

Original**Introducing A Floor Cleaner with Dust Collection Function for Hospital Kitchen**

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ABSTRACT *Background and purpose.* In Japan, recent soaring prices and labor cost hikes have put pressure on hospital food service operations, and cost-cutting measures are challenging. We believe that cost-effectiveness can be improved by changing a kitchen with a dry systemized floor cleaning from 4 processes (conventional method) such as mop and squeegee (drainage) to 1 process (FD method) with a floor cleaner with dust collection function. We tried to clarify this question in this research. *Methods.* This research was conducted in a kitchen with a dry systemized a 457-bed acute care hospital in Tokyo (49 kitchen employees, providing approximately 1,000 meals per day). Data include retrospectively summarized data from daily "hospital meal work diary" records in 2022, so comparative research of the first 6 months (conventional method) and the latter 6 months (FD method). The target of the floor cleaning was the non-contaminated area (cooking room) with a total of 134.2m², cleaning once a day, with cleaning, sanitizing, and brushing once a month. *Results.* The total work time for cleaning and disinfection was 559.5 hours for the conventional method and 182.5 hours for the FD method, with a difference of 377 hours. This difference can be said to have reduced the cleaning labor time by 33%. Assuming that one employee works 8 hours a day, work will be reduced by 47 days. Personnel costs were 1,035,075 yen for the conventional method and 337,625 yen for the FD method. Labor costs for cooking assistants vary depending on years of experience. Therefore, the calculation was based on the average wage according to the "Salary Contract Schedule". Detergent and disinfectant costs were 73,000 yen for the conventional method, and 37,778 yen for the FD method, and tool costs were 9,000 yen for the conventional method and 30,000 yen for the FD method. The total cost for six months was 1,117,075 yen for the conventional method and 405,403 yen for the FD method, with a difference of about 712,000 yen. The FD purchase cost was thus offset in about 2.4 months. *Conclusion.* By changing from the conventional method to the FD method for cleaning a kitchen with a dry systemized floor area of 134.2 m², we were able to reduce the work time by 377 hours and the cost by about 712,000 yen over 6 months.

Keywords: a floor cleaner, hospital kitchen floor cleaning, cost-effectiveness

INTRODUCTION

In Japan, recent soaring prices and labor cost hikes have put pressure on hospital food service operations, and cost-cutting measures are challenging. However, there are few reports on solutions, and the government has not approved support for capital investment.

Hospital meals in Japan are hygienically managed according to the sanitation management manual for mass cooking facilities by Hazard Analysis Critical Control Points (HACCP) (1), as in other countries (2). It stipulates that kitchen floors should be cleaned at least once a day and, if necessary, washed, and disinfected. However, no specific cleaning or washing/sanitizing methods are specified. Furthermore, it is also stated that "it is desirable to actively promote a dry system. Not only hospitals but also the kitchens of

group feeding facilities, including school lunches, should introduce dry systems and if they have not been introduced, it is clearly stated that a dry operation should be attempted (3). With the aging of the working population in Japan (4), most of the employees responsible for cleaning kitchen floors are middle-aged and elderly. For them, cleaning floors daily is a whole-body job, and it takes a long time to complete the four steps. In addition, the monthly cleaning, sanitizing, and brushing work requires strength when handling the large automatic washer for commercial use (used not only in the kitchen but throughout the hospital) because it is large and heavy. Therefore, we thought that the work time could be shortened by introducing floor cleaners with a dust collection function (FD). However, FD has a high capital investment cost as a cleaning tool, and there is yet no verification of whether labor efficiency will increase when it is introduced for cleaning floors in hospital kitchens. Therefore, in this research, a kitchen with a dry

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systemized floor cleaning was changed from 4 processes (conventional method) such as mop and squeegee (draining) to 1 process (FD method), This was carried out to clarify the cost-effectiveness of the change.

MATERIALS AND METHODS

The hospital under research is a Tokyo hospital with 457 beds, and 49 kitchen employees, and serves approximately 1,000 meals per day. The floor cleaning area under research was a dry systemized non-contaminated area (cooking room), with a total floor cleaning area of 134.2 m² (excluding the area of cooking equipment and cooking tables installed directly and fixed above the floor), The research period was 6 months from January to June 2022 for the conventional method and 6 months from July to December 2022 for the FD method, Data was collected from daily "hospital meal work diary" records.

