Creating the essential links for educating the evidence-based medical practitioner of the 21st Century

Andrew Heath, Lisa Kruesi, Heather Todd and Pauline McLeod (University of Queensland Cybrary)

Introduction

A new postgraduate Medical (MBBS) program at the University of Queensland has been the catalyst for the development of a range of University of Queensland (UQ) Cybrary initiatives, in areas of information resources, services and support. Over the past seven years the UQ Cybrary has successfully integrated library services into the problem-based learning and the e-learning environment of the MBBS Program. Information and communications technology developments have been harnessed by the Cybrary to support the needs of the Program which are dispersed throughout the vast state of Queensland. In particular, there has been a focus on using information and communications technology (ICT) to provide efficient and equitable access for all those involved with UQ city and rural health education. The Cybrary has risen to the challenge of providing information services and resources to support evidence-based practice (EBP) and lifelong learning, ultimately contributing towards achieving an outstanding medical workforce for the 21st Century. This paper will outline how the UQ Cybrary has addressed these issues, particularly in the areas of integration of online materials in the e-learning environment, the development and delivery of tailored information literacy programs and the use of ICT to support access to information and services.

The University of Queensland Cybrary

The University of Queensland Cybrary (http://www.cybrary.uq.edu.au) is one of the largest academic libraries in Australia and the largest in Queensland. The UQ Cybrary delivers customer-focused, innovative information products, services and programs of the highest quality that are integrated with, and central to, the University's teaching, learning, research and community services activities. The term Cybrary is used to describe the integration of cyberspace and physical space and its delivery of real and virtual information resources, with both on-line and in-person assistance in a high tech, high touch environment. The Cybrary facilitates excellence in teaching, creates an appropriate learning and research environment, anticipates and responds to student learning and research needs, contributes to positive graduate outcomes and provides the information infrastructure necessary for leading edge research activity. Staff and students of the UQ are able to access services and resources 24 x 7 via the website, including remote access via authentication.

The Cybrary mission is:

> *We link people with information, enabling the University of Queensland to achieve excellence in teaching, learning, research and community service.*

The Cybrary comprises thirteen branches (based previously on discipline) located on the St Lucia, Gatton and Ipswich campuses and in three teaching hospitals and in the Dental School, e-zones, the University Archives, and several warehouses. The hospital branch libraries are funded jointly, although not equally, by the university and hospital authorities and managed by the Cybrary. Service delivery through the branches is supported by centralised processing, information technology services and corporate services.

Providing customer-focused quality services is the Cybrary's driving force. The Cybrary has one of the largest collections amongst Australian academic libraries and by far the largest collection in Queensland. Over 2 million volumes are held, 27,000 videos, 12,000 print journal titles, 22,000 e-journals, 300,793 e-books and 752 networked databases as well as microform, manuscripts and pictorial materials. Links to learning and research resources are provided via the Cybrary's website, as is access to digitised exam papers, theses and other locally held electronic resources. In 2004 the Cybrary budget exceeds $26,000,000 AUD (approximately 18 million USD). Approximately 245 staff deliver service at over 20 service points up to 84 hours per week. Over 44,000 people attended information skills programs and over 3100 attended IT training programs provided by the Cybrary in 2003. Over 1,100 personal computers are available for public use. The website has over 5,000 pages. Over 30 million pages of the website were used in 2003, with over 85,000,000 pages accessed by computers not connected to the UQ network. Over 3,000,000 people visited the branch libraries.

The Cybrary's clients include over 29,000 students, approximately 20% of whom are postgraduates and 18% international, over 4,500 academic and general staff and clients from groups with which the University has formal links, including the over 16,000 staff in the major teaching hospitals as well as the wider community.

Services provided by the Cybrary focus on the specific needs of its client base and include the following:

- Provision of teaching, learning, work-related and research materials in a wide variety of formats for onsite access, use and loan
- Access to the global body of knowledge through the Internet
- Assistance in the use of information resources
- Provision of information skills programs to facilitate lifelong learning
- Provision of facilities to support effective teaching, learning and research
- Document delivery services for researchers
- Electronic updating services (current awareness services)
- Publications and pamphlets outlining services including *Find-its* and *Use-its,* available in print and on the website
- Research support and assistance

- Training in computer skills
- *Ask a Cybrarian* (including phone, email and online chat) and *AskIT services*

The Health Sciences Library Service

The Health Sciences Library Service operates from six UQ branch libraries and two service points including the:

- Herston Medical Library (Royal Brisbane and Women's Hospital and Royal Children's Hospitals)
- UQ/Mater McAuley Library (Mater Hospital)
- Joint Princess Alexandra Hospital/UQL (Princess Alexandra Hospital)
- Biological Sciences Library (St Lucia)
- Dentistry Library
- Ipswich Library (Nursing only)
- Rural Clinical Division Service Point, Central Queensland Region, Rockhampton (based at the Rockhampton Hospital)
- Rural Clinical Division Service Point, South West Region, Toowoomba (based at the Toowoomba Hospital)

In addition to the collections housed in the above branches there are substantial collections to support courses in Human Movement Studies, Psychology and Speech Pathology and Audiology in the Social Sciences and Humanities Library at the St Lucia campus.

