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Patterns of Practice of Telemedicine at a Quaternary Super-speciality Referral Hospital in a Developing Country

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Abstract

All India Institute of Medical Sciences (AIIMS) is the apex super-specialty, quaternary referral hospital of India. Telemedicine facilities have been available at AIIMS since 1999. A study was undertaken at the Institute from October 2005 to September 2006 to assess the patterns of practice of Telemedicine and identify the difficulties faced by the doctors. Results of the study conducted across 23 surgical and non-surgical disciplines are presented..

Keywords:

telemedicine, telemedicine utilization, tele-consultation, developing country, super-speciality hospital

Introduction

India has the second largest population in the world (1.1 billion) and providing medical care to all its citizens is a Herculean effort. The task isn't made any easier by the fact that this population is spread over the world's seventh largest land mass stretching 3214 km (North to South) and 2933km (East to West) over all kinds of terrain - from Himalayan mountain ranges to remote islands and from deserts to tropical forests. In the above scenario Telemedicine would appear to be the panacea for all ills that plague the Indian healthcare system.

All India Institute of Medical Sciences (AIIMS) is the apex super-specialty quaternary referral hospital of India. It was established in 1956 with the mandate to develop the highest standards in the trinity of medical education, research and patient care. A pilot Telemedicine project started by the Ministry of Communication & Information Technology in 1999 has developed into a full-fledged Telemedicine Facility.

The present descriptive study was undertaken at the Institute from November 2005 to October 2006 to assess the usage pattern of the Telemedicine and identify the difficulties faced by the doctors. The study demonstrated the need for distant consultation currently being fulfilled by the doctors by using conventional methods rather than Telemedicine. Most of the use of Telemedicine at AIIMS was found to be in the form of "second opinion" type Doctor-to-Doctor consultations – conforming to the role of the Institute as an apex super-speciality quaternary referral center. The problems in usage of Telemedicine relating to technical, connectivity and administrative issues as well as personal concerns of the doctors were also studied.

Materials and methods

A record-based retrospective study of last 3 years (1 July 2003 to 30 June 2006) was carried out at the Telemedicine Facility to determine the utilization pattern of the Telemedicine services at AIIMS. A non-randomized purposive sample of representative surgical and non-surgical disciplines was selected for further study on the basis of maximum frequency of usage of Telemedicine Facility during the last three years. The study was descriptive in nature, study design was cross-sectional and reference period concurrent.

A semi-structured self-administered survey was planned for the next phase. A pilot study was conducted (n=6) and the questionnaire was modified based on the inputs received. The questionnaire survey was conducted over three months (August to October 2006) amongst the doctors (Faculty members) from the disciplines selected from the above retrospective study with the following objectives:

1. To study the present pattern of providing distant medical advice from AIIMS to other doctors and patients.
2. To assess the usage pattern of Telemedicine at AIIMS
3. To identify the problems faced by the doctors in using the Telemedicine Facility.

In order to increase the sample size the study population was expanded to include Faculty members from all other surgical and medical disciplines which had utilized Telemedicine Facility during the last 3 years. To reduce bias, at

least 2 Faculty members were randomly selected from the department-wise list of designated Faculty.

The data was analyzed using Stata (ver 9.1) statistical software package which is a complete, integrated statistical package for data analysis, data management, and graphics. The findings were further analyzed to see if there was any difference in usage pattern depending on whether the respondent was from a surgical or non-surgical discipline. Fishers exact test was used as the test of significance.

Results

Total 61 questionnaires were distributed to the faculty at AIIMS of which 58 (95.08%) were completed and returned. Non-response rate was reduced to about 5% by repeated visits after stipulated collection date. 45 (77.6%) of the respondents were male and 13 (22.4%) were female. The respondents were aged between 31 – 60 years (Mean age = 44.37 years).

The respondents were from 23 clinical specialities (Table 1 - Specialities covered in the study1). 35 (60.3%) of the respondents were from non-surgical disciplines and 23 (39.7%) were from surgical disciplines.

