

# Survey of Evidence-Based Practice Use and Understanding Among Final (5<sup>th</sup>) Year Medical Students in South-East Asia

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**Abstract:** The SEA-ORCHID project (South East Asia - Optimising Reproductive Child Health in Developing countries) initiated a survey among undergraduate medical students at five South-East Asia universities to ascertain their understanding of evidence-based practice, information seeking practices, access to Information Technology and evidence-based databases as well as their understanding of clinical practice guidelines. The survey took place during August to December 2006 and was completed by 172 fifth year undergraduate medical students. The findings from this survey indicate that fifth year undergraduate medical students from the participating five South East Asian universities need to be well equipped in knowing what databases exist, how to search these and how to critically appraise the information obtained. This need, plus a lack of exposure to clinical practice guideline appraisal and development, highlights some of the issues medical students encounter when attempting to learn and practice evidence-based practice effectively.

**Keywords:** Evidence-based practice, 5th year medical students, clinical practice guidelines, developing countries, barriers to practice change, survey.

## INTRODUCTION

High information load, increasing time constraints and the inability to access online information provides medical students, as well as clinicians in South-East Asia (SEA) with challenges to obtain evidence-based and up-to-date information [1] and adapt these into evidence-based practice (EBP). One of the most consistent research findings is the gap between best practice according to scientific evidence and the actual clinical care provided [2].

EBP has been defined as 'the integration of the best research evidence with clinical expertise and patient value applied in context' [3]. The principles of evidence-based practice are to encourage health professionals to use practices with proven benefit and eliminate the use of those shown to be ineffective or harmful. Current maternal and perinatal practice according to beneficial forms of care and forms of care likely to be ineffective or harmful are suggested and frequently updated in the World Health Organization Reproductive Health Library No.7 [4] and the Cochrane Library [5].

The Cochrane Collaboration is a non-for-profit, global organisation of volunteers who aim to improve decision-making in healthcare by producing and disseminating systematic reviews of healthcare interventions as well as promoting and supporting clinical trials and other studies [6]. The freely accessible, web-based Cochrane Library contains systematic reviews, thereby providing current best evidence from relevant, valid research regarding the effects of health

interventions worldwide [5]. The freely accessible, online World Health Organization Reproductive Health Library, started in 1997 as an annual publication and is prepared by an editorial team based in the WHO department of reproductive health and research and other partner institutions internationally. It aims to put the best available evidence into a practical context so that it can be used to improve health outcomes [4]. Current best evidence from sources such as these global libraries are crucial to help facilitate the understanding, accessing and implementation of EBP which is increasingly becoming known to provide appropriate and effective care in pregnancy, childbirth and the postnatal period for women and their babies [7]. However the wider application of EBP depends in part on the progress made in undergraduate medical education teaching of skills such as accessing evidence-based research [8], and the ability to critically appraise literature and clinical practices that impact on clinical decision making [9,10].

The potential benefit of EBP in low and middle income countries is exceptionally apparent where each year over 98% of the half a million maternal deaths world-wide occur. For women in Asia the lifetime risk of maternal death is one in 65 compared with one in 1,800 for women in high income countries [11]. Access to scientifically valid and up-to-date information is a prerequisite for providing evidenced-based care [12]. Effective implementation of beneficial practices in developing regions [13,14], such as South East Asia, should lead to a reduction in maternal and neonatal mortality and morbidities. Medical, nursing and midwifery students are a vital component in knowledge transfer [15] and need to be taught how to access, critically appraise and implement information (synthesise), as well as how to generate research that will inform practice [16,17].

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In the South East Asia Optimising Reproductive and Child Health In Developing countries (SEA-ORCHID) project, the three phases of the study included an audit of the baseline rates and clinical care practice, an educational intervention to improve evidence-based care and a follow-up audit of change of rates and quality of clinical practice, as described in more depth in the published study protocol [18]. One facet of the intervention was to support medical schools that were interested in incorporating or adding to evidence-based components into their curricula.

This survey assessed current knowledge, attitudes, activities, enablers and barriers to EBP amongst fifth year undergraduate medical students at the five participating universities.

