Advantages of Bedside Flush Toilet for those who require nursing care

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Abstract

In this study, we report the advantages of two types of Bedside Flush Toilet (BFT) for those who require nursing care. 1) Fixed BFT for the new-built special senior citizens nursing home, “Nanokamachi Komakusa-en” in Yamagata-city can realize unassisted elimination for several residents. Some residents have increased ADL in several months. We found the fixed BFT has many definite merits but it is used by only less than 20% of residents in nursing home and it is difficult to install to used buildings. 2) Mobile BFT have the same merits as fixed one with less term and personal installation cost for remodeling.

Keywords

Nursing care, commode chair, flush toilet, bedside toilet, ADL

1 Introduction

Recently, the burden of the care is rapidly increasing more and more due to the declining birthrate of 1.27 and a growing proportion of elderly people in Japan. The long-term care insurance system was established in 2000 for those who require nursing care with the aim of fulfilling their wishes to maintain their dignity and independence.
The long-term care expenditures are expected to be approximately 19 trillion to 24 trillion yen in 2025.

Those who require nursing care can use 1) In-home services including nursing care preventive services, 2) In-home care support, 3) Community-based services, 4) Facility services after certification of long-term care need at the municipal level. The certification is classified into two levels of requiring support and five levels of requiring long-term care. Those who certified as requiring long-term care level 5 needs the heaviest nursing care. Those who certified as requiring support are subsidized nursing benefits.

The current total expenditures for long-term care are approximately eight trillion yen. Figure 1 shows the number of care service users is approximately 4.7 million in April of 2009 with the annual growth rate of 115%. Figure 2 shows the population by age group and the number of those who certified as requiring support. The ratio of them is increasingly frequent with age rapidly; above 30% of over 80 and above 67% in over 90.

Excretion care is one of the heaviest burdens of the care personnel. Figure 5 shows the result of a questionnaire into facilities for the senior citizens (the special nursing-care homes for the aged and the welfare institutions for senior citizens people). The heavy burdens of the care personnel are bathing assistance, excretion care, help with eating and change of diaper in descending order. Bathing assistance can be applied home-
visit bathing long-term care, however excretion often needs irregular assistance many times including at midnight, so it is the great work of housemate.

Diapers are used for bedridden adults and those who have no urge to defecate. Generally, an outer diaper and inner changeable pad is used in combination in Japan from 1989. A changeable pad could be used as an inner liner in a diaper and removed after urination without changing the diaper. Diaper might allow them to remain bedridden and neglect their activities of daily living (ADL).

Commode chairs at bedside comes into popular use for toilets of those who have difficulties to walk from the bed to the bathroom. They are also used at elsewhere in home because they cannot be assisted in narrow bathroom such as width of 800mm. There are many kind of commode chairs in various forms and materials, that resemble furniture in appearance or compatible with shower chair. Some of them have functions such as solidification treatment or packing to dispose night soils easily, but dispose of human waste is still physical and mental burdens for not only care personnels but also those who require nursing care because they feel a delicacy about handling it with stenches. We heard many opinions directly at the hospitals and the various care sites in our survey

“I hate my night soils to be seen by my family”
“I’m sorry that my family disposes my night soil, and I’m full of lament.”

We think independent toilet care for those who require nursing care is important to help them maintain and restore functions of normal everyday life, furthermore to preserve their dignity.

2 Advantages of BFT

2.1 Analysis of present state of BFT
Toilets of wards or rooms of facilities for the senior citizens are usually placed near the entrance in Japan. Figure 6 shows their typical room size of approximately five meters by three meters. The toilet is located three to four meters away from bed in this case. This distance is too far for ones certified as requiring long-term care level 3 to 5, to travel with continence.

We define Fixed BFT as installed toilet at bedside within a distance of one or two steps in Figure 7. User can travel safely from bed using handrail. Figure 8 is the example of Fixed BFT. It can decrease the risk of falling in traveling to toilets. Even senior citizens with feeble legs and little physical strength can use toilet by their own effort.

