Empirical Study of Health Information Needs of Older Adult Users in Online Health Communities: Postprint

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Abstract

[Purpose/Significance] At present, the needs of elderly users remain unmet in the process of utilizing health information, and research on elderly users' health information requirements requires further strengthening. Exploring the content and models of elderly users'health information needs and identifying corresponding solutions can enrich theoretical research outcomes on elderly users' health information needs, and inform practical initiatives such as smart elderly care in aging societies and online medical platform services.

[Method/Process] This study is grounded in online health communities and utilizes a sequential exploratory mixed-methods design (qualitative followed by quantitative) to conduct an exploratory investigation. First, through interviews with elderly users, 37 free nodes of health information needs were identified. Subsequently, via questionnaire-based surveys and employing factor analysis, six major categories of health information needs were extracted as tree nodes: usage operation, information seeking, privacy and security, medical treatment behavior, interaction and feedback, and self-actualization, which were further aggregated into three main categories: physical, cognitive, and emotional.

[Results/Conclusion] Ultimately, a model of elderly users' health information needs was developed, integrated with Maslow' s hierarchy of needs theory to elucidate the implications of the elderly users' health information needs model and propose corresponding strategies and recommendations.

Full Text

Preamble

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Abstract

[**Purpose/Significance**] Current elderly users remain unsatisfied in their utilization of health information, and research on their health information needs requires strengthening. Exploring the content and models of elderly users' health information needs and seeking relevant solutions can enrich theoretical research findings on this topic while guiding practical initiatives such as smart elderly care in aging societies and online medical platform services. [**Method/Process**] This study conducted exploratory research using a mixed-methods approach (qualitative followed by quantitative) within online health communities. First, interviews with elderly users identified 37 free nodes of health information needs. Subsequently, a questionnaire survey and factor analysis extracted six major categories of health information needs: usage operation, information search, privacy and security, diagnosis and treatment behavior, interaction and feedback, and self-actualization, which were further categorized into three main domains: physical, cognitive, and emotional. [**Result/Conclusion**] The study ultimately constructed a health information needs model for elderly users, explained its connotation using Maslow' s hierarchy of needs, and proposed corresponding strategies and recommendations.

Keywords: Online health communities; Elderly users; Health information needs; Mixed-methods research

1 Literature Review

Existing research on elderly users' information needs encompasses their definition, classification, influencing factors, service guarantees, and countermeasures. Studies indicate that current information technologies for improving elderly users' health and quality of life have not been developed according to their needs, including age-related technological usage issues and varying demands across age groups, patients, and medical personnel. Researchers have proposed recommendations from the perspectives of developers, researchers, suppliers, and consumers regarding technology production, evaluation, recommendation, and purchasing to meet elderly needs. Other scholars have identified factors influencing elderly information needs, including regional environment, social context, family and friends, and individual characteristics, establishing an explanatory structural model that stratifies these factors into surface, middle, and deep layers. Research also shows that elderly users' basic needs remain unmet, with particularly strong demands for medical security and daily care. The widely recognized hierarchical model of elderly information needs categorizes them into five levels: physiological, safety, emotional, esteem, and self-actualization.

Research on health information needs primarily originates from medical and information science scholars. Medical studies often focus on specific disease pa-

tients or younger populations without distinguishing user groups. For instance, international scholars have examined health information needs among long-term cancer survivors and patients with urological and breast tumors. Domestic researchers have investigated needs among maternal and child health communities and assisted reproductive technology patients. Information science research, meanwhile, emphasizes health information needs in specific regions, Q&A communities, and various applications. Studies have explored health information-seeking motivations and behavioral characteristics among urban and rural youth, while surveys of Chinese populations in Dallas-Fort Worth revealed interests in nutrition, specific diseases, and fitness, with particular interest in breast cancer and diabetes information. Other research has constructed consumer health information need models based on social Q&A communities, while mobile medical apps have been analyzed to understand user health information concerns.

However, several gaps persist. First, current research lacks in-depth exploration of elderly users' health information needs—the critical starting point for online health community services and smart elderly care strategies. Second, compared to other groups, elderly users' health needs are more urgent, but their limited information literacy results in sparse textual data in online health communities, creating difficulties for text-mining approaches. Research specifically targeting elderly users in online health communities remains scarce. Finally, the specific content of elderly users' health information needs remains unclear, and their needs for medical information remain unmet, necessitating urgent research attention.

