ORIGINAL ARTICLE

Characteristics of Medication Administration Problems in Patients with Dysphagia

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Objective: To identify administering medications problems faced by dysphagia patients

Materials and Methods: Cross-sectional research was conducted between February and August 2023 at the Srinagarind Hospital, Khon Kaen University. Data were collected from patients and/or caregivers using a questionnaire and a structured interview.

Results: A total of 89 participants included 64 males (71.9%) and 25 females (28.1%). Stroke was found to be the most common cause of dysphagia in 84 subjects (94.4%). The median of the duration since the onset of dysphagia was 40 weeks. Problems encountered in drug administration can be divided into 3 issues. The first part is problems related to the patient themselves: unable to take medicine by mouth yet was 61 cases (68.5 %), unable to self-administer medication was 70 cases (78.7%) and they had experience choking problems while taking the medicine was 18 cases (29.5%). The second part is the problem of managing the daily medications. For individuals receiving medication through the feeding tube, the tube blockages and improper medication preparation were prevalent. Some types of medicines crushed with improper equipment can leave drug residue in the mortar, resulting in patients receiving incomplete dose. Third part is the patient rely totally on caregiver for administer medication was 85 (95.5%), which problems encountered such as not reading drug label was 7 cases (7.9%). Preparation of medicine by incorrect methods or using improper equipment for grinding results in incomplete dosage of medicine.

Conclusion: Administering medications effectively, with a focus on quality of life, is a major challenge for people with dysphagia and those who care for them. Pharmacists should not only develop standard procedures and instruments to reduce these issues but also play a significant role in improving the administration of medications.

Keywords: Medication administration; Dysphagia; Stroke; Medication problem

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A prevalent disease associated with neurological disorders is dysphagia; these include Parkinson's disease, multiple sclerosis (MS), amyotrophic lateral sclerosis (ALS), Alzheimer's disease, and, most famously, stroke. Dysphagia is generally found between 37% and 78%[1-7]. Individuals with head and neck malignancies who undergo surgery may also be at risk for dysphagia due to the affected organs. This may lead to issues with swallowing. Motor neurons were among the neurons affected by this condition. Dysphagia can lead to many consequences such as malnutrition, dehydration, and aspiration pneumonia. In severe cases, dysphagia can be life threatening. Moreover, swallowing medications can be challenging for individuals with dysphagia, often necessitating alternative delivery methods such as tube feeding.

There are challenges in medication management for dysphagia patients and their caregivers. These include inappropriate preparation of medications and equipment, such as inadequate grinding or splitting of pills, dissolving them in water instead of crushing them into fine powder before administration through feeding tubes. Such practices can result in tube occlusion caused by improper preparation, compromised drug stability and bioavailability, and deviation from pharmacological principles in controlling the dosage. These factors increase the risk of suboptimal

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therapeutic outcomes or severe events for patients.

In Chomsri village, Udon Thani Province, prior research on drug administration and the health-related behaviors of senior patients with chronic diseases revealed that patients could report medication allergies during doctor visits and seek advice from pharmacists when they encountered medication-related problems[8]. They had inappropriate opinions on the use of other medications, removed medication capsules for quick relief, and discontinued taking medication themselves. Drug-related behaviors: They exhibited appropriate behavior when it came to taking medication as prescribed. They behaved appropriately when it came to varying dosages and taking different medications. A few of them also told others about their experiences in medicine. Misunderstandings occurred over the use of other people's prescription drugs and the process of splitting open capsules to release the contents and accelerate drug effects. Physicians sometimes prescribe drugs in formulations that are inappropriate for enteral administration, according to this research on issues connected to enteral medication delivery. In addition, it was common for nurses to co-administer phenytoin with food or to administer various medications simultaneously without rinsing the tube in between[9,10].

