# Investigation on oral nursing of elderly patients and prognosis of patients

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**Abstract.** – **OBJECTIVE:** To understand the oral care status of elderly inpatients in various departments, analyze the existing problems, and provide a basis for further improving the oral care practices and promoting the oral health of elderly patients.

**PATIENTS AND METHODS:** This study intends to investigate the oral care status of patients in a tertiary hospital in Chongqing. This study was divided into two phases, the first phase was designed as a cross-sectional study. Our aim was to explore the implementation status of oral care in each department. The second phase of this study was to explore the correlation between patient oral care and patient outcomes.

**RESULTS:** We extracted a total of 9,164 cases of elderly discharged patients. Primary care patients were mainly distributed in various general wards, among which orthopedics was the most frequent, accounting for 30.19%. The oral care doctor order rate of the patients with premium care was 80.21%, and the rate of oral care orders of the primary care patients was only 2.10%. The study analysis found that among surgical and intensive care unit (ICU) patients, patients in high-frequency group and low-frequency group were significantly better than that of patients without oral care in terms of overall survival.

**CONCLUSIONS:** The oral care is still insufficient, and the frequency of use is relatively infrequent. This study also found that oral care can improve patient outcomes and reduce the incidence of ventilator-associated pneumonia (VAP).

*Key Words:*
  Oral Nursing, Elderly, Prognosis.

## Introduction

The oral cavity is a complex and complete ecosystem[1]. The suitable temperature, humidity and food residues in the oral cavity provide a favorable environment and conditions for the growth and reproduction of microorganisms[2]. Coupled with its special physiological structure and characteristics, it has become one of the ways for pathogenic microorganisms to invade the human body that can lead to the occurrence of various diseases. Oral care is an important measure to maintain good oral hygiene, and the cotton ball wiping method has been the most commonly used oral care method for many years[3-5].

The physiological function and self-care ability of the elderly decline, and oral hygiene is more likely to affect their physical and mental health and social interaction. A number of studies[6] have shown that the oral hygiene status of elderly patients is not optimistic, and the incidence of oral problems such as caries, periodontal disease, and mucosal lesions ranges from 70.0% to 87.6%. Several studies[5,6] have also found that elderly patients with non-tracheal intubation and indwelling nasogastric tubes lack the knowledge of oral health care, and their healthy oral hygiene habits are weakened after admission, and their oral health status has not been significantly improved. Implementing oral care can effectively control plaque, reduce the risk of caries and periodontal disease, and improve oral cleanliness and comfort[7,8]. Nurses play a key role in promoting oral health management as primary implementers and educators of oral care for elderly patients during hospitalization. The purpose of this study is to understand the oral care status of elderly inpatients in various departments, analyze the existing problems, and provide a basis for further improving the oral care practices and promoting the oral health of elderly patients.

## Patients and Methods

This study intends to investigate the oral care status of patients in a tertiary hospital in Chongqing. The hospital has more than 3,000 beds, 35

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clinical departments, and 7 ICUs, with an annual discharge of about 130,000 patients. Inclusion criteria of patients: patients aged ≥60 years in premium care and primary care (except oral and maxillofacial surgery). This study was divided into two phases, the first phase was designed as a cross-sectional study. Our aim was to explore the implementation status of oral care in each department. The specific process was as follows:

Through the hospital HIS system, the oral care orders of patients who met the inclusion criteria from January 1, 2020, to December 31, 2020, were retrieved to understand the patients' oral care status during their stay in the hospital. The specific method was as follows:

1. Key fields for data extraction: "Age ≥ 60 years old and special care or primary care"; "Age ≥ 60 years old and oral care and premium care or primary care".

2. Data extraction process: contact the director of the nursing department of the relevant hospital, explain the research purpose, and obtain the support of the nursing department. Then the technical staff of the information department retrieved the relevant data from the hospital informative system.

3. Data solidification: The data extracted by the HIS system is encrypted and solidified by the information section and sent to the information officer of the nursing department in the form of OA mail, and then sent to the researcher by mail.