Patterns of consultation

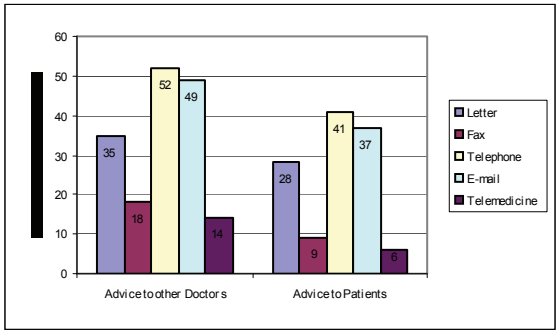

Figure 1- Methods of providing medical advice

Almost all the respondents were using conventional methods viz. letter, fax, telephone or e-mail to provide medical advice to doctors / patients in other places (Table1). Only 3 (5.17%) doctors said they did not use any of these methods, to provide advice to doctors / patients in other places.

Use of Telemedicine at AIIMS

The Telemedicine Facility had conducted a total of 481 tele-consultations in the three-year period (from 1 July 2003 to 30 June 2006). This included Telemedicine sessions with various hospitals and medical colleges within India and abroad (including UK, France, USA and Canada).

The frequency of use of Telemedicine facilities was found to be low. About one-third (32.8%) of the respondents had never used Telemedicine and 30 (51.7%) had used it less than once a month. Only 2 (3.4%) respondents had used Telemedicine every week. An overwhelming majority of the doctors i.e. 34 (87.18%) had used Telemedicine for tele-consultation and the rest 5(12.82%) had used Telemedicine only for tele-conferencing.

Table 1 - Specialities covered in the study

Non-surgical disciplines	**Surgical disciplines**
Cardiology	ENT
Dermatology	General Surgery
Endocrinology	Gastro-intestinal Surgery
Gastroenterology	Gynaecology & Obstetrics
Haematology	Neurosurgery
Medicine	Ophthalmology
Nephrology	Orthopaedics
Neurology	Paediatric Surgery
Medical Oncology	Oncosurgery
Paediatrics	Surgery
Physical Medicine & Rehabilitation	Urology
Psychiatry	
Rheumatology	

There was no significant difference in frequency of use between male / female doctors. Doctors from surgical disciplines were found to be more likely to have used Telemedicine than those from non-surgical disciplines though the difference was not statistically significant *(Table 2 –Usage of Telemedicine: Surgical vs Non-surgical 2).*

Doctors in higher age groups *(Table 3 – Relationship between usage of Telemedicine and age3)* and those with more than 10 years of experience (Table 4 - Relationship between usage of Telemedicine and experienceTable 4) were more likely to have used Telemedicine. A linear trend was noticed in the relationship between the age groups and usage of Telemedicine but the trend was not statistically significant (p=0.054). The correlation with number of years of experience was found to be statistically highly significant (p=0.019).

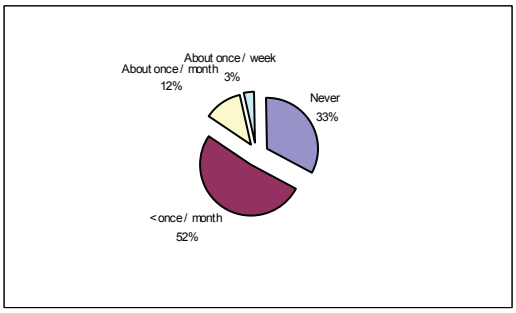

Figure 2 - Frequency of use of Telemedicine

Table 2 –Usage of Telemedicine: Surgical vs Non-surgical

Discipline	Used TM		Total
	N	Y	
Non-surgical	14	21 (60%)	35
Surgical	5	18 (78.26%)	23
Total	19	39	58

Table 3 – Relationship between usage of Telemedicine and age

Age	Used TM		Total
	No	Yes	
31-40 yrs	10	12 (54.55%)	22
41-50 yrs	7	15 (68.18%)	22
51-60 yrs	2	12 (85.71%)	14
Total	19	39	58

Table 4 - Relationship between usage of Telemedicine and experience

Experience	Used TM		Total
	No	Yes	
<= 10 yrs	8	5 (38.46%)	13
> 10 yrs	11	34 (75.56%)	45
Total	19	39	58

Patterns of telemedicine use

A cross-sectional analysis of the consultation pattern was done by asking the respondents about their last Telemedicine session. Only in 17 (43.59%) cases the patient was present during the Telemedicine session. Interaction between the specialist (at AIIMS) and the remote patient was there in only 12 (30.77%) cases. The patient was examined by proxy i.e. the remote doctor was asked to do specific physical examination, during the session in only 9 (23.08%) cases. Patient's clinical history was taken in 21 (53.85%) cases and laboratory investigations and radiological investigations were reviewed in 26 (66.67%) and 22 (56.41%) cases, respectively. Live ultrasonographic examination was done in just one case (2.56%) and special equipment like electronic stethoscope, digital ECG machine, etc. were used in only 2 (5.13%) cases.