## **MATERIALS AND METHODOLOGY**

### **Eligibility, Sampling and Time Frame**

As part of the initial data collection in the four South East Asian countries (Malaysia, Indonesia, Thailand and The Philippines), all fifth year undergraduate medical students present at five universities were invited to participate in a survey of current knowledge, attitudes, activities, enablers and barriers to evidence-based practice. 5<sup>th</sup> year medical students were chosen as they would have had potentially the greatest opportunity for EBP exposure through the curriculum and clinical practice experience before embarking on their practice years. The survey was administered during August to December 2005 over a time frame of two weeks. The time interval allowed for site variation in different countries, for availability of field workers and local investigators to translate and administer the survey and enter data on-line. Incentives were not utilised. The EBP survey was approved by eight relevant ethics committees for the SEA-ORCHID participating sites. The five universities involved were: Khon Kaen University, Thailand; University of the Philippines, Philippines; Royal College of Medicine, Perak and Univeristi of Sains Malaysia, Malaysia; Gadjah Mada University, Indonesia. Hospitals associated with these universities were tertiary referral institutions with regional referrals of women with a high risk pregnancy. All hospitals had obstetric specialists and caesarean section facilities available. Normal vaginal births were facilitated by doctors and/or midwives (including nurses with midwifery qualifications) in all hospitals. Medical schools at the five universities involved had a specific interest of including EBP in their curriculum or currently incorporated EBP components.

At each site the distribution of the questionnaires was managed by the local SEA-ORCHID investigator. At all universities the surveys were handed personally to the fifth year medical students and collected within the two week time frame. Most of the students had the opportunity to fill in the survey during a lecture and handed it straight back after the lecture had finished.

Instructions on how to administer the survey and how the data were to be entered online were emailed to all local study investigators, who instructed the field workers as to the correct data entry procedure. The instructions were also posted on the SEA-ORCHID website ([www.seaorchid.org](http://www.seaorchid.org)) for easy access. Zoomerang software ([www.zoomerang.com](http://www.zoomerang.com))

was used for secure online data entry and entered data were converted into Excel for data checking and analyses.

### **The Survey Questionnaire**

The survey consisted of 34 questions and was developed and piloted by one of the SEA-ORCHID clinical educators (RM) with feedback from SEA and Australian investigators with two questions altered as a result of this feedback. The pilot data were not included in the analyses.

Most survey questions needed to be answered by writing a number in a box next to listed responses (1 indicating no, 2 indicating yes and 3 indicating maybe) with the opportunity to specify additional information as appropriate. The survey comprised seven sections. The first section collected demographic data and IT available to the student at the training institution. The second assessed the health information sources used by the medical student. Learning about EBP and how it was provided by the training institution were addressed in section three as well as whether the student was required to do a research project or a systematic review during the training. Sections four and five sought information about the student's knowledge of the World Health Organization (WHO) Reproductive Health Library (RHL) [4] and The Cochrane Library [5]. Section six explored students exposure and learning of clinical practice guidelines during their training and the understanding of these. Students were also invited to state what they found most helpful during their clinical placements related to clinical practice guidelines. Finally students identified workshops they would like to attend for enhancing their understanding of EBP and what might prevent them from attending such workshops.

### **Statistical Analysis**

Data analysis was conducted using pivotTables in Microsoft Office Excel 2003 calculating frequency and corresponding percentages to describe the responses to the survey questions for all participating medical students and combining the data for all four SEA countries. Responses to two questions were presented as a list and frequency of occurrence rather than given as percentages.

## **RESULTS**

### **Demographics**

A total of 172 medical students in year five, their final undergraduate medical education year were surveyed across the four SEA-ORCHID countries (Malaysia n=76, Indonesia n=25, Thailand n=13, the Philippines n=58). Apart from Malaysia, who had half their students away on a clinical placement, there was a 100% survey response from all other 5<sup>th</sup> year medical students. Overall they identified as 108 (63%) female and 64 (37%) male. Most medical students fell into the 20-29 age category (170, 99%) and two (1%) into the 30-39 age category.