The three hospital libraries are staffed and managed on a day-to-day basis by the UQ Cybrary and all offer a similar range of services. The hospital libraries serve all UQ staff and students located at the hospital in addition to the hospital staff. The quality and size of hospital library collections, range of services and types of facilities are important indicators for hospital accreditation programs. During March 2004, the Herston Medical Library (HML) was included in the accreditation undertaken by the Australian Council on Healthcare Standards (ACHS) of the Royal Brisbane and Women's Hospital, and received an Outstanding Achievement rating, with the Library being described as 'at or near world standard'. During 2003 the UQ/Mater McAuley Library was also reviewed during a Mater Private Hospital's accreditation and the Library received an ACHS rating of Extensive Achievement.

In 2003, 382,573 people came through the doors of the three hospital libraries. Almost 4,000 attendees participated in information skills program in the hospital libraries. The hospital libraries lent 60,200 items, shelved 116,212 items and 568,804 pages were photocopied or printed. Medline continues to be the most heavily used database and *The Lancet* the most heavily used online journal across the entire University.

There are 60 public-access computers, several photocopiers networked printers in the Health Sciences Library Service branches. Each library has fully equipped multimedia training facilities called e-zones. In addition to access to the Internet and electronic information resources, the Cybrary provides access to an extensive range of applications software including e-mail, Microsoft Office products and the University's Student Information System SI-Net.

University staff and students are also located in hospitals in various towns throughout Queensland and in other Brisbane locations, such as Bundaberg, Greenslopes, Townsville, Nambour and Cairns. In these instances, students and staff have access to a range of electronic services and are supplied with journal articles and loans as required.

In 2001, the Commonwealth Government announced that the UQ School of Medicine would establish a new Rural Clinical School with two regions: the Central and South West Queensland Regions based in provincial teaching hospitals in Rockhampton and Toowoomba respectively. The UQ Cybrary submitted a proposal to fund a comprehensive library and information service for the School. Funding of AUD$1,200,000 ($840,000 USD) over five years has been allocated to the Cybrary by the School of Medicine. To date, two rural library service points have been established at Rockhampton and at Toowoomba. Print collections have been established and are supplemented by access to a range of electronic information products and services as well as the employment of a University funded librarian dedicated to information support and delivery at each of the regions.

The MBBS course

The School of Medicine offers a four-year Bachelor of Medicine/Surgery (MBBS) graduate entry program. The program began in January 1997 and reflected the worldwide move towards graduate entry medical courses. Students must have completed an undergraduate degree and are then selected on the basis of success in the Graduate Australian Medical School Admissions Test (GAMSAT) and an interview to assess personal attributes including communication, cognitive style, co-operativeness, evidence of active participation, motivation to practise medicine, open-mindedness, self confidence, stable self identity and the ability to contribute to the health services in Australia. There are approximately 835 students currently enrolled over the four years of the course. Places are also made available to full fee paying students from Australia and internationally.

The MBBS Program has no formal subjects but focuses instead on "Domains of Learning". Students are required to pass each of the four domains:
- Basic and Clinical Sciences (BCS)
- Interpersonal and Clinical Skills, Clinical Reasoning and Practice (ICSCRP)
- Population and Preventative Health (PPH)

- Ethics, Personal and Professional Development (EPPD)

The structure of the MBBS Program is shown in table one below:

Table 1. MBBS Program structure

Year	Title	Key Features
1	Foundations of Medical Practice	• Introductory subjects • Weekly problems
2	Systematic Preparation for Clinical Practice	• Weekly problems • Literature review
3	Core Clinical Rotations (5x 8 weeks)	• Medicine • Surgery • General Practice and the Community • Mental Health • Rural Medicine
4	Core Clinical Rotations (4x 8 weeks)	• Paediatrics, Child and Adolescent Health • Obstetrics, Gynaecology and Neonatology • Specialties 1 and 2 (electives) • Trainee Internship

The curriculum for years 1 and 2 focuses on set weekly problems. Small groups of students meet with a tutor, twice a week for a Problem Based Learning (PBL) session. The students' own learning objectives drive the process. Students are encouraged to use a variety of resources including lectures, expert tutorials, computer assisted learning packages and library resources. In years 3 and 4 the teaching focus changes to clinical placements undertaken in hospitals and other health care settings such as General Practices. Instead of using set problems students are encouraged to base their learning on patients.