The cleaning and washing/sanitizing method (conventional method) was performed as follows. At least once a day: 1) Remove dust with a broom and dustpan, 2) Wipe with a mop soaked in a neutral detergent (for severe oil stains, use a special cleaning agent for oil stains), 3) Wipe a well-washed mop, 4) Drain with a squeegee or wipe dry with a dry mop. In

addition, once a month, for cleaning, sanitizing, and brushing: 1) Remove dirt and dust with a large commercial floor cleaner, 2) Brushing and collect sewage while spraying a neutral detergent containing a floor disinfectant such as sodium hypochlorite in a large automatic washer for commercial use, and 3) Wipe dry with a drainer or a dry mop.

In the FD method, a floor cleaner with dust collection function for cleaning the dry zone (Karcher BR 30/4 C Bp https://www.kaercher.com/jp/profesional/pro_hygiene.html) was used.

The instruction manual for this product explains that the water supply tank is 4 L and consumes 1 L of water per minute. Therefore, we decided to stop using the water supply tank and use the FD to wash the floor after sprinkling a cleaning and sanitizing solution on the floor. Because this FD is small and cordless, it is easy to handle. In general cleaning, 4 processes and once a month, for cleaning and disinfection are required, but this FD is equipped with a dust collector, it can vacuum floor debris while simultaneously cleaning and sanitizing the floor with a cleaning and sanitizing solution and brush. In addition, it can also collect sewage. This means that daily and monthly cleaning and sanitizing can be completed in one process

RESULTS

Table 1 shows a comparison of the cleaning time and various costs of the conventional method and the FD method. The floor cleaning was the non-contaminated area (cooking room), which

used a dry system, with a total floor cleaning area of 134.2m² (excluding the area of cooking equipment and cooking tables installed directly and fixed above the floor).

Table 1. Comparison of time and cost spent on kitchen floor cleaning with conventional and FD methods

		Conventional method		FD method
Floor space:134.2m ²		Broom, neutral detergent, mop, disinfectant,...		A floor cleaner with dust collection function,...
Floor cleaning time	1 (day)		3	1
	1 (month)	hours	90 + 2*	30 + 0**
	6 (months)		547.5 + 12*	182.5 + 0**
	1 (year)		1,095 + 24*	365
labor cost [Average hourly wage 1,850 yen]	1 (day)		5,550	1,850
	1 (month)	yen	170,200	55,500
	6 (months)		1,035,075	337,625
	1 (year)		2,070,150	675,250
Detergent/ disinfectant fee	1 (day)		400	207
	1 (month)	yen	12,000	6,210
	6 (months)		73,000	37,778
	1 (year)		146,000	75,555
Tool/equipment cost	All equipment fee	yen	55,000 [3 years of useful life]	300,000 [5 years of useful life]
	1 (month)		1,500	5,000
	6 (months)	yen	9,000	30,000
	1 (year)		18,000	60,000
Total cost	1 (month)		183,700	66,710
	6 (months)	yen	1,117,075	405,403
	1 (year)		2,234,150	810,805

*Major cleaning once a month, **No monthly cleaning required

The cleaning work hours for 6 months are 559.5 hours for the conventional method (90 hours/month \times 6 months = 547.5 hours, plus 2 hours of disinfection cleaning once a month, 2 hours \times 6 months = 12 hours) and 182.5 hours for the FD method (30 hours/month \times 6 months, plus 0 hours of disinfection cleaning once a month).

Since the labor cost was the average wage according to the "Salary Contract Schedule" 1,850 yen/hour, it cost 1,035,075 yen for the conventional method and 337,625 yen for the FD method for 6 months. The cost of detergent and disinfectant was 73,000 yen (12,000 yen per month \times 6 months) with the conventional method; the FD method was 37,778 yen (6,210 yen per month \times 6 months). The cost of tools and equipment for the conventional method (broom, dustpan, mop, bucket, squeegee) was 9,000 yen (the total tool cost was 55,000 yen, the hospital sets the depreciation period at 3 years, 1,500 yen per month \times 6 months), but for the FD it was 30,000 yen (FD 300,000 yen, the depreciation period at 5 years, 5,000 yen per month \times 6 months). The total cost for six months was 1,117,075 yen for the conventional method and 405,403 yen for the FD method, with a difference of about 712,000 yen. The FD purchase cost was thus offset in about 2.4 months. In addition, the cleaning work time for 6 months was 559.5 hours for the conventional method and 182.5 hours for the FD method, with a difference of 377 hours.

DISCUSSION

Switching kitchen floor cleaning from the conventional method to the FD method has resulted in a reduction in the cleaning work time and improved cost efficiency.