### **Information Technology Access**

Nearly three quarters of the medical students (123, 72%) had access to a computer with broadband connection at their training institution. This varied between countries. The numbers and percentages of student access were 10 (40%) in

**Table 1. Access to Computers and IT Services by Medical Students and Countries (n=172)**

Country	No Access, n (%)	Yes, without Internet Connection n (%)	Yes, with Phone Internet Connection n (%)	*Yes, with Broadband Internet Connection n (%)
Malaysia*	5 (7)	5 (7)	5 (7)	61 (80)
Indonesia	4 (16)	4 (16)	7 (28)	10 (40)
Thailand	0 (0)	0 (0)	1 (8)	12 (92)
Philippines	4 (7)	1 (2)	13 (22)	40 (69)
<b>Total</b>	<b>13 (7)</b>	<b>10 (6)</b>	<b>26 (15)</b>	<b>123 (72)</b>

\*Two universities in Malaysia, one university in all other countries. All percentages are rounded to the nearest whole number.

Indonesia, 40 (69%) in the Philippines, 61 (80%) in Malaysia and 12 (92%) in Thailand (Table 1).

Of all the surveyed students who indicated difficulty accessing a computer, 10 (48%) indicated that this was due to a limited supply of computers with internet access, three (14%) indicated that the computers were located too far away and four (19%) identified that the computers were always in use.

### Health Information Used During Training

Resources 'frequently' used during medical training for studies were textbooks (158, 92%), lecture notes (133, 77%), fellow students (84, 49%), journals (16, 9%), and resources from pharmaceutical companies (10, 6%) (Table 2). Resources 'sometimes' used were journals (127, 74%), fellow students (83, 48%), pharmaceutical companies (69, 40%), lecture notes (28, 16%), and textbooks (13, 8%). Students also indicated resources that they never used. These included pharmaceutical company resources (93, 54%), journals (29, 17%), lecture notes (11, 6%) and fellow students (5, 3%). There was little variation between participating SEA countries.

The internet was used as a resource for studies during medical training with a mixture of databases and search engines used. The Internet was used frequently by 82 (48%) students, sometimes by 80 (47%) students and never by 10 (6%) (Table 2). The most often visited website was www.emedicine.com (94, 55%), followed by www.google.com (35, 21%), then www.pubmed.nl (33, 19%) and www.pubmedcentral.nih.gov (20, 12). Yahoo, www.yahoo.com was also used for studies as a search engine (19, 11%), as well as

www.bmj.com (18, 11%) and www.medicalstudent.com (15, 9%). There was a variation between participating SEA countries. For Indonesia the most often used website was www.bmj.com (14, 36%), for Thailand it was www.google.com (7, 26%) and for Malaysia and the Philippines it was www.emedicine.com.

### Evidence-Based Practice Learning

Students were asked if they learnt about evidence-based practice, evidence-based medicine or evidence-based care during their university's study program. 137 (80%) medical students indicating they had learnt about the concept (Table 3). The data from individual SEA countries showed some variation with 58 (100%) of the Philippines's participating medical students indicating that they been exposed to evidence-based practice teaching, 11 (85%) in Thailand, 17 (68%) in Indonesia and 51 (67%) in Malaysia (Table 4).

Of the students that indicated learning about EBP, 116 (67%) opted to write down their personal definition of EBP. The answers varied considerably between the students with a large range of definitions and similar variation across the SEA countries. Of all the medical students surveyed, 62 (54%) indicated that it meant '*basing clinical practice on (any) research only*' and 11 (10%) indicated it was '*the clinical practice based on the integration of best research evidence with clinical expertise and what the patient values*'. Small numbers of students indicated that it meant '*basing clinical practice on the case studies learnt at their training institution*' or that it meant '*to use journals*'. Other students thought it meant that '*they had to be accountable in clinical practice*' or it '*helped them to learn how to use data in clinical practice*'. Some students thought that it was the term

**Table 2. Frequently Used Resources for Studies During Medical Training by Students and Countries (n=172)**

Country	Textbooks n (%)	Journals n (%)	Lecture Notes n (%)	Lecturers n (%)	Fellow Students n (%)	Resources from Pharmaceutical Companies n (%)	Internet n (%)
Malaysia*	75 (99)	2 (3)	62 (82)	46 (60)	47 (62)	3 (4)	31 (41)
Indonesia	22 (88)	3 (12)	21 (84)	15 (60)	11 (44)	3 (12)	16 (64)
Thailand	10 (77)	1 (8)	3 (23)	9 (69)	4 (31)	0 (0)	5 (38)
Philippines	51 (88)	10 (17)	47 (81)	40 (69)	22 (38)	4 (7)	30 (52)
<b>Total</b>	<b>158 (92)</b>	<b>16 (9)</b>	<b>133 (77)</b>	<b>110 (64)</b>	<b>84 (49)</b>	<b>10 (6)</b>	<b>82 (48)</b>

\*Two universities in Malaysia, one university in all other countries. All percentages are rounded to the nearest whole number.