2 Research Design

This study employs a mixed-methods exploratory design, typically initiated with qualitative research when mature constructs, frameworks, and measurement instruments are lacking. Qualitative methods first identify valuable elements, which then inform quantitative instrument development for subsequent surveys or experiments, ultimately achieving theoretical model exploration and construction. Given the absence of mature theoretical frameworks in elderly user health information needs research, this study follows an exploratory sequence—qualitative followed by quantitative.

First, interviews identified valuable information, yielding 37 free nodes of health information needs from 23 elderly users. Subsequently, questionnaire data enabled quantitative research through factor analysis to extract six major categories of health information needs (tree nodes), which were further organized into three domains (physical, cognitive, emotional) to construct an elderly user health information needs model. Finally, Maslow' s hierarchy of needs was applied to analyze the model' s connotation and propose fulfillment pathways.

2.1 Semi-Structured Interviews

The WHO defines elderly as 65+ years in developed countries and 60+ in developing nations (particularly Asia-Pacific); this study adopts the latter standard. Due to varying abilities and information literacy among elderly users, their needs for online medical platforms differ significantly. Purposeful sampling was employed to select information-rich cases: participants aged 60+ with six months of online medical platform usage and no communication barriers. For representativeness, participants were recruited from three tertiary hospitals across two provinces (Jiangsu Provincial Hospital of Integrated Chinese and Western Medicine, Nanjing Drum Tower Hospital, and Bengbu Medical College First Affiliated Hospital) using snowball sampling, ultimately interviewing 23 elderly users (13 male, 10 female; ages 60-65: 14, 66-70: 6, 71-75: 3; education: 11 with private schooling/elementary, 5 middle school, 3 high school, 1 college, 2 bachelor's, 1 master's; diverse occupational backgrounds with private enterprise employees comprising the largest group).

Interviews were conducted face-to-face from June 25 to July 15, 2018, lasting approximately one hour each. Participants were informed of the study's purpose, assured confidentiality, and consented to audio recording. Participants were coded as p1-p23, with transcripts as w1-w23. Irrelevant content was removed, yielding 962 coded statements (R001-R962). The interview outline [Figure 1: see original paper] focused on elderly users' health information needs, covering: (1) understanding and usage duration of online health communities; (2) primary usage purposes; (3) life needs fulfilled by the community; (4) usage obstacles; and (5) improvement suggestions. Interviews followed logical progression and divergent thinking, adjusting in real-time based on responses to elicit complete expressions.

This study employed grounded theory using NVivo 11 for inductive analysis. Developed by Glaser and Strauss in the 1960s, grounded theory systematically collects and analyzes data through open coding, axial coding, and selective coding to generate theoretical models. To reduce manual coding time and subjective bias, NVivo 11 was utilized. Researcher A coded needs in transcripts w1-w10, while Researcher B coded w11-w20. After comparing extracted elements and discussing ambiguous concepts, 37 needs were identified. Transcripts w21-w23 were used for saturation testing, achieving 92% inter-coder consistency, meeting research requirements.

2.2 Questionnaire Survey

Following needs extraction, a questionnaire was designed for the 37 elements, asking elderly users with online health community experience (e.g., Haodf, Chunyu Doctor, WeDoctor) to indicate current needs. The questionnaire comprised two sections: basic information (gender, age, occupation, education, health status) and health information needs (rated 1=very unnecessary to 5=very necessary). Factor analysis results would inform needs categorization.

The questionnaire was distributed both online (via "Wenjuanxing" platform through QQ, WeChat, forums) and offline (paper copies in communities, senior universities, and hospitals, with researcher assistance but no directional guidance). One hundred copies were distributed each online and offline. After excluding incomplete or invalid responses, 32 online and 70 offline valid questionnaires were recovered (51% response rate, N=102).

The sample showed balanced gender distribution (53.4% male, 46.6% female). Age distribution was predominantly 60-65 years (78.3%), followed by 66-70 (21.4%) and 71-75 (0.3%). The 60-65 age group, mostly recently retired, demonstrated greater capability to use online health communities for health information needs (e.g., chronic disease treatment, medication guidance, wellness information). Education levels varied: 59 with private schooling/elementary, 22 middle school, 13 high school, 4 college, 2 bachelor' s, and 2 master' s. Occupations were diverse, with business and private enterprise employees most common, plus enterprise leaders, cleaners, hospital security, farmers, teachers, purchasers, dance instructors, and state-owned enterprise employees. Most elderly users had chronic conditions, particularly hypertension and diabetes, plus arthritis, bone hyperplasia, stones, and vascular diseases.