The School delivers the MBBS Program through three Australian Clinical Divisions and a Division in Brunei. The Central Clinical Division is mainly based in Brisbane's northern suburbs at the hospital complex at Herston (Royal Brisbane and Women's Hospital and the Royal Children's Hospital), the Mayne Medical School at Herston, and the Prince Charles Hospital at Chermside. The Southern Division includes The Princess Alexandra Hospital, The Mater Health Services Hospitals, Greenslopes Private Hospital, Wolston Park Hospital and other health facilities within the Southern Health Zone of Queensland Health.

The Rural Clinical Division provides an opportunity for medical students to undertake their clinical training across a network of hospitals, general practice surgeries and community

medical centres in locations throughout Central and South West Queensland. The Division aims to provide a focus for education and research programs in rural and community medicine, build and support a robust academic community comprising health professionals living and working in rural and remote locations, inject significant capital infrastructure into central and southwest Queensland and facilitate medical workforce planning and recruitment to rural and remote areas.

A clinical teaching division has also been established in Brunei in collaboration with the Brunei Ministry of Health and the Universiti Brunei Darussalam (UBD). UQ MBBS students are currently undertaking clinical rotations in Brunei in Medicine, Surgery, General Practice, Obstetrics and Gynaecology, and Paediatrics and Child Health. Continued development of this Division is proposed and staff appointments in Brunei have commenced. Library access for teaching staff in Brunei is under negotiation between the Cybrary and the School of Medicine. UQ students on placement in Brunei are able to access services remotely through appropriate authentication.

Liaison Librarians

Liaison Librarians are dedicated to supporting each year of the medical course, with a Librarian based at the St Lucia campus, one at each of the three Hospital Libraries and two located in the Rural Clinical Division service points. The role of the Liaison Librarian is to:

- Market Library Services to staff and students
- Liaise with Academic staff to ensure appropriate information resources are available to students
- Arrange for the course materials to be made available and integrated into the MBBS website
- Develop and deliver integrated information skills that support the graduate outcomes of the UQ
- Develop supporting materials to assist in the use of Cybrary Services
- Provide expert information retrieval skills and knowledge of evidence-based practice to staff and students

Liaison Librarians actively market their expertise in information management to academic staff and students with involvement in curriculum planning and development as a goal. The Cybrary is represented on the School of Medicine's Teaching and Learning Committee and Board of Studies and the Faculty Board of Health Sciences. A sound knowledge of the curriculum assists the Cybrary in identifying opportunities for the integration of information skills into teaching programs such as training in evidence based practice tools. The MBBS Liaison Librarians' Group meets monthly and works to evaluate and develop information services and resources. Additional input to the course is achieved through participation in the special forums such as the MBBS annual Curriculum Conference.

Information Resources

Print and multimedia resources

The Cybrary has extensive collections of traditional print and multimedia resources to support the information needs of MBBS students. Cybrary funds are allocated separately for the support of teaching and learning, and for research. Reading lists are obtained from the Schools to ensure that the appropriate learning materials are available in the appropriate branch libraries. Liaison Librarians provide active input to teaching staff to assist in maintaining the currency of reading lists. The strength of the Cybrary's collection plays a significant role in helping to achieve the Graduate Attribute, "will have in-depth knowledge of the field(s) studied".

The Cybrary uses the Conspectus methodology, developed by the Research Libraries Group (US) to evaluate its collection. The Conspectus evaluation for each subject describes the existing collection and the desired rate of acquisition. Overall the medical collections in the Health Sciences Libraries are rated at Conspectus Schedules 3b level, (defined as "consistently supporting at least post-graduate work". The collections must contain material on the primary topics suitable for undergraduate studies and independent study. Some areas of the collection show particular strength and are rated slightly more highly. These areas are closely related to research trends within the school.

In 2000 a survey was undertaken to better MBBS students' needs and the following reforms were undertaken:

- print resources are now housed in selected Queensland Health Libraries (including core textbooks and journal articles)
- funds for textbooks have been redistributed to reflect the distribution of students across various hospitals

In addition, each branch library reviewed their collections and items were weeded or redistributed. A considerable number of purchases of popular series including "Crash Course", "ABC of", "Recall", "Lecture Notes on", "Blueprint" and "At a glance" were also made.

e-Access - journal subscriptions and databases

Access to electronic resources has brought about a significant enhancement to the Cybrary's information provision. Materials are available to UQ staff and students at anytime, any place from anywhere in the world. The Cybrary has built an impressive collection of electronic health resources including bibliographic databases, electronic journals and textbooks. The Cybrary spent close to $12,000,000 AUD ($8,300,000 USD) on subscriptions for print journals, electronic journals and databases in 2003. As costs are paid from central funds it is difficult to determine the precise amount spent on journals to support the Health Sciences, but it is estimated to be in excess of $3,700.000 AUD ($2 600 000 USD).

