

# Development of an Intelligent Risk Hierarchical Management System on Pulmonary Aspiration for the Elderly

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**Abstract.** For the elderly, the risks associated with pulmonary aspiration are significant, and can severely impact their quality of life. Therefore, the management of pulmonary aspiration risk is crucial in promoting healthy aging, an aspect often overlooked in self-health management for the elderly. To enhance self-management of pulmonary aspiration risk among the elderly, we have organized a multidisciplinary team to develop an intelligent risk hierarchical management system on pulmonary aspiration for the elderly. This system tailors the assessment with different questionnaires based on the elderly individual's environment. Additionally, it utilizes elderly-friendly formats such as pictures, videos and animations, making it easier for seniors to comprehend the occurrence and hazards of pulmonary aspiration. This enables them to proactively take preventive measures to manage the risk, thus achieving self-management of pulmonary aspiration risk.

**Keywords.** respiratory aspiration, risk management, elderly, self-management

## 1. Introduction

When solid or liquid materials, stomach contents, or oropharyngeal secretions enter the lower respiratory tract while eating or not eating, it's referred to as pulmonary aspiration. Elderly people are more likely to aspirate due to age-related physiological changes and the presence of several chronic conditions, which can lead to more serious implications. Therefore, enhancing the nutritional status of the elderly and reducing mortality associated with pulmonary aspiration requires a more comprehensive approach to its management. Currently, the management of pulmonary aspiration in the elderly is inadequate in terms of tailored and systematic approaches, and it often does not extend to community or home settings. There is a need to promote self-management awareness among the elderly for comprehensive prevention of aspiration risks <sup>[1]</sup>. The intelligent risk hierarchical management system on pulmonary

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aspiration for the elderly that we have developed aligns with the World Health Organization's advocacy for leveraging digital technology to promote healthy aging [2]. This system aims to be intelligent, dynamic, and personalized, empowering elderly individuals to proactively manage their health, reduce the incidence of pulmonary aspiration, and enhance overall quality of life.

## 2. Methods

We have gathered a multidisciplinary team comprising a software engineer, academic researchers, experienced doctors, nurses, and rehabilitation therapists to manage pulmonary aspiration in the elderly. By working closely with healthcare professionals, we ensured that knowledge from various disciplines were integrated into the system's design, enhancing its ability to serve the health and well-being of elderly individuals.

### *Stage 1: Alpha Version of the System*

Based on an extensive review of relevant literature and books in the field of elderly pulmonary aspiration, we sought advice from healthcare professionals specializing in neurology and rehabilitation. After careful consideration and discussion from multiple angles, we finally identified the functional modules of the system, which include assessment, recommended measures, knowledge base, and communication.

### *Stage 2: Beta Version of the System*

The researchers worked closely with information technology engineers to adjust details, incorporating real-life experiences of the elderly. The focus was on improving the user interface for ease of operation and enhancing the accuracy of assessments and recommendations to promote personalized aspiration risk grading management.

## 3. Results

To access the "Intelligent Risk Hierarchical Management System on Pulmonary Aspiration for the Elderly", users must first register, and log in. The system consists of four main modules. (Figure 1, Figure 2, Figure 3, Figure 4)

### *Step 1: Assessment*

First, elderly individuals choose their living environment. Hospitalized patients are assessed by professionals using the Gugging Swallowing Screen questionnaire, while elderly people in the community or at home complete the Ohkuma questionnaire either by themselves or with the assistance of their caregivers.

### *Step 2: Management*

Based on the results obtained from the Assessment module, the system automatically recommends corresponding tasks. The interface displays the progress of each task, reminding elderly individuals or their family members of completion status.

### Step 3: Knowledge

The knowledge module comprises eight sub-modules, allowing patients to freely explore topics of interest. Content formats include images, text, animations, and videos.

### Step 4: Personal Center

This module includes functions such as patient information, learning records, information tracking, professional consultation, peer discussions, and settings.



Figure 1. Assessment.



Figure 2. Management.

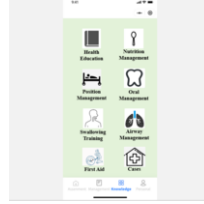


Figure 3. Knowledge.

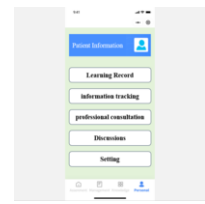


Figure 4. Personal.

## 4. Discussion

Effective management of pulmonary aspiration risk is crucial for promoting healthy aging. However, self-management is relatively weak in this domain. We developed an intelligent risk hierarchical management system on pulmonary aspiration to help the elderly better control their pulmonary aspiration risk.

The system provides extensive materials for preventing pulmonary aspiration risk, categorized based on whether the individual is hospitalized or living in the community. The system visually presents the complex process of pulmonary aspiration, prompting elderly individuals to understand its significance. Moreover, the system prioritizes user-friendliness for the elderly, featuring an intuitive and friendly user interface to ensure accessibility and comprehension. In summary, the system intends to enhance the elderly's understanding of the consequences of pulmonary aspiration, motivating them to take proactive preventive actions.

## 5. Conclusions

This study details the development of a hierarchical management system for pulmonary aspiration risk in the elderly. To empower the elderly in self-managing pulmonary aspiration risk, the system integrates user-friendly processes, systematic content, and tailored functionality. The system will be further improved based on feedback from the elderly and their caregivers.

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## **References**

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