Older people's health-related ICT-use in Sweden

Sarianne Wiklund Axelsson MSc[a]
E: sarwik@ltu.se

Anita Melander Wikman PhD[a]

Annika Näslund PhD[a]

Lars Nyberg PhD[a]

[a]Department of Health Sciences, Luleå University of Technology, Luleå Sweden

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Purpose The aim of this study was to describe the degree to which information and communication technology (ICT) was utilised by older people for health information and communication with health services during a one-year period in Sweden. **Methods** The participants (n=154) were aged 55 and over (mean 71.9, 52% women) and had been randomly selected from a population register. The participants responded to a survey with a set of questions about their general usage of ICT appliances, as well as their usage of different ICT tools to retrieve health information and to communicate with the health services. **Results** The results showed that, in contrast to a rather frequent general ICT usage, the most common way to communicate with healthcare services was by personal contacts or by a land line telephone. A mobile phone was used by 24% of such communications, SMS messages by 11%, websites, chat forums or blogs by 4%, and audio and video communication by 2%. Self-reported overweight problems, general use of mobile phone, and general use of Internet were significantly and independently associated with having experience of using mobile phones or more advanced ICT appliances in contacts with the health services. **Conclusion** The low health-related ICT usage found in this study may be understood as a low degree of implementation of ICT in contact with health services, but the relatively high experience of general ICT usage indicates a potential for a wider use in the future in Sweden.

Keywords: aged, health services, medical informatics, survey research

The demands on health care systems related to the global trend of aging populations, together with the recent development of information and communication technology (ICT) and e-health solutions aimed at improving the accessibility of health services, are placing older people´s ICT usage and ICT readiness in focus.

There is an on-going investment in ICT in health services world-wide, and the European Union (EU) has since 2008 invested €335 million in healthcare research related to ICT[1,2]. The European strategy in ICT for Ageing Well[3] concerns improved quality of life: a high degree of independence and autonomy, enhanced mobility, improved access to age-friendly ICT and personalised integrated social and health care services. ICT systems can be helpful in improving relations between patients and health services by the transmission of health data and peer-to-peer communication between patients and health professionals[2]. Since 2010 it has been possible in Sweden for citizens nationwide to obtain certified health-related information on the Web[4] and to communicate with health services using e-services named 'My Contacts in Healthcare'[4,5]. Andreassen et al.[6] found in a European study of people aged 15 to 80 that two Scandinavian countries were most effective in health-related use of the Internet. In Denmark, 62% of the respondents used the Internet for health purposes and 59% of the respondents in Norway. Andreassen et al.[6] further stated that the most common way to use the Internet for such purposes was to read information, and the second most common way was to use the Internet as support for decisions on whether to see a doctor and to prepare for and follow up on doctors' appointments.

The perception exists that ICT usage is an age-related phenomenon, and reports confirm that ICT usage decreases with advancing age[7]. Moreover, usage rates for health information technology were shown to decrease in the older age groups in an American study[8]. However, older people in Sweden are experienced users in a European perspective[9]. Of Swedes aged 65-79, 66% have access to the Internet and a computer, and 81% have access to a mobile phone[7]. The usage of mobile phones among older people in Europe is at present approaching the usage in younger generations, in contrast to the final decades of the

twentieth century, when the mobile phone was regarded by older people as a security device[10]. This trend whereby older people's usage of ICT is approaching that of the younger generations has also been shown in research by Näsi et al.[11].

Positive outcomes of using health-related ICT in rehabilitation among patients and healthcare personnel have been reported in a systematic review by Kairy et al.[12]. The benefits of using health-related ICT in the home can increase the possibilities of ageing in place with control over one's own life, feeling safe and maintaining a healthy lifestyle[13]. This is important, as ageing in place has been reported to be linked to security and familiarity[14]. Older people in Sweden have been reported to describe the home as the hub of health[15]. Research has ascertained that older adults, despite a limited experience of using computers, when using a technology platform with Internet-based videoconferencing, valued the ability to access healthcare from their habitual environment and to communicate with persons in the same situation, healthcare professionals, and other people[16]. Eriksson et al.[17] reported that communication by videoconferencing between patients' homes and a hospital was experienced by the patients as a different but reinforced communication, providing a sense of closeness at a distance. In a study by Melander Wikman et al.[18] participants described how the use of a mobile safety alarm made them feel secure, knowing that someone would be responding to their alarm in the event of an emergency.