For this reason, the pharmacist serves as a crucial liaison, educating patients about medication use to achieve optimal treatment outcomes. This research focused on the challenges associated with drug administration among patients with dysphagia and their caregivers to develop a comprehensive understanding of these difficulties. The findings from this research are anticipated to significantly contribute to enhance the overall quality of care, with particular emphasis on the domain of pharmaceutical care services.

Materials and Methods

Data from 89 patients with dysphagia and/or their caregivers were gathered for this cross-sectional research while they were receiving medication at the Rehabilitation Medicine Clinic, Srinagarind Hospital, Faculty of Medicine, Khon Kaen University, between February and August 2023.

Sample, inclusion and exclusion criteria

Patients with dysphagia and/or their caregivers receiving treatment at the Rehabilitation Medicine Clinic, Srinagarind Hospital, Faculty of Medicine, Khon Kaen University.

The inclusion criteria for patient participants were as follows: 1) age 18 years or older, 2) dysphagia diagnosed by a physician for at least one week (confirmed through medical history and/or screening using the Modified Water Swallowing Test, MWST ≤3 points), and 3) ability to communicate. Interviews with caregivers will be conducted in the event of speech abnormalities. Additionally, the inclusion criteria for caregiver participants were as follows: 1) a minimum age of 18 years, 2) caregivers refer to relatives who are predominantly responsible for care or contracted caregivers, and 3) the ability to communicate. Conversely, patients who experienced unstable vital signs, including respiratory distress or a high fever, were excluded from the present study.

Development of a questionnaire

Literature review and consultation with experts' opinions contributed to the development of a preliminary interview questionnaire. This was tested on 10 dysphagia patients in a focus group to provide information and feedback. The researcher collected and improved those comments until the completed questionnaire was refined. Subsequently, four qualified experts (two rehabilitation physicians specializing in dysphagia rehabilitation, one nurse specializing in dysphagia patient care, and one pharmacist with over five years of experience) performed the tool quality checks. Suggestions were gathered and incorporated to produce the final interview questionnaire to be used in data collection. The questionnaire consists of 2 parts: 1) general information about the patient, 23 questions, and 2) information from the hospital information system, 7 questions.

Data collection

After obtaining informed consent, data were collected using the developed interview questionnaire and by reviewing patient information in the Electronic Medical Record (EMR) system of Srinagarind Hospital.

Ethical considerations

The present study was approved by the Research Ethics Committee, Khon Kaen University, under project number HE651497.

Statistical analysis

Descriptive statistics were used to analyze demographic data, presenting means and standard deviations, or frequencies. Logistic regression analysis was employed to examine the relationship between sociodemographic factors, knowledge, attitudes, and medication usage behaviors. Four problem lists including 1) Dosage adjustment by themselves, 2) Forgot to take the medicine, 3) Do not know information about medicines, 4) Allergic/Adverse drug reaction and sixteen the indicators data including 1) Gender information, 2) Patient's age, 3) Marital status, 4) Educational level, 5) Working status, 6) Caregiver's age, 7) Caregiver's education level, 8) Person who managed medications administration,

9) Preparer of medications administration, 10) Method of administration, 11) Way to swallowing pills, 12) How to break pills, 13) How to crush pills, 14) Reading pill labels, 15) Choking on pills, 16) Choking on liquid medicine were compared by Pearson's Chi-square test, or Fisher's exact test. Additionally, the participants data, such as sex, age, education level, medication administration management, reading medicine labels, giving medicine, choking on medicine, and underlying conditions, were analyzed to determine the association between medication omitted and received from different hospitals. Stata version 18 was used for the analysis, with a confidence level of 95% ($p<0.05$).

Results

General information

Of the 89 participants for the study, general data showed that 71.9% were male and 28.1% were female. Stroke was the primary cause of dysphagia in approximately 94.4% of medical records. Participants experienced dysphagia for a median of 40 weeks, with a range of 16 to 40 weeks. Feeding tubes accounted for 58.4% and 65.2% of all food and medication administrations, respectively. Of the participants, 28.1% were retired, and more than 50% did not work for health-related reasons. Moreover, 2.3% of the participants had no caregivers, whereas 97.8% of the participants had caregivers. Of those providing care, 82.6% were family members, and 17.4% were workers. Table 1 shows that the majority of the participants (50.6%) completed their high school education.

