In the name of God

Internet-based technologies to improve cancer care coordination: Current use and attitudes among cancer patients

Lecturer Name: Alireza Banaye Yazdipour
Supervisor Name: Dr. Khalil Kimiafar
Email Address: bannaya961@mums.ac.ir
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ANNE GIRAULT

Affiliation

Ecole des hautes études en santé publique
Location
Rennes, France
Department
Institut du Management
Position
PhD student

Anne Girault • 3rd
PhD Student
Management des organisations de santé • EHESP • Université Pierre et Marie Curie (Paris VI)
Paris Area, France • 202 26

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Alireza Banaye Yazdipour
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Alireza Banaye Yazdipour
KEYWORDS

➢ Telemedicine
➢ Online systems
➢ e-Health
➢ Health information technology
Today, a number of important changes are altering cancer care delivery.

Clinical advances have improved the survival rates for most cancers, leading health professionals to treat cancer as a chronic disease.

With oral therapies, more cancer patients, even during active treatment, can also be cared for from home.

These changes could save costs.
• Internet-based technologies (IBT) such as patient portals, websites and applications, managed by healthcare institutions, have therefore been recognised as a significant lever to improve cancer care coordination practices.

• In light of this, IBT can bring valuable opportunities to improve cancer care coordination:
  - enhancing patient-provider communication
  - monitoring adverse events
  - providing better patient follow-up at distance.
• However, more evidence is needed regarding cancer patient’s current use and willingness to use IBT to monitor their health.

• First, it is important to know more about their physical connectivity to Internet.

<table>
<thead>
<tr>
<th>EU28 (European Union)</th>
<th>2007</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to the internet</td>
<td>55 %</td>
<td>79 %</td>
</tr>
<tr>
<td>Internet connection</td>
<td>42 %</td>
<td>76 %</td>
</tr>
</tbody>
</table>

• Nevertheless, cancer patients can have specific characteristics compared to the general population, especially as cancer patients tend to be older.
INTRODUCTION

- Secondly, it is required to understand the **attitudes** regarding computers, internet and applications as they may play an important role in the willingness to use them for their health.
INTRODUCTION

• Thirdly, the question of the influence of social inequalities has to be addressed.

• In the literature, the most frequent socio-demographic factors found to be predictors of IBT use were:
  
  ➢ age
  ➢ education
  ➢ socioeconomic status
  ➢ gender
  ➢ place of living and social isolation.
· Based on a patient survey, the three objectives of the study were:

I. To understand the current level of use of IBT (computers, tablets, mobile phones and smartphones).

II. To assess the intention to use IBT for their health.

III. To determine what socio-demographic criteria could be predictors of the use and willingness to use new IBT in healthcare.
METHOD

- A questionnaire-based survey
- June 2013
- **Gustave Roussy** (Gustave Roussy is the largest comprehensive cancer centre in Europe, and is located in the suburbs of Paris. The hospital cares for about 50,000 cancer patients annually.)
- seven outpatient departments (medical oncology for prostate, breast, skin, head and neck, endocrine, gastric and cervical cancers, radiotherapy, radiology, anaesthesia, haematology).
The questionnaire was built upon a preliminary literature review conducted between January and June 2013 on Google Scholar, Web of Knowledge and PubMed.

The questionnaire consisted of a total of 38 multiple-choice questions and one open question.
The questionnaire comprised three parts:

(i) **Use of internet** through computers, mobile phones and tablets

(ii) **Willingness** to use information technologies for their health

(iii) **Socio-demographics.**
To investigate whether different groups within the population had different patterns of use, we selected five socio-demographic variables including:

- age
- gender
- socioeconomic status (based on employment status)
- number of people in the household
- Type of locality they live in (rural/urban).
- Intention to use IBT for different services in health was measured using a 5-point Likert scale ranging from 1 (definitely not useful) to 5 (definitely useful).

- The services were:
  - provision of information about disease and treatment
  - provision of information about care and support
  - peer communication in support groups
  - patient-provider communication by e-consultation
  - symptom monitoring
To ensure **validity** in this method, we tested the questionnaire through **face validity**, using two complementary approaches.

First, we gathered a panel of **experts** (two physicians, two pharmacists, two nurses and two senior researchers) to evaluate the questionnaire. Following their suggestions, minor modifications were made.

Second, content validity was then checked by passing the questionnaire to a group of **patients** \(n = 20\) within Gustave Roussy to ensure the questions were relevant and properly answered by patients.

Eventually, the final draft of the questionnaire was reviewed in consultation with a **statistician** to ensure that the questions could be coded appropriately for data analysis.
METHOD
DATA COLLECTION

- Patients over the age of 18
- Patients were willing to complete
- Consent
- Anonymous

- The questionnaire was distributed between 6th June and 14th June, 2013, during seven non-consecutive days.
Survey data were analysed with an optical scanner.

Statistical analyses were performed using R.

Results were considered significant at $\alpha = 0.01$.

The first computed descriptive statistics based on survey responses.

