The Role of Gender and Clear Communication in Digital Health Engagement for Blood Clot Management

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Abstract: This study examines factors influencing older patients' use of the Internet to access health-related information, focusing on gender differences and the clarity of information provided by emergency units about anticoagulant treatment and blood clot management. Data were collected from respondents aged 60+ through a survey, with responses weighted to align with population demographics. Statistic methods and regressions were employed to analyze the data. The results indicate that gender significantly predicts Internet use, along with the clarity of emergency service offerings. However, reverse analysis suggests that Internet usage does not significantly improve patient understanding of emergency unit support.

1 INTRODUCTION

A significant challenge in contemporary society is to seek the availability of high-quality information, particularly with regard to healthcare matters. Although young people apparently find the process of searching for information from online sources easy, older generations face challenges in this endeavor. The amount of poor-quality information available online is very large, making the process of selecting trustworthy and correct information extremely difficult.

Human-computer interaction is critical in this context today. The risks associated with oral anticoagulant therapy increase with age (Torn et al., 2005), which highlights the need for comprehensive information to ensure effective treatment management (Kagansky et al., 2004).

Consequently, a question arises naturally: How effective is the communication and information sharing process between healthcare providers and elderly patients on anticoagulant treatment and blood clot management, and what role can digital platforms play in improving patient understanding and patient satisfaction with health care?

In order to address these topics, we define the research questions as follows:

- ⋆ To what extent does gender affect the likelihood that older patients will use digital resources to supplement their understanding of anticoagulant treatment and blood clot management?
- ⋆ How does the clarity of information provided by the emergency unit about anticoagulant treatment and blood clot management influence the use of the Internet to search for information about one's condition and medication in connection with the illness?

Conducting a survey might help fill in some of the gaps in our understanding and get different perspectives on this issue based on age.

To obtain answers to these questions, we conducted a survey among patients receiving anticoagulant treatment in the Blekinge region.

2 LITERATURE REVIEW

Research suggests that effective communication between healthcare providers and patients about anticoagulant treatment can be improved through digital platforms and multimedia interventions. Although

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Table 1: Survey Questions.

Q1	Please specify your gender. Choice of male, female, or I prefer not to answer.
Q2	What is the age group to which you belong? Choices: $18-39$; $40-59$; $60-79$; $80+$
Q3	Did you use the internet to search for information about your condition and medications in relation to your illness?
Q4	After you left the hospital, did you receive information from a nurse about blood-thinning treatment?
Q5	Have you received an information brochure about the emergency unit and one brochure about the medication?
Q6	Did you think the written information about the emergency unit was a good support in your treatment?
Q7	What pages/sources?
Q8	Is it clear to you as a patient what the emergency unit can offer you for support?

traditional methods remain effective, multimedia approaches can improve patient knowledge and save healthcare professionals' time (Sim and Galbraith, 2020). Visual aids, such as digitized color menus for warfarin pills, have been shown to increase patient-provider concordance, particularly in patients with communication barriers (Schillinger et al., 2006). Patients, especially young people who have been a short time since starting therapy, express interest in using mobile devices to collect information to support the treatment of anticoagulant therapy (Olomu et al., 2014). However, barriers to optimal patient education include limited time with providers and a lack of coordinated treatment management programs (Wang et al., 2022).

Although seniors use the Internet to learn about diseases, medications, treatments, and healthy living (Waterworth and Honey, 2018), barriers such as low trust, financial restrictions, lack of familiarity with the Internet, and low health literacy can hinder their access. However, research shows that customized online medical databases can significantly improve older adults' health-related knowledge (Freund et al., 2017). These findings suggest that older adults are willing to use technology for the acquisition of health information when provided with the appropriate tools.

According to (Fischer et al., 2014), older adults approach online health information differently than younger adults, with adoption rates increasing but with some obstacles still present; barriers to technology adoption include issues with familiarity, trust, and privacy.