The second phase of this study was to explore the correlation between patient oral care and patient outcomes. The oral care orders of patients hospitalized from January 1, 2020 to December 31, 2020 were retrieved retrospectively, and the patients were divided into oral care group (high-frequency), oral care group (low-frequency) and no oral care group. The study outcome was set as the patient's survival status, and the patient's death was set as the occurrence of the outcome event. At the same time, important clinical information such as gender, age and major comorbidities of patients were extracted. For ICU and surgical patients, the secondary outcome was the incidence of ventilator-associated pneumonia (VAP).

### Statistical Analysis

Statistical analysis was performed by Statistical Package for Social Science (SPSS version 25.0, IBM Corp., Armonk, NY, USA) and R (version 4.0.5, The R Foundation for Statistical Computing, Vienna, Austria). Continuous variables were expressed in mean ± standard deviation or median (range) as appropriate. Differences between subgroups were analyzed using $\chi^2$ or Fisher's exact test for categorical parameters and student *t*-test and Mann-Whitney U test for continuous parameters as appropriate. The Kaplan-Meier (KM) method was used to estimate the cumulative probability of study endpoints. All statistical tests were two-sided. Statistical significance was taken as $p < 0.05$.

## Results

### Baseline Characteristics of Included Patients

We extracted a total of 9,164 cases of elderly discharged patients. Among the 9,164 cases, there were 5,084 males and 4,080 females; aged 60-103 years old, with an average age of 71.24 years old; 4,397 patients in special care, 4,767 patients in primary care. Premium care patients are mainly distributed in various ICUs, and the Coronary Care Unit (CCU) is the largest, accounting for 29.07%. Primary care patients were mainly distributed in various general wards, among which orthopedics was the most frequent, accounting for 30.19% (Table I).

### Patient Oral Care Order Rate

There were 3,627 patients with oral care orders, accounting for 39.58% of the total, and 3,527 ICU patients, accounting for 97.24% (Table II). The oral care doctor order rate of the patients with premium care was 80.21%, and the rate of oral care orders of the primary care patients was only 2.10%.

### Frequency of Patient Orders for Oral Care

The oral care frequency of 3,627 elderly hospitalized patients was mainly bid, accounting for 65.21%, and the rest are shown in Table III. The frequency of oral care in 18.94% of the patients was qid, and the frequency of 5.43% was qd.

### The Relationship Between Oral Care and Patient's Disease Treatment Outcome

The second phase of the study explored the association between oral care and patient outcomes. A total of 9,164 elderly patients were included in this study, and 3,627 of them had oral care. We

**Table I.** Distribution area of special and first-class care elderly inpatients (n=9,164).

| Department | Premium care (N) | Primary care (N) |
|---|---|---|
| ICU | | |
| RICU | 451 | - |
| NICU | 383 | - |
| NSICU | 328 | - |
| CCU | 1,278 | - |
| CSICU | 1,246 | - |
| SICU | 235 | - |
| EICU | 476 | - |
| Normal Department | | |
| Nephrology | - | 89 |
| Gastroenterology | - | 62 |
| Endocrinology | - | 67 |
| Cardiology | - | 14 |
| Hematology | - | 38 |
| Geriatrics | - | 42 |
| General Medicine | - | 48 |
| Traditional Chinese Medicine | - | 6 |
| Infectious Diseases | - | 41 |
| Respiratory Medicine | - | 306 |
| Neurology | - | 422 |
| Oncology | - | 15 |
| Psychiatry | - | 1 |
| Rehabilitation Medicine | - | 26 |
| Gastrointestinal Surgery | - | 18 |
| Hepatobiliary Surgery | - | 97 |
| Vascular Surgery | - | 323 |
| Burn Plastic Surgery | - | 19 |
| Neurosurgery | - | 23 |
| Orthopedics | - | 1,439 |
| Urology | - | 782 |
| Cardiothoracic Surgery | - | 74 |
| Otorhinolaryngology | - | 454 |
| Ophthalmology | - | 3 |
| Gynecology | - | 349 |
| Pain Department | - | 9 |

ICU means intensive care unit; RICU means respiratory intensive care unit; NICU means neurological intensive care unit; NSICU means neurosurgery intensive care unit; CCU means coronary care unit; CSICU means cardiac surgery intensive care unit; SICU means surgical intensive care unit; EICU means emergency intensive care unit.

