## Contents

**EDITORIAL**

Clinical Trial Registry - India (CTR-I): A meaningful initiative. How to take it forward?

Bavdekar SB

1

**ORIGINAL ARTICLES**

Detection of Rh antibodies using two low ionic diluents: Extension of the incubation time and the number of Rh antibodies detected

Skaik YA

4

Immunophenotypic characterisation of peripheral T lymphocytes in pulmonary tuberculosis

Al Majid FM, Abba AA

7

Relationship between N-terminal pro-B type natriuretic peptide and extensive echocardiographic parameters in mild to moderate aortic stenosis

Cemri M, Arslan U, Kocaman SA, Çengel A

12

Relative efficiency of polymerase chain reaction and enzyme-linked immunosorbent assay in determination of viral etiology in congenital cataract in infants

Shyamala G, Sowmya P, Madhavan HN, Malathi J

17

Stomaplasty—anterior advancement flap and lateral splaying of trachea, a simple and effective technique

Trivedi NP, Patel D, Thankappan K, Iyer S, Kuriakose MA

21

**CASE REPORTS**

*Rhodotorula mucilaginosa* as a cause of persistent femoral nonunion

Goyal R, Das S, Arora A, Aggarwal A

25

Repeated fracture of pacemaker leads with migration into the pulmonary circulation and temporary pacemaker wire insertion via the azygous vein

Udyavar AR, Pandurangi U M, Latchumanadhas K, MullaSari A S

28

Recurrent respiratory papillomatosis complicated by aspergillosis: A case report with review of literature

Kuruvilla S, Saldanha R, Joseph LD

32

*Citrobacter freundii* infection in glutaric aciduria type I: Adding insult to injury

Mukhopadhyay C, Dey A, Bairy I

35

**IMAGES IN RADIOLOGY**

Chordoma: A rare presentation as solitary ivory vertebra

Kumar S, Hasan R

37

**IMAGES IN PATHOLOGY**

Intracystic papillary carcinoma associated with ductal carcinoma *in situ* in a male breast

Dragoumis D M, Tsiftsoglou AP

39
REVIEW ARTICLE

Implications of HLA sequence-based typing in transplantation
Shankarkumar U, Pawar A, Ghosh K

DRUG REVIEW

Ramelteon: A melatonin receptor agonist for the treatment of insomnia
Devi V, Shankar PK

STUDENTS CORNER

The internet: Revolutionizing medical research for novices and virtuosos alike
Jethwani KS, Chandwani HS

VIEW POINT

Documenting indications for cesarean deliveries
Kushtagi P, Guruvare S

CLINICAL SIGNS

Cherry-red spot
Suvarna JC, Hajela SA

LETTERS

Central retinal vein occlusion associated with thrombotic thrombocytopenic purpura/hemolytic uremic syndrome
Author’s reply
Simultaneous umbilical hernia repair in patients undergoing laparoscopic cholecystectomy: Is obesity a risk factor for recurrence?
Authors’ reply
Snap sound and detumescence: Fracture penis
Paraphenylene diamine-induced acute renal failure: Prevention is the key
Inadequate awareness of the role of erythrocytic parameters in the detection of beta-thalassemia minor
Model for end-stage liver disease and outcome of portosystemic encephalopathy
Aortic thrombus during invasive aspergillosis in a kidney transplant recipient
Castleman's disease in interpectoral lymph node mimicking mammary gland neoplasia
Bacterial endocarditis due to Group C streptococcus
Postpartum Group B streptococcal meningitis
The internet: Revolutionizing medical research for novices and virtuosos alike

Jethwani KS, Chandwani HS

The internet, due to the recent upsurge in its penetration and the plethora of information available, has the potential for unparalleled impact on the way research can be conducted in the future by medical students and professionals alike. Since the past few years, the internet has proved to be the most promising and powerful tool to review existing literature. It helps researchers to not only save time but also gives them access to resources that were unavailable in the past. Communication amongst researchers working on similar issues can provide gateways to more meaningful international interactions and exchange of ideas and intelligence. The utility of the internet has by far been restricted to providing a database of information. The fact that the internet has now become a household name lends itself to further exploitation by researchers. In the following article, we discuss the methods, merits and drawbacks of using the internet further for medical research.