In contrast to the above-mentioned positive experiences of older people when using healthcare-related ICT solutions, systematic reviews on the impact of telemedicine and e-health provide a rather contradictory overall picture, with some studies concluding that the measures are effective andothers that the evidence is limited and inconsistent[19]. In comparison with younger people, older people have self-reported to a higher degree the existence of barriers to using healthcare-related ICT, i.e. barriers like technology dependence, the feeling that one is being monitored and controlled by technology, and a concern about personal data being exposed[20]. Välimäki et al.[21] showed that older patients, in comparison with younger patients, more often had negative perceptions regarding the use of e-mails for information purposes and regarding the development of information technology for disseminating health information. Even if older persons accept using monitoring applications, in relation to privacy they want to have control of the technology by turning it off and on[22]. Further, a perceived high level of technology anxiety and physical limitations among frail elderly people cause barriers for using the technology [23]. Åkesson et al.[24] concluded that more research is needed to measure consumers' experiences of ICT in contacts with health services, as well as the factors that influence those experiences.

On the basis of the societal e-health development commitment, and the somewhat contradictory picture regarding both experience of the effects of e-health interventions and what can be expected regarding the readiness of older people to adopt such solutions, an assessment of the current situation regarding older people's health-related ICT usage is called for. Therefore, the aim of this study was to assess the degree of ICT usage among older people in Sweden in order to retrieve health information and to communicate with health services, and to investigate the factors related to this.

Methods

This cross-sectional survey was based on a set of questions answered by respondents in a telephone interview or in a questionnaire form filled in at home and sent by post. The study was approved by the Regional Ethical Review Board in Umeå, Sweden (Ref. no. 2594-10).

The first part of the set of questions concerned personal data and information about factors expected to be related to ICT usage concerning health issues: age, gender, marital/cohabitation status, education level (3-point ordinal scale), income (4-point ordinal scale), current self-

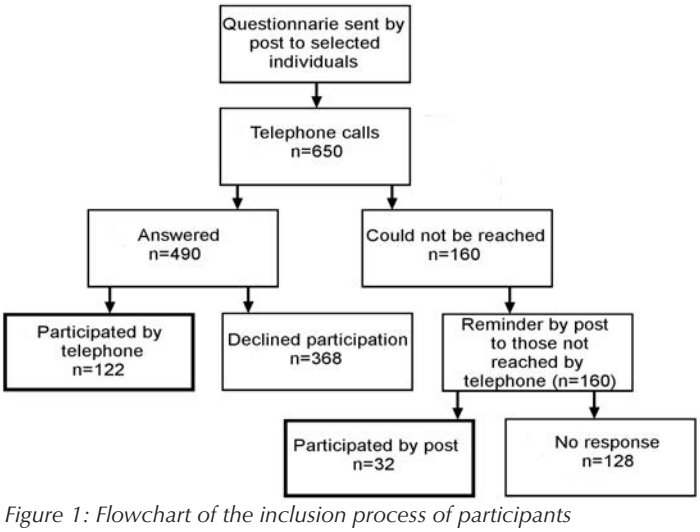

Figure 1: Flowchart of the inclusion process of participants

rated health status on the basis of EQ-5D VAS[25], self-reported height and weight, self-perceived overweight problems and self-reported achievement of physical activity levels for adults recommended by WHO [26,27].

In the second part, the respondents answered questions concerning their ICT experience in general, such as their use of a computer, e-mails, the Internet, and a mobile phone for calls and/or SMS messages (4-point ordinal scales ranging from never to daily), as well as their experience of using the Internet to retrieve information about health issues, physical activity and exercise, and diets (yes/no questions). This part also included yes or no questions about their contact with the health services in a one-year period through personal visits, land line telephone calls, mobile phone calls, SMS messages, e-mails, websites, chat forums or blogs, and audio and video communication on a computer. To ensure the face validity[28], experienced researchers in the field created the set of questions, and a pre-trial which included three older persons was conducted. This indicated that there was no need for changes.

Table 1. Characteristics of the respondents; SEK=Swedish kronor; EQ5D= visual analog score for health state; BMI= body mass index; SD=standard deviation; CI=confidence interval;=self-rated or self-reported;**=in the last 12 months*

Variable	n	Mean±SD	%	95% CI
Age, years	154	71.9±8.7		
Health*, EQ5D	154	72.5±18.0		
Gender, female	154		52	44-60
Living alone	154		32	25-39
Educational level	154			
Primary school			36	28-44
College			34	27-41
University			31	24-38
Income, SEK	154			
<8,000			9	4-14
8,000-17,999			47	39-55
18,000-25,999			28	21-35
≥26,000			16	10-22
BMI>25	149		54	46-62
Overweight problems*	154		20	14-26
Low physical activity*	153		38	30-46
ICT general use ≥1/ week	154			
Computer			55	47-63
Internet			57	49-65
e-mail			42	34-50
Mobile phone voice calls			72	65-79
SMS message			23	16-30
Internet use for health information	154			
General health information			38	30-46
Physical activity and exercise			15	9-21
Diet			24	17-31
Health service communication by:**	154			
Personal visit			88	83-93
Land-line phone			74	67-90
Mobile phone (voice call)			24	17-31
SMS			11	6-16
e-mail			7	3-11
Website, chat, forum, blog			4	0-7
Audio/video on computer			2	0-4

Procedure and participants

The study sample was randomly selected from the Swedish population aged 55-105 using the official identity and address registry for Swedish residents[29]. It was calculated that a total of 325 participants would be sufficient to produce a 95% confidence interval, with a 95% confidence interval of +/- 5 % with a significance level of 5%, for a proportion of about 30%, and, considering an expected response rate of 50%, 650 persons were invited to participate.

An information letter was sent by post to the 650 selected individuals, together with the questionnaire, and they were contacted by telephone during March to October 2011. If participation was accepted, the questionnaire was answered directly by telephone. Those declining participation were asked to provide data on their gender and age. The telephone calls were made by the authors and an assistant following a standard procedure. A maximum of five attempts were made to reach each individual, all at different times of the day. Those individuals who were not reached by telephone were sent a reminder questionnaire by post and asked to complete it and return it to the researchers, using a pre-paid and pre-addressed envelope. To obtain data on the age of those who were not reached by telephone or by post, a commercial Web-based service was used. The Web-service provided data from the official identity and address registry and also reported the year of birth of each individual.

The inclusion process is described in a flowchart (*Figure 1*). As shown, 154 individuals (24%) responded to the survey, 368 (57%) declined, and 128 (20%) could not be reached. The respondents differed slightly from the non-respondents regarding age (the mean age was 71.9 for the respondents and 74.1 for the non-respondents (p=0.010) (*Table 1*), and gender (p=0.407) (data not shown).

Data analysis

The body mass index[30] of each respondent was calculated by dividing the self-reported body weight (kg) by the square of the reported height (m). All statistical inferences were calculated

*Table 2. Communication means with health services during the last 12 months in responders with advanced ICT-use (mobile phone, Internet) and without advanced ICT use (only personal visit or land-line phone), in relation to some responder characteristics; Student´s t-test, χ2-test, and Mann Whitney U-test are used with a confidence limit of 0.05; significant values are in bold; *=self-rated or self-reported*

Characteristic	ICT use, mean rank sum or %		p
	Advanced	Not-advanced	
Age	51%	52%	**0.014**
Gender	83.14	64.35	0.950
Living alone	22%	28%	0.506
Educational level	70.69	88.35	**0.014**
Income	70.14	89.47	**0.006**
Health*	74.70	78.62	0.601
Overweight problems*	16%	34%	**0.009**
Low physical activity levels	14%	32%	**0.007**
General use of:			
Mobile phone	68.52	94.46	**<0.001**
SMS	69.80	91.84	**0.001**
Computer	69.04	93.40	**0.001**
e-mail	62.22	93.03	**0.001**
Internet	69.00	93.47	**0.001**

using 95% confidence intervals and 5% significance levels[31]. Computations were performed using IBM© SPSS© Statistics, version 19. In the sampling failure analyses, the responders were compared with the non-responders using Student's t-test and the χ^2-test. For analyses of the degree of ICT usage in communication with health services (*Table 1*), the sample data were presented using standard descriptive statistics and 95% confidence levels were calculated for proportions. When analysing the variables related to this ICT usage (*Tables 2-3*), bivariate associations were calculated using the χ^2-test, Student's t-test, and the Mann Whitney U-test. Covariance between variables was analysed using principal component analysis with varimax rotation. Scree-plots were used to define the number of components, and variables were judged to load strongly on a component if the loading score was >.60. When variables loaded strongly on a common component, the one with the strongest loading was selected for further analysis, together with variables not showing strong loadings on any one of the principal components derived. The selected variables were then put into a forward stepwise multiple binary logistic regression model, in order to analyse how the variables were independently associated with ICT usage in communication with health services. Ordinal variables were in this analysis dichotomized.

Results

Analysis of the participants' general use of ICT technology revealed that the majority of them used a mobile phone, a computer and the Internet at least once a week. Their usage of e-mails and especially SMS messages was less frequent. Their levels of Internet usage for health issues were rather low, and their health-related Internet usage showed no significant associations with gender, self-reported overweight problems or self-reported low physical activity levels (*Table 1*).

Regarding the respondents' contacts with the health services (*Table 1*), most of them reported that their communication had been through personal visits or by making calls on a land-line telephone. As indicated by the 95% confidence intervals, less than one third of the population would be expected to have had communication with the health services using a mobile phone, and even fewer using SMS messages, websites, chat forums, blogs or audio and video communication by computer. Thirty-three percent of the participants (95% CI: 25%-40%) could be described as advanced ICT users in their contact with the health services, as they had experience of using mobile phones or more advanced ICT appliances in such contacts.

As presented in the bivariate analyses (*Table 2*), age, education level, income, self-reported overweight problems, self-reported low physical activity levels and all the assessed aspects of general ICT usage differed significantly between those respondents who had experience of using mobile phones or more advanced ICT appliances in their contact with the health services, and those respondents who had no such experience. A factor analysis of the variables analysed in Table 2 revealed that the following sets of variables loaded strongly on common factors: gender and marital/cohabitation status; education level and income; self-rated health and self-reported physical activity level; and computer, e-mail and Internet usage. We therefore selected the variables

*Table 3. Result of forward stepwise multiple binary logistic regression analysis of variables associated with advanced ICT use in communication with health services in the last 12 months; Dependent variable: advanced ICT use in health-services communication; Not included in the final model: gender, age, education level, self-rated health, general use of SMS messages; Model significance: p<0.001, Nagelkerke R Square 0.19; *=self-reported; **=general use, ≥1/week; OR (Exp (B))=odds ratio; CI=confidence interval*

Item	OR (Exp (B))	95% CI	p
Constant	0.09		<0.001
Overweight problems*	2.51	1.04 - 6.06	0.041
Mobile phone use**	3.04	1.04 - 8.93	0.043
Internet use**	2.55	1.12 - 5.77	0.025

age, gender, education level, self-rated health, self-reported overweight problems, and general use of a mobile phone, SMS messages, and the Internet in a forward stepwise multiple binary logistic regression model (*Table 3*). The analyses resulted in three variables that were significantly and independently associated with experience of advanced ICT usage in communication with health services: general usage of a mobile phone and of the Internet at least once a week, and self-reported overweight problems. Including these variables, the model explained 19% of the variance. Age, gender, education level, self-rated health and SMS usage did not contribute to the model.

Discussion

The results indicated that Internet usage to retrieve information on health issues among older people in Sweden is not common and that the usage of mobile phones and more advanced ICT in communication with health services is rare. Experience of such ICT usage in communication with health services seems to be associated with the participants' general usage of a mobile phone and the Internet, as well as their self-reported overweight problems.

This low rate is in contrast with both the goals of societal policies regarding the development and implementation of e-health services[4] and the participants' general ICT usage, which was rather frequent (in correspondence with previous studies[32,33]). Our results concerning general ICT usage indicated at minimum a weekly use of the Internet in at least half of the population and weekly mobile phone use in at least two thirds of the population.

Although the health-related usage was low in comparison with an American survey[8], we found a substantially higher frequency in corresponding age groups. This might be a reflection of older Swedes being relatively experienced as general ICT users[9], which is in line with our findings that general ICT experience (specifically mobile phone and Internet use) is associated with health-related ICT usage. General ICT usage, in turn, seems to be determined by the accessibility of computers and support, age, marital/cohabitation status, education and health[33], which corresponds to some of the factors that were bivariately associated with health-related ICT usage in our data (*Table 2*), but were not included in the final multiple model (*Table 3*).

A rather surprising and interesting finding was the relation between self-reported overweight problems and usage of ICT in communication with health services. This may indicate that overweight problems are a factor which contributes to a greater readiness to use ICT for this purpose, on the part of the user, the health provider, or both of them. The participants with self-reported overweight might have used advanced ICT in communicating with health care services because they felt more comfortable with this method of communication. Stigmatization of persons with overweight is common[34] and a systematic review of published literature[35] has shown Internet to be a way of reaching people suffering from conditions that have caused them to feel embarrassed or stigmatized. This has been found to be the main reason for the increasing interest in health intervention via the Internet[35]. The participants in our study may also have received interventions where Internet and e-mail were used.

Factors behind the low degree of ICT-usage may be a possible reluctance and a low readiness to adopt health-related ICT among the older adults themselves[33] or a low user-friendliness [36]. Older adults have indicated more computer anxiety and lower computer self-efficacy than both younger and middle-aged adults[37]. On the other hand, a qualitative study focusing on older persons with medium to high experience of using the Internet[38] reported that the participants found healthcare services provided using ICT to be useful, but were not aware that the services existed.

These findings indicate that problems with ICT implementation can be understood from a theoretical perspective provided by the technology acceptance model (TAM)[39]. In this model, the acceptance of a technology is influenced by its perceived ease of use and perceived usefulness. In relation to this, Phang et al.[40] suggest that perceived ease of use is, in turn, influenced by computer anxiety and computer support. Further, the adoption of a technology is suggested to be a process which starts by becoming aware of the technology and ends with the full use of it, and acceptance is described as an attitude developed in this process[41]. The adoption process is described as consisting of three phases, which can be facilitated or derailed by various factors[41]. Our findings may therefore indicate a need for service providers to consider factors that facilitate or counteract the adoption process among the intended users, i.e. factors such as awareness, social factors, support, computer anxiety, ease of use and perceived usefulness. The positive association between self-perceived overweight problems and health-related ICT usage found in our results might, for example, be a reflection of an awareness of related services provided and the perceived usefulness of those related services, which might perhaps possess greater usefulness than e-health services.

Other factors behind the rare ICT use in older people's contacts with health services may be found in the healthcare systems themselves. More than ten years ago, Eysenbach[42] suggested that, in order to use ICT, healthcare organizations would need a new way of thinking and acting. Halford et al[43] point out that the territorial conflicts between professionals, managers and users and other complex inter-professional relations may affect the outcomes of e-health initiatives. Obviously, human and organizational factors must be understood well throughout both the planning and the implementation phase[44]. A fear has been reported among different professionals that technology will replace them, and they can see their role changing from being an expert in their fields to sharing knowledge with other professionals and elderly care takers[45]. One study reports that in healthcare systems with strong hierarchical traditions, workers conform to current culture rather than to embrace new initiatives and changes[46].

The present survey was based on a random sample from the official Swedish population register, which vouches for good external validity. Since the failure analysis did not indicate a large selection bias concerning gender and age, we do not deem the lower than expected response rate to constitute a major problem concerning population representativeness. The set of questions were not formally tested for reliability and validity, but were based on the experience of previous field research focusing on similar age groups and related issues[18]. The questions were also scrutinized by the authors from a content validity perspective and the experiences from the pilot study were confirmative in this respect. One limitation is that the questions did not penetrate the circumstances surrounding the ICT usage, for example the environment, service access or general ICT attitudes. Although we believe that the set of questions served our aim, which was to describe the degree of health-related ICT usage, these issues deserve further investigation in future studies. This also applies to a factor such as ethnicity, which has seldom been in focus in Swedish surveys covering older populations because of a high degree of ethnical homogeneity in these age groups until recently.

As indicated by the fact that the variables in the multiple regression model explained no more than 19% of the variance, there are obviously more variables to explore. The fact that we in some cases were forced to use an additional data sampling method might imply an internal validity threat, but those who responded by post did not differ from those who responded by telephone regarding gender, age, education level, income, general use of ICT, or use of ICT in the context of healthcare.

In conclusion, we found a low usage rate of mobile phones or more advanced ICT among older people in their communication with health services. The rate of use was associated with general mobile phone and Internet usage, as well as self-reported overweight problems. The low usage rate might be understood as a result of a low degree of implementation of ICT in healthcare targeting larger population groups, in contrast to the aims of societal policies. The relatively high level of experience of general ICT use in the population, on the other hand, indicates a potential for a more widespread health-related ICT adoption. Further, our findings emphasize a need to take into account factors related to adoption when planning further development and implementation of ICT in healthcare, as well as a need to consider the risk of a possible digital divide.

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