**Table II.** Oral care orders for elderly inpatients (n=9,164).

| Department | Premium/Primary care (N) | Oral care doctor's order | |
|---|---|---|---|
| | | Yes [n (%)] | No [n (%)] |
| RICU | 451 | 450 (99.78) | 1 (0.22) |
| NICU | 383 | 376 (98.17) | 7 (1.83) |
| NSICU | 328 | 328 (100.00) | - |
| CCU | 1,278 | 993 (77.70) | 285 (22.30) |
| CSICU | 1,246 | 674 (54.09) | 572 (45.91) |
| SICU | 235 | 233 (99.15) | 2 (0.85) |
| EICU | 476 | 473 (99.37) | 3 (0.63) |
| Normal department | 4,767 | 100 (2.10) | 4,667 (97.90) |
| Total | 9,164 | 3,627 (39.58) | 5,537 (60.42) |

RICU means respiratory intensive care unit; NICU means neurological intensive care unit; NSICU means neurosurgery intensive care unit; CCU means coronary care unit; CSICU means cardiac surgery intensive care unit; SICU means surgical intensive care unit; EICU means emergency intensive care unit.

**Table III.** Oral care orders for elderly inpatients (n=9,164).

| Department | N | Oral care frequency [n (%)] | | | |
|---|---|---|---|---|---|
| | | qd | bid | tid | qid |
| RICU | 450 | - | - | 378 (84.00) | 72 (16.00) |
| NICU | 376 | - | 295 (78.46) | - | 81 (21.54) |
| NSICU | 328 | - | - | - | 328 (100.00) |
| CCU | 993 | 156 (15.71) | 837 (84.29) | - | - |
| CSICU | 674 | - | 674 (100.00) | - | - |
| SICU | 233 | - | 189 (81.12) | - | 44 (18.88) |
| EICU | 473 | - | 311 (65.75) | - | 162 (34.25) |
| Normal department | 100 | 41 (41.00) | 59 (59.00) | - | - |
| Total | 3,627 | 197 (5.43) | 2,365 (65.21) | 378 (10.42) | 687 (18.94) |

RICU means respiratory intensive care unit; NICU means neurological intensive care unit; NSICU means neurosurgery intensive care unit; CCU means coronary care unit; CSICU means cardiac surgery intensive care unit; SICU means surgical intensive care unit; EICU means emergency intensive care unit.

analyzed the data according to different department types, including internal medicine, surgery and ICU. The main outcome of this study was the survival of patients. The frequency of oral care was divided into high-frequency group (tid and qid), low-frequency group (qd and bid), and no oral care group. The study analysis found that among surgical and ICU patients, patients in high-frequency group and low-frequency group were significantly better than that of patients without oral care (*p* lower than 0.001) in terms of overall survival (Figure 1). Our secondary outcome was the occurrence of pneumonia. Analyses in surgical and ICU patients found that oral care significantly improved the incidence of hospital-associated pneumonia.

## Discussion

A total of 9,164 cases of discharged elderly patients were extracted in this study, and 3,627 patients had oral care orders, accounting for 39.58% of the total. The oral care doctor order rate of the patients with premium care was 80.21%, and the rate of oral care orders of the primary care patients was only 2.10%. The oral care frequency of 3,627 elderly inpatients was mainly
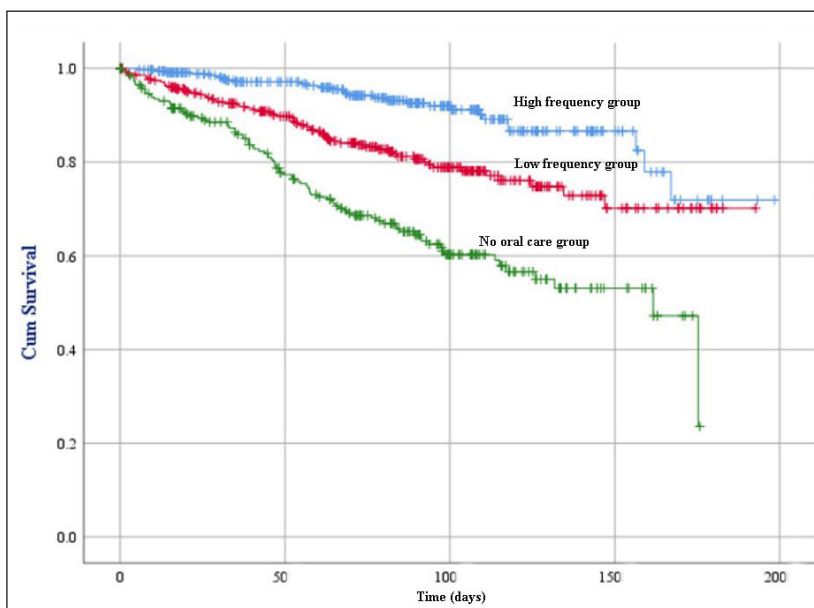


