ICT in the ICU: using Web 2.0 to enhance a community of practice for intensive care physicians

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ABSTRACT

Contemporary information and communications technology (ICT), particularly applications termed "Web 2.0", can facilitate practice development and knowledge management for busy clinicians. Just as importantly, these applications might also enhance professional social interaction and the development of an interprofessional community of practice that transcends the boundaries of the intensive care unit, health service, jurisdiction and nation.

We explore the development of Web 2.0 applications in health care, and their application to intensive care practice in Australia and New Zealand. The opportunities for using podcasts, blogs, wikis and virtual worlds to support clinician development and knowledge exchange are clear in theory. However, strategic leadership from the Colleges is needed to fully exploit these technologies and to enable the development of a strong and sustainable ICU community of practice.

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Keeping up to date with specialist medical knowledge has become increasingly difficult for clinicians. However, in this digital age, the development of ICT — information and communications technologies — and especially the interactive applications labelled "Web 2.0" has created new opportunities for learning and professional development for clinicians.

Traditionally, professional development has relied on didactic educational strategies, such as conferences, rounds, journal clubs, meetings and symposia, as well as research reports and reviews published in general and specialist journals. Common factors that limit clinicians' ability to fully engage with their rapidly evolving evidence base include lack of time, support and training, and professional isolation. Nevertheless, patient safety and quality of care require that relevant information is readily accessible and specific to clinicians' real-time needs. Contemporary practice therefore requires a more dynamic and collaborative approach to knowledge acquisition and skills maintenance.

Contemporary ICT has prompted a "re-think" of learning and professional development strategies, from traditional formal face-to-face methods to more asynchronous learner-centred approaches. A variety of technological tools are now beginning to be used for learning, including web-based courseware, online discussions, blogs and podcasts of educational material. These approaches allow health care professionals to review learning material in their own time and at their own pace; they also enhance interprofessional communication and collaboration for improving the health outcomes of our patients.

Here, we explore these emerging technologies and consider how they might be applied in intensive care practice in Australia and New Zealand.

Background

Some "Web 1.0" technologies, such as listservs and websites, are already being widely used to support clinical practice. Listervs (member-based email groups) have been used by professional groups for many years for a range of functions — communication, exchange of information and tacit knowledge and, perhaps most importantly, peer support.[1,2] Websites provide static repositories of information and are important as a first stage for exchanging knowledge. However, they lack the functionality for true collaboration that enables knowledge management and the development of a community of practice. Web 2.0 applications may provide this opportunity.

What is Web 2.0?

The term "Web 2.0" was coined in 2003 by Dougherty of O'Reilly Media,[3] and used widely following that company's Web 2.0 conference.[4] Despite disagreements about definition, Web 2.0 applications emerged rapidly and reflected the view that it is "the read–write web" — the applications focus on interactivity between end-users and various online functions. Applications include blogs, podcasts, wikis, mashups, RSS, XML, facebook, folksonomies, semantic web, serious gaming, virtual worlds, Twitter and Second Life.[5]

In contrast to the traditional, static "flat" pages of Web 1.0, Web 2.0 includes user-generated content (eg, blogs, podcasts and wikis), confirming that it is "all about people",[6] where applications can be used to read, write, play

and listen online, anytime and anywhere there is access to a web browser. A YouTube video — *The machine is us/ing us*[7] — both provides a helpful overview of Web 2.0 and exemplifies a Web 2.0 application.

The benefit of these applications is simplicity of creation, as they do not require the end-user to possess sophisticated programming skills.[8] The content generated by an author beckons users to comment, rate and edit what has been instantaneously published to the Web. This interaction promotes collaboration, communication, socialisation and education in a powerful and unique way; it is consequently also known as a "participatory web".[9] Furthermore, web-based learning encourages self-reflection through iterative development of discussions.[10] However, successful use of ICT for learning does require some support: informatics competencies for users and participants;[11] a set of technical resources to support learners in an online environment;[12] and a different skill set for facilitators to sustain participant interactivity.[13-15]

Importantly, Web 2.0 represents more than a technology, and encompasses cultural, social and political, business, education and health care aspects.[16] Web 2.0 applications have the potential to create an anthropological architecture of web-based participation that could help social and professional groups increase their collaborative efforts to disseminate information and form knowledge.

In health care, Web 2.0 applications could allow health care practices to become more transparent, reduce the effort required of clinicians to keep up to date, and promote effective communication with patients and colleagues.

How is Web 2.0 being applied in health care?