3 Data Processing

3.1 Open Coding

Open coding extracted free nodes from interview transcripts. After importing 23 transcripts into NVivo 11, top-down and bottom-up coding were performed simultaneously while browsing, yielding 113 initial free nodes (partial sample shown in Table 1). Ambiguous expressions were converted to corresponding nodes (e.g., p23' s "what diseases can eat what" became "dietary nutrition"). Duplicate and similar concepts were merged and standardized (e.g., "elderly exercise" to "daily wellness," "online consultation" to "online inquiry"). After sorting free nodes in descending order, 37 concepts were extracted.

3.2 Axial Coding

Axial coding further inductively grouped free nodes into higher-level tree nodes. To better categorize them, questionnaire data from elderly users were analyzed using factor analysis to extract principal components as references. Results showed KMO=0.916, Bartlett' s test $p=0.000<0.05$, indicating suitability for factor analysis. Six factors with eigenvalues >1 explained 94.468% of total variance (see rotated component matrix in Table 2).

Factor 1 encompassed daily wellness, dietary nutrition, health indicators, medical courses, medical lectures, food safety, elderly care, hospital introductions, medical trends, browsing reviews, disease introductions, and medical knowledge —all related to information-seeking behavior, named "information search."Factor 2 comprised expert consultations, appointment registration, online inquiry, telephone consultation, remote diagnosis, electronic medical records, test reports,

rehabilitation guidance, medication guidance, and follow-up examinations—covering pre-, during-, and post-diagnosis processes, named "diagnosis and treatment behavior." Factor 3 included registration/login, query entry, online help, navigation, and subscription steps—usage operation needs, named "usage operation." Factor 4 encompassed writing reviews, participating in voting, sharing illness experiences, and sharing insights—higher-level needs of user contribution and self-value realization, named "self-actualization." Factor 5 focused on personal privacy, illness information leakage, and payment security, named "privacy and security." Factor 6 concerned order progress, response speed, and notifications—platform feedback and user-community interaction, named "interaction and feedback." These six factors formed six tree nodes with 37 free nodes (Table 3).

3.3 Selective Coding

Selective coding identified relationships among tree nodes, revealing a hierarchical structure: usage operation, information search, privacy and security, diagnosis and treatment behavior, interaction and feedback, and self-actualization. Referencing foreign scholars' needs classifications (e.g., Lindemann et al., Perenc), who defined basic needs of disabled children as physical needs ascending to cognitive and affective needs, this study further categorized the six tree nodes into three main domains: physical, cognitive, and emotional. Usage operation and information search constitute basic-level physical needs that must be satisfied before higher-level needs emerge. Once physical needs are met, elderly users develop community cognition and begin focusing on privacy/security and medical activities (cognitive domain). Finally, at the highest level, emotional needs drive desire for "perceived control," community feedback, interaction, and value realization through personal capabilities (interaction/feedback and self-actualization in the emotional domain). This constructed the elderly user health information needs model (Figure 2 [Figure 2: see original paper]).

4 Results Analysis

Maslow' s hierarchy of needs, a foundational theory in behavioral science, has been applied to elderly users' information system and healthcare needs (e.g., Thielke, Nydén, Lu & Chen). This basic theory can explain and summarize elderly users' health information needs. This section interprets the model' s connotation using Maslow' s theory.

The model comprises three main domains (physical, cognitive, emotional), six tree nodes (usage operation, information search, privacy/security, diagnosis/treatment behavior, interaction/feedback, self-actualization), and corresponding health information content. This section explains the model' s implications and proposes fulfillment pathways from perspectives of software developers, elderly service agencies, software operators, hospital IT departments, national legislation, academic theory, society, and enterprise crowdsourcing.

4.1 First Level: Usage Operation

Maslow' s first level comprises physiological needs (breathing, water, sleep, food, sex)—basic survival conditions analogous to this study' s physical domain. For elderly users in online health communities, the most fundamental needs are usage operation and information search (levels 1-2). Over half of interviewees reported difficulties using online health communities, primarily in registration/login, subscription steps, online help, navigation, and downloading health information. As participant p8 noted: "Online consultation requires mobile number registration, submitting basic information, and entering personal health data—the steps and operations are very difficult." This stems from elderly users' age, physical condition, and education level, resulting in insufficient information literacy, particularly network skills. Literature shows middle-aged and elderly users eagerly desire internet products to meet needs but experience anxiety when using electronic products due to various barriers. Addressing these needs benefits both elderly users' utilization of online medical services and requires design attention from online health communities. This level' s needs are strong, requiring software developers to create elderly-oriented functions and navigation systems (simplified processes, clear labels, online help). Elderly service agencies should regularly offer computer skills training, lecture series, and instruction booklets to improve information literacy.

