
Evidence-based medicine as a tool for clinical decision-making in Puerto Rico

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Evidence-based medicine (EBM) is defined as “the process of systematically finding, appraising and using contemporaneous research findings as the basis for clinical decisions”. Although EBM has been extensively described across the Americas and Europe, no study has looked at the practice of EBM in Puerto Rico. A cross-sectional analysis based on a 23-item questionnaire was employed. We showed that there is a high use (88%) and familiarity (93%) with EBM, and that physicians keep a positive attitude towards EBM (80%) in Puerto Rico. There is an over-

representation of academicians (58.9% vs. 34.6%, p = 0.02) and an under-representation of solo office practitioners (10.5% vs. 26.9%, p = 0.03) among EBM users. Additionally, patient workload (48%), time constraints (36%), and limited access to the Internet (28%) were the most frequently cited obstacles to the practice of EBM in Puerto Rico. Taken together, these results help create a cross-sectional profile of EBM practice among Puerto Rican physicians.

Key words: Evidence-Based Medicine, EBM, Puerto Rico.

The breadth of medical information potentially available to the physician has increased more or less exponentially (1). For example, on the narrow subject of “childhood obesity and hypertension”, an Internet search covering the last three years yielded 1038 articles for which it is clear that no physician can commit such volumes of contributions to memory. However, a recent study implied that clinicians still relied greatly on personal experience and the opinions of their colleagues when making clinical decisions (2), which might have serious implications in today’s litigious environment. The digitalization of information has also accelerated the distribution and accrument of new evidence, flooding the practicing physician with information, and making it difficult to distinguish between relevant and irrelevant evidence. Collectively, these factors led some to the creation of a systematic approach for basing clinical decisions, the Evidence-Based Medicine model (3-11).

Evidence-Based Medicine (EBM) is defined as “the process of systematically finding, appraising, and using

contemporaneous research findings as the basis for clinical decisions” (9). First coined by the McMaster School of Medicine in the 1980’s (12), EBM was devised in an effort to optimize patient-care by connecting healthcare providers to the ever-increasing body of medical literature. In doing so, it has helped physicians cope with this rapidly changing body of relevant information (9). The practice of EBM requires the practitioner to base clinical decisions on the best available evidence, ideally integrating clinical experience and patient values (3-4,6,13-14). More specifically, EBM involves four steps (7): 1) formulating a clear question based on a clinical problem, 2) identifying relevant studies from the literature, 3) critically appraising the validity and usefulness of the literature, and 4) applying the findings to the specific clinical problem.

Apart from its role in clinical decision-making, EBM is also a platform for medical education (3-4). Some believe that the pedagogic aspects of EBM are its strongest attributes as the evidence-based approach to medical problem-solving preached by EBM is conducive to scholarly discussion and life-long learning (12,15-16). This view has gained acceptance after several studies suggested that physicians trained in EBM were more likely to keep up-to-date with the most current evidence when compared to more traditionally trained physicians (15-16).

Despite its benefits, the practice of EBM has not come without its share of opponents (17-18). This has been partly because not a single study to date has shown

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improved outcome in patient care under an EBM model of practice versus traditional medical reasoning and management (3,17). However, proof for improved outcomes with EBM would require the technically challenging exercise of separating EBM versus non-EBM practices. Some have raised concerns that the theoretical practice of EBM bears little resemblance to real-life experience (e.g. insurance constraints, lack of resources, patient preferences) (3,5-6,13-14). Moreover, some contend that it spouses “cookbook medicine” (13,17,19) and still, others argue that the intrinsic flaws of study design (e.g. sampling bias) are an irreconcilable hurdle against adopting evidence-based decisions (3-6,13,17,19).

Further hindering the implementation of EBM is the fact that several obstacles exist to the practice of EBM, six of which are particularly salient amongst physicians (20). These include: 1) the excessive time required to find information; 2) difficulty modifying the original question, which was often vague and open to interpretation; 3) difficulty selecting an optimal strategy to search for information; 4) failure of a seemingly appropriate resource to cover the topic; 5) uncertainty about how to know when all the relevant evidence has been found so that the search can stop; and 6) inadequate synthesis of multiple bits of evidence into a clinically useful statement (20). Despite its inadequacies, proponents sustain that the EBM approach to clinical problem-solving is the “best available” tool for the systematic evaluation of medical evidence and for guidance in clinical decision-making (3, 5-7, 9, 12).