This research is a "retrospective observational research" based on one-year records. Retrospective research can sometimes lead to ambiguous results, however, we believe that the present case is based on time, wage, expenses, etc. management records from the "hospital meal work diary" and "Salary Contract Schedule," which provide objective and accurate data. There are no daily variations because employees are working according to the rules. Therefore, numerical values are understood as being exact and directly comparable.

The cost of hospital kitchen cleaning is not a small burden for many hospitals. However, we could not find any papers about differences in the time and cost by changing the method as in this research. It is hoped that this paper will serve in the future as a good example of research on daily activities.

When kitchen employees changed the tools, they used to clean floors with traditional brooms, mops, and squeegees to a floor cleaner with dust collection function, The cleaning work time for 6 months was

559.5 hours with the conventional method and 182.5 hours with the FD method, for a difference of 377 hours. This means that the working hours needed for one employee have been reduced by 33%, and if one person works 8 hours a day, the working hours have decreased by 47 days in 6 months.

kitchen employees were able to save two hours of work per day. Since the wage of the kitchen employees responsible for cleaning work is an average wage of 1,850 yen per hour, it means that about 697,000 yen was saved in half a year and about 1.39 million yen in a year.

For the kitchen employees responsible for cleaning work, this not only reduced time, but it may have also reduced the physical and mental burden. If you assume that cleaning work takes 1 hour to process and that it takes 3 hours for 4 processes, everyone will choose the former. This is because the physical and mental burden would be reduced by one-third. With the aging of the working population in Japan (4), most of the employees responsible for cleaning kitchen floors are middle-aged and elderly. For them, cleaning floors daily is a whole-body job and takes a long time because it involves four processes. In addition, the monthly cleaning, sanitizing, and brushing work requires strength when handling the large automatic washer for commercial use (used not only in the kitchen but throughout the hospital) because it is large and heavy. For this reason, even if hospital kitchens recruit employees, the lack of applicants is a chronic problem. The reduction of mental and physical burdens by introducing FD will help solve the important issue of securing employees.

The reduction in mental and physical effort improves the quality of each task, and the time saved helps [the cooking staff, which in turn leads to the provision of improved meals. Hospital kitchen operations are part of the medical service industry. Whether or not shortening working hours has a direct meaning for a service should be considered on a case-by-case basis. For example, in the case of the manufacturing industry, shortening working hours means increasing production efficiency. In service industries such as cooking and cleaning, shortening working hours not only reduces costs but also improves employee satisfaction at work. We believe that this will lead to the provision of better meals with a high degree of patient satisfaction.

Teamwork is important in kitchen work. If everyone isn't working together with the same purpose, teamwork will be skewed. A kitchen operation that places a physical and emotional burden on only certain tasks is a source of frustration and stress for the employees who are responsible for them, leading to poor relationships and making it difficult for the team to have the same purpose. This will have the adverse effect of increasing the turnover rate. We believe that hospital dietitians must not only improve the quality of

meal service but also contribute to teamwork. To do so, they may have to overcome many difficulties. However, We believe that working diligently toward this goal will lead to the trust and respect of those around them and, as a result, enrich the dietitian's own life.

Regarding hygiene management, the FD can provide safer meals than the conventional once-a-month sterilization cleaning because the FD is always cleaned, sanitized, and brushed daily at the same time. At the hospital under research, mops were conventionally soaked in neutral detergent and wiped on the floor during daily cleaning. Even when neutral detergent with floor sanitizer was used, monthly sanitizing cleaning by the brushing function of a large commercial floor washer was still necessary.

Purchase of FD requires permission from the hospital because the price at the time of purchase is higher than equipment such as conventional brooms. To justify the purchase, it is necessary to demonstrate the benefits of buying FD. We believe this research will help explain the benefits of purchasing FD for many hospital dietitians.

While time and cost savings are important, we believe the most important factor is the motivation and physical and mental health of kitchen employees. Today, AI, robots are progressing at an accelerated pace worldwide. However, hospital meals are highly diverse, because of factors such as the specific disease, food type, presence or absence of allergies, preferences, and anorexia. No matter how much we consult with AI about the menu, it will only give me a notice and it will not work as a business. We believe that AI cannot handle the complexity and diversity of hospital meals or the kitchen work that is responsible for school lunches for the growth and health of children.

We believe that creating a kitchen system that motivates kitchen employees to "make delicious meals for patients," and that also takes care of their physical and mental well-being, will improve the quality of meals and increase the job satisfaction of the dietitians themselves.

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