Table 1. Demographic of participant (n=89)

Variable	Number (%)
Gender	
Male	64 (71.9)
Female	25 (28.1)
Cause of dysphagia	
Stroke	84 (94.4)
Cord injury	3 (3.4)
Other	
Meningioma	1 (1.1)
Parkinson's disease	1 (1.1)
Food administrations	
Oral	25 (28.1)
Feeding tubes	52 (58.4)
Oral and Feeding tubes	12 (13.5)
Medication administrations	
Oral	28 (31.5)
Feeding tubes	58 (65.2)
Oral and Feeding tubes	3 (3.4)
Working Status	
Full time	11 (12.4)
Part-time	3 (3.4)
Unemployed	50 (56.2)
Retired	25 (28.1)
Caregiver	
Yes	87 (97.8)
No	2 (2.2)
Relationship between patient and caregiver	
Family	71 (82.6)
Employee	15 (17.4)
Caregiver educational	
Elementary school	8 (9.2)
High school	44 (50.6)
High vocational certificate	19 (21.8)
Bachelor's degrees or higher	16 (18.4)

Medication management

Medication management was handled by 78.7% of caregivers, compared to 4.5% of individuals who did it on their own, according to the present study. The authors found that the medication management provided by caregivers was the reason 62.5 % of the participants were most satisfied, as shown in Table 2.

According to the results, 65.2% of patients and caregivers occasionally read the medication label before administering it. Furthermore, 27% of patients or caregivers read the medicine label before delivering it to them, whereas 7.9% did not. The findings showed that 100% of the patients in the group who did not read the medication label before taking the medication also forgot to take it. Additionally, 93.1% of the patients in the sporadic group failed to take their medication. Our findings indicated that the majority of the group—100%—had reviewed the medication's label prior to its administration. However, approximately 66.7% of the group neglected to consume the medication. Furthermore, the authors discovered that, in addition to making administering medicine easier, 82.0% of caregivers had to crush and mix drugs. Three different types of equipment were available for drug crushing, with the mortar and pestle being the most commonly used. Nonetheless, caregivers preferred to use a mortar and pestle with plastic bags more often than other equipment if they required two different techniques for crushing drugs, as shown in Table 3.

Medication management problems and challenges

The research found that the two most common problems with feeding tube administration were drugs left in the mortar or mixing cup (90.2%) and medication clogging the tube (93.4%). It was discovered that 75 individuals could not swallow oral pills. There were 4 (5.3%) instances of incorrect capsule preparation. Although the volunteers often had difficulty swallowing tablets and had to split them, less than 30.0% of them suffered nausea or vomiting after

Table 2. Number and percentage of volunteers from Medication administrations

Daily medication management	Number (%)
Volunteers manage every step	4 (4.5)
Volunteers do some by themselves	15 (16.9)
Caregivers manage every step	70 (78.7)
Satisfied of caregiver's medication management	**Number (%)**
Least satisfied	1 (1.1)
Less satisfied	1 (1.1)
Moderately satisfied	6 (6.8)
Very satisfied	25 (28.4)
Most satisfied	55 (62.5)
Most satisfied	**Number (%)**
Never	7 (7.9)
Sometimes	58 (65.2)
Always	24 (27.0)

Table 3. This table shows how to prepare the medicine

How to give medicine	Number (%)
Prepare medicine without crushing	16 (18.0)
Prepare the medicine by crushing	73 (82.0)
How to crush pills	**Number (%)**
Prepare medicine by crushing with 1 technique	46 (63.0)
Use a mortar and pestle	36 (72.3)
Use a wooden mortar	6 (13.0)
Use plastic bags	4 (8.7)
Prepare medicine by crushing with 2 techniques	23 (31.5)
Prepare medicine by crushing with 3 techniques	4 (5.5)