We conducted a web research and door-to-door survey of Fixed BFT installed in single dwelling houses. The results are shown in Figure 9 and Figure 10. The population of web research was 25,113 families of over the age of 30 who had made a house renovation or refurbishment within 15 years. Fixed BFT were installed in 0.9% of all age groups; meanwhile toilets near bedroom were installed 6.2% of them. The ratio of installation of Fixed BFT has no large imbalances between age groups between over 30 to over 70. Figure 11 shows the example of Fixed BFT at single dwelling house. In door-to-door survey, we found Fixed BFT was installed by those who have the ability to walk to avoid long travel to toilet in the midnight in some cases. This shows BFT aren’t used only for those who require nursing care.

The ratio of installation of toilet near bedroom rises with age. This result reflects the fact that difficulties of travel from bedroom to toilet commonly escalate with aging. The survey revealed quite a few people remodeled toilets to shorten the distance from bedroom to toilet.

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2.2 Risks of falling of senior citizens related to toilet

Falling of senior citizens may cause bone fractures. Patients of femoral fracture generally need to be hospitalized for over one month. Some of them become confined to their bed because of muscle weakness in duration of hospital stays. Yamamoto studied postoperative results of 25 elderly patients with femoral head fracture in detail\(^1\). 23 patients acknowledged the decrease of ADL. 17 patients were newly certified requiring long-term care after bone fractures. 10 patients were put into facilities for the senior citizens. For this reason, it is necessary to pay particular attention to the prevention of accidents the falling of senior citizens.

Suzuki et al. surveyed the falling accidents in single dwelling houses of senior citizens. The results are shown in Figure 12 and Figure 13. 5.6% of the accidents occurred in living room. 35.6% of accidents in living room happened when they moved and walked to toilet. Nakano surveyed that 72% of falling accidents in facilities for the senior citizens were caused by themselves. 27.2% of the accidents occurred at excretion or moving to toilet. According to Ibaraki prefecture report, most frequent remote causes
of falling accidents were 77% of impatience to excretion or uneasiness of being incontinent.

2.3 Troubles on commode chairs

Commode chairs are generally used by those who cannot reach toilet. 300,000～400,000 pieces of commode chairs are sold in a year in Japan. Since 90% of the cost are covered by the nursing-care insurance, people can purchase it for several thousand yen. Commode chairs have a merit that no diaper disposal, however they have many demerits such as disposal and stench of night soil shown in Figure 14. Figure 15 shows the reasons for the people not to want to use portable toilets.

Kyushu University Beppu Hospital analyzed the toileting assistance with commode chair. The average time of toileting assistance was 4min 6s. The average time of disposal of night soil was 56s. Risks for falling are 72 cases of near misses and 25 cases of accidents in 3 years. 10 patients felled with their commode chairs owing to lightweight of the chairs. They said, “I thought I could toilet without assistance”. They seem to have strong intention of independent toilet.

2.4 “Komakusa Method”

2.4.1 Reason of the selection of “Nanokamachi Komakusa-en”

Michiko Tanabe, the administrative director of Nanokamachi Komakusa-en in Yamagata City, put great effort into potty training and independent toilet care by Fixed BFT from 1999, standing by the principles “Toilet care is the most important area of care relating to the dignity of people”. Yaichiro Nagaoka, the conceptor of Fixed BFT, termed it “Komakusa Method”.

We found Nanokamachi Komakusa-en and Komakusa Method according to the article of Bungei Shunju, Top 10 hospital where you can die at ease“. Nanokamachi Komakusa-en was introduced as the special elderly nursing home which can naturally practice potty training and independent toilet care. Hideomi Nakahara, the president of Nitobe Bunka Junior College said, “The bedridden resident of Nanokamachi Komakusa-en can toilet independently after four months training. BFT can change the nursing care in Japan”.

