Acceptance of Tele-Consultation and its Determinant Factors among Doctors in Outpatient Clinics in the Hospital of Conselor Tuanku Muhriz, Kuala Lumpur, Malaysia

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Abstract
The recent introduction of information technology has improved the quality of healthcare services. In many developing countries, including Malaysia, patients suffer from a shortage of trained medical specialists and tele-consultation (TC) would ease access to specialists. The need to know if doctors are willing to accept such technology has prompted this study. The objective of the study therefore was to examine the knowledge, and attitude towards tele-consultation among doctors in Conselor Tuanku Muhriz, Kuala Lumpur, Malaysia (HCTM) and to identify the factors which influence its acceptance. Factors such as socio-demographics, knowledge, attitude, perceived ease of use (PEOU) and perceived usefulness (PU) towards tele-consultation were chosen according to the technology acceptance model (TAM) and some literature. This was a cross-sectional study based on a quantitative method. Data was collected from HCTM outpatient clinics in Cheras area, Kuala Lumpur, Malaysia in March 2017. A total of 90 questionnaires were collected from eight different outpatient clinics in HCTM. Statistical Package for the Social Sciences (SPSS) (version 22.0) was used to analyse the data. The results showed an acceptance rate of 63.3% among doctors in HCTM. The study also showed that perception of usefulness and positive attitude had a significant association with the acceptance of TC. In conclusion, this study has revealed the important factors that have influenced tele-consultation acceptance as perceived usefulness and positive attitude. Furthermore, the overall findings from the study suggest that TAM is an appropriate model for explaining physicians’ technology acceptance decisions.

Keywords: Telemedicine; Perception; Tele-consultation; Acceptance; Doctors

Introduction
In many developing countries, including Malaysia, patients usually face lack of trained medical specialists especially in the rural areas. Many patients have to wait for a while before they get to see a specialist and general practitioners often have to refer patients with complicated medical cases from their primary health centres to tertiary centres due to lack of available specialists [1].

Technological discoveries are reforming the way in which healthcare services are delivered. Modern technology has changed the constitution and organization of the entire medical field, starting from the universal acceptance of electronic medical records to the progress in biomedical engineering and technology [2].

Malaysia is one the countries that has made many amendments in advance of health information implementation into the health system. The concept of the term “Paperless hospitals” started in 1996-2000 through the seventh Malaysian plan by introducing a fully computerized system for electronic medical records, telemedicine, and tele-conferencing [1]. Improving Health Information Management was also one of the primary intentions to attain the vision of the 9th Malaysian plan to ensure the Integration of Health information Management into all healthcare organizations of the country [3].

Tele-consultation is a form of telemedicine that does not involve a direct ‘face to face’ or ‘in person’ consultation for diagnosis or follow-up of any medical conditions. There are 2 methods of tele-consultation namely: The store-and-forward method (asynchronous) in which, patient medical information is compressed in a digital matter, and sent via the network such as electronic mail (e-mail) to a known specialist or physician. This method is found to be feasible for developing countries since it provides low-cost telemedicine for clinical purposes [4,5]. The second method is to use TC in an interactive way (synchronous), which involves the use of video conferencing between the sender and the receiver for the purpose of medical advice. This method is less implemented in developing countries compared to the synchronous mode due to the inappropriate tele-communication infrastructure in these countries [5].

Telehealth was implemented by the Malaysian government under the Multimedia Super Corridor (MSC) project, Telehealth Flagship in 1996. This project was one of the seven flagship applications of MSC grouped under the ‘Multimedia Development Flagship Application’ and has great knowledge with reasonable depth on Telehealth. At first, the support provided was to access the sources of information by healthcare professionals via the internet to medical journals, e-books, and medical databases and to use the e-mail and related technologies to create virtual environment for the healthcare professionals to interact and communicate electronically [6,7]. The Telemedicine Act 1997 endorsed the growth of information communication technology (ICT) in the health sector. The Ministry of Health wanted to manage patient information by linking systems and providers through a solid
program of information communication technology and initiated the telemedicine plan which included the Multimedia Super Corridor Flagship initiatives, Program/function-based enterprises including the Nationwide Health Management Information System, the State-wide Tele-primary Care, and Public/Client Access.