Although the practice of EBM among physicians has been explored throughout the Americas and Europe (2,4-5,7-10), no single study has tackled the issue of whether the practice of EBM has been adopted by the medical community of Puerto Rico. Furthermore, it is not clear what sources of evidence Puerto Rican physicians currently rely on when solving medical problems or what obstacles may hinder the practice of EBM in Puerto Rico. We hypothesize that Puerto Rican physicians under-use EBM as a tool for clinical decision-making and that a more traditional, experience-based or “anecdotal” mode of evidence gathering prevails. We also hypothesize that a great number of obstacles exist against the practice of EBM in Puerto Rico.

Methods

To examine how physicians are utilizing EBM and to identify which barriers may exist to the use of EBM in Puerto Rico, we designed a cross-sectional study based on a 23-item questionnaire as described (2,7). Surveys were administered by random hall encounters to

consenting participants throughout University of Puerto Rico School of Medicine-affiliated hospitals, including the University Hospital, San Juan Veterans Affairs Medical Center, I. González Martínez Oncology Hospital, Hospital Dr. Federico Trilla, University Pediatric Hospital, San Juan Municipal Hospital, and First Hospital Panamericano. Sampling was carried out during March of 2006. A major inclusion criterion for the survey was that respondents be physicians (post-graduate M.D.) involved in active patient care in Puerto Rico, including house staff and attending physicians. Retired physicians and those devoted to research or administration were excluded from the study. In addition to demographic data, the survey included questions assessing the respondent’s general familiarity with EBM, self-reported use of EBM in clinical practice, methods used for basing clinical decision-making, and barriers to the use of EBM for the resolution of clinical problems. General attitudes towards EBM were also tested using a 4-point scale (1 – Not important, 2 – Somewhat important, 3 – Important, 4 – Very important). Validity of the respondents’ responses were assessed by looking for expected associations between self-reported use of EBM and other variables (e.g. testing the degree of association between self-reported use of EBM with a positive attitude towards EBM, $p < 0.01$). Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software. Differences in categorical values were tested using Fisher’s Exact Test. Continuous variables were tested using the Student’s *t* test.

Results and Discussion

Two-hundred eighteen questionnaires were completed by consenting physicians, of which 2 were incorrectly filled (1%) and were excluded from the final analysis. The study group consisted of 216 completed surveys. For comparison, respondents were divided by self-reported use (EBM user) versus non-use (Non-EBM User) of EBM in clinical practice. Demographic characteristics of the respondents (Table 1) showed no significant difference in gender ($p = 0.40$). However, EBM users tended to be younger (35.3 ± 1.6 years vs. 44.2 ± 5.5 years, $p = 0.01$) and have less years of post-graduate experience (10.2 ± 1.8 years vs. 17.3 ± 5.7 years, $p = 0.03$), suggesting that younger and less-experienced physicians tended to use EBM to base clinical decisions. One-hundred ninety (88%) of the surveyed physicians reported the use of EBM and 201 (93%) said to be familiar with EBM (Figure 1A), indicating a high degree of EBM use and familiarity among Puerto Rican physicians. Nevertheless, more physicians were familiar with than actually using EBM in practice (93% vs. 88%) suggesting under-utilization. When asked about their attitudes towards