Methods

The internet can be used to simplify almost any stage of a medical research project. Be it outsourcing some stages of the analysis or processing to other institutions or individuals, recruiting sample populations for drug trials by pharmaceutical companies, the uses are countless. Students can use the internet to access recent trends and investigations into a topic of their choice and frame their research question accordingly. Also, any research question requires in-depth analysis of the past and recent literature, to frame a study that will help further the existing knowledge and be useful in the prevalent clinical or research scenario. Various databases online archive indexed journals, providing abstracts or full-text articles.

Data Collection

Medical students are usually hard pressed for time as research is often extra-curricular. The internet can come in handy, especially in reducing the time taken for data collection. Posting questionnaires online on a website, through email groups or social networking forums reduces the time required to collect data. Project Mumbai VOICES is one such endeavor where medical students, residents and health professionals have created a website to collect and analyze the voices of those affected by the July 11, 2006 serial bomb blasts in Mumbai.

Recruiting Subjects

As the internet has now entered homes, the number of people accessing the internet and the reasons for this access have grown multifold. Diverse age groups with diverse interests are now found in the virtual world. Chat forums, online discussion groups, email distribution lists and social networking portals have grown by leaps and bounds owing to this diversity and provide ample scope for observations of human behavior.

Groups of people who are difficult to locate otherwise, like homosexuals, people suffering from mental illnesses like depression, eating disorders, victims of sexual abuse etc. can be studied easily using the internet. An example of a study utilizing this aspect of the internet is Biesenbach-Lucas and Weasenforth’s study to predict whether a certain group of students may have problems in completion of coursework due to poor negotiation and justification skills. This would enable the faculty to give the affected students the necessary help.

Observation of online forums and mailing lists is also particularly useful for students because it gives them easy access to a large number of subjects and an opportunity to observe differences in social interaction between different kinds of population groups which will not only pique their interest in further research but also help them understand their patients better.

Final stages of the research, including statistical analysis and the final paper form important aspects of the project, as these showcase the research findings. The internet can assist in these by providing easy references for paper designs, articles style of the target journals, statistics used in similar situations by other researchers and newer tools and advances available for easing out this process, like reference managers, statistical tools etc.

Advantages over conventional research methods

The internet offers many advantages to researchers which they
would be bereft of otherwise. The biggest advantage offered is absolute subject anonymity, which is impossible to achieve with conventional research methods. The subjects are at ease in their habitual surroundings and responses thus obtained are as close to the real picture as possible. In fact, it has been shown that interviewer-based surveys, especially those comprising face-to-face interviews, tend to elicit more socially acceptable or desirable answers, not necessarily honest. Such avenues provide a real picture as far as expression of feelings and thoughts is concerned, as subjects know that they are unidentifiable and hence what they feel or say cannot be held against them. It can be especially useful in trying to focus on sensitive issues like racism, sexual preferences, body image perception that people are embarrassed to discuss about.

Another benefit possible through the internet is that it helps achieve obliteration of geographical boundaries in research. It is true that such research has been made possible up till now through postal and telephonic surveys, but the internet eases the entire process manifold. The response rate for such conventional methods does not exceed about 20%, which could increase manifold using the internet.

It is worthwhile knowing the limitations and drawbacks of internet-based studies.

### Challenges

The internet can be used for simple studies that involve administering questionnaires, where little or no prior debriefing is required or as a resource for preexisting records available (like email usage details, purchase patterns, communication behaviors etc). This saves time, effort and money that would otherwise be invested in data collection. But other complex experiments or surveys involving manipulations or essential counseling/debriefing, cannot be conducted using this modality.

### Data quality

The prime reason for poor data quality in online research is selection bias. Selection bias arises not only due to the obvious differences between internet users and nonusers, but also because of self-selection, a relative lack of control over choosing subjects and higher dropout rates. A few studies have documented the dropout rates to be higher for online experiments as compared to similar laboratory-conducted studies.

In Asian countries, a wide socioeconomic and literacy difference still exists between internet users and nonusers. This limits the use of the modality as a fair source to obtain subjects.

Also, if studies use a sample population that is not identifiable, the kind of data generated would not be entirely reliable, as there is no way to ascertain their authenticity. We have all heard of men posing as women or older people quoting younger ages over the internet.

Moreover, the researcher loses control of the environment in which the questionnaire is answered, like debriefing sessions in the middle of the interview section, clarifying doubts or ensuring that the participant is alert and sincere, which might affect the overall quality of the data obtained.