The objectives of this study, therefore, were to assess the acceptance, knowledge, and attitude towards tele-consultation among doctors at outpatient clinics in tertiary hospitals and the determinant factors of using tele-consultation. To identify the factors that influence the acceptance of teleconsultation among doctors in HCTM including socio-demographic factors (age, sex, education level, medical specialty, years of experience, and computer literacy), knowledge, attitude, perceived ease of use and perceived usefulness towards tele-consultation. Finally to explore user technology acceptance in healthcare organization planning to provide telemedicine care and services.

The technology acceptance module theory

Technology Acceptance Module (TAM) is a global module proposed by Fred. D. Davis in 1989 for evaluating the acceptance of any new technology [8]. This module processes the behavior-related part of attitude in order to differentiate between belief and attitude towards the new technology by setting up a relationship of the two factors (the perceived ease of use and perceived usefulness). Such acceptance is then calculated by users’ perceived ease of use, their perceived usefulness and their attitude towards the new technology. Perceived ease of use (PEOU) is evaluated by assessing how much users believe that the new technology is free of any mental and physical effort. On the other hand, perceived usefulness (PU) is evaluated by assessing how much the user believes that using a particular technology will enhance the diagnosis and treatment of patients thus improving health care practices (Figure 1) [9,10].

Methodology

In this study, a descriptive cross-sectional survey using a definite questionnaire was established to assess associations between the variables by accumulating data from the Hospital of Conselor Tuanku Muhriz (HCTM), Cheras, Malaysia. The duration of this study was from February to June 2017. Doctors in the outpatient clinics in HCTM where chosen. Questionnaires were then administered to the Multimedia Super Corridor Flagship initiatives. The HCTM center was chosen because it is not only a tertiary centre but also a teaching hospital and a research institution; where intranet solution for teleconferencing is available. A pre-test was done among 26 doctors inside and outside HCTM who had more than 10 years of experience and only 1% of the participants had 1-5 years of experience.

The highest number of participants were below 40 of years (91.1%) and a little more than half were males. (51.1% males vs. 48.9% females). The number of participants (25.6%) were from Gynaecology and Obstetrics department followed by the Orthopaedic and Internal Medicine departments (22.2% and 20%) respectively then other departments followed. Majority of participants 75.6% had obtained the MBBS degree as their highest level of education, while only 15.6% had obtained a Master Degree and 8.9% had obtained other certificates after their MBBS. None of the participants had a PhD degree. About 71% of the participants had between 5-10 years of experience in the health sector while 19% had more than 10 years of experience and only 10% of the participants had 1-5 years of experience.