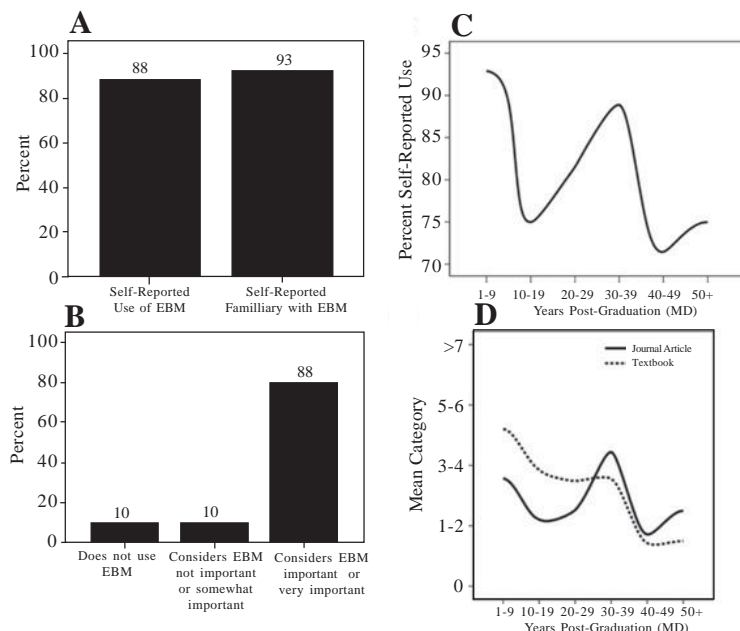


Figure 1. EBM as a tool for decision-making in Puerto Rico. A, Percent respondents that reported using EBM in their clinical practice or to be familiar with EBM. B, Percent respondents that reported EBM to be “not important” or “somewhat important”, “important or very important”, or “non-user”. C, Percent self-reported EBM use was plotted against years of post-graduate experience categories. D, Mean category textbook (dashed line) and journal article use (solid line) were plotted against years of post-graduate experience categories.

EBM (Figure 1B), 173 (80%) of surveyed physicians reported that they considered EBM “important” or “very important” in their clinical practice, whereas only 22 (10%) reported EBM to be “somewhat important” or not important”, indicating that the majority of sampled physicians have a positive attitude towards EBM.

When EBM use was plotted against years of post-graduate experience (Figure 1C), an initial high in self-reported EBM use at 1-9 years of post-graduate experience (93%) declined to 75% at 10-19 years. This was followed by a second rise in self-reported EBM use, peaking at 30-39 years (89%). Finally, a tailward decline, with 71% and 75% at 40-49 and 50+ years of post-graduate experience, respectively, was observed. This trend may signify that physicians use EBM during training (1-9 years) and then rely on their training, and not EBM early on (10-19 years). Physicians may then shift to more current sources, and thus practice EBM, once training-based concepts have evolved or become obsolete. To further characterize this trend, we examined textbook versus journal article use as surrogates for training derived versus more current sources of evidence, respectively. Surveyed physicians were asked to report how many times (1-2, 3-4, 5-6, or >7) they had used a textbook or a journal article to solve a

clinical question in the previous month of practice. Mean categories were then plotted against years of post-graduate experience. As seen in Figure 1D, textbook use had a continuous decline across increasing years of post-graduate experience, whereas journal article use remained initially low, but increased to surpass textbook levels following 20-29 years of post-graduate experience. This supports the notion that Puerto Rican physicians use textbooks early in their careers, reflecting the reliance on the well-established principles taught during medical training, but, once these become out-dated, they switch to more current literature (journal articles) to substantiate clinical decisions. Reflecting the trend in self-reported EBM use across years of post-graduate experience, journal article utilization initially troughs at 20-29 years and then peaks at 30-39 years of post-graduate experience, suggesting that journal article use alone can be used as a marker for EBM. A concurrent decline in the use of textbooks and journal articles (and EBM) in the “40-49” and “50+” categories may reflect over-reliance on clinical experience in this group, or may be due to the fact that these categories represent a retiring demographic population.

When we examined the sources of information used to tackle clinical questions (Table 1), only “journal club” was statistically over-represented among EBM users (60.0% vs. 26.9%, $p < 0.01$). Nevertheless, there was a trend for EBM user to utilize journal subscriptions (81.1% vs. 65.4%, $p = 0.08$), the Internet (78.9% vs. 69.2%, $p = 0.31$), and research forums (22.1% vs. 7.7%, $p = 0.12$), whereas non-EBM users tended to rely on medical conventions (80.8% vs. 73.2%, $p = 0.48$) and professional associations (42.3% vs. 37.9%, $p = 0.67$). These findings suggest that EBM users tend to rely on current sources of information such as peer-reviewed journal articles, journal club discussions, the Internet, and research forums to base clinical decisions, but non-EBM users depend on authoritative sources such as medical conventions and professional associations. There was a small, but statistically significant increase of self-reported use of computers in clinical practice among EBM users (89.5% vs. 73.1%, $p = 0.03$), probably reflecting the fact that much of the medical literature is now available on-line.