Two techniques are to use mortar and pestle and wooden mortar

Three techniques are to use mortar and pestle, wooden mortar and plastic bags

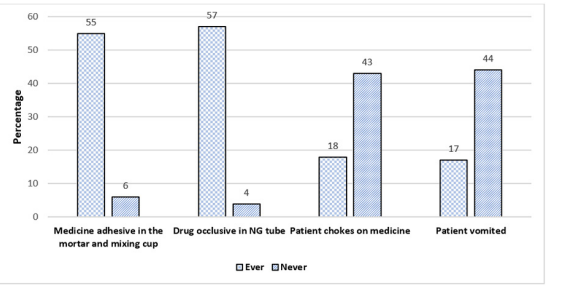

Figure 1. Problems from receiving medicine through a feeding tube.

receiving drugs via feeding tubes. However, only 66.3% of caregivers were aware of the availability of specialist pill-splitting devices (such as pill splitters). Nonetheless, hospitals (93.3%), online stores (91.0%), and drugstores (64.0%) were among the suppliers of specialized pill-splitting devices that caregivers or volunteers approximately recognized, as shown in Figure 1. 82.6% of patients who received support from caregivers reported no difficulties in adjusting their medication dosage. Additionally, patients with medication organizers who regularly read labels before taking medicine reported considerably fewer instances of medication forgetfulness ($p<0.05$).

The analysis focused on the correlation between the four drug use problems listed and the 16 indicators. The authors reported the correlation between the individual adjusting the dosage, the person managing the medication administration, and the person preparing the medication. Furthermore, the authors reported the patient's age, their inability to read pill labels, and their failure to take the medicine. The authors discovered a correlation between the patient's lack of knowledge about medicines, their educational level, and their employment status. Finally, a correlation was reported between allergic/adverse drug reactions, choking on pills, and choking on liquid medicine ($p<0.05$).

Discussion

This high prevalence rate indicates that a significant number of aged care residents are at high risk of malnutrition, dehydration, aspiration pneumonia, and a reduced quality of life. Prioritization of timely assessment, accurate diagnosis, and appropriate management pathways are, therefore, of utmost importance. Despite a prevalence being estimated, it is clear that the true burden of dysphagia in this population remains underestimated[11]. There was a discrepancy between the patients' self-identified and actual assessed medication management abilities. Furthermore, patients used routines and techniques for coping that did not align with their medication schedule and the product labels' usage recommendations to manage the complications of their total drug regimen[12]. In an investigation concerning medication administration problems in individuals with dysphagia, 65.2% of participants were using feeding tubes to provide their prescribed medicines. Additionally, the authors discovered two potential problems with feeding tubes: drug clogging (93.4%) and drug residue in the mortar or mixing cup (90.2%). Furthermore, 29.5% of subjects choked after receiving medicine. This result found that food and medicine were the main causes of tube obstruction in dysphagia patients who had tube feeding after a stroke. Medication is the cause of tube clogging. For example, doxazocin, which is crushed, changes into xatral® XL, which is not crushable. Moreover, the authors discovered that the example of pellet preparation was omeprazole, which was the reason for the tube obstruction. According to the general medication management data collected from volunteers and caregivers, caregivers have been persuaded to adjust the dosage of their medications. Ignoring the medicine is associated with age. Their knowledge of the drugs they administer is influenced

by their work position and educational attainment ($p<0.05$).

The outcome of the study aligned with earlier research that investigated older adults' management of drug behaviors in Thailand. In a previous study, medication use was correlated with decision-making skills and medication management approaches. The elderly demonstrated three primary medication management behaviors: 1) noncompliance with medical advice, 2) unsafe self-medication due to ignorance, and 3) improper handling and storage of medications[13]. Furthermore, the study confirmed that recent examinations of the issues patients face when taking their medications have revealed physical, sensory, and/or cognitive limitations in managing the medications or using their devices, as well as in reading and comprehending the labels[14,15].