**Table 3. Exposure to EBP During Medical Training (n=172)**

Country	No n (%)	Yes, Through One Workshop n (%)	Yes, Through Two or More Workshops n (%)	Yes, Through a Series of Lectures n (%)	Yes, Subject for One Year n (%)	Yes, Through Problem Based Case Studies n (%)	Yes, Through Research Project n (%)
Malaysia*	25 (33)	7 (9)	1 (1)	11 (14)	1 (1)	22 (29)	15 (20)
Indonesia	8 (32)	0 (0)	1 (4)	7 (28)	1 (4)	16 (64)	0 (0)
Thailand	2 (15)	1 (8)	0 (0)	6 (46)	1 (8)	2 (15)	1 (8)
Philippines	0 (0)	3 (5)	3 (5)	32 (55)	2 (3)	14 (24)	2 (3)
<b>Total</b>	<b>35 (20)</b>	<b>11 (6)</b>	<b>5 (3)</b>	<b>56 (33)</b>	<b>5 (3)</b>	<b>54 (31)</b>	<b>18 (10)</b>

\*Two universities in Malaysia, one university in all other countries.  
All percentages are rounded to the nearest whole number.

used for ‘*transferring theory into practice*’ or that it was ‘*a clinical practice guideline*’. Another small proportion of students commented that EBP was ‘*overrated*’ and others mentioned that they did not understand the term. One student commented that it meant ‘*curriculum vitae*’.

### The Cochrane Library

The SEA-ORCHID project was interested in obtaining information about the knowledge and access of online evidence-based information. The Cochrane Library is one such online resource, reliable for obtaining evidence-based clinical information and up-to-date systematic reviews in health care.

Of the surveyed medical students 63 (37%) indicated they had heard about The Cochrane Library, with large variations between the participating SEA countries. In Indonesia only four (16%) of the medical students indicated that they had heard about The Cochrane Library, in Malaysia 17 (22%) students had heard of it, 31 (53%) in the Philippines and 11 (85%) in Thailand (Table 4).

When asked about access to The Cochrane Library, 18 (29%) medical students indicated they had access and 22 (35%) didn’t know. This was consistent between Malaysia, Thailand and the Philippines. In Indonesia all students identified that they had no access or indicated the ‘don’t know’ option to the access question. Access is obviously related to online computer access and whether a subscription had been paid by the training institution or country. However, of the medical students who had access to The Cochrane Library, 10 (56%) used it once a year, two (11%)

indicated that they never used it, 5 (28%) used it once a month and one (6%) used it once a week. There were large variations between the three countries.

Only 17 medical students answered the question in regards to finding The Cochrane Library helpful, with eight (47%) indicating it was a helpful tool and seven relating the usefulness to accessing systematic reviews. Overall 128 (74%) medical students expressed interest in attending a workshop on how to access information from The Cochrane Library.

### WHO Reproductive Health Library

The WHO Reproductive Health Library is another on-line evidence-based resource aiming to put the best available evidence into a practical context so that it can be used to improve health outcomes.

The RHL had been heard of by 22 (13%) fifth year medical students surveyed. This varied between countries, with only two (3%) of medical students having heard about the RHL in the Philippines, eight (11%) in Malaysia, five (20%) in Indonesia and seven (54%) in Thailand. Of the students who had heard about the RHL five (23%) had access to it despite the fact that RHL is a free resource to low and middle income countries (Table 4).

Students were asked if they found the RHL tool helpful for their studies and training. Only five students answered this question and all indicated that they found the RHL helpful, in particular the video clips. All five students indicated that they had access to the tool at their training institution.

**Table 4. Heard About the Reproductive Health Library (RHL), the Cochrane Library and Evidence-Based Practice (EBP) (n=172)**

Country	Reproductive Health Library (RHL) n (%)	The Cochrane Library n (%)	Evidenced-Based Practice (EBP) n (%)
Malaysia*	8 (11)	17 (22)	51 (67)
Indonesia	5 (20)	4 (16)	17 (68)
Thailand	7 (54)	11 (85)	11 (85)
Philippines	2 (3)	31 (53)	58 (100)
Total	22 (13)	63 (37)	137 (80)

\*Two universities in Malaysia, one university in all other countries.  
All percentages are rounded to the nearest whole number.