To explore if EBM use varied with working environment, we examined EBM utilization across practice settings (Table 2, Figure 2A). There was an increased percentage of academicians among EBM users (58.9% vs. 34.6%, $p =$

Table 1. Respondent Demographic Characteristics Sorted by Self/Reported Non-EBM Versus EBM Use

Characteristic	Self-Reported Non-EBM User (N = 26)	Self-Reported EBM User (N = 190)	p-value
Age (mean ± 85%CI)	44.2 ± 5.5	35.3 ± 1.6	0.01
Post-Graduate Experience (mean ± 95%CI)	17.3 ± 5.7	10.2 ± 1.8	0.03
Gender N(%)			0.40
Male	13(50)	113(59.5)	
Female	13(50)	77(40.5)	
Grouped Post-Graduate Experience N(%)			0.05
1-9	10(38.5)	131(68.9)	
10-19	7(26.9)	21(11.1)	
20-29	5(19.2)	22(11.6)	
30-39	1(3.8)	8(4.2)	
40-49	2(7.7)	5(2.6)	
50+	1(3.8)	3(1.6)	
Information sources N(%)			
Journal subscriptions	17(65.4)	54(81.1)	0.08
Medical conventions	21(80.8)	139(73.2)	0.48
Research forums	2(7.7)	42(22.1)	0.12
Journal club	7(26.9)	114(60.0)	<0.01
Professional associations	11(42.3)	72(37.9)	0.67
Internet	18(69.2)	150(78.9)	0.31
Served as an educator N(%)	19(73.1)	161(84.7)	0.16
Used a computer in practice N(%)	19(73.1)	170(89.5)	0.03
Subscribed to a basic science journal N(%)	6(23.1)	63(33.2)	0.37
Consulted a basic scientist N(%)	8(30.8)	76(40.0)	0.40

0.02). This may be related to the fact that EBM is used as a didactic tool in academia (3-4). In support of this, there was a greater number of respondents in the EBM group that stated they had served as educators in the previous

Table 2. Practice Setting and Specialty Characteristics Sorted by Self-Reported Non-EBM Versus EBM Use

Characteristic	Self-Reported Non-EBM User (N = 26)	Self-Reported EBM User (N = 190)	p-value
Practice settings N(%)			
Academic	9(34.6)	112(58.9)	0.02
Hospital based	15(57.7)	103(54.2)	0.84
Solo office practice	7(26.9)	20(10.5)	0.03
Group practice	3(11.5)	13(6.8)	0.42
HMO	0(0)	0(0)	
Locum Tenens	1(3.8)	2(66.7)	0.32
Specialty N(%)			
Internal Medicine	5(19.2)	54(28.4)	0.48
Pediatrics	3(11.5)	12(6.3)	0.40
Family Medicine	0(0)	7(3.7)	1.00
Surgery	1(3.8)	9(4.7)	1.00
Obstetrics/Gynecology	1(3.8)	16(8.4)	1.00
Psychiatry	4(15.4)	18(9.5)	0.31
Radiology	5(19.2)	5(2.6)	<0.01
Pathology	1(3.8)	6(3.2)	0.60
Emergency Medicine	1(3.8)	11(5.8)	1.00
Other Specialty	5(10.2)	52(27.4)	0.40
Primary Care Physician N(%)	14(53.8)	92(48.4)	0.68

month (84.7% vs. 73.1, p = 0.16; Table 1). Solo office practitioners, on the other hand, were more highly represented among non-EBM users (26.9% vs. 10.5%, p = 0.03), suggesting an under utilization in this group. No statistical difference was found among hospital based, group practice, or Locum Tenens practitioners. Unfortunately, HMO practice was not reported, for which it was not possible to study EBM use in this sub-group. When we examined EBM use across medical specialties (Table 2, Figure 2B), no statistically significant differences were noted between EBM versus non-EBM users, albeit radiology was more highly represented in the non-EBM group (19.2% vs. 2.6%, p < 0.01). Likewise, there was no difference in EBM use among self-reported primary care practitioners (Table 2).