**Figure 1.** The KM curve for patients from different groups on the survival.

bid, accounting for 65.21%. In addition, research analysis found that among surgical and ICU patients, patients in the high-frequency group and the low-frequency group were significantly better than that of patients without oral care in terms of overall survival. Analyses in surgical and ICU patients found that oral care significantly improved the incidence of hospital-associated pneumonia. At present, there is still a lack of understanding of oral care.

At present, the main oral care method is still the traditional cotton ball scrubbing method, which is suitable for critically ill patients who cannot take care of themselves[9,10]. There is also evidence that a variety of improved oral care methods such as oral rinsing, gargling, and tooth brushing have improved the nursing effect[11]. The combination of oral scrubbing and rinsing can delay the occurrence of VAP and effectively reduce the incidence of VAP in critically ill patients[12]. However, new oral care methods have not been widely used. In the United States, the routinely used oral care methods are scrubbing, and rinsing, and there are no reports of using electric toothbrushes for routine care[13]. Brushing with a toothbrush is considered the best way to clean the mouth.

Oral care solutions are widely used in intensive care units, and it is very important to select oral care solutions according to the patient's condition[14-16]. The selection of drugs based on oral pH measurements can improve oral care, especially when the oral cavity is in an acidic environment, the use of sodium bicarbonate mouthwash can effectively reduce fungal infections[17]. Certain herbal gargles improve oral care. Chlorhexidine, iodophor, etc. have been proved[18] to be of great significance to reduce the incidence of VAP. Only a few units in China use chlorhexidine as a routine care solution. European surveys show that oral care solutions are commonly used in intensive care units for oral care, of which chlorhexidine is the most used[19]. In the United States, 96% of intensive care units use different types of oral care solutions, with an average of 1.4 different types of care solutions per care unit. Among them, 20% used chlorhexidine, 10% used normal saline, and none used iodophor[20].

Our study showed that oral care could improve patient outcomes and reduce the incidence of VAP in surgical and ICU patients. Critically ill patients, especially mechanically ventilated patients, have complex types of pathogenic bacteria in the respiratory tract and oropharynx, and the probability of mixed infection is high. Oral care through sputum culture and drug susceptibility results combined with systemic medication and mouthwash can make most patients with positive sputum culture turn negative after 1 week or convert multi-strain infections to single strains. Results from a prospective cohort of 16 ICUs in Canada showed conclusive evidence that inhaled oropharyngeal colonization of pathogens is a potential, relatively independent risk factor for VAP. Taking reasonable measures to reduce the microbial colonization of the oropharynx has a positive effect on the prevention of nosocomial infection. Previous studies[19,20] found that a selective use of antimicrobials and disinfectants in the oropharynx reduced colonization by pathogenic microorganisms and was beneficial in reducing mortality in intensive care unit patients. This might be one of the reasons why we found that the oral care was beneficial to the survival of our patients.

### Limitations

There were several limitations in the present study. First, the sample size of the study was not large enough, the future study should validate our results in a larger sample size. Second, the retrospective design might lead to bias. Third, the study was a single center study, multicenter study might provide more evidence than the present study. Fourth, the follow-up duration was relatively short.

## Conclusions

In summary, the oral care is still insufficient, and the frequency of use is relatively infrequent. This study also found that oral care can improve patient outcomes and reduce the incidence of VAP.

### Conflict of Interest
The Authors declare that they have no conflict of interests.

### Ethics Approval
The study was approved by the Ethics Committee of the First Affiliated Hospital of Chongqing Medical University. All methods were performed in accordance with the ethical standards as laid down in the Declaration of Helsinki and its later amendments or comparable ethical standards.

### Informed Consent
Written informed consent was obtained from all participants.

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