**Table 5. Workshops Interested in Attending by Medical Students Across Four SEA Countries (n=172)\*\***

Country	RHL n (%)	Cochrane n (%)	EBP Including Critical Appraisal n (%)	CPG n (%)	Use of Evidence n (%)
Malaysia*	52 (68)	52 (68)	45 (59)	50 (66)	57 (75)
Indonesia	17 (68)	19 (76)	19 (76)	22 (88)	19 (76)
Thailand	5 (38)	8 (62)	5 (38)	7 (54)	7 (54)
Philippines	33 (57)	49 (84)	31 (53)	28 (48)	40 (69)
<b>Total</b>	<b>107 (62)</b>	<b>128 (74)</b>	<b>100 (58)</b>	<b>107 (62)</b>	<b>123 (72)</b>

\*Two universities in Malaysia, one university in all other countries.

\*\*One additional suggestion by 4 students was a workshop on internet search strategies. All percentages are rounded to the nearest whole number.

Overall 107 (62%) medical students expressed interest in attending a workshop on how to use the RHL more effectively. This presented as 17 (68%) students from Indonesia, 52 (68%) from Malaysia, 33 (57%) from the Philippines and five (38%) from Thailand (Table 5).

### Clinical Practice Guidelines

The Clinical Practice Guideline (CPG) section of the survey invited the students to comment on their learning exposure to CPGs. Across all four SEA countries, 133 (77%) had not attended a CPG workshop during their undergraduate medical training. There was variation between countries at local level with 25 (100%) medical students in Indonesia indicating that they had never attended a workshop on CPGs, 66 (87%) in Malaysia, eight (62%) in Thailand and 34 (59%) in the Philippines. However, 117 (68%) of students did indicate some discussion and examination of CPGs occurred during their undergraduate medical training. This ranged from one (8%) student in Thailand, to nine (36%) in Indonesia, 59 (78%) in Malaysia and 48 (83%) in the Philippines.

The SEA-ORCHID Project was interested to find out if the undergraduate medical training of surveyed students included CPG development and implementation exposure at their medical schools. Overall 76 (44%) students answered yes. Again the results differed between the individual countries and universities with three (23%) students from Thailand indicating exposure to CPG development and implementation learning during their medical training, 25 (28%) in the Philippines, eight (32%) in Indonesia and 40 (53%) in Malaysia.

Students were then asked to express their thoughts on the importance of CPGs. Overall 156 (91%) students indicated that CPGs were important, which was consistent across the five universities in the four SEA countries with a range of 84% to 93%. Students had to give reasons for their answers and 122 (71%) opted to do so. The majority of students identified CPGs as important because *'it standardises treatment and helps with the management and decision making in the clinical setting'* 38 (31%). CPGs were thought important to 35 (29%) students as *'it ensures clinical practices are evidence based'* and 30 (24%) identified CPGs as *'guiding clinical decision-making'*. A range of other reasons were listed by a small number of students, these included five students stating that CPGs *'help them to study'*, two students thought CPGs *'improve the quality of*

*education'*, a further two students stated that CPGs *'don't help much'* and two other students stated that CPGs are important as they assist *'to avoid any medico-legal problems'*.

It is assumed that fifth year medical students are also exposed to CPGs during their clinical placements. Therefore it was of interest to the project to find out what students found most helpful in learning about CPGs in the clinical setting. Of all the students surveyed, 145 (84%) indicated *'having had easy access to clear clinical practice guidelines was most helpful'* and *'clinical case presentations'* also assisted with CPG learning during the clinical practice placements (118, 69%). Results differed between countries. Access to CPGs was seen as most helpful by 23 (92%) students in Indonesia, 66 (87%) in Malaysia, 47 (81%) in the Philippines and nine (69%) in Thailand. The helpfulness of case presentations differed as well with 24 (96%) students in Indonesia indicating it as most helpful, 51 (67%) in Malaysia, 37 (64%) in the Philippines and six (46%) in Thailand. 101 (59%) students indicated that *'close clinical guidance from a clinical supervisor'* in regards to CPGs was helpful. This was consistent across the five universities in the four SEA countries surveyed. However, only 53 (31%) students found attending clinical staff meetings as helpful for CPG learning and 35 (20%) found it useful to have access to RHL or The Cochrane Library for CPG learning.