To study potential limitations for the implementation of EBM practices, respondents were asked to choose from a list of factors they perceived as hindering the use of EBM. Answers included, but were not limited to, “takes too much time”, “Internet not readily available”, “difficulty accessing the library”, “patient workload is too large”, “would be too expensive”, “patient preference”, “insurance limitations”, and “not trained in EBM”. The three most highly cited barriers for incorporating EBM to the respondents’ clinical practices were an excessive patient workload (48%), the extra time necessary to practice EBM (36%), and that the Internet was not readily available (28%) (Figure 3). Additional responses included problems accessing the library (15%), not being trained in EBM (12%), factors relating to insurance (6%), and patient preference (1%). One percent reported EBM as not important and 27% identified “other” barriers to the use of EBM.

The data presented here help create a cross-sectional profile of EMB use in Puerto Rico. Nevertheless, some limitations require acknowledgement. First, this study did not directly measure EBM practices per se, but instead, self-reported use of EBM. However, to directly examine EBM practices, respondents would have had to describe the decision-making strategy used to tackle a given clinical problem (Ex. work-up for

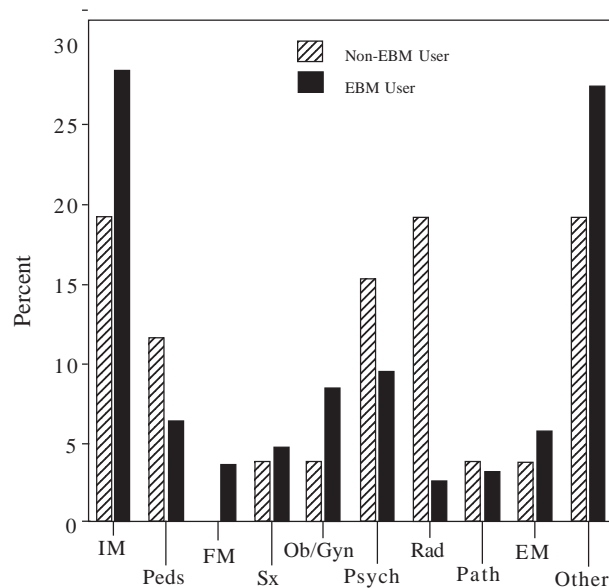
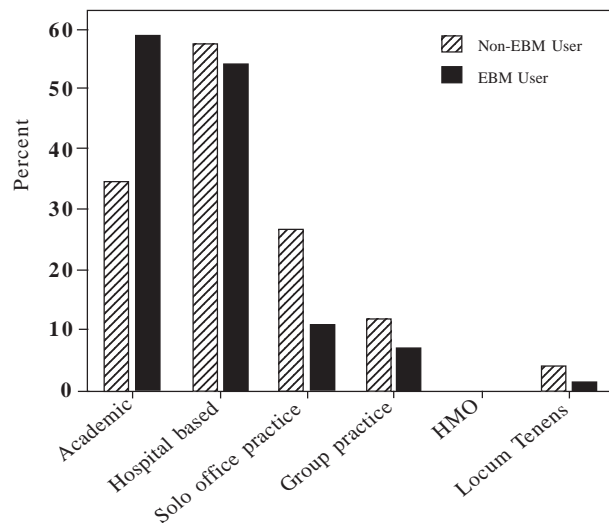


Figure 2. EBM use across practice settings and specialties. A, Percent EBM users (black bars) versus non-EBM users (dashed bars) were plotted according to reported practice settings and, B, specialty. IM, Internal Medicine; Peds, Pediatrics; FM, Family Medicine; Sx, Surgery; Ob/Gyn, Obstetrics and Gynecology; Psych, Psychiatry; Rad, Radiology; Path, Pathology, EM, Emergency Medicine.

abdominal pain), allowing validation of self-reported EBM use. This type of analysis would be challenging due to the varying degrees of familiarity by the different medical specialties with the management options for the proposed problem (i.e. Internal Medicine vs. Ob/Gyn and the management of vaginal bleeding). Second, our sample was heavily based on metropolitan area hospitals, limiting the

generalization of our results to physicians throughout the island of Puerto Rico. However, the fact that nearly half of all physicians practice in the metropolitan area [21] broadens the applicability of this study. Third, despite instructions to choose a predominant “practice setting”, respondents on some occasions chose more than one, limiting the strength of our analysis on EBM use across work settings. Lastly, our study did not address the types of clinical questions physicians utilize an EBM approach for.