E-books have assisted in making the delivery of medical information resources more flexible for the MBBS Program. The University of Queensland Cybrary has purchased the electronic version of several medical texts such as Harrison's Online, Scientific American Medicine, STAT!Ref (34 textbook titles) and MDConsult (69 textbooks titles). Other e-book packages are currently being evaluated.

The following bibliographic databases are of particular interest to the Health Sciences:

- Medline (networked locally, as well as being made available via Pubmed)
- Embase – Drugs and Pharmacology
- Embase – Rehabilitation and Physical Medicine
- PsycINFO (international literature in psychology and related disciplines)
- Biosis
- AMI (Australasian Medical Index)
- IPA (International pharmaceutical abstracts)
- AMED (Alternative Medicines database)
- Web of Knowledge (providing access to Current Contents, ISI Citation databases, Derwent Innovations Index and Journal Citation Reports).
- Cochrane Library

The Cybrary has an exceptional e-journal collection of more than 2,500 health sciences titles as well as other online materials. Some of these resources include:

- Lippincott, William and Wilkins (210 health sciences e-journal titles)
- ProQuest health and medical complete (over 350 e-journals)
- Wiley Interscience (397 e-journals with approximately 100 titles in the health sciences area)
- Science Direct (1577 electronic journals with approximately 500 titles in the health sciences area. This product includes journals from the publishers Elsevier, Academic Press and Harcourt Health.)
- Stat-Ref (34 key medical textbooks online)
- LINK (Springer publications)
- Swetswise (includes Blackwell journals, with approximately 278 health sciences e-journals)
- Kluwer Online (over 700 electronic journals) including Cancer Causes and Controls
- Clinical Evidence (BMJ Publishing Group)
- Nature and Cell press titles
- Harrison's online (online version of Harrison's Principles of Internal Medicine)
- Cochrane Library
- Australian Medicines Handbook

- MIMs Online
- Images.MD (a database of images that can be incorporated into the School's lectures, covering histology, pathology and radiographs)
- ACS Surgery Online
- Oxford University Press containing 25 health sciences journals.
- Micromedex – Drug information databases
- BMJ Publishing Group's 21 titles covering a broad range of medical specialties, and include journals such as Gut, Heart and Thorax.
- ADIS International Journals – a collection of drug related journals including Drug Safety, Pharmacoeconomics and Drugs and aging
- American Association of Cancer Research collection of journal titles including Cancer Epidemiology, Biomarkers and Prevention and Cancer Research
- Cambridge University Press – site wide access to its journals including Annals of Human Genetics and Genetical Research
- Oxford University Press – site wide access to 150 titles including Brain, Nephrology, dialysis, transplantation and International Immunology.
- PsycArticles - the American Psychological Association's collection of more than 25,000 full-text journal articles in psychology from 1988
- American Society of Microbiology's collection of 11 journals including Clinical Microbiology Reviews and Journal of Clinical Microbiology

Electronic access allows staff and students to access the most recent journal information from not only within the library branches, but also from their places of work or study and their homes. To maximise the ease-of-use of these resources, an authentication service has been established to allow access to electronic resources from non-UQ IP addresses. The technology employed includes Lightweight Directory Access Protocol (LDAP), Ezproxy (URL rewriting proxy server software) and Innopac Library Management System.

In addition to the above resources, the Cybrary has purchased institutional membership to BioMed Central, which is an independent publishing house committed to providing immediate free access to peer-reviewed biomedical research. The institutional membership allows UQ research staff and students to publish an unlimited number of research articles in journals published by BioMed Central without paying any article processing charges. All research articles published in BioMed Central's journals are covered by the PubMed bibliographic database. Citations of articles published in BioMed Central journals are captured in the ISI Web of Science and preliminary studies show that, on average, open access articles are more highly cited than those that require paid access. Some of BioMed Central's journals are citation-tracked by ISI and many are indexed by other services.

Electronic/Web-based resources – Course Materials

The majority of the MBBS learning resources are delivered via the MBBS Intranet. Each week for years 1 and 2 the Cybrary contributes to the MBBS Intranet by providing e-access to resources such as textbooks, photocopied articles, videocassettes, and websites relevant to each week's problem. Years 3 and 4 are also provided with readings, including articles, websites and textbooks relevant to each of the rotations. The Liaison Librarians have worked closely with School of Medicine staff to ensure online access to course readings. By 2000 all required and recommended readings were available via the Cybrary and integrated with other teaching materials on the MBBS website. Much of the material is now available in electronic form through Cybrary subscriptions. The articles have been linked using Persistent Uniform Resource Locators (PURL), and / or Digital Object Identifiers (DOI), or scanned and made available in portable document format (pdf). Web resources have been included. These resources are particularly valuable to year 3 and 4 students who may have limited access to other information resources when on clinical placement.