Swallowing impairments negatively impact solid oral dosage form administration, leading to poor adherence and inappropriate alterations (e.g., crushing, splitting). Different strategies have been proposed over the years in order to enhance the swallowing experience with solid oral dosage forms, by using conventional administration techniques or applying swallowing aids and devices. Nevertheless, new formulation designs must be considered by implementing a patient centric approach in order to efficiently improve solid oral dosage forms administration by older patient populations[16].

A variety of factors influenced medication management behaviors, including individual abilities (e.g., knowledge, attitude, memory, vision, manual skills), routine duties (e.g., work, caregiving), modifications to behavior due to disease symptoms and treatment outcomes, social factors (e.g., family, neighbors, medical personnel), and medication-related factors (e.g., drug properties, side effects, medication administration complexity). Remarkably, powder, tablets, capsules, and liquid forms (such as clear liquids, suspensions, and emulsions) were the most often used medicine forms, with tablets being the most commonly used. However, not all patients could swallow tablets, especially those receiving tube feedings. In such cases, caregivers might attempt to crush tablets for administration, despite the potential adverse effects on drug efficacy (drug interaction) and interactions with food or other medications (drug-food interaction)[17,18]. Patients unable to read medicine labels discovered that they had missed 100% of the prescribed medication. Because the patients in this group often take their pills by recalling the medication's color, dose, and time of administration. Patients who were able to consistently read medicine labels, compared to those who could only read them, sometimes missed 93.1% and 66.7% of their medications, respectively. The authors believe that while both groups disregarded reading the medicine before taking it, the frequent usage of medication was the cause of the medication omissions. As a result, to improve the effectiveness of treatment and the patient's quality of life, the pharmacist has to evaluate the scenarios and find out how to create a procedure that will teach this group of volunteers or caregivers about medication administration.

However, individuals with polypharmacy who live at home should self-prepare and administer medications following an arrangement schedule and use guidelines. A certain level of cognitive, perceptual, and behavioral abilities is required for this[19]. The authors found that 45.2, 29.0, 25.8, and 29.0, respectively, of the patients with comorbidities such as stroke, hypertension, dyslipidemia, and gastrointestinal disorders receive treatment with polypharmacy. However, the present study's findings were not as comprehensive as those of cancer patients. Additionally, 61 percent of cancer patients obtained their prescription drugs from several hospitals[20]. From the difficulties in administering medication to individuals who have dysphagia to various factors affecting the patient's medication administration, pharmacists should therefore provide strategies or put enormous value on medication education for this group of patients.

In conclusion, this research shows that caregivers and volunteers who manage patients with dysphagia who are experiencing problems with inappropriate drug use have ineffective medication management practices. This decreases the treatment's efficacy and affects quality of life. In addition to their medical skills, pharmacists play a significant role in drug management. To enhance precision and reduce errors in the administration of medicine, a combination of science and art is essential. By adapting and expanding knowledge, as well as cultivating a positive mindset among patients and caregivers about drug management, pharmacists ensure the accurate administration of medication to patients. In this scenario, a pharmacist is a person who developed tools or standardized procedures that reduce medicine administration problems for individuals suffering from dysphagia.

What is already known on this topic?

Research indicated that 68.5% of subjects were unable to ingest their medication orally, and 78.7% could not self-administer it. The authors found that the subjects were unable to ingest oral tablets. The subjects suffered pain after getting medicines via feeding tubes.

What this study adds?

The present study discovered that the most prevalent issues with feeding tube administration were medications left in the mortar or mixing cup (90.2%) and medication obstructing the tube (93.4%). Despite the fact that the volunteers frequently struggled with swallowing pills and

had to divide them, this issue significantly impacted their ability to receive medications through feeding tubes. This reduces the treatment's effectiveness and impairs quality of life. In addition to their medical expertise, pharmacists play an important role in drug management.

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Conflicts of interest

The authors declare no conflict of interest.

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