According to the results of interviews to several architect offices of the special elderly nursing home, Fixed BFT was applied only one case besides Nanokamachi Komakusa-en. We estimated the reasons that BFT was not popular in Japan were following: i) the advantages of “Komakusa Method” wasn’t analyzed quantitatively ever, ii) the cost increases with plumbing fixtures, iii) the number of beds in facilities decreases. In the
special elderly nursing home, usually toilets are placed near the entrance of room or between the next room to share with neighbors. The position of toilet is restricted by the cost and space of the pipe shaft and therefore they cannot apply Fixed BFT. BFT is hardly applied because of the restriction of the cost and space of the pipe shaft. The main building of Nanokamachi Komakusa-en has four stories of reinforced concrete structure, which was established as the special elderly nursing home in July 1999. It has 60 beds; 50 beds for residents and 10 beds for short-stay visitors. Figure 16 shows the example of a floor plan of Nanokamachi Komakusa-en. Fixed BFT are also applied in the annex established in May 2011. We studied its main building and its residents.

2.4.2 Results of survey of Komakusa Method
We surveyed in Feb. 2012. The average of requiring long-term care level of 49 residents was 4.5, which was considerably larger than 3.9 of the average level in Japan. Eight residents used Fixed BFT and others were diapered. No one used commode chairs.

All of the Fixed BFU users were women. Seven of the eight residents of Fixed BFT users had a history of femoral fracture. They came into the facility owing to difficulties in nursing care in single dwelling houses or group home after discharged from hospital. The other had difficulties in travelling from bed to toilet with left paralysis after brain infarct.

The changes of physical status of eight residents after moving are shown in Figure 17. We classified ADL into 5 levels; A (who can walk), B (who cannot walk but can stand), C (who cannot stand but can sit), D (who cannot sit), E (almost bedridden) and independence of toilets into 3 stages; 1 (no incontinence with desire to defecate), 2 (incontinence with desire to defecate), 3 (incontinence without desire to defecate) in Figure 17. Six of the eight residents of fixed BFT users improved her independence of toilets. Two of the six also improved her ADL.

For example, Ms. S, 85 years old of requiring long-term care level 4, came to the facility because she couldn’t walk after she had broken her thighbone and discarded
from hospital. She had needed excretion support first, however she was able to evacuate by herself a month later.

Ms. M, 78 years old of requiring long-term care level 4, came to the facility by similar reason of Ms. S. She was bedridden and diapered at first. She gradually improved her physical status in 18 months. She could totter along arm rails and evacuate by herself with napkin-type incontinence pads after training.

Ms. N, 90 years old of dementia rank M, improved her independence of toilet from level 3 to level 1 after coming to the facility with similar reason of Ms. S. She was senile dementia of Alzheimer type, so she roared in going to toilet in the middle distance because she couldn’t make out the toilet at first. She could gradually make out lying toilet close to her bed. Finally, she became to be able to take a pee sitting on the Fixed BFT. She still used napkin-type incontinence pads. Her care assistant said, “She could have been bedridden without BFT”.

Ms. Tanabe said, “Excretory behavior by oneself is a kind of physical and mental rehabilitation measure for close bedridden senior citizens. It could also slow one's progress of dementia, prevent situation of bedridden, and draw one's residual function.“ The utilization ratio of Fixed BFT in Nanokamachi Komakusa-en was only 16.3%. Fixed BFT installation to all rooms in the special elderly nursing home may be excess investment in spite of its secure improvement on the independence of toilets. Ideal installation of BFT for the facilities is to install only for the ones who need to use it. We came across the following difficulties in installation of conventional toilet as fixed BFT to rooms of the special elderly nursing home:

1) over $\phi 100$ opening to reinforced concrete wall without cut of reinforcement arrangement
2) adverse influences on downstairs such as temporary refuge and water stoppage,
3) noise and dust in installation

2.5 Mobile Bedside Flush Toilet(BFT)

2.5.1 Overview of Mobile BFT
TOTO had developed Mobile BFT to reduce burden of excretion help in single dwelling houses and did field trial for five years from 2005. Figure 18 shows appearance of Mobile BFT. It was floor-standing toilet combined a tankless, one-piece toilet with a flapper valve, intelligent seat, armrest, and crush-pumping unit. It had two wheels on backward legs to be moved smoothly with less power. Figure 19 showed cross-section structure of Mobile BFT. Human waste and toilet paper are crushed to be passed screen of $\phi 10$ in crush-pumping unit and pumped into drain hose when the flush-button is pushed. Conventional toilets were applied to gravity drainage, which must be connected to 75A of drain pipe with gradient of 1/50. Mobile BFT is applied pumping drainage, which can connect 20A drain with zero gradient. It can arrange its position or direction according to the body situation of those who require nursing care. The smaller drain hose can make easy installation for remodeling of facilities and houses.