MBBS Liaison Librarians play a critical role in providing awareness of new resources to teaching staff and assist in the identification of the best and latest evidence or resources available to the students. Liaison Librarians identify and collect multimedia items in various formats (eg Online, Videos, CD-ROMs) that contain images, videos, animations and/or simulations. Whether subscription based or freely available on the web, all quality resources are catalogued. Useful resources can be located in the Cybrary catalogue by doing a key word search on a topic (e.g. pathology) and then modifying the search to find videos, CD-ROMs, DVDs, Slides, and Electronic Resources. Resources such as Images.MD provide access to many quality clinical images that can enhance teaching presentations. Students can be directed to online resources that include simulations to supplement their learning. Other resources include "Acland's DVD atlas of human anatomy", "the Visible Human", "RCPA (Royal College of Pathologists of Australasia) Manual", "Eye care skills on CD-ROM" and "Some common dermatoses" from the collection of the National library of dermatologic teaching slides. Whilst Liaison Librarians select relevant items on behalf of the Program, suggestions for purchase of resources from teaching staff are always welcomed.

Liaison Librarians can register teaching staff for electronic alerting services that provide regular search profile updates, including subject areas and content pages services. Automatically receiving updates by email may help teaching staff identify articles for a range of uses. Easy access to full text articles is available via the Cybrary's collection of electronic journals.

Additional e- tools
The Virtual Reference Collection (www.Cybrary.uq.edu.au/internet/vref.php) is available to provide help with answers to specific questions quickly, such as addresses, facts, figures,

statistics, definitions and dates. An excellent listing of Consumer Health websites is available from the Health link from this site.

The e-print archive ePrints@UQ is a deposit collection of papers that showcases the research output of UQ academic staff and postgraduate students across a range of subjects and disciplines, both before and after peer-reviewed publication. It is relevant to MBBS Clinical Lecturers and students as a repository to access UQ research and for School of Medicine staff and students undertaking research to promote their work.   More details are available from: http://eprint.uq.edu.au/

The *Endnote* reference management software can be used by Clinical Lecturers and medical students to help organise reading materials. The Endnote software is essential when undertaking the literature search component of the MBBS, but additionally throughout the course it can be used as an electronic filing cabinet to keep track of key references and other information resources. More details are available from: http://www.cybrary.uq.edu.au/faqs/endnote/. A site licence means that the software is available free of charge from the Cybrary.

Information Literacy

Integration of information literacy programs into the curriculum is a major priority for librarians in the higher education sector concerned with information skills or information literacy. Most universities have teaching and learning plans and libraries are directing their services and programs towards the implementation of these plans. At the University of Queensland, the Teaching and Learning Enhancement Plan 2003–2007 (http://www.uq.edu.au/teaching_learning/download/TLEP2003-2007FinalAugust2003.pdf) emphasises the mapping and embedding of graduate attributes (see Table Two) in courses or subjects.

Table 2. Statement of Graduate Attributes

A University of Queensland bachelor (pass) degree graduate will have in-depth knowledge of the field(s) studied. In addition, graduates will display effective communication skills, independence and creativity, critical judgement and ethical and social understanding. The following statement outlines the key features of the graduate attributes indicated above.	
In-depth knowledge of the field of Study	• A comprehensive and well-founded knowledge of the field of study. • An understanding of how other disciplines relate to the field of study. • An international perspective on the field of study.
Effective Communication	• The ability to *collect, analyse and organise information* and ideas and to convey those ideas clearly and fluently, in both written and spoken forms.

	• The ability to interact effectively with others in order to work towards a common outcome. • The ability to select and use the appropriate level, style and means of communication. • *The ability to engage effectively and appropriately with information and communication technologies.*
Independence and Creativity	• The ability to work and learn independently. • The ability to generate ideas and adapt innovatively to changing environments. • The ability to identify problems, create solutions, innovate and improve current practices.
Critical Judgement	• The ability to define and analyse problems • The ability to apply critical reasoning to issues through independent thought and informed judgement • The ability to evaluate opinions, make decisions and to reflect critically on the justifications for decisions.
Ethical and Social Understanding	• An understanding of social and civic responsibility • An appreciation of the philosophical and social contexts of a discipline • A knowledge and respect of ethics and ethical standards in relation to a major area of study • A knowledge of other cultures and times and an appreciation of cultural diversity.

The University of Queensland is committed to providing experiences for its students that develop 'capacities for independent thought, computer literacy, critical judgement, problem solving, effective communication and ethical sensitivity, to equip graduates for lifelong learning and leadership roles in the professions, business and industry, government and society. It is by making this commitment explicit through the mapping and embedding of graduate attributes in courses and programs, that the university community expresses to various stakeholders its aims and aspirations for its graduates.