4.2 Second Level: Information Search

The first two levels exhibit mutual reinforcement: learning usage operation enhances information search capability, and searching promotes operational skills. Elderly users' health information search focuses on daily wellness, dietary nutrition, health indicators, medical courses, medical lectures, elderly care, hospital introductions, medical trends, browsing reviews, food safety, and medical knowledge. Literature confirms elderly users are most concerned with nutrition and wellness information. The questionnaire revealed most elderly users suffer from chronic diseases (especially hypertension and diabetes) and urgently need medication management and continuous health information services. However, problems include difficulty finding precise information among diverse content and inconsistent advice from different doctors. Solutions require software operators to prioritize quality control, with professionals reviewing and regularly updating health information, intercepting and deleting misleading or unscientific content. Software developers should provide health information navigation maps (e.g., prominent navigation icons on homepages, thematic sections for elderly concerns).

4.3 Third Level: Privacy and Security

Maslow' s second level comprises safety needs (personal safety, property ownership, family security, health protection)—the cognitive domain, corresponding to this study' s third level. Elderly users also focus on community security, including personal privacy, illness information, and payment security. The in-

ternet provides privacy for sensitive conditions like HIV, where virtuality and anonymity offer convenience, and teenagers anonymously consult about private health issues. However, most programs have privacy leakage problems, which have become mobile security' s primary threat. Elderly users show more significant concern about payment security than other groups, as p3 stated: "I immediately stop when bank card binding is required, fearing theft." This need remains a key focus, with academia and society working on theoretical and technical breakthroughs, and the state advancing personal information protection legislation. Online health communities provide private environments for diagnosis, but users must also remain vigilant when providing personal information like ID numbers and bank accounts. Communities must implement permission settings, encryption, and identity verification.

4.4 Fourth Level: Diagnosis and Treatment Behavior

After satisfying the first three levels, elderly users' behaviors change as they recognize their health information needs and begin using online health communities for diagnosis-related services—also in the cognitive domain. This category includes pre-, during-, and post-diagnosis needs: expert consultation, appointment registration, online/telephone consultation, remote diagnosis, electronic medical records, test reports, rehabilitation guidance, medication guidance, and follow-up examinations. While appointment registration services are mature, online/telephone consultation and remote diagnosis remain underdeveloped due to effectiveness and economic considerations. Interviews revealed elderly users desire post-visit doctor contact for follow-up guidance, as p7 noted: "Continuous online communication with medical services would greatly help patients." Some large hospitals have implemented this, but issues like untimely/incomplete responses and limited free consultations persist. National policy and economic support are needed, along with software developers improving systems and collaborating with hospital IT departments, and hospitals actively embracing national strategies to advance mobile and smart healthcare.

4.5 Fifth Level: Interaction and Feedback

Maslow' s third level comprises emotional needs (love, belonging), while the fourth (esteem) and fifth (self-actualization) levels reflect psychological and spiritual needs for respect and achievement—both emotional domains. Human needs for self-worth evaluation and others' recognition drive desire for importance, which elderly users also experience in online health communities through response speed/quality, timely notifications, and order progress updates. Elderly users' psychological loneliness increases desire for personalized services that convey attention, corresponding to community feedback and user-community interaction. Research shows "smart healthcare" services require "condition-triggered" functions that automatically send reminders based on patient information. However, interviews revealed issues with untimely feedback and unclear notifications, requiring community operators' attention to promptly notify users about orders,

payments, and test results, and establish doctor assessment mechanisms to incentivize complete responses, providing elderly users with humanistic care.

4.6 Sixth Level: Self-Actualization

Maslow' s fifth level comprises self-actualization needs (creativity, problem-solving)—the highest human growth need, corresponding to this study' s sixth level: writing reviews, participating in voting, and sharing illness experiences/insights. Retirement and relocation weaken elderly users' social interactions, increasing loneliness, yet they desire to utilize their capabilities to participate in society and create value. Older adults are enthusiastic about knowledge contribution with lower benefit expectations than younger users, though limited information literacy constrains their virtual community contributions. In online health communities, elderly users hope to help others by sharing experiences through reviews and comments, preferably via voice broadcasts and short videos matching their habits. Elderly groups aspire to "contribute after retirement." Future enterprises could bridge this through "crowdsourcing," rehiring retirees for wisdom utilization, alleviating aging challenges while improving elderly users' knowledge contribution skills—a win-win scenario.

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Note: Figure translations are in progress. See original paper for figures.