Common Web 2.0 applications such as blogs, podcasts and wikis have been, and continue to be, used as tools in education, health care and medicine.[17-19] Blogs (web-logs) are Internet-based tools for information dissemination. They can include text, images and other objects, and can be the common diary-type or filter-style. The latter provides educational opportunities as an interactive learning tool, with posting of information and threaded asynchronous discussions. Blogs can replace email listserv discussion lists, and are appropriate for implementing declarative or procedural approaches to knowledge-building, because of the iterative development of content through peer-review feedback and discussion.[17]

Use of rich site summary (RSS) software also enables a broadcast version of a blog to be created as a podcast. Blogs are instantly published by the author, and act as avenues for distributing mass information, as well as sites for social networking. By using "permalinks" or "tags", posts from other similar-content blogs can be conveniently linked. It is easy to create a personal blog using open-source software such as Blogger.[20] Wikis extend the blog functionality by enabling group-developed web material; a well-known general-purpose wiki is Wikipedia.[21]

The emergence of personal MP3 and other media players as educational delivery tools provides new opportunities for mobile learning, not confined to an Internet connection.[18] Podcasts provide a defined set of audio material (or video depending on the capability of the player — "vodcasts") for the learner, in a "conversational voice" that may enhance learning.[18] Podcasting — a portmanteau of "broadcasting" and "iPod" (Apple's version of an MP3 player) — via RSS is very popular because it provides "any time, any place" access via computer desktop or mobile device.[18,19]

An enhanced podcast can include audio, video and text. This enables all senses to be tapped for optimal learning. Apple's GarageBand is an easy to use software program that allows individuals to create and publish interactive podcasts.

Some of these applications are now being used in health. The Society of Critical Care Medicine's iCritical Care portal allows access to educational podcasts, vodcasts and RSS feeds.[22] Similarly, podcasts are available through the *British Medical Journal* website (http://podcasts.bmj.com/bmj/). In Canada, a project using web-based learning in the implementation of a new clinical practice guideline in an emergency department proved successful, with high participation rates, and some critical reflection and asynchronous discussion of decision-making resulting from the simulated case scenarios.[23]

Health 2.0

There is ongoing discussion about the nature of Health 2.0, and how these applications may contribute to health care.[24] Some commentators believe that Health 2.0 is more than the application of Web 2.0 to health care, and that it will have a major impact on the future delivery of health care. As health care becomes more "person-centred", there will be a shift towards humanising its delivery, and Web 2.0 technology may help individuals to socialise, collaborate, and benefit from more personalised attention.

A current definition of Health 2.0 is:

> a new concept of healthcare where all the constituents (patients, physicians, providers, and payers) focus on healthcare value (outcome/price) and the use of competition at the medical condition level over the full cycle of care as the catalyst for improving the safety, efficiency, and quality of health care.[24]

Another view is that Health 2.0 is about enhancing communication and collaboration between health profes-

Table 1. Examples of Web 2.0 applications used in health care

Application	Internet site
Blogs	
Clinical cases and images	http://www.casesblog.blogspot.com
Health Informatics Forum	http://www.healthinformaticsforum.com/
Informaticopia	http://www.rodspace.co.uk/blog/blogger.html
Science Roll: Medicine 2.0	http://scienceroll.com/medicine-20/
Wikis	
AskDrWiki	http://askdrwiki.com/mediawiki/index.php?title=Physician_Medical_Wiki
Medpedia	http://www.medpedia.com/
Health 2.0	http://health20.org/wiki/Main_Page
Podcasts	
Health and research	http://www.med.umich.edu/podcast/

sional groups and patients, to ensure excellent clinical practice.

Examples of Web 2.0 applications that are commonly used in health care are listed in Table 1, including blogs, wikis and podcasts. Other suites of online tools that are emerging and being used by health informaticians are folksonomies, where user-based tagging, classification and indexing are used to organise web-based content. Individuals suggest that folksonomies be used to help disseminate medical standards that describe what and how clinical data are collected, and "describe information content".[25]

More advanced Web 2.0/3.0 applications that are rapidly evolving and being considered by health care professionals and educators are listed in Table 2.

Why apply Web 2.0: the opportunities

The 2007 *Horizon report*[26] noted the time to adoption for social networking would be 1 year or less. This prediction was correct, as today we see many computer applications supporting social networking ideas in many professions. The outstanding function of Web 2.0 is social networking and the ability to develop asynchronous and virtual communities of practice.