In conclusion, this study suggests that there is a high degree of self-reported use of EBM as a tool in clinical decision-making among Puerto Rican physicians and that there is a high degree of familiarity with concepts advocated by the EBM model of practice. Although it has not been determined if the use of EBM improves

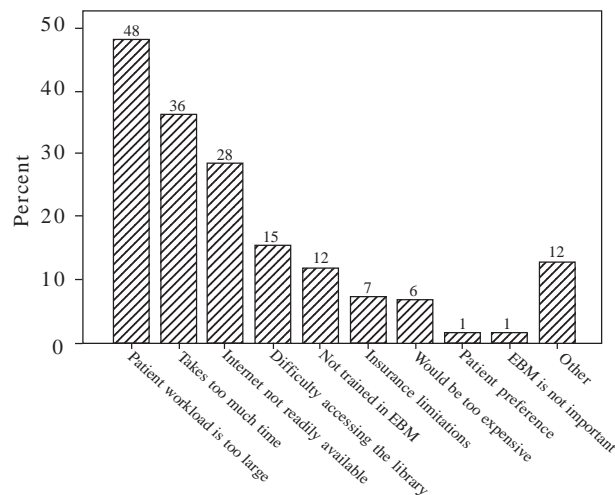


Figure 3. Barriers to the use of EBM in Puerto Rico. Percent reported barriers were plotted in decreasing frequency. Answers not mutually exclusive.

patient outcomes, it is reasonable to infer that the use of up-to-date sources of information by EBM practitioners guarantee the most current and best available level of care. Our study suggests that this is the case of the patients of Puerto Rico. Further study will be necessary to determine what impact an under utilization of EBM among solo practitioners may have on the communities served by this sub-set of healthcare providers. Finally, the two most frequently cited barriers for the use of EBM, patient workload and time, are strongly inter-related and may be compounded by the third most commonly cited obstacle, inaccessibility to readily available information on the Internet. A concerted effort by physicians and associated staff will be required to overcome these barriers to EBM practice.

Conclusions

There is a high degree of self-reported use and familiarity with EBM among Puerto Rican physicians. The majority of sampled physicians consider EBM “important” or “very important”. Physicians may be relying on knowledge acquired during training for basing clinical decisions early on, but switch to more current, evidence-based sources as they advance in their post-graduate experience, possibly due to evolving standards of practice. Additionally, EBM use is high in academia, but low among solo office practitioners. There is no difference in EBM utilization across medical specialties, except for radiology, which tends to be non-EBM users. EBM users tend to rely on journal articles, journal clubs, the Internet, and research forums, whereas non-EBM users rely on authoritative sources such as professional associations and medical conventions. Finally, patient workload, time constraints, and access to the Internet are the most frequently cited barriers to the use of EBM in Puerto Rico.

Resumen

Medicina basada en evidencia (MBE) se define como “el proceso de sistemáticamente encontrar, valorar y utilizar los hallazgos contemporáneos de las investigaciones como base para tomar decisiones clínicas”. Aunque la MBE se ha descrito extensamente en Norteamérica, Suramérica y Europa, ningún estudio ha mirado la práctica de la MBE en Puerto Rico. Se utilizó un análisis transversal basado en un cuestionario de 23 ítem. Demostramos que hay un alto uso (88%) y familiaridad (93%) en relación con la MBE y que los médicos mantienen una actitud positiva hacia la MBE (80%) en Puerto Rico. Hay una alta representación de académicos (58.9% vs.34.6%, $p=0.02$) y una subrepresentación de médicos de oficina (10.5% vs. 26.9%, $p=0.03$) entre los usuarios de la MBE. Además, la carga de trabajo con los pacientes (48%), las limitaciones de tiempo (36%) y la limitación de acceso a la Internet (28%) fueron los obstáculos más frecuentemente citados para llevar a cabo la MBE en Puerto Rico. Todos estos factores ayudan a crear un perfil transversal de la práctica de la MBE entre los médicos puertorriqueños.

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