### Workshop Attendance

All students were invited to indicate their interest in attending listed workshops on evidence-based health care and to provide suggestions for further learning opportunities and topics. Across all four SEA countries and the five universities the majority of students surveyed were interested in attending EBP workshops including critical appraisal and understanding systematic reviews (128, 74%). Further learning opportunities were identified by the students as workshops on how to use or put evidence into clinical practice (123, 72%) and workshops for developing clinical practice guidelines (107, 62%). A further four students suggested workshops on designing effective search strategies (Table 5).

When offering further learning opportunities to students it is important to understand the reasons and concerns that could prevent students from attending. Student responses included; 113 (66%) indicated that they had no reasons that would prevent them from attending offered workshops; 30

(17%) students stated 'yes' to having concerns about being able to attend workshops and 29 (17%) indicated that 'maybe' there were concerns. Of those that identified concerns, 84 (49%) indicated the reason as being too busy and not having any spare time from their normal studies, 74 (43%) indicated they needed financial support but none was available and 27 (16%) indicated language as a barrier.

## DISCUSSION

During the last century there has been an information explosion and growth of research and knowledge. With this expansion of knowledge it stands to reason that clinical practice should be more effective. However, this is not the case [19]. Increasing time constraints and the inability to access online information provides medical students with challenges to obtain evidence-based and up-to-date information and adapt these into evidence-based practice [20]. The findings from this survey provide useful information for planning future interventions and directions for incorporating EBP knowledge and approaches for the SEA-ORCHID project and the medical schools involved and with their curriculum development. Understanding the barriers and enablers for educating medical students in evidence-based practice can lead to more effective teaching strategies and improvements in clinical care [21,22]. The number of students completing the audit was limited by the student enrolment at the university medical schools participating in the SEA-ORCHID project and may not be representative of all university medical schools within each of the represented countries.

Medical schools at each university that were chosen for the survey were interested in incorporating or further developing EBP components of their course, so it is likely that students at these sites had greater exposure to EBP. The survey results, therefore, would be likely to over-estimate EBP, knowledge and clinical change in reference to South East Asia as a whole.

### Information Technology Access

Easy internet access is fundamental to access EBP information and EBP resources. Three quarters of the medical students had easy access to a computer with broadband connection at their training institution. This is encouraging, considering that internet connection *via* dial-in phone connection experiences frequent interruptions. However, students need to have knowledge and skills to perform online searches frequently, effectively and need to demonstrate searching with relevance to their studies and learn how to translate best evidence into clinical practice. Evidence-based practice teaching in the medical curriculum needs to include these skills [9,23]. Students in Indonesia were less likely to have access to the internet *via* broadband connections and more likely to experience difficulty in accessing EBP information. Nearly half the students in this survey identified difficulty in accessing computers, mainly due to the limited supply of computers or computers always in use. This relates to a funding issue that is traditionally a worldwide problem for educational institutions and is difficult to overcome [24] but also indicates that there has to be a commitment by medical schools to ensure students have ready access to evidence-based literature that informs clinical practice. It has been reported in the literature that

easy access to online resources increase the frequency of literature searches and therefore increase the reading of more evidence-based articles [25,26].

### Use of Health Information and Resources During Medical Training

The data from this survey indicated that most frequently used health information resources by students during their medical training were textbooks (92%) and lecture notes (77%). Journals were not frequently used as a resource but three quarters of the students indicated that they used journals sometimes. Nearly half of the students indicated that they used fellow students and pharmaceutical companies sometimes for health information. Textbooks can quickly become out-of-date and fellow students may be more opinion-based about clinical care rather than evidence-based [16]. It is also now well established in the literature that information from pharmaceutical companies may be biased towards their own research and products [27]. Peer reviewed journals can be an effective source for EBP information but students need to know how to access these. Nearly half of the students did identify that they also used the internet as a frequent resource for health information with the most popular website being <http://www.emedicine.com> for Malaysia and the Philippines, <http://www.bmj.com> for Indonesia and <http://www.google.com> for Thailand. This indicates students need to be well equipped in knowing what databases exist, how to search them and how to critically appraise the information obtained [28]. EBP courses in the undergraduate medical curriculum have been found to increase EBP knowledge, the use of EBP resources and the application of EBP in the clinical settings, as well as teach lifelong learning skills [29]. Training staff involved in medical student learning to conduct relevant workshops may be one effective way to train students and will form part of the SEA-ORCHID project intervention.