Then, an analysis based on spearman coefficients and Fisher’s exact tests was conducted to investigate correlations between characteristics of patients’ IBT usage and attitudes, and their age, gender, socioeconomic status, social isolation (number of people in the household) and place of living (urban/rural).
METHOD

- For the multivariate analysis, **multinomial logistic regressions** were done including **socioeconomic status** and **age** as independent variables.

- The outcome variables for the **first set of regressions** were ‘frequency of use of mobile phone’, ‘frequency of use of smartphone’ and ‘frequency of use of computer’. The outcome variable of the **last regression** was the perceived ease of use of IT devices by patients (‘I feel able to use a computer, a smartphone or a tablet’).

- **Likelihood ratio tests** were conducted to ensure for the goodness of fit of the models.
RESULTS

The participation level was 85%.

Questionnaires with more than five missing answers were excluded from the survey.

Finally, 1072 questionnaires were selected (final response rate = 67%).
RESULTS

Gender (%)

- 70 % Women
- 30 % Men
### Table 1
Description of respondents.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>53.37</td>
</tr>
<tr>
<td>Gender (% women)</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>70%</td>
</tr>
<tr>
<td>Men</td>
<td>30%</td>
</tr>
<tr>
<td># of people in the household (%)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>16%</td>
</tr>
<tr>
<td>2</td>
<td>36%</td>
</tr>
<tr>
<td>3 et +</td>
<td>47%</td>
</tr>
<tr>
<td>n/a</td>
<td>1%</td>
</tr>
<tr>
<td>Professional categories (%)</td>
<td></td>
</tr>
<tr>
<td>Retired</td>
<td>26.4%</td>
</tr>
<tr>
<td>Manager</td>
<td>22.2%</td>
</tr>
<tr>
<td>Worker</td>
<td>21.8%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>7.4%</td>
</tr>
<tr>
<td>Other</td>
<td>13.6%</td>
</tr>
<tr>
<td>n/a</td>
<td>4.3%</td>
</tr>
<tr>
<td>Localisation (%)</td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>78%</td>
</tr>
<tr>
<td>Rural</td>
<td>18%</td>
</tr>
<tr>
<td>n/a</td>
<td>4%</td>
</tr>
</tbody>
</table>
93% of our diverse population accessed the Internet from home.

Among them, 68% used Internet every day.

Only 7% of them did not have access at home.
Internet-based technologies to improve cancer care coordination

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Less than once a week</th>
<th>A few times per week</th>
<th>Every Day</th>
<th>Missing data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablets</td>
<td>54.00%</td>
<td>7.00%</td>
<td>7.00%</td>
<td>19.00%</td>
<td>13.00%</td>
</tr>
<tr>
<td>Computers</td>
<td>7.28%</td>
<td>6.44%</td>
<td>21.18%</td>
<td>62.50%</td>
<td>2.61%</td>
</tr>
<tr>
<td>Smartphones</td>
<td>44.00%</td>
<td>1.00%</td>
<td>3.00%</td>
<td>43.00%</td>
<td>10.00%</td>
</tr>
<tr>
<td>Mobile phones</td>
<td>5.88%</td>
<td>4.29%</td>
<td>14.55%</td>
<td>71.18%</td>
<td>4.10%</td>
</tr>
</tbody>
</table>
Age and employment status were significantly associated with the frequency of use of mobile phones, smartphones and computers ($p < 0.05$).

The respective correlation coefficients were negative and moderate (coefficients between 0.25 and 0.49).

Age and employment status were then included in the logistic models.
Age and employment status were predictors of the frequency of use of mobile phones, smartphones and computers.

Table 2
Coefficients of the multinomial logistic regression on frequency of use.

<table>
<thead>
<tr>
<th>Applications</th>
<th>Frequency of use of a mobile phone</th>
<th>Frequency of use of a smartphone</th>
<th>Frequency of use of a computer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Every day versus less than once/wk</td>
<td>A few times/wk versus less than</td>
<td>Every day versus less than once/wk</td>
</tr>
<tr>
<td>Age</td>
<td>5% decrease</td>
<td>5% decrease</td>
<td>5% decrease</td>
</tr>
<tr>
<td></td>
<td>-0.05***</td>
<td>-0.05***</td>
<td>-0.05**</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manager</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Worker</td>
<td>-0.2</td>
<td>-0.23</td>
<td>-0.75*</td>
</tr>
<tr>
<td>Retired</td>
<td>-1.14*</td>
<td>0.3</td>
<td>-1.25**</td>
</tr>
<tr>
<td>Unemployed</td>
<td>0.2</td>
<td>0.9</td>
<td>-0.81*</td>
</tr>
</tbody>
</table>