This clearly shows that Telemedicine at AIIMS was used mainly for providing "second-opinion" type doctor-to-doctor consultations. Use of Telemedicine for direct patient evaluation was very limited.

Data transfer

Over half of the Telemedicine sessions involved online transfer of data. Only 3(7.69%) respondents had used the offline mode. 1/3rd of the respondents had used both modes – online as well as offline – and that was the preferred mode for receiving data.

Satisfaction with technical quality

Respondents had a high level of satisfaction with the technical quality with nearly 3/4th of the respondents rating it as 3 and above on a Likert scale (5=Excellent, Mean score 2.923).

Problems faced in utilization of telemedicine facilities

The various problems faced by the respondents in utilizing the Telemedicine facilities were grouped as follows (Figure 3)

1. Technical problems
2. Connectivity problems
3. Administrative problems
4. Personal concerns

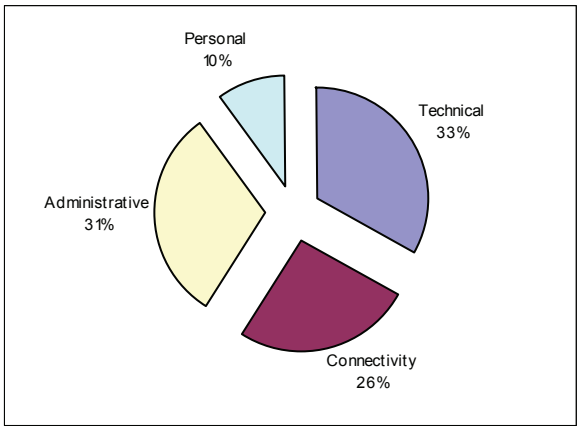

Figure 4 Problems faced in using telemedicine

More than half the respondents felt that improvements in the technological aspects (Technical and connectivity related problems) would improve their usage of Telemedi-

cine *(Figure 4 Problems faced in using telemedicine4)*. Poor quality of video was the commonest technical problem faced by more than half of the doctors. Nearly half the respondents had suffered frequent disconnections during Telemedicine sessions. More than half (61.54%) of the doctors reported difficulty in sparing time for Telemedicine because of busy work schedule. Again, more than half the doctors (56.41%) had apprehensions about limitations of Telemedicine in conducting physical examination of the remote patient and more than one-third (38.46%) were concerned about the reliability of investigations in the peripheral hospitals. The details of the various problems faced by the doctors are listed at *Table 5-Problems faced by users of Telemedicine Facility5*

Table 5-Problems faced by users of Telemedicine Facility

Technical problems	
Poor Video quality	22 (56.4%)
Audio-video mismatch	19 (48.7%)
Poor audio quality	13 (33.3%)
Poor Image quality (X-rays, photos, etc)	13 (33.3%)
Connectivity problems	
Frequent disconnection during the session	19 (48.7%)
Difficulty in getting connection	15 (38.5%)
Inadequate bandwidth	11 (28.2%)
Administrative problems	
Overcrowded work schedule	24(61.54%)
No agency to coordinate	16(41.03%)
Inconvenient timings	12(30.77%)
Distance of Telemedicine Centre from own Dept.	7 (17.95%)
Personal concerns	
Difficulty in performing physical examination of the remote patient	22(56.41%)
Medico-legal issues	16(41.03%)
Unreliable investigation reports from peripheral hospitals	15(38.46%)
Data security & confidentiality	10(25.64%)

Discussion

All India Institute of Medical Sciences (AIIMS) was established in the year 1956 as an autonomous body with the triple mandate– to develop the highest standards in medical education, research and patient care. AIIMS has lived-up to its role as the apex super-specialty, quaternary care hospital of India.

Table 6 - AIIMS : Important annual statistics (2004 - 05)

1	Teaching Departments and Centres	50
2	Faculty members	510
3	Total number of hospital beds	2012
4	Total annual OPD attendance	2,394,270
5	Total annual A & E attendance	179,574
6	Total annual admissions	212,612
7	Total annual surgeries performed	118,234

Telemedicine at AIIMS

There are two telemedicine projects in AIIMS. The first was a pilot project by the Ministry of Communications & Information Technology in 1999. This was followed by point-to-point satellite connectivity provided by Indian Space Research Organization (ISRO). These have been expanded step-by-step to now include 81 districts all over the country. The connection is through ISDN lines or through satellite communication. 6 ISDN lines have been provided each with 128 kbps bandwidth. The lines can be used singly or can be cascaded together to have an effective bandwidth of upto 768 kbps. Satellite communication is provided by ISRO through INSAT 3A satellite.