Information Skills for the MBBS Program

The Cybrary has a strong commitment to information skills instruction and invests considerable resources in developing and delivering training for students. The commitment of the Cybrary to information skills programs reflects the educational priorities of the School of Medicine, and increasingly information skills classes are integrated with the teaching and learning requirements within the School and are intrinsically linked with the Graduate Attributes. MBBS graduates, as 'new' doctors will need to "collect, analyse and organise information" efficiently to answer clinical questions. These skills will help them to be effective practitioners of evidence-based medicine.

The Cybrary also plays a key role in developing the skills of information management and computer literacy of the students, and Cybrary staff work collaboratively with academic staff in the delivery of information instruction. This ongoing collaboration can sometimes be difficult to maintain and foster, and the founding MBBS PBL (Problem Based Learning) librarian identified the formal integration of information skills instruction into the program as the major challenge in her work with the School[1]. The literature supports this view and indicates that for training to be effective and well attended it needs to be integrated into the curriculum and explicitly supported by the teaching staff [2] [3] [4]. Training needs to be clearly linked to the clinical setting with real examples drawn from contact with patients, and information skills classes should be:

- grounded in adult learning theory;
- informed by the aims of self-directed and life-long learning;
- problem-based; and,
- developed in collaboration with outside experts.

Cybrary information skills classes are designed to help students learn how to locate, evaluate and manage information resources to assist their learning. The classes also develop or enhance the knowledge and skills of students to enable them to better complete assessment items such as the Literature Review, a major assessment item in year 2 of the MBBS Program, and various assignments requiring finding and evaluating evidence related to clinical questions.

The personal development component of the MBBS Program involves the development of a commitment to life-long continuing education and evaluation. Part of this component is recognition by students that the ability to effectively manage information is an essential component of self-reliance in learning and that the dynamic nature of information resources obliges regular knowledge and skill updates.

Orientation

The Cybrary Liaison Librarians offer traditional orientation presentations at the beginning of each year to outline the support, resources and services available to students. An intensive program of four expert tutorials is offered to year 1 students to orientate them to the Cybrary,

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[1] Foxlee, N and Todd, H 1997. 1997, *Challenges and realities of the Graduate Medical Course for The University of Queensland*, Proceeding of the 7th Annual Special, Health and Law Librarian's Conference, ALIA, Adelaide, Australia

[2] Brahmi, F. A., London, S. et al 1999, *Teaching lifelong learning skills in a fourth-year medical curriculum*, Medical References Services Quarterly, 18, 1-11.

[3] Murphy, J. 2000, *The role of health science librarians in preparing tomorrow's doctors to manage information*, Health Libraries Review, 17, 7-13.

[4] Green, M. L. and Ellis, P. J. 1997, *Impact of an evidence-based medicine curriculum based on adult learning theory*, Journal of General Internal Medicine, 12, 742-750.

the MBBS Program Intranet, and to core health resources and information seeking strategies which support evidence-based practice.

These sessions include:

1. Cybrary, MBBS, Intranet and Electronic Resources
2. Using and searching the WWW
3. Searching for best evidence using databases
4. Searching the Cochrane Library

In the class, 'Searching for best evidence using databases' students use the PICO (Patient, Intervention, Comparison, Outcome) framework to formulate a clinical question based on the weekly problem and use Medline clinical queries filters to retrieve relevant evidence-based information. Critical appraisal of the literature follows. The class is co-taught by the Liaison Librarian with a member of the academic staff and follow-up or drop-in sessions by a librarian are integrated into the students' PBL tutorials. The EBP Process worked through during these sessions can be summarised by the following six steps:

1. Patient/Problem/Population
2. Formulation of the Clinical Question using PICO
3. Study/Question Type
4. Search the literature
5. Critically appraise the literature
6. Patient/Problem/Population

Librarian in the classroom

In 2001 a "Librarian in the Classroom" program was developed to support students on the first year medical course (MBBS Year 1) in completing an evidence-based practice assignment for a case-based literature review. The program is now ongoing following the success of the pilot. The material covered was developed in conjunction with an academic from the School of Medicine, and all classes provided hands on practice. The program includes revision of the evidence-based practice process, in particular developing an effective search strategy based on a clinical question arising from a patient's case with a view to identifying a relevant article to critically appraise. The process concludes with the student applying the results of their research to the patient. Particular assistance is given to students in searching the Cochrane Library, for information related to effectiveness of therapy, and to PubMed with Clinical Queries for those considering doing a clinical question, other than treatment, for their literature review.