A study (Bujnowska-Fedak and Mastalerz-Migas, 2015) reveals that face-to-face interactions with healthcare professionals remain the preferred source of health information for older adults, with only 32% opting for the Internet for documentation. This study also emphasizes other influence factors, such as gender, education, living situation, or self-assessed health. Several strategies adapted to the needs of the elderly are proposed to address these challenges in (Marschollek et al., 2007), with an emphasis on the importance of customization and accessibility. Regarding the online medical records that are becoming more and more prevalent these days, (Huvila et al., 2018) examines differences in the way older and younger adults experience reading these records.

Studies reveal that gender also plays a role in differences in the search for online health information among older adults (Picchiello et al., 2021). Men tend to view the Internet as more useful and trustworthy for health decisions compared to women. The source of information also differs: men are more likely to use official sources, while women focus on alternative sources like social media. In addition, (Paimre and Osula, 2022) observes that during the COVID-19 crisis, men showed a greater readiness for vaccination, while women focused on alternative treatments.

Even if older adults generally experience more frustration with online health information seeking (Ybarra and Suman, 2008), internet health information seeking appears to enhance patient-provider relationships across age groups and genders.

3 STUDY DESIGN

The standards of the scientific community regarding case surveys, as described in (Ralph, 2021) were used when conducting this research. Before establishing the methodology, we initially evaluated the scope of the investigation.

Scope: The purpose of the study was to determine how gender and availability of information influence patient satisfaction with that provided by online sources or digital sources about the treatment of blood clots.

Who: Patients, age 60+, from the Blekinge region, Sweden, treated for blood clots.

When: In the period between May and June 2024, we asked patients who receive blood clot treatment to complete a postal survey to capture their perspective on our research topic.

How: We applied a standard strategy, analyzing the responses quantitatively.

Participation: The survey was anonymous, and participation in the study was voluntary, ensuring that we were unable to map the participants with the responses.

3.1 Survey Design

After we established the purpose of the investigation and formulated the research questions, we prepared the survey questions. The process was iterative: first, we elaborated on a set of questions, then two authors discussed, proposed, and validated changes to the form and structure of the questions. The second draft was discussed with the third author, and we agreed on the final versions of the questions.

We decided to use eight closed questions. The first question was used to determine the groups and categories of participants (men versus women). The second question was to ensure the eligibility of the participant for the study. The next five questions are related to sources of information and the last refers to the perceived quality of the information. The questions asked in the survey are listed in Table 1.

The answer to question seven was a multiple-choice item with the options: 1177.se; Blodtroppsskolan.se; The pharmaceutical company's own website; FASS; Online medical journal/scientific article; Other website; Other sources (not online). We intended with this question to identify the most popular online source of information.

3.2 Participants

All elderly patients (age 60+) in the target region who were treated for blood clots made up the target audience for our survey. Consequently, there were 120 people in the participant set to study. The sample is small because it is not a common disease.

3.3 Methodology

The methodology used in this study is similar to those employed in other similar types of research (Ralph, 2021).

For the study, we conducted a survey that included eight closed questions. Accountable questions make it easier to work with and interpret data.

To balance the ratio of women versus men in participants in the survey, we adjusted the discrepancy between sample proportions and target population proportions using the standard procedure used in practice (De Leeuw et al., 2012): weighting the responses according to gender.

To address this, we took the following steps:

- Step 1: Define Proportions
  The proportions of respondents in the sample and the corresponding proportions in the target population were identified for each group.
- Step 2: Calculate Weights
  Weights were calculated as the ratio of the target population proportion to the sample proportion for each group. This ensured that each group was appropriately represented in the analysis.

$$w_{\text{group}} = \frac{p_{\text{target, group}}}{p_{\text{sample, group}}}$$

- Step 3: Apply Weights
  The calculated weights were assigned to each respondent based on their group. These weights were incorporated into the analysis to compensate for sample imbalance, ensuring that the results better reflected the target population.
- Step 4: Analyze Weighted Data
  All statistical analyses, including descriptive statistics and regression models, were performed using weighted data to provide representative results. For all analyses, we used the PSPP 2.0.0 software.