Being the apex medical institution of the country, AIIMS has a very important role to play in terms of providing super-specialist medical advice to the rest of the medical community in India. The present study shows that 95% of the doctors at AIIMS frequently provide medical advice to doctors and patients at distant places. Telephone and e-mail are the most popular methods, although some still use letters. This is proof of the immense need for means to provide super-specialist medical advice to doctors in distant places where no such facilities are available. It also establishes the fact that the doctors are comfortable with the concept of providing remote medical advice to distant places and do not have any significant concerns while using conventional methods. Thus "*the practice of medicine at a distance*", i.e. telemedicine in a broader sense, appears to be widely prevalent at AIIMS albeit using conventional forms of communication. It may safely be surmised that adoption of Telemedicine in its high-tech avatar is just a matter of getting used to the technology.

In a literature survey of teleconsultations Laatinen, et al (2002), reviewed 128 articles identified through Medline, and found that 79% of the teleconsultations were between doctors and only 8.5% were between doctors and patients[1][1]. In the present study where it was found that most of the teleconsultations were "second opinion" type doctor-to-doctor consultations and interaction between doctor and patient took place in less than 1/3rd cases.

1 Laatinen P.T., Forsstrom J.J., Loula P. Teleconsultations : who uses them and how? Journal of Telemedicine and Telecare. 2002: 8 (16) : 319-324(6).

AIIMS has had state-of the-art equipment at its Telemedicine Centre since 7 years but the present study found its use to be rather low. The usage was low in comparison with even other Indian Telemedicine projects. AIIMS had only 481 Teleconsultations in a span of 3 years whereas Christian Medical college, Vellore, in South India reported over 100 consultations in a period of 4 months[2][2] and Amrita Institute of Medical Sciences (AIMS), Kochi, again in South India, reported 874 tele-consultations in a period of 2 ½ years (Sep 2002 – Feb 2005)[3][3]. A study at the same Institute in 2004 had noted that the majority of physicians felt that better quality of patient care could be provided only in person [4] . The low usage at AIIMS could be due to lack of awareness of the potential of the technology and apprehensions about its limitations.

Most users had complaints about the technical quality and connectivity problems (Table 5-Problems faced by users of Telemedicine Facility5 & Figure 4 Problems faced in using telemedicine4). These issues will have to be addressed before more users embrace Telemedicine as a way of practice.

Significantly, it was found that doctors in higher age groups and those with more than 10 years of experience were more likely to have used Telemedicine. This difference was contrary to expectation as the younger generations are thought to be more tech-savvy and more inclined to use newer technologies. The reasons for this may be that the younger doctors are busier with routine clinical work whereas the senior doctors have more spare time and more opportunities to work outside their own department. Another reason could be that the senior doctors, because of their well-established reputation were more likely to be consulted for a "second opinion" than their younger colleagues. The good news here is that the resistance to change and adoption of new technology in any organization usually comes from the "*old block*". At AIIMS the "old block" has already been conquered and it is a matter of time before the use of Telemedicine becomes routine practice.

Some important issues in implementation of Telemedicine in the country are – availability, accessibility, acceptability and affordability and reliability[5][5]. Acceptability of Telemedicine to the clinicians can be improved by increasing their awareness about the technology and educating them about its utility.

A large number of respondents felt the need for a coordinator – a role that can be fulfilled by a Hospital Administrator.

Conclusion

This is the first study of patterns of practice of Telemedicine at this apex quaternary super-specialist referral hospital. Almost all clinicians at AIIMS were found to be using conventional methods (telephone, e-mail, letter,, fax) to provide distant medical advice. But the level of usage of Telemedicine was low even by Indian standards. Use was mostly for "second opinion" type consultations between doctors, which matches the mandate of the Institute and is also similar to international patterns of usage. Most of the problems faced by the users related to technological issues (technical and connectivity issues).

India, with its wide inequity in distribution of healthcare resources, can benefit immensely from the immense potential of this technology to take super-specialist care to the masses. But a sustainable model of Telemedicine is possible only if can we address the gaps in technology and, at the same time, improve acceptability of the technology amongst the clinicians.

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