After running the Chi square analysis (Table 1) we found association between perception of usefulness and acceptance of TC (P=0.001), Phi and Cramer’s V value of 0.34 shows moderate strength of association. There was an association found in the attitude towards tele-consultation with acceptance of TC (P=0.001), Phi and Cramer’s V value of 0.35 shows moderate strength of association. Other factors such as socio-demographics, knowledge and perceived ease of use did not show association with the acceptance of TC among doctors in HCTM.
| Variable                  | Acceptance of TC | No Acceptance | $\chi^2$ | P-value |
|--------------------------|------------------|---------------|---------|---------|
|                          | n                | Percentage    | n       | Percentage |
| **Age**                  |                  |               |         |          |
| 30 to 39                 | 32               | 39%           | 50      | 61%      |
| 40 to 49                 | 0                | 0%            | 5       | 100%     |
| 50 to 59                 | 1                | 50%           | 1       | 50%      |
| 60 and above             | 0                | 0%            | 1       | 100%     | 3.823      | 0.281      |
| **Sex**                  |                  |               |         |          |
| Male                     | 15               | 32.6%         | 31      | 67.4%    |
| Female                   | 18               | 40.9%         | 26      | 59.1%    | 0.667      | 0.414      |
| **Medical speciality**   |                  |               |         |          |
| Hematology               | 0                | 0%            | 1       | 100%     |
| Family medicine          | 1                | 33.3%         | 2       | 66.7%    |
| ENT                      | 0                | 0%            | 5       | 100%     |
| General surgery          | 5                | 33.3%         | 66.7    | 100%     |
| Orthopedic               | 8                | 40%           | 12      | 60%      |
| Obs and Gyn              | 8                | 34.8%         | 15      | 65.2%    |
| Internal medicine        | 8                | 44.4%         | 10      | 55.6%    |
| Paediatrics              | 3                | 60%           | 2       | 40%      | 5.332      | 0.62       |
| **Highest grade obtained** |            |               |         |          |
| MBBS                     | 25               | 36.8%         | 43      | 63.2%    |
| Master                   | 3                | 21.4%         | 11      | 78.6%    |
| Others                   | 5                | 62.5%         | 3       | 37.5%    | 3.699      | 0.157      |
| **Years of service in health sector** | | | | |
| 1-5 Years                | 4                | 44.4%         | 5       | 55.6%    |
| 5-10 Years               | 22               | 34.4%         | 42      | 65.6%    |
| More than 10 years       | 7                | 41.2%         | 10      | 58.8%    | 0.528      | 0.768      |
| **Feel comfortable with technology** | | | | |
| Yes                      | 30               | 34.9%         | 56      | 65.1%    |
| No                       | 3                | 755           | 1       | 25%      | 2.649      | 0.104      |
| **Knowledge**            |                  |               |         |          |
| Poor knowledge           | 16               | 48.5%         | 17      | 51.5%    |
| Good knowledge           | 17               | 29.8%         | 40      | 70.2%    | 1.42       | 0.233      |
| **PEOU**                 |                  |               |         |          |
| No PEOU                  | 11               | 47.8%         | 12      | 52.2%    |
| PEOU                     | 22               | 32.8%         | 45      | 67.2%    | 1.657      | 0.198      |
As shown in (Table 2) only two independent variables made a unique statistically significant contribution to the model (perceived Usefulness and positive attitude) when simple logistic regression was done while only positive attitude was statistically significant when multiple logistic regression was done. This study showed that doctors who would accept TC were over 4 times more likely to have positive attitude towards TC than who had negative attitude towards TC. Similarly, doctors who would accept TC were over 4 times more likely to have perception of usefulness of TC compared to doctors who had no perception of usefulness of TC with p<0.05, after controlling of all other factors in the model, yet this factor was no longer a significant predictor for TC when multi logistic regression was done.

Table 2: Final model for factors associated with TC using logistic regression.

| Variables          | Simple logistic regression | Multiple logistic regression |
|--------------------|----------------------------|----------------------------|
|                    | B  | Crude OR (95% CI) | P-value | B | Adjusted OR (95% CI) | P-value |
| Sex(Male)          | 0.358 | 1.431 (0.605-3.384) | 0.415 | 0.879 | 2.401 (0.605-9.596) | 0.213 |
| Age                | -0.446 | 0.640 (0.39-10.60) | 0.755 | 37.425 | 1.792 (0.0-0.0) | 0.999 |
| Medical specialty  | -0.264 | 0.768 (0.566-1.041) | 0.089 | 20.197 | 590754 (0.00-0.00) | 1 |
| Years of service   | -0.11 | 0.989 (0.440-2.220) | 0.978 | 0.057 | 1.059 (0.175-6.395) | 0.95 |
| Comfort with tech  | 1.723 | 5.6 (0.558-56.203) | 0.143 | 0.616 | 1.852 (0.143-24.06) | 0.638 |
| Knowledge (good)   | 0.795 | 2.215 (0.911-5.380) | 0.079 | 0.475 | 1.608 (0.497-5.200) | 0.428 |
| PEOU               | 0.629 | 1.875 (0.715-4.917) | 0.201 | 0.233 | 1.263 (0.347-4.595) | 0.723 |
| PU                 | 1.466 | 4.333 (1.737-10.811) | 0.002 | 1.123 | 3.073 (0.839-11.253) | 0.09 |
| Attitude(Positive) | 1.549 | 4.706 (1.876-11.805) | 0.001 | 1.479 | 4.389 (1.162-16.578) | 0.029 |