* <0.01.
** <0.001.
### INTENTION TO USE IBT FOR HEALTH CARE

#### Table 3
Perceived usefulness of internet-based technologies (IBT) applications.

<table>
<thead>
<tr>
<th>IT applications</th>
<th>Useful/very useful (%)</th>
<th>Neutral (%)</th>
<th>Not useful/rather not useful (%)</th>
<th>n/a (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have access to electronic medical records</td>
<td>80</td>
<td>4</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Fill out a self-test about your health status</td>
<td>78</td>
<td>5</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td>Communicate via emails with your physician</td>
<td>75</td>
<td>5</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>Schedule an appointment</td>
<td>71</td>
<td>6</td>
<td>22</td>
<td>1</td>
</tr>
<tr>
<td>Get information about disease/support</td>
<td>69</td>
<td>12</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>Get access to external contacts (psychologist, nurses,...)</td>
<td>66</td>
<td>13</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>Get help with medication monitoring (reminders, side-effects)</td>
<td>61</td>
<td>12</td>
<td>26</td>
<td>1</td>
</tr>
<tr>
<td>Give access to a relative for using these functions</td>
<td>48</td>
<td>14</td>
<td>37</td>
<td>1</td>
</tr>
<tr>
<td>Receive a reminder for the appointment</td>
<td>44</td>
<td>35</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>Chat with peer patients</td>
<td>44</td>
<td>23</td>
<td>31</td>
<td>2</td>
</tr>
<tr>
<td>Communicate via video</td>
<td>36</td>
<td>18</td>
<td>44</td>
<td>2</td>
</tr>
</tbody>
</table>

Not useful by a majority of respondents
Chat with peer patients was not important for them
84% of the population studied declared to be able to use a computer, a tablet or a smartphone.

Only 8% disagreed.
RESULT
PERCEIVED EASE OF USE
INFLUENCE OF SOCIO-DEMOGRAPHICS

- **Age and employment status** were significantly associated with the perceived ease of use of mobile phones, smartphones and tablets (p < 0.05).

- The respective **correlation coefficients** were **negative** and **moderate** (coefficients between 0.25 and 0.49).

- Age and employment status were then included in the logistic models.
As shown in Table 4, Perceptions regarding the ability to use IBT devices were **negatively** associated with age and employment status.

Table 4

<table>
<thead>
<tr>
<th>Applications I am able to use a computer, a tablet or a smartphone</th>
<th>Agree versus disagree</th>
<th>Neutral versus disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>$-0.07^{**}$</td>
<td>$-0.03$</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manager</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Worker</td>
<td>$-1.43^*$</td>
<td>0.33</td>
</tr>
<tr>
<td>Retired</td>
<td>$-1.37^*$</td>
<td>0.27</td>
</tr>
<tr>
<td>Unemployed</td>
<td>$-1.7^*$</td>
<td>0.28</td>
</tr>
</tbody>
</table>

* $p < 0.01$.  
** $p < 0.001$.  
- 7% decrease  
- 76% decrease  
- 82% decrease  
- 75% decrease
Overall, a majority of the patients included in our study sample were willing to use IBT for their health care.

Except that, the only issue raised by respondents was the question of data confidentiality.

A third of the population (32%) reported being worried about this matter.
The first findings indicated that access and use of IBT were widespread in the population. These proportions align with the projections that had been made for developed countries.

It is estimated that there were six billion mobile phones in 2013, with over 85% of the world’s population having access to a mobile signal.

It is less evident for tablets and smartphones (46%) which are still used by a minority, even if the figures could change rapidly (e.g. the proportion of people owning a smartphone has doubled between 2012 and 2013 in the general population in France).
The second findings were related to patient willingness to use IBT for their health.

80% of respondents considered the possibility to get an improved access to their medical records as a priority. It is something observed for other clinical conditions over the last decade [20], yet far fewer (7%) had experience doing so [21].

We can highlight that chatting with peer patients was not necessary according to most patients (54%) even if some blogs have been developed with success over the last decade.
The third findings were related to the influence of age and socioeconomic status in both access to and perceived ease of use of IBT.

This measure of influence should be considered in a dynamic way (for instance, the percentage of social network users aged fifty-five to sixty-four rose from 9 percent at the end of 2008 to 43 percent by mid-2010).
DISCUSSION

CHALLENGES

- Implementation of such IBT required health care organizations to comply with standards to ensure patients a sufficient level of **privacy** and **security** when using internet-based technologies.

- This study shows that **older patients** are **less likely to use** web-based tools. As old patients are also less likely to search for information about their cancer \[25\], **customization** is necessary in order to adapt IBT to their **specific needs**.

- Last, the increase in the use of IBT can alter the **doctor-patient relationship**. (Face to Face contact)
IBT at the hospital level:

- Enhancing coordination between professionals
- Improve quality of care
- Save costs
- Reduce mails, telephone communications and missed appointments
- Reduce time.
IBT at the patient level:

- Reduce outpatient visits
- Monitor adverse events associated with chemotherapies
- Maintaining contact with the clinical team
- Providing useful information to the patients
- Medication refills
- Appointment scheduling
- Access to general medical information.
Last, IBTs could also be used to facilitate **real-time data collection** of patients’ health status and they can provide useful information to health professionals.
Limitations of this study include its **sampling from a single centre** in a metropolitan area, so the results may have limited generalizability.
As patients are open to use them, IBT could play a significant role in cancer care coordination in the near future.

This study confirmed a majority of the cancer patients were willing to use Internet-based technologies for their health care.

The effects of age and socioeconomic status have to be addressed.

This study shows that older patients are less likely to use web-based tools.
Thanks for Your Attention

Alireza Banaye Yazdipour
Email Address: bannaya961@mums.ac.ir