Information Skills Linked to Assessment

Information Literacy and EBP skills are assessed, formatively and summatively, at all stages of the MBBS program. Assessment types include:

- Multi Station Assessment Task (MSAT) examinations (students are required to search the Cochrane Library at one station)
- Case-based literature reviews
- Written examinations – critical appraisal skills

Liaison Librarians have worked with Academic staff to develop and offer programs to provide the students with the knowledge and skills to complete assessments at an optimal level. The programs also increase the students' awareness of the Allied Health literature which enables them to complete their Allied Health project required during their rural medicine rotation.

Rural Medicine Rotation

Orientation to the services specifically available to students undertaking the Rural Medicine rotation in year 3 of the Program is also delivered by the Liaison Librarians of the Rural Clinical Division. Groups of approximately 25 students join their rural counterparts for an eight week rural attachment in both the Central and South West Queensland regions. Cybrary staff ensure that the students have access to information about the available electronic resources and in cases where Internet access is not adequate by providing a mail order or fax service.

Year 3 students are required to complete an Allied Health Project to raise their awareness of the role of Allied Health Professionals (AHPs) in the health care team. The project involves documenting a clinical problem that requires the involvement of at least one Allied Health Professional (AHP) in the care of the patient and to outline the management options. The presentation is to include a description of the roles of other health professionals in managing the patient with the clinical problem. Students are required to research the interventions and critically review the evidence to assess the efficacy or effectiveness of the intervention. The Liaison Librarians of the Rural Clinical Divisions liaise with teaching staff to develop an integrated training session informing students of the role of Allied Health Professionals and introducing students to information resources that provide access to the Allied Health literature such as Embase, PEDro, OT Seeker and CINAHL. The session includes a revision of the EBP Process which they learn in year 1 and on which they are assessed throughout the course.

General information skills programs

In addition to the formal, integrated information skill programs, all Health Sciences Libraries offer a range of general information skills classes on a regular basis. A selection of classes offered in 2004 includes:

- Introduction to the Cybrary
- Medline (WebSPIRS)
- CINAHL (WebSPIRS)
- PubMed

- Cochrane Library
- CKN Essentials
- CKN Advanced
- Research on the Internet
- EndNote
- E-Journals
- Information Skills for EBM

Other Learning Resources:

Findits and *Useits* are guides to resources created by Liaison Librarians at the University of Queensland Cybrary. A *Findit* provides starting points for finding information in a subject area, including reference material and basic texts, databases and websites for those who are unfamiliar with the subject. Over 180 *Findits* are available on the Cybrary website at http://www.cybrary.uq.edu.au/findit/, including a range of guides for the health sciences (eg. Evidence Based Medicine, Paediatrics & Child Health, Pharmacology, etc).

A *UseIt* provides a step by step guide to using a particular resource, such as a database, referencing style or specialised resource (eg. The Cochrane Library, Medline Clinical Queries). They are available on the Cybrary website at http://www.cybrary.uq.edu.au/useit/.

Ask a Cybrarian and *Ask*IT

Assistance for students is also available via the Cybrary's two virtual reference services; *Ask*aCybrarian (library and research information help) and *Ask*IT (information technology help and training). These services are available by phone, email and web based chat.

Mobile Technology

The UQ School of Medicine, in partnership with the Cybrary, is currently undertaking a project to evaluate the use of Personal Digital Assistants (PDAs) to staff and students located at the School's Rural Clinical Division (RCD). The Project is being funded by the Australian Commonwealth Department of Health and Aged Care. When the project commenced in 2003 there were no PDA projects underway in any Australian medical schools.

The formal Project objectives are to:

- Provide access to authoritative, evidence-based information to the RCD medical students at their point of need.
- Contribute to a positive rural medical education experience and address equity issues for students who are placed in remote or isolated areas and have limited access to information and technology infrastructure.

- Optimise the application of contemporary information and telecommunications technologies in healthcare and to prepare students for medical practice in 21st Century.
- Provide a platform for the UQ School of Medicine to assess the applicability of this technology to the teaching and learning environment.
- Provide the UQ Cybrary with experience in the provision of appropriate resources, training and support for PDAs.

A total of 95 iPAQ PDAs have been purchased and distributed to all permanent Rural Clinical Division students and selected staff members. Resources available to participants during the Project included:

- *The Oxford handbook of clinical medicine*
- *The Oxford handbook of clinical specialties*
- *The Oxford concise medical dictionary*
- *MIMs (Australian drug information database)*
- *Archimedes (clinical calculator)*

In addition the *ClearVue* document reader (to allow viewing of PowerPoint files), *Acrobat* reader and *Mobipocket* reader were loaded on each unit. The option to load Micromedex (drug database) was also offered.

Extensive evaluation is being undertaken in the form of user survey, focus groups and usage logs. To date the Project phase post-survey elicited a response rate of 68%, which included 50 surveys being completed out of a total of 73 surveys that were originally distributed. The user surveys have yielded a wealth of information. Of particular interest are responses relating to perceived usefulness of various PDA functions, the usage of the various information products and the value of the technology and its impact on the students learning.