Table 1: Relationship between acceptance of TC with other factors.

| Factors          | Simple logistic regression | Multiple logistic regression |
|------------------|---------------------------|-----------------------------|
|                  | B  | Crude OR (95% CI) | P-value | B | Adjusted OR (95% CI) | P-value |
| PU               | No PU | 22 | 55% | 18 | 45% | 10.421 | 0.001 |
|                  | PU | 11 | 22% | 39 | 78% |

Discussion

A total of 57 doctors had good behavioral intention to use TC when it becomes available in HCTM. This percentage is slightly lower than a similar study done in Iran [13] with a 75% acceptance rate and in Italy with an acceptance rate of 85% [14]. Majority of the factors studied in this paper did not have a significant influence on acceptance. Even though this percentage is slightly lower than what is expected, it is considered a proper outcome because of the factors that affected the overall acceptance of doctors. According to Vieru [15] doctors’ higher education and experiences make them more likely to accept new technologies when compared with fresh medical graduates. In this study most doctors had MBBS as their highest degree (75.6%) although they lack experience about TC since TC is not yet implemented in HCTM. Another factor affecting their acceptance is the objection to the concept of seeing patients online even only for simple illnesses (39% disagreement rate regarding seeing patients online, for the purpose of diagnosing or prescribing medication of diseases that do not require much investigation). This phenomenon can be explained by the use of tele-consultation in Malaysia only between doctors for referral or for second opinions.

Unlike the studies by Vankatesh and Au [16,17] men were not more influenced by their perception of usefulness while females were more influenced by ease of usefulness. In terms of age the majority of participants 91.1% were between 30-39 years of age, yet 39% of this age group did not accept TC (compared to 100% acceptance among the 40-49 age group), nor did it influence their perception of usefulness...
Conduct and Recommendations

This study has highlighted the acceptance of tele-consultation among doctors in HCTM. It used a cross-sectional study method to gather data from doctors in the outpatient departments of HCTM. Acceptance rate among doctors in HCTM was moderate which was lower than similar studies. Majority of the factors studied in this paper did not have a significant influence on acceptance except perception of usefulness and positive attitude. The lower acceptance rate might be due to the lack of “actual” experience of TC or due to having MBBS as the highest degree obtained among participants. Male gender, years of experience and technology literacy and medical speciality did not influence the acceptance of TC unlike similar studies [5]. In addition, good knowledge and perception of ease of use did not have influence on the acceptance of TC unlike similar studies [13,18].

The study had significant impact on technology adoption studies in health care in Malaysia. It has revealed the important factors that have: Influenced tele-consultation acceptance, established a significant role in the acceptance of the technology in the health care environment. These aspects were found to be Perceived usefulness of TC and positive attitude towards TC. In addition, the overall, findings from the study suggest TAM be an appropriate model for explaining individual physicians’ technology acceptance decisions.

It is recommended that doctors get proper training before implementing tele-consultation in HCTM so they gain more perception about the usefulness of TC and more perception of ease of use such technology. Proper training also would widen their horizon about the application of diagnostic and management methods when it comes to distant telecommunication with patients and not only with doctors. It is also recommended that the government along with stakeholders arrange the legal framework for any rules and regulations related to telemedicine and deal with the telemedicine issues, such as confidentiality, reliability, liability and cross-border authority.

Providing the equipment required for implementation of telemedicine is a key factor in finding good suppliers and providers of the hardware, and the software of telemedicine required for the implementation. The availability of TC would help users get familiar with technology which would affect their perception and acceptance.

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