2.5.2 Results of test marketing of Mobile BFT
Figure 20 shows the buyer’s motives of Mobile BFT. Figure 21 shows attribution of buyers of Mobile BFT. 60% of buyers’ motives were to reduce burden of excretion help for those who require nursing care. Most of the Mobile BFT were bought for less
severe senior citizens than residents in Naokamachi Komakusa-en to prevent falling accident in future. Some healthy elder people with no trouble walking bought it on fears of falling while walking from bed to toilet in midnight or after awaening.

![Figure 18-Appearance of Mobile BFT](image)

![Figure 19- Composition of Mobile BFT](image)

The typical comments of customers were following:
“I'm deeply grateful. My house was deodorized!”
“I can evacuate without worrying about anything.”
“I need not to wash the bucket of commode chair!”
“Great! I do not have to see any more what I hate to see!”

![Figure 20- Reasons of purchasing the Mobile BFT](image)

![Figure 21- Physical conditions of those who purchased the Mobile BFT](image)

Figure 22～Figure 24 shows three actual cases.
User Ms. A, user of wheel chair of requiring long-term care level 2, bought it to excretion without help. She said, “It is user friendly bedside toilet because it can be moved at my request after installation. I really appreciate Mobile BFT. Please use my photo for the promotion of this product.”
User Ms. B, left paralysis of requiring long-term care level 2, bought it to reduce burden of nursing care by her aging sickly husband. She said, “We won’t be able to wash the bucket of commode chair in near future, so we selected Mobile BFT to locate a toilet in the center of my bed room.”

User Ms. C, requiring long-term care level 3, could move laterally with effort. She could not travel to toilet by herself for 8m of the distance from bed to toilet. Her son bought a Mobile BFT to provide comfortable life for her. He said, "We didn’t know this kind of toilet. TOTO should bring it to the mainstream. We want it not only for her but also for us in future. We are so lucky!!"

2.5.3 Merits on installation of Mobile BFT
30% of buying motive of Mobile BFT was to avoid the impossibility of plumbing, due to 1/50 of secure gradient and 75A of thicker pipe with gravitational drainage. The crush-pumping unit can drain human waste and paper through 20A of thinner pipe with zero gradient, so Mobile BFT can be used as a ubiquitous toilet. Mobile BFT has many beneficial effects on both facilities for the senior citizens and single dwelling houses such as:

1) Easy installation : 20A piping allows us to install flush toilets in existing buildings or houses with much smaller holes as ordinary flush toilets.
2) Installation on demand : To install BFT in the room where the resident needs it is easy by pre-installing sleeves for piping.
3) Mobility : Flexilbe pipes enable to position change according to the user's physical condition changes.

3 Consideration
It is said that one of the biggest reasons to give up home care is excretion nursing, so we believe that the independent toilet is the key to promote home care for those who require nursing care in hyper-aged society. Residents of facilities are eager to excrete by themselves.

BFT has a beneficial effect on not only independent toilet but also improvement of ADL for those who require nursing care. The improvement of ADL can block out the step-like route from falling to hospital stay to bedridden state. Kyushu University Beppu Hospital studied the improvement of ADL by a Mobile BFT for a woman of 40’s
with Marfan syndrome. She could excretion without help after suitable toilet training of eight months.

In order to preserve human dignity and reduce burden of nursing care with BFTs, we think it is necessary to solve various installation problems of them to facilities or dwelling houses. Mobile BFT can solve most of the problems.

We also identify and remedy the problems of Mobile BFT in field test such as ease of mobility, robustness against foreign matters, and pressure mitigation of crush-pumping unit without air pipe. We will reports those studies in near future.

Note

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