The Cochrane Library and the RHL are two reliable evidence-based health information resources. About one third of students had heard about The Cochrane Library and less than a quarter of students had heard about the RHL. The usage of these resources varied among countries but overall the students that were able to access these used them only once a year. This indicates that the majorities of students, with the exception of Thailand, were unaware of the existence of The Cochrane Library or RHL or did not know how to access or use them. Educational intervention could be targeted for these resources.

### Evidence-Based Practice Learning

In addition to finding out how and where students accessed EBP information, it was also of interest to find out how much EBP teaching is actually included during the students medical training. Over three quarter of students thought they had had exposure to EBP teaching. Two thirds of the students opted to write down their definition of EBP, with the majority indicating that it meant '*basing clinical practice on any research*', which is a significant finding needing to be addressed, as it is an inaccurate definition. 10% of students understood the concept to be threefold, as it includes not only critically appraised research but also the integration of clinical expertise and patient values in context, as defined by Sackett *et al.* [3].

## Clinical Practice Guidelines

During clinical placements having access to clear clinical practice guidelines and clinical case presentations were identified as assisting students with CPG learning, as well as having close clinical guidance from a clinical supervisor in regards to CPGs. This indicates the importance of an in-depth knowledge base about CPG development and implementation for clinical lecturers or supervisors to assist medical students with their learning on their clinical placements. Consideration for CPG knowledge dissemination needs to include student education and regular professional development for the health professionals teaching medical students [30-32].

## Workshop Attendance

Across all four SEA countries and the five universities the majority of students surveyed were interested in attending EBP workshops including critical appraisal and understanding systematic reviews. Three quarters of the students wanted to have further learning opportunities on how to use or put evidence into clinical practice and workshops for developing clinical practice guidelines, as well on how to use The Cochrane Library and Reproductive Health Library. Difficulties in attending any of the suggested learning opportunities were identified as financial barriers and at having no time available outside their own studies. A small proportion of students indicated that language would be a barrier if English is the choice of tuition. These difficulties are echoed in the literature and are always a challenge to overcome [22, 33].

## CONCLUSIONS

The findings from this study indicate that undergraduate medical students in the five universities surveyed need to be well-equipped in knowing what databases exist, how to access and search these and how to critically appraise the information obtained. In contrast, the majority of students were using textbooks as their main access to health information. This and a lack of exposure to clinical practice guideline appraisal and development highlights some of the issues medical students encounter when attempting to learn and apply EBP effectively. The size of this survey was small and it is difficult to generalise the findings to other university medical schools in the countries involved. However, it presents the SEA-ORCHID project with useful information for intervention development and planning for participating Universities and hospitals. Further research in the area of undergraduate medical students understanding and barriers of evidence-based practice to facilitate their future evidence-based clinical practice.

**Please note:** The EBP student survey tool can be made available from the author.

## CONFLICT OF INTEREST

The authors declare that they have no competing interests.

## AUTHORS' CONTRIBUTIONS

All authors contributed to the study design, interpretation of the data and preparation of the drafts of the manuscript. All authors read and approved the final manuscript.

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The SEA-ORCHID project was approved by the local ethics committees of each hospital and by the ethics committee of the University of Sydney, the administering institution in Australia

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#### Malaysia

*Country Investigator:* Jacqueline Ho.

*Royal College of Medicine Perak:* Jacqueline Ho and *Universiti Sains Malaysia:* Hans Van Rostenberghe for administering the survey and Swi Sim Cam and Sivasangari Subramaniam for data entry for both universities.

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*Khon Kaen University:* Jadsada Thinkhamrop, Piangjit Tharnprisan, Ussanee Swadpanich, Janyaporn Ratanakosol for administering the survey and Natthaleeya Narash and Rabieb Poombankor for data entry.

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*University of the Philippines:* Mario Festin for administering the survey and Jocelyn Magsipoc for data entry.

#### Australia

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