Intensive care clinicians may be attracted to social networking sites because of the content, community and interactive activities that abound. As many of these social networking areas are open source, professionals are turning to sites such as LinkedIn (http://www.linkedin.com/) and Facebook (http://facebook.com) to build personal websites that promote their professional status and connect with others in the same profession. It is also very easy to build a social networking space within any website (eg, a Google homepage).

The primary reasons that social networking applications build rich and interactive learning environments are their abilities to encourage community and social expression, to enable foreign-language professionals to establish connections with native speakers, and to extend the life of conferences and workshops by allowing participants to contribute before and after the event.

Social bookmarking services, such as Delicious (http://delicious.com) provide professionals with access from anywhere for saving and sharing of hyperlinks of important websites. For the mobile health professional who is responsible for writing reports or manuscripts, Google Docs (http://docs.google.com) is an Internet-based word processor that allows authors to share documents written either individually or in groups.

Social networking areas, such as MySpace (http://myspace.com), can be used to connect with other online communities. Other online resources that can be used as networking tools include YouTube (http://youtube.com), podcasts, and sites that allow sharing of photographs, such as Flickr (http://flickr.com/services),[27] and medical knowledge, such as MDPIXX (http://mdpixx.com).[28] The latter allows physicians to exchange medical images and video, while reporting clinical cases in a secure and private manner. These are only a handful of the resources available to individuals who wish to use the Internet for social networking and connecting with other health care professionals.

Table 2. Evolving Web 2.0/3.0 applications

Application	Internet site
Folksonomies	
Greenonions.com	http://www.greenonions.com
Web 3D	
Second Life	http://www.secondlife.com
Second Health	http://virtualworlds.nmc.org/portfolio/second-health/
Play2Train	http://play2train.hopto.org/
Virtual Medical Education	http://scienceroll.com/2007/04/24/virtual-medical-center-the-future-of-medical-education/
Mobile phone	
Serve Doctors in Developing Countries	http://www.readwriteweb.com/archives/mobile_phones_to_serve_as_doctors_in_developing_countries.php

How should we develop this potential?

This advanced technology offers many opportunities for intensive care practice in Australia and New Zealand. The potential for exchange of information and communication is enormous. Synchronous or asynchronous online discussion groups could enable individuals from different locations to interact, facilitated by a remote facilitator.[29] Blog functions can enable both clinicians and the community to participate. The process of developing clinical practice guidelines is labour intensive, but could be made more efficient through use of Wiki technology.

Where will the leadership come from? In Australia, the National Institute of Clinical Studies (NICS)[30] was set up in 2000 to address the gap between research and implementation at a broad clinical level. NICS has developed the beginnings of a "community of practice" for emergency care, which they describe as:

> [a] voluntary network of people who share information, build on existing knowledge, develop expertise and solve problems for a common purpose ... and expertise to help close evidence-practice gaps and improve patient care.[30]

Difficulties in knowledge translation have also been documented in intensive care.[31,32] We argue that communities of practice should be developed by intensive care clinicians — not as a top-down organisation or a third-party structure, but managed by clinicians using social networking through web-based technologies. Initially in New South Wales and now more broadly, the Intensive Care Coordination and Monitoring Unit has promoted this model of a collaborative, clinician-driven approach to supporting practice development and quality of care in ICUs. Its initial activities included:

- setting up a listserv for members to seek advice on clinical issues, particularly for those in rural and remote areas;[2]
- providing a repository of policies and procedures from member ICUs on its website;[33] and
- use of consensus conference and Delphi panel approaches to develop state-based clinical practice guidelines.[34]

Each of these activities supports the concepts of knowledge management and community of practice.[35,36]

Ideally, the Australian and New Zealand Intensive Care Society, the Joint Faculty of Intensive Care Medicine and the Australian College of Critical Care Nurses should provide leadership in developing this approach at a national or binational level, and in engaging with other relevant ICU-based organisations and groups.

Conclusions

Web 2.0/3.0 technologies are increasingly used in health care education and professional practice. Further research is needed to determine the outcomes of their application for intensive care education and professional practice. Important concepts, such as client-centred care, interprofessional team development, evidence-based practice, and patient safety may be directly affected by the use of Web 2.0/3.0 technological tools by health care professionals.

There is a movement towards Health 2.0 — the use of information technology to enhance and support up-to-date essentials in client care and to promote knowledge-building by health care professionals. These are exciting times, and perhaps it is time for health care professionals and organisations around the globe to begin adopting these technologies to stay current in practice and professional development. It is time to fully explore their potential in intensive care practice in Australia and New Zealand.

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