Using the internet also gives scope for participation by people with malicious intent, multiple submissions by the same user, stealing of data over local area networks, etc. These can be counteracted by deft protocol designing, using adequate security measures and incorporating these shortcomings in the analysis of the problem.

### Protection of participant rights

When using data that is already available online or observing chat forums and discussions, the right to privacy is breached.

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**Table 1: Online medical databases useful for review of literature**

<table>
<thead>
<tr>
<th>Name</th>
<th>Salient Features</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>PubMed</td>
<td>Text-based system of access to citations, abstracts and full-text articles from biomedical literature</td>
<td><a href="http://www.pubmed.gov">http://www.pubmed.gov</a></td>
</tr>
<tr>
<td>Medscape</td>
<td>Reviews, latest happenings in the world of medicine besides a citation and article database</td>
<td><a href="http://www.medscape.com/home">http://www.medscape.com/home</a></td>
</tr>
<tr>
<td>American Medical Association (AMA) Journals</td>
<td>Full text of JAMA(journal of the American Medical Association) and other specialty journals  produced by the AMA</td>
<td><a href="http://pubs.ama-assn.org/">http://pubs.ama-assn.org/</a></td>
</tr>
<tr>
<td>EMBASE</td>
<td>Mainly has data on drugs and pharmacology but also includes other biomedical specialties</td>
<td><a href="http://www.embase.com/">http://www.embase.com/</a></td>
</tr>
<tr>
<td>Science Citation Index</td>
<td>Useful for finding follow-up work done on a key article and for tracking down addresses of authors. The database is also available on a DVD which can be ordered online</td>
<td><a href="http://scientific.thomson.com/products/sci/">http://scientific.thomson.com/products/sci/</a></td>
</tr>
</tbody>
</table>
Hence study designs should carefully identify the difference between public and private data. Usually, any forum requiring registration or membership or where explicit instructions and norms are laid down for maintaining confidentiality and privacy, are regarded as private spaces.[10] Any research involving these requires an informed consent. Studies that simply use preexisting data, like old postings on mailing lists or forums can be treated like conventional retrospective studies and similar guidelines can be applied.[11] It is eventually left to the discretion of the researcher and the authorizing institutional regulatory board to safeguard the interests of potential subjects.

**Risks to subjects**

Online researches usually carry no additional harm as compared to conventional studies. They may, in fact, be emotionally and psychologically less demanding,[7] as they give subjects a chance to withdraw whenever they feel uncomfortable. The care that must be taken during designing a questionnaire for an online study is usually no different than for conventional studies, except that detailed and clear debriefing is slightly more difficult to ensure in the former.

It is also more difficult to understand why a particular respondent quit the study, hence there is no chance of ‘undoing’ the harm caused or modifying the study to prevent similar occurrences with other participants.

**Legal and ethical issues**

There are many legal and ethical issues involved with online research. Research has revealed that online informed consent is comparable to informed consent obtained on paper.[13] Even though this takes care of most ethical issues, legalities are still a grey zone in India. The United States has framed laws which define what public and private data is and what kind of data about a subject can and cannot be disclosed.[14] The Parliament of India passed the Information Technology Act (2000) which addresses some of the legal issues related to subject confidentiality with respect to the internet and any data obtained with its use.

The legal quandary in online subject confidentiality arises from the logging of Internet Protocol (IP) addresses. An IP address is a digital signature that one computer leaves on a server when it communicates with it over the internet. This concept seemingly negates confidentiality to a certain extent. But the IT Act (2000) allows for encryption of IP addresses so as to maintain anonymity. Website developers and server controllers can have control over these encryptions and may be able to identify subjects. However, proper enforcement of the Act can help prevent such an eventuality.

**Conclusion**

This novel modality of conducting research is a boon to researchers, irrespective of age and experience. However, some precautions must be taken before undertaking an internet-based study. The main consideration while using the internet for research should be the kind of data needed. Only studies that can overcome disadvantages like selection bias, high attrition rate or poor data quality should use the internet for conducting research. Ethical considerations like maintenance of privacy, confidentiality and intellectual property rights and minimizing potential risks to subjects should be kept in mind while designing the protocol.[14]

The subject should be educated about the study in complete detail. Also, any kind of debriefing required, either before or while answering the questionnaire (through pop-up windows) should be made available at all times.

**References**