3.4 Data Collection

Data were collected in a postal survey. Patients received a letter containing all the information about the study, the questionnaire, and a return envelope. In addition, the meta-information included informed the subject about the purpose and content of the study (following the procedures of (De Leeuw et al., 2012)), as well as instructions on how to complete the survey. We ensure that in this self-administrated questionnaire, the respondent received all the information.

The process consisted only of one phase, the data collection. We skipped the typical first phase, a contact phase, to eliminate any bias related to Q4; usually this step is made by a member of the hospital, which could lead to a different answer to this question. The agreement and the conditions of the full anonymity of the survey were included in the meta-information.

4 RESULTS

The data collected from the survey are analyzed in this section, and the results are outlined. In our analyses, we took into account the different gender perspectives.

We received 91 questionnaires back, and only one of them was invalid (the age of the respondent was under 60 years old). The result is good, considering that postal surveys have the lowest rate of responses in general (Edwards et al., 2002).

Q1. Please specify your gender.

Of the respondents, 57.7% were men and the rest were women. In the target region, according to the statistics for 2023 (Statistics Sweden, 2023), there are 47.9% men and 52.1% women. The results have statistical significance even if there is this discrepance between the men/women ratio in the 60+ population in the region compared to the ratio of participants due to the tendency among older women to be rectulant in answering surveys compared to men of the same age, see (Porter, 2004).

To cope with this difference, we will weight the answers according to the methodology described in subsection 3.3.

We define the proportions in the sample:

$$p_{sample,men} = 57.7\% = 0.577$$

$$p_{sample,women} = 42.3\% = 0.423;$$

in the target population:

$$p_{target,men} = 47.9\% = 0.479$$

$$p_{target,women} = 52.1\% = 0.521.$$

We calculate the weights for each gender:

$$w_{men} \approx 0.83$$

$$w_{women} \approx 1.23.$$

We will apply these to all computations by assigning a weight of 0.83 to each man's response and, respectively, a weight of 1.23 to each woman's response.

As we can see in Table 2, after applying the weights, we have the same ratio of men/women in the sample as in the target population.

Table 2: Frequency Distribution of males and females that agreed to participate in the survey and send back the filled-out questionnaires.

Answers	Freq.	Percent
women	46.74	52.0%
men	43.16	48.0%
Total	89.90	100.0%

Q3. Did you use the Internet to search for information about your condition and medications in relation to your illness?

As we can see in Figure 1, 31.3% of the respondents search the Internet for information related to their illnesses and how they can be treated (in emergency rooms or by appropriate medication).

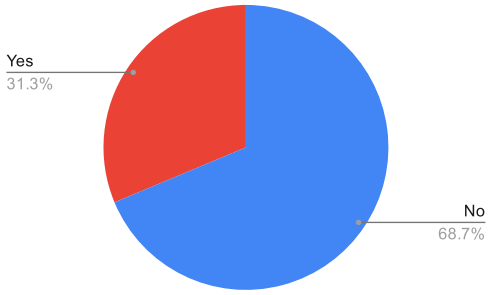

Figure 1: Frequency Distribution of participants in the study that were searching the Internet for information.

Q4. After leaving the hospital, did you receive information from a nurse about blood thinning treatment?

The percentage of patients who confirm that a nurse answered their questions and informed them about their treatment is 13.3%, for a meeting in person and 51.1% by phone, as we can see in Table 3 .

Table 3: Frequency Distribution of subjects that declare that they received direct information from a nurse about their disease.

Answers	Freq.	Percent
No	32	35.6%
Yes, in person	12	13.3%
Yes, by phone	46	51.1%
Total	90	100.0%

Q5. Have you received an information brochure about the emergency unit and one brochure on medication?