The Project's objectives have been met, and within budget constraints, a limited set of evidence based information resources was provided to the RCD medical students at their point of need. Most resources were useful for answering clinical questions (e.g. the *Oxford Handbooks and MIMS).* It has been identified that students would like additional PDA resources, such as the *Australian Medicines Handbook, Harrison's on Hand, therapeutic guidelines* and *UpToDate.* Provision of resources for PDA use in a clinical setting requires periodic reassessment; especially as additional PDA resources are constantly being released on the market.

The PDAs have contributed to creating a positive rural medical education experience, with 45% agreeing and 31% strongly agreeing that PDA use improved access to information resources whilst working in a remote or isolated area, and attracted students to RCD placements. Further exploration of teaching and learning applications of PDAs within the School of Medicine and in the tertiary education sector will continue. The School of Medicine

plans to develop clinical electronic-logbooks for the collection of clinical competencies using the Internet and PDAs as the means of data collection.

The PDA Project has optimized the use of contemporary information and telecommunications in healthcare and prepare students for practicing medicine in the 21st Century and demonstrates that the innovative use of technology helps students to manage information and use information effectively.

The success of the Project and the fact that PDAs are becoming more pervasive at hospitals supported by UQ Branch Libraries also raises a number of issues for the UQ Cybrary. It is anticipated that the Library will be able to support PDAs in a number of areas including:
- Additional Evidence Based Healthcare PDA information resources
- The creation of a PDA compliant website (including catalogue)
- The creation of PDA specific resources such as Evidence-based Healthcare guides
- The ongoing implementation of wireless infrastructure within branch libraries
- Lobbying and negotiation with information resource suppliers and publishers to address the lack of site licensing options for resources
- Lobbying to have one payment for information resources rather than paying a site wide subscription and a further PDA download charge
- Provision of PDA training and education opportunities
- Provision of technical support and advice to users
- The development of a PDA Website to provide information and support to users
- The promotion of PDAs use through user groups

Focus groups were being held at the time of writing to explore the themes emerging from the survey findings and to elicit other feedback. Results from the focus groups and data from manual usage logs undertaken by participants will be reported in a later paper. Once all the data has been analyzed at the conclusion of the Project in December 2004, the final report will include recommendations regarding the future use of PDAs at the School of Medicine and the UQ Cybrary.

The UQ Cybrary gained valuable experience. The Librarian's role in enhancing information resource use, provision of training, technical support and management of the units was a key learning experience. The input from a range of staff with wide-ranging expertise also contributed to the successful outcomes of the Project.   The relationship between the Library and the School of Medicine has been strengthened through close association during the Project.

Most participants used their PDAs several times a day and used them with minimal instruction. Most participants found the PDAs very convenient and comfortable to use in front

of a range of groups. It was demonstrated that the PDAs were used for accessing a wide range of resources, including academic timetables, contact details, clinical facts and drug data. UQ health librarians will continue their proactive role in helping to create an evidence-based training environment for all medical students, to ensure that good habits are formed early and continue leading to life long successful clinical practice.

Challenges

A range of challenges and opportunities currently face the UQ Cybrary in continuing to improve our support of the MBBS program. Particular areas under current consideration include:

Integration with new eLearning platform
The MBBS online content is currently delivered by a system developed in house by the School and is under review. With the implementation of a new system under consideration, it is of great importance that the Cybrary use this opportunity to improve the level of integration of its information resources. The University is also considering the implementation of a Content Management System to manage all facets of online content. The Library is actively involved with the definition of user requirements for such a system.

Access to the best available evidence
It has always been a challenge to ensure that students have access to the best available evidence to support the MBBS teaching and learning. Ongoing liaison is critical to ensure that the learning and information resources are constantly updated to reflect current best practice.

Remote Students
The provision of equitable access to students regardless of location continues to be a challenge. Where more students will be trained in remote areas of Australia and internationally, the provision of the appropriate ICT infrastructure and accessible resources continually needs to be addressed.

Information Literacy
The further development and integration of information skills into the curriculum are important so that students are well equipped to practice evidence-based medicine in the twenty first century.

Mobile Technologies
The opportunity to expand the Cybrary's level of support of mobile technologies such as PDAs is currently under consideration. Areas under consideration include the provision of PDA resources, the development of additional support and training programs, the creation of

PDA compliant resources such as the Library Website and catalogue and the continued development of wireless networks within the Library.

Conclusion

Much has been achieved by the UQ Cybrary since the introduction of the Graduate MBBS course at the University of Queensland. Liaison Librarians working closely with teaching staff has been extremely effective. Outstanding access to e-resources and course materials, improved services to remote students and staff, the integration of information literacy programs and the employment of various information and communications technologies have created the essential links for educating the Evidence-based medical practitioner of the 21st Century.