifically about the subject in question, or whether it makes a passing reference to it (what is sometimes called "focus"). In the future, file searching may improve as there are more and better metadata tags. For the moment however, limitations in searching make good filing paramount.

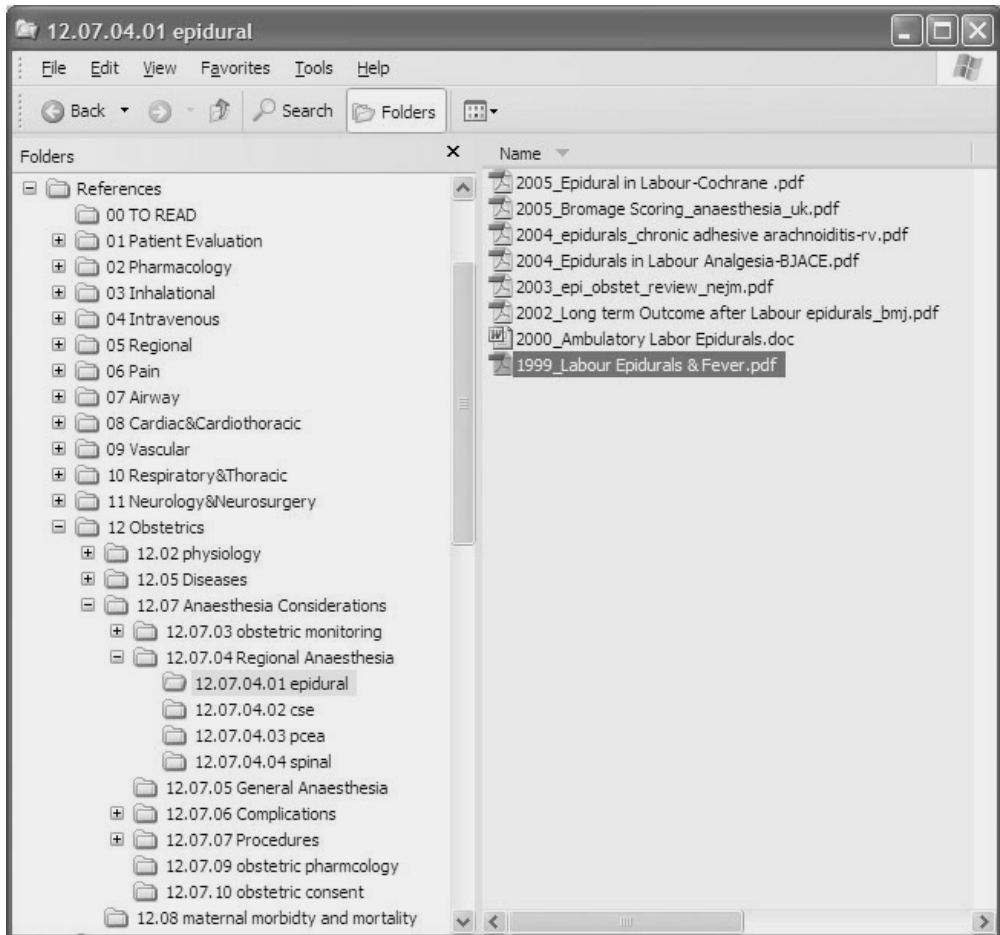
c. "MetaData" and tagging

The above naming system is actually a form of metadata tagging. Metadata is a term meaning "data that describes data". Naming our files describes the data within them, and makes them easy to search and find. PDF files allow much more sophisticated metadata tagging, similar to what you may be familiar with when using computerised journal indexing systems (such as "MeSH" headings). PDF has separate "metatags" (a piece of metadata) for title, author, subject and keywords. These would help a lot when searching a lot of files for something particular. When we do searches using OVID, typically we use keywords to find articles. Sadly, most journals do not fill out the metatags at all. You can add them yourself, though some PDF articles prohibit editing. This means searching your own library of PDF articles much harder, and necessitates a filing system. HTML articles at this stage do not have a system of metatagging.

d. Filing systems

You could use any filing system that suits your needs and style of practice, but it is important that the system you use allows easy expansion as your library grows. The easiest option is to personalize an already established system. A system specifically designed for anaesthesia was developed and published by Amar in 1992 (1). It consists of major subject areas designated principally by body system and type of surgery which have two digit identifying numbers (e.g. "10 Respiratory & Thoracic", "12 Obstetrics"). Under these are further subdivisions of subjects, each with a further two digit number, down to four separate two digit numbers separated by decimal points. An example is shown in figure 1.

The purpose of the filing system is to provide a structure for storing articles so they can be easily found. You can do this by creating folders on your computer named according to the filing system, and then placing your articles within the folders.

Figure 1: Filing System, in the form of Computer Folders

You don't have to use all the subheadings to begin with. Say you have only five articles on "regional anaesthesia" specifically for obstetrics, you could simply make the folder "12.07.04 Regional Anaesthesia" and place them in there. You can add more subfolders later if you get more articles on each sub-type of regional anaesthesia.

Sometimes articles may fit into more than one category (does an article on "epidural opioids" belong in "02.08 Opioid pharmacology" or "05.02 Neuraxial blockade"?). There are several options in this situation. You can just keep it in one place and *hope* to find it later. You can make a "shortcut" – a pointer to the original file and place it in the second location. This can be a problem if files are moved later as the system becomes more complex (such as copying your references folder or moving the original to a new subfolder you've created) since computers are poor at tracking the connections. **The best option is simply to make a copy of the file and store it in both locations.** File sizes are typically not large and the need to do this is infrequent,

so that it makes best sense in terms of utility. My current folder of over 3000 articles is only 1 Gigabyte – tiny in comparison to most current hard drives or even flash drives, so duplicating even 5% of articles would make little difference.

I have computerised and updated this particular filing system and it is available for download from the College website for use by anyone, as a PDF file (.pdf), Microsoft word (.doc) and text (.txt) documents. The latter two allow you to edit the system further to suit your own needs.

PART IV: PRACTICE

Being aware of current literature, downloading it and reading it is a substantial part of continuing education, but the final piece in the puzzle is putting it into practice. Traditional methods often do not lead to changes in practice. It can be difficult to remember the recommendations of an article read a few months ago, and finding the physical location of a photocopy, or remembering the journal, volume and issue even harder. The result: an inability to put the information into practice.

To put it another way, if you have a collection of “useful” or “interesting” articles, but you can’t find the relevant ones when you want them, you might as well recycle the paper! In fact, it is this that led me to my current system. I had an article I referred to about once a year on breastfeeding and anaesthesia. Of course, one day, when I needed it could not be found. Not in the usual filing cabinet spot, not in the briefcase. When it later turned up (after the case) while cleaning the top of the desk I knew my system of filing had to be improved.

21st century methods fare far better. By carrying the articles we have identified as relevant to our practice and then downloaded, read and filed, we can access them at the bedside when confronted with a clinical problem. Laptops and smartphones with internet access also allow further searching for more articles as required and hence are even more useful.

CONCLUSION

Keeping up to date has now moved beyond a dog-eared manilla folder in your briefcase labeled “articles to read”. Today, it is within the reach of all practicing anaesthetists to:

- (i) be aware of the latest publications related to their area of practice
- (ii) download and read these articles immediately after publication anywhere in the world
- (iii) keep electronic copies of these articles for later reference at the bedside when the clinical need arises

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