Table 4 presents the responses rates to this question. It is evident that over fifty percent obtained brochures supplied by the hospital, with only 14% that did not get any of them. We investigated the possibility that these patients sought alternative information online; however, this was not substantiated by data, as none of the patients who did not receive printed material searched the Internet.

Q6. Did you think the written information about the emergency unit was a good support in your treatment?

Another potential incentive for online searches that we examined was related to patients' belief that the

Table 4: Frequency Distribution of people that receive the written brochure about their medication and the help provided by the emergency unit regarding their illness.

Answers	Freq.	Percent
No	14.82	16.5%
Yes, both	55.28	61.5%
Yes, only on medication	19.80	22.0%
Yes, only about emergency	00.00	00.00%
Total	89.90	100.0%

textual support was inadequate. Only 12% of the participants deemed the information inadequate, and of them, merely 2 sought additional sources online. So, this is also not an indicator for a positive answer to Question 3.

Table 5: Frequency Distribution of people that consider that the written information provided good support for their treatment against blod clodth.

Answers	Freq.	Percent
No	12	13.3%
Yes	70	77.8%
No answer	8	8.9%
Total	90	100.0%

Q7. What pages/sources?
The responses to this question are centralized on the following list:

- 1177.se: 22 responses (24.4%)
- Blodproppsskolan.se: 2 responses (2.2%)
- The pharmaceutical company's own website: 0 responses (0.0%)
- FASS: 2 responses (2.2%)
- Online medical journal/scientific article: 0 responses (0.0%)
- Other page: 4 responses (4.4%)
- other sources (not online): 26 responses (28.9%)
- No answers: 34 responses (37.8%)

Observe that the percentage of people who used online sources of information differed by exactly 2.2% between Q3 and Q7. One reason for this may be that the FASS mobile application may not be considered an online source of information for older people despite its actual status.

Q8. Is it clear to you as a patient what the emergency unit can offer you for support?
As we can see from Table 6, 40% of the subjects answered negatively to this question and 60% considered that they received clear information about the support offered by the emergency unit.

Results Analyzes. In order to get a deeper understanding of the searched phenomena, we performed a series of binary logistic regressions.

Table 6: Frequency Distribution of subjects that consider that they have comprehensive, clear information about the services offered by the emergency unit.

Answers	Freq.	Percent
No	36	40.0%
Yes	54	60.0%
Total	90	100.0%

First, we do a regression with the dependent variable, the answer to Q3, and the sex of the subject is the independent variable.

The resulting model, which was designed to predict the likelihood that a senior person would search for information online based on gender, demonstrated a modest fit to the data, as indicated by the value of -2 *Log Likelihood* 109.97. The pseudo R^2 values Cox & Snell ($R^2 = 0.05$) and Nagelkerke ($R^2 = 0.07$), suggest that the gender explained 5% to 7% of the variance in Q3. This indicates that while sex has a statistically significant effect, the overall explanatory power of the model is limited, and as a consequence, we need to refine it (for example, by adding more variables).

Regarding the predictor significance, the regression results showed that gender is a statistically significant predictor of the likelihood of searching the Internet for information ($B = -1.01$, $p = 0.038$). The odds ratio for gender is given by:

$$\text{Odds Ratio (Exp(B))} = e^{-1.01} \approx 0.36$$

This indicates that for men, the odds of searching for information online increase by 64% compared to women. Thus, individuals classified as women are significantly less likely to fall into the "search" category.

If we consider as predictors the answers to questions four and five, we find that this explains only a modest portion of the variance in the answers to Q3, suggesting that additional factors may influence the outcome.

In another analysis, we examine the relationship between the perception of understanding the services provided for this disease in the emergency room (the independent variable) and the disposition to search for information online (the dependent variable). The analysis showed that understanding what the emergency unit can offer for support is a significant factor in predicting whether patients use the Internet to search for information on their condition and medications related to their illness. The found coefficient ($B = 1.54$) indicates that for each one-unit increase in clarity about the emergency unit's support, the log-odds of using the Internet to search for information increase by 1.54. Furthermore, the odds ratio ($\text{Exp}(B) = 4.67$) suggests that higher clarity makes

the likelihood of using the Internet approximately 4.67 times greater, holding all other factors constant. This effect is statistically significant ($p = 0.026$), confirming that clarity about the emergency unit's support is a meaningful and impactful predictor of Internet usage for health-related information.

Performing the analysis in reverse, we found that using the Internet to search for information is not a significant predictor of clarity about the emergency unit's support ($p = 0.074 > 0.05$). The weak explanatory power of the model and the classification imbalance limit its utility.

Results Discussion

Gender and Internet Usage. Gender significantly predicts older patients' use of the Internet for health-related information ($B = -1.01, p = 0.038$). Men were 64% more likely than women to use digital resources, as indicated by the odds ratio ($Exp(B) = 0.36$). The model only explains a small portion of the variance in this behavior, as shown by the pseudo R^2 values (Cox & Snell $R^2 = 0.05$, Nagelkerke $R^2 = 0.07$). These findings indicate that, while gender is important, other factors also influence Internet use, emphasizing the need to include additional predictors. These can be, for example, digital literacy, access to technology, or health-related concerns.

Clarity of Emergency Unit Information and Internet Use. The clarity of information in the emergency unit regarding anticoagulant treatment and blood clot management emerged as a significant and impactful predictor of Internet use ($B = 1.54$, $p = 0.026$). The odds ratio ($Exp(B) = 4.67$) shows that patients who perceive more clarity in the support of the emergency unit are 4.67 times more likely to use the Internet to search for health-related information. This suggests that transparent and well-communicated emergency unit support can empower patients to actively manage their health using online resources.

When the analysis was reversed, the model revealed no significant relationship between Internet usage and the clarity of emergency unit support ($p = 0.074$). This asymmetry demonstrates that, while clear communication can encourage Internet use, simply searching online does not necessarily improve patients' understanding of emergency services.

5 THREATS TO VALIDITY

Through the analysis, one of our goals was to minimize any possible risks. We also attempted to mitigate the potential threats to validity that were identified during the investigation. Three aspects were considered following the standard guidelines: construct validity, internal validity, and external validity. For internal validity, we focus specifically on the participant set, participant selection, dropout contingency measures, and author biases.

Construct Validity. To eliminate the authors' biases, the questions were prepared using a multi-step method indicated in the Survey Design. The recommended survey questions were in line with the study goals given in the introduction.

Internal Validity. We found several possible internal risks, including participation and participant selection, dropout rates, author subjectivity, and ethics.

Participant Set and Participant Selection. Every postal survey included a notice of the research's aims as well as an invitation to participate. The letters were sent to all 60+ patients that were receiving blood thining medication from that region. As a result, the target group of participants was well determined, removing possible hazards related with the participant pool or their selection. More than that, to ensure eligibility, we included a question regarding age and made it clear that it referred to the blood clot condition.

Drop-outs Rates. Postal surveys are voluntary by default. There are very few methods to reduce the drops-out rates. We enclosed an appealing and clear meta-information outlining the benefits of our research; the letter had a friendly design; and we limited the number of questions in an attempt to increase participation. We also waited two months for the letters with the responses to return to the hospital until we declared the survey closed.

Author Subjectivity. We considered and investigated the possibility of subjectivity in data processing. We did the analysis in accordance with the specified data processing standards and we crossvalidated each other's work.

Ethics in Our Research. We exhibited our commitment to ethics by informing participants about our objective for collecting data, our anonymous data collection method, and our planned use of the data. In addition, we made it clear that participation was voluntary, and some indeed opted not to participate. In the letter accompanying the questionnaire, we notified the subject that by returning the letter with their responses, they consent to participate in the study.

The Swedish Ethics Authority (Etikprövnings myndigheten www.etikprovningsansokan.se) received the study proposal for approval after deciding on the format, questions, and survey design, and they agreed with the study in this form. One

main reason for this approval was that we did not request any patient information in the questionnaire that could potentially identify the subject.

External Validity. We investigate the feasibility of generalizing our study's findings to a wider patient population. It is noted that generalization to the entire society is not attainable, since we examined a specific cohort from a particular location. Nevertheless, we might cautiously generalize to other elderly patients from that region.

6 CONCLUSION AND FUTURE WORK

This study explored factors that influence the use of the Internet by older patients to access health-related information, focusing on gender differences and the clarity of the information provided by emergency departments about anticoagulant treatment and blood clot management. The findings highlight key insights into patient behavior and areas for improvement in healthcare communication.

The results show that gender significantly predicts Internet use among older patients. Men are 64% more likely than women to use digital resources for health-related information, as indicated by the odds ratio. This finding underscores the persistent gender disparity in the adoption of online tools for self-education about health. However, the model explains only a small portion of the variance in Internet usage behavior, suggesting that there are other additional factors that may also play a significant role. These results emphasize the need for targeted strategies to support older women in accessing and using online health information, potentially through education or improved access to technology.

The clarity of the information provided by emergency services also emerged as a predictor of Internet usage. Patients who perceive higher clarity about the services offered by emergency units are 4.67 times more likely to search online for information related to their condition and medications. This finding highlights the importance of clear and transparent communication from healthcare providers in empowering patients to actively manage their health using digital resources.

In contrast, a reverse analysis revealed that Internet usage does not significantly predict patients' understanding of the support provided by emergency units. This asymmetry suggests that while clear communication from healthcare providers can encourage patients to seek information online, online searches alone do not necessarily improve patients' understanding of healthcare services. This underscores the need for emergency units to prioritize direct communication strategies to ensure patients fully understand the available support.

The findings have several important implications for healthcare providers and policy makers. First, addressing gender disparities in Internet use requires targeted interventions to improve digital literacy and access to technology, particularly for older women. Educational programs tailored for older patients could help bridge the gap and increase the adoption of online resources.

Second, the strong relationship between the clarity of emergency unit information and Internet usage highlights the critical role of effective communication. Emergency units should prioritize providing clear, accessible and comprehensive information about available services, especially for complex conditions such as blood clot management.

Third, while encouraging the use of the Internet can empower patients, it is not a substitute for direct communication from healthcare providers. Patients benefit most when clear guidance from healthcare professionals complements their online searches. Therefore, a balanced approach that combines digital engagement with personalized communication is essential.

These findings suggest that patients who receive clear information may feel more empowered to investigate related topics online. Alternatively, individuals who receive ambiguous information may feel overwhelmed or discouraged to seek further clarification. A relevant conclusion is that explicit communication from physicians may indicate to patients that further information is beneficial and worth pursuing.

An additional significant conclusion is derived from the responses to inquiries concerning the source of the online material. The search predominantly occurs on official sites or applications, with only 2 percent of subjects conducting searches in unofficial sources. Furthermore, popular information tends to be the most straightforward and comprehensible, such as government or hospital manuals, rather than more advanced sources, such as scientific publications or pharmaceutical websites.

To improve the management of anticoagulant therapy, future research should focus on developing comprehensive educational content, determining optimal delivery formats, and evaluating the impact of digital interventions on health outcomes and clinical practice.

Future research may examine whether competencies and/or experience in IT usage, or motivation to

use IT applications among women and men, influence the findings. Additionally, if these issues impact the utilization of IT applications or what other factors may influence their use, such as limited access to IT applications.

7 AI DISCLOSURE

The QuillBot AI tool was used in the preparation of this manuscript for paraphrasing and language correction purposes. The AI tool did not assist in the creation of original content, the formulation of the research design, the analysis of the data, or the interpretation of the findings. The authors take full responsibility for the content, accuracy, and